

has approximately 1,400 railroad tunnels totaling more than 300 miles in length.

But tunnels for trains or trucks or cars are by no means the longest nor the most important. There are tunnels the world over for other purposes as vital to our society as transportation tunnels.

Beginning with the first civilization, man has had to construct tunnels to carry water to the populations. In New York State, for example, there are two tunnels sunk deeper than the height of the Empire State building and snaking 105 miles to relieve the thirst of the nation's largest city.

Chicago, Denver, Los Angeles and San Francisco are only a few of the cities in this

PHYSICS

Plasma Eater for Studies

► A "PLASMA EATER" is being used for studies essential to developing ways of controlling H-bomb reactions for peaceful purposes, the American Physical Society was told in Washington, D. C.

The plasma eater may also contribute to research programs on burning coal to make electricity from roaring plasma jets instead of spinning turbines, two scientists from Oak Ridge National Laboratory, Oak Ridge, Tenn., reported. The device could also help in the development of space ship power using plasma jets.

The device measures the rate of flow of a plasma, and consumes the plasma as it does so, hence its name. The plasma eater is simply a stack of spaced metal plates, resembling an open Venetian blind, placed across the plasma flow, Drs. I. Alexeff and R. V. Neidigh told the meeting.

A plasma, sometimes called the fourth state of matter, is a collection of neutral particles, charged particles and free electrons that as a whole is electrically neutral. Ordinary matter—water, rocks, potato peelings, etc.—becomes plasma when it is heated to temperatures of many thousands of degrees. Lightning bolts and fluorescent lights are common examples of plasmas.

Normally a plasma would merely flow between the plates of the "plasma eater." However, if alternate plates are connected to a sufficiently high voltage, the plasma is electrically pulled apart. The electrons are attracted to the positive plates, and the positively charged ions to the negatively charged plates, thus destroying both.

The reason for doing this is to find out about plasma flow. By measuring the electrons being collected, the amount of plasma entering the plasma eater each second can be found. When the plasma source is turned off, the plasma density can be calculated. Also, the time required for the plasma to flow into the plasma eater indicates the velocity of flow.

Such knowledge is essential to the development of controlled nuclear fusion in which a confined plasma duplicates the power source of the sun.

• Science News Letter, 81:283 May 5, 1962

Weight of Electron

► IF YOU KNEW your own weight as accurately as the weight of an electron has been measured, you would know your

country dependent on tunnels for water.

Sewage tunnels channel waste waters from most of the cities in the nation to be disposed in plants and rivers. Hydroelectric power is also produced in tunnels which are part of several large dams.

Sweden has pioneered in tunneling underground hangars for military planes and underground bases for ships to steam into as protection against atomic bombs. In Stockholm there is also a 1,000-foot-long tunnel garage for 600 cars which can be converted to a shelter for 6,000 persons in the event of war.

• Science News Letter, 81:282 May 5, 1962

Measure Speed of Light

weight within one-thirtieth of an ounce.

The weight of the electron is .910904 with 26 zeroes between the decimal point and the first nine. Dr. E. Richard Cohen of Atomics International, a division of North American Aviation, Inc., Canoga Park, Calif., said the electron's weight had been measured with an accuracy of approximately one part in 100,000. He reported his findings to the American Physical Society meeting in Washington, D. C.

• Science News Letter, 81:283 May 5, 1962

Measure Speed of Light

► DR. R. D. CUTKOSKY of the National Bureau of Standards told the meeting of the American Physical Society in Washington, D. C., that the speed of light would soon be measured again in darkness. Other measurements made so far, he said, indicate that the value now accepted for the speed of light is quite accurate.

This value is in close agreement with one computed from measuring the unit of resistance, the ohm. The value of the ohm has been determined both directly and indirectly and results of both methods agree, Dr. Cutkosky said. The National Bureau of Standards' unit of resistance is 1.0000023 ohms, with an estimated 50% error of two parts in a million.

• Science News Letter, 81:283 May 5, 1962

Cesium for Clocks

► IF THE MOTIONS of cesium atoms were used as the frequency element in a clock, the clock would be so uniform that it probably would not lose or gain more than one second in 16,000 years, when compared with another clock just like it. This was reported to the meeting of the American Physical Society in Washington, D. C., by Dr. R. C. Mockler of the National Bureau of Standards.

He noted that British Nobelist P. A. M. Dirac had suggested many years ago that perhaps gravity is weakening. The attraction between the sun and earth or between the earth and a satellite may decrease by a very tiny amount as time goes by. Dr. R. H. Dicke, Princeton University, has considered this possibility in some detail, and has suggested that this weakening of gravity could be measured.

• Science News Letter, 81:283 May 5, 1962

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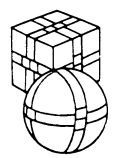
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