SCIENCE NEWS

THE DEEPEST MINES

Science Service

BRAZIL still contains the mine that goes the deepest below the surface of the earth, although the deepest below sea-level and the nearest therefore to the center of the earth is in the United States. So said Dr. Thomas T. Reed, of the United States Bureau of Mines, in a recent address before the New York section of the American Institute of Mining and Metallurgical Engineers. He has recently returned from a visit to the Brazilian mine.

The deepest hole in the earth is a gold mine in the state of Minas Geraes and is known as the Morro Velho or St. John del Rey mine. It is owned by the St. John del Rey Mining Company, an English corporation, which has been working it almost continuously since 1834.

The mine is now 6,726 feet below the surface at the top of the shaft through which it is entered. The next deepest mine is in the Kolar gold field of India, where one shaft descends to 6,140 feet. The Village Deep mine in South Africa goes to 6,100 feet. The deepest in the United States is Tamarack No. 5, a copper mine in the Lake Superior region, with a depth of 5,308 feet. The bottom of this shaft is 4,100 feet below the level of the sea, while that of the St. John del Rey is only 3,958 feet below sea-level, since the mouth of the shaft is in a mountain country 2,768 feet above sea-level. The Tamarack mine goes nearest to the center of the earth.

The temperature of the rock at the lowest level of the St. John del Rey mine is 117 degrees. The miners work in an air temperature of 98 degrees. The outside air has an average temperature of 68 degrees, but is cooled to 42 degrees before being forced to the lowest levels from which it is drawn to the surface by powerful fans. On its way to the lowest depths it gains heat from the rocks and from its own compression, because air at that great depth is considerably denser than air at sea-level.

The mine is a dry one, there being no water at the lower levels, and because of the low relative humidity of the air which has been dried before being forced into the mine, the men are able to work under satisfactory conditions. The average pay is about a dollar a day.

The St. John del Rey mine is not only the deepest mine in the world, but is organized by the oldest registered English mining company, organized in 1830 to work a mine at a place some distance from the present workings. This mine proved to be unprofitable, and in 1837 operations were transferred to the present site where they have since been carried on almost continuously.

The deepest hole in the bedrock foundation of the crust of the earth has been recently reported to have been drilled in South Africa. It is not the deepest from the surface, but the point is that its 5,300 feet of depth is all in the pre-Cambrian strata, the underlying rocks which were laid down and finished some hundred million or so years ago.

Scientists of the American Geophysical Union are much interested in the deep drilling, and it has been suggested that the secretary of the organization communicate with the proper authorities in South Africa so that the temperature of the boring at various depths might be ascertained.

Taking mother earth's temperature is one of the most difficult of tasks, although much attention has been given to it, and, while much is known of the temperature of her skin, about which men walk and in which they dig a little, just what her real bodily temperature is no one really knows accurately. The reported digging is the deepest into the real depths of the earth's crust, which in that part of South Africa are practically on the surface. They are free from volcanic activity or other changes which might affect their temperature locally, having come to stability millions of years before there was life on the earth's surface. Their temperature would, it is believed, be an important clue to the problem of the earth's internal heat.

THE ELIMINATION OF OFFICE NOISES

Science Service

AN oil-cloth ceiling, full of small holes, over a thick layer of felt, is the latest contribution of acoustical science to the elimination of office noises. As explained by Clifford M. Swan, consulting engineer, this special ceiling has reached that stage of perfection which will do away with annoying reverberation.

Tests in offices of banks, department stores and other large mercantile establishments have shown that the perforated ceiling greatly reduces office noises and substantially produces the effect of an office in the open air.

The most common source of acoustical trouble is reverberation. This is more true to-day than it used to be, owing to modern fire-proof construction, with its hard walls and plain surfaces. In the technical sense reverberation signifies the prolongation of a sound by its multiple reflection from surface to surface before its energy is sufficiently absorbed to become inaudible. Since the average sound must be reduced approximately to one millionth of its original intensity before it reaches the limit of audibility, and since such a sound once produced in a bare room loses but from two to four per cent. of its energy at each reflection, it is evident that such a sound must be reflected several hundred times before it becomes inaudible. Since this process consumes time, owing to the finite velocity of propagation, the sound is prolonged for a period of several seconds after the original source has ceased to emit energy.

It is this reverberation, particularly of high-pitched noises, that has been found to be most distracting and tiring to the worker. It is only by the unconscious expenditure of energy, indeed, that an office worker can get "accustomed" to noise. It is the function of acoustical engineering to do away with reverberation and with high-pitched noises.

The remedy now offered, with the perforated ceiling of oil-cloth and felt, is based on the researches of the late Professor Wallace C. Sabine, of Harvard University, who is recognized everywhere as a world authority on acoustics. The felt eliminates the reverberation by absorbing high-pitched sounds of short wave lengths. The perforated oil-cloth provides a covering for the felt which obviates the reflection which would take place from an unbroken painted cloth surface.

RADIO TROUBLES

Science Service

CAUSES of two of the principal difficulties in radio transmission, "fading" and "dead spots," are the subject of a thorough research now in progress at the United States Bureau of Standards.

Everything connected with radio-circuits, tubes, antennæ and other factors involved has been thoroughly studied except the radio waves themselves. The present investigation is intended to give greater knowledge of what happens in the transmission of these waves. The first phase to be studied has been that of the mysterious phenomenon known as "fading," or irregular variation of the signals the amateur hears at night.

A related problem, one of the pet worries of the arm-chair radio fan, is "Why is a dead spot?" More locally the question is, "What's the matter with Baltimore?" Owners of receiving sets in that city found themselves barely able, or more often unable to hear signals or concerts from Washington, 40 miles away, while stations at much greater distances were received clearly. Messages from Washington to Baltimore frequently have to be sent by way of Boston or New York.

Some of these things sounded rather doubtful to the scientists when the amateurs began to complain of them, but further investigation showed the problem to be a real one and to exist everywhere. It is believed to be intimately associated with the general problem of atmospherics, and variations of signal intensity by day and by night, and to lead to the discovery of some of the peculiarities of the ways in which radio waves are transmitted.

All these phenomena are related, says Dr. J. H. Dellinger, of the Bureau of Standards, to properties of the little known "Heaviside" surface, the boundary of the outer conducting portions of the atmosphere, which surrounds the earth at a height of from 50 to 100 miles. When this is in good working order, transmission is good; when it gets ruffled or disturbed the reverse is the case.

What causes the disturbances in this layer is still unknown, as is the cause of "dead spots," but it is known that "atmospherics" which are thought to be due to its disturbances have certain centers of action from which they proceed to cause varying degrees of mental and aural anguish to radio fans. One of these centers is over the state of Texas, another is in California.

A scientific paper on the investigation of the fading of signals and other radio-wave eccentricities is soon to be issued by the Bureau of Standards. These researches are still under way and promise future results of great importance, for if the cause of these trials of the great army of "listeners in" can be determined a big step toward a remedy will have been taken.

ECLIPSE EXPEDITION OF THE LEANDER McCORMICK OBSERVATORY

Science Service

AN expedition, led by Dr. S. A. Mitchell, director of the Leander McCormick Observatory of the University of Virginia, will observe the total eclipse of the sun on September 10, probably from the Catalina Islands off the coast of Southern California.

Dr. Mitchell has made a specialty of observing the spectrum of the sun during total eclipses. As long as a small portion only of the sun is visible, its light is so powerful that the ordinary solar spectrum of dark lines on a bright background is always found. But at the instant of totality everything is changed. The dazzling disk of the sun is covered up, and the sun's atmosphere of heated gases is then permitted to give its spectrum without interference from the more brilliant light of the solar surface. The spectrum of the heated solar gases, the so-called "chromosphere," consists of a series of bright lines on a dark background. The change from the dark-line or Fraunhofer spectrum to the bright-line spectrum of the chromosphere takes place at the instant of the beginning of totality. The change is an abrupt one and the bright lines are seen to flash out so suddenly that the spectrum has been called the "flash spectrum."

Since its discovery by Young, of Princeton, in 1870, observation of the flash spectrum has found a very important place at each total eclipse of the sun. At first the observations were made visually, but greater and greater success has been obtained by the use of photography. The flash spectrum was first successfully photographed as recently as the eclipse of 1896.

There are many problems that can be studied only under the conditions of an eclipse. Such observations with the spectroscope furnish the constitution of the solar atmosphere and the height in miles to which each gaseous layer extends above the surface of the sun. It is safe to say that these researches have given more information regarding the gases in the sun's atmosphere than is known of the earth's atmosphere from the work of all the weather bureaus all over the world, and this in spite of the fact that we live and move and have our being in the earth's atmosphere while the atmosphere of the sun is ninety-three millions of miles away.

This will be the fifth total eclipse which Dr. Mitchell will have witnessed, yet the total time for observation which has been available from the preceding four is only ten minutes. The spectroscope used in the coming eclipse will consist of a powerful Rowland grating ruled on a concave surface and used without a slit.

THE DETECTION OF CARBON MONOXIDE POISONING

Bureau of Mines

THROUGH investigations conducted by government technologists' methods of detecting carbon monoxide, most insidious and deadly of poisonous gases, have been greatly simplified. Secretary of the Interior Work has made a public announcement to this effect and through a letter informed 700 industrial physicians and surgeons throughout the country of this new discovery.

For some time the Bureau of Mines of the Interior Department has been conducting research work with the result that means have been found by which it is possible to discover within three minutes the extent that a person has been affected by carbon monoxide gas through the extent of poison saturation in the blood. Formerly it took approximately from 24 to 48 hours before diagnosis could be made of such cases either in hospitals or well-equipped laboratories with the services of a skilled organic chemist. The test is effected through a simple and inexpensive instrument which may be carried in the pocket and which requires no special training for its operation.

Many human lives are expected to be saved by the general adoption of this mode of finding gas poisoning, particularly in the mining industry, as well as other fields where dreaded gases are a menace. With this quick method of diagnosing it is possible to promptly institute the proper emergency treatment.

Carbon monoxide is the universal industrial poison gas and manifests itself at mine explosions and fires, combustion of explosives in the atmosphere around coke ovens, coal gas, water gas and producer-gas plants, as well as in the exhaust gases of automobile engines, improperly constructed and operated kitchen gas ranges, and in smoke from burning buildings.

Because of possible exposure of citizens in all walks of life sooner or later to its deadly influence the new instrument for detecting it in the blood is expected to be in universal use among the physicians within the near future. Symptoms of carbon monoxide poisoning consist of headache, dizziness, weakness in the legs, increased respiration at first which becomes irregular and depressed, finally resulting in collapse, unconsciousness and possibly death.

With the letter sent to the 700 industrial physicians of the country was a report of the investigations of the department's Bureau of Mines giving detailed information of the dangers of carbon monoxide poisoning and describing the latest discovery for detecting it.

PHYSIOLOGICAL EFFECTS OF HIGH TEMPERATURES

Science Service

VENTILATION is of little use in reducing discomfort from high temperatures in humid air, after the temperature has risen to approximate-

ly that of the human body, according to a report of recent experiments made by the United States Bureau of Mines on the physiological effect of high temperatures with and without air movement. In temperatures up to 95 degrees the movement of air caused much relief. At 100 degrees the symptoms were fully as severe with moving air as with still.

The experiments were carried out by Dr. R. R. Sayers, chief surgeon of the Bureau of Mines, and D. Harrington, supervising mining engineer. The subjects were experienced mine laborers. The work was carried on in deep and hot metal mines.

The principal effects of exposure to hot, humid and stagnant air were a rise in the body temperature of two or three degrees, a fall in the blood pressure, perspiration so profuse that the subjects' shoes were partly filled with sweat, and sensations of giddiness and weakness. These symptoms were all very pronounced at 95 degrees in stagnant air. If the air were in moderate motion, little discomfort was felt.

This was not the case, however, at temperatures of 98 degrees and more. Symptoms in still air, which were more trying than at the lower temperatures, were not much relieved by a current of air, while at 100 degrees they were so unbearable that even when the air was moving the subjects were not able to stand a full hour's exposure to the conditions.

More recently a more thorough study of the effect of high temperature has been made possible through the use of a specially designed room where any desired conditions of temperature, humidity and air movement which are likely to be met may be maintained.

From this a system of "comfort lines" is being worked out, a graphical representation of the combinations of temperature and moisture at which equal comfort is experienced. It has been shown that while humidity has a marked influence the temperature taken by the ordinary dry-bulb thermometer is of great importance. The discomfort experienced is shown to be due more to the increase in the pulse rate than to any other cause.

ITEMS

Science Service

DEVELOPMENT of hydroelectric power in South America, and especially in Brazil, is progressing on a large scale, according to reports received by the Pan-American Union. No great deposits of coal or oil are yet available and the countries of the southern continent are turning to their abundant water power to motivate their growing industries. Plans are now under way for the electrification of the railroad from Rio Janeiro to São Paulo, the principal city of southern Brazil, and the seat of some of its most important manufactures. The distance to be electrified amounts to about 400 miles. In the state of São Paulo, of which the city of that name is the capital, there were manufactured last year 7,000,000 pairs of shoes and 3,500,000 hats by machinery run by electric power. American machinery is used. Another development is the electrification of the railroad from Valparaiso to Santiago, Chile. All these projects depend upon water power, which is being used more and more, as in much of South America it is convenient to the places where it is to be applied.

INCUBATOR chicks have long been known; incubator cheese is the latest product of inventive ability in Wisconsin's cheese industry. The cheese incubator is the idea of J. D. Sammis, of the dairy staff of the Wisconsin College of Agriculture. The ordinary egg incubator is now used to detect milk unsuitable for cheese making. The incubator method can be applied to any one of the several curd tests now in use in cheese factories. In every one of these tests, the milk samples should be kept at a temperature of about 100 degrees Fahrenheit to give the best results. A modified egg incubator is now on the market for the new method. Instead of the egg trays, it is equipped with racks and glass tubes to hold the milk samples. Before the introduction of this latest method in the cheese industry, it was a common practice for cheese makers to hang their samples on the boiler room wall, which resulted in uneven temperatures and poor tests.

To locate a suitable place for observing the total solar eclipse on September 10, a party of six scientists, headed by Dr. A. E. Douglass, of the University of Arizona observatory, and Dr. D. T. MacDougal, general secretary of the American Association for the Advancement of Science, drove from Tucson to Port Libertad, 238 miles southwest, on the Gulf of Mexico, passing through some of the most arid country in North America. Data to be used in locating the observing station within the zone of totality were obtained.

ALLOWANCE must be made for a wind of about seven miles an hour from the west at the average altitude used in the transcontinental rail service flights of the U. S. Post Office Department aviators.

THE Welch bacillus, a tiny plant found in infected wounds, is also thought to be the active agent of a "starter" used in the manufacture of salt-rising bread.