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ADVANCES IN ELECTRICAL AND CIVIL ENGINEERING

A PEEK into the future of long-distance telephonic communication was given at the recent meeting of the American Institute of Electrical Engineers. Developments in the use of existing telephone wires as guide paths for carrier waves has made it possible to have twelve messages going over the same wire without interference. Two engineers from the Bell Laboratories, C. W. and E. I. Green, discussed new details of the carrier system for toll cables. The new advances are the culmination of a long-range program of applying high frequency waves to wires. Early developments utilized special wires, but the new work has succeeded in using existing cables, both aerial and underground. "Plans already under way call for the application of large numbers of these systems to meet the rapid growth in long-distance traffic. There is every indication that, taken collectively, these broad band systems will have far-reaching effects upon the toll telephone plant of the Bell System. A transition is already under way from the time when carrier (waves) was used only on open wire, and comprising only a small part of the toll plant, to a time when carrier systems will furnish a major part of the toll circuit mileage of the Bell System."

THE ultimate solution of the controversial question of the costs of electrical power will come only after all hysteria has been removed from the discussion, is the opinion of John C. Page, Commissioner of Reclamation, at the symposium of the subject recently sponsored by the American Society of Civil Engineers. Thus was set the keynote of the conference in which the engineers sought to appraise the social and economic consequences of the things which their technical ingenuity has wrought. "Thought on the subject of power," said Mr. Page, "ranges from that of the evangelist who believes power should be as free as the air, to that of the tycoon who views power as the silver spoon meant for the mouths of those born to the economic purple. The engineer, as a professional man, has spent much of his time with the formulae of the power industry, but has devoted too little of his thought to the implications, social or otherwise, of what he has wrought." Mr. Page called on engineers to forget their prejudices and give the problem the same impartial study which they show in their design and building. Public agencies have demonstrated their ability to manufacture and distribute power efficiently in many localities. Likewise, he added, private enterprise has demonstrated the same fact in other places. This means that there is nothing inherently bad in either public or private ownership of electrical utilities, which an unprejudiced study can not overcome.

NEW YORK CITY is preparing now to solve the gigantic traffic problems of the 1939 World's Fair at which 40,000,000 to 50,000,000 visitors are expected. Daily attendance will average 250,000 persons, according to the report of Colonel John F. Hogan, chief engineer of the Fair, at the meeting of the American Society of Civil Engineers. On many days 600,000 will attend and on the maximum day there should be approximately 800,000 visitors. Over 160,000 people an hour can be handled by the terminal facilities now being created. Of these, 115,000 will come by rapid transit—train, subway or trolley—and 45,000 by motor vehicle. Half of the Fair's 1,200 acres will consist of the world's largest parking lots. On peak days 21,000 automobiles can be parked simultaneously and 35,000 handled during a single day. Within the fair grounds three types of transportation will be available: 1. Buses seating 60 people will cover over four and a half miles of route. 2. Over streets not served by this first system there will be trains of 4 or 5 cars seating 10 people each. 3. Individual service for two or three people in independent vehicles driven by trained guides.

MECHANICAL and electrical ingenuity are tackling that most baffling of all accounting systems—the modern department store with its thousands upon thousands of daily transactions. At the meetings of the American Institute of Electrical Engineers in New York, Professor L. F. Woodruff, of the Massachusetts Institute of Technology, described a system of electric remote-control accounting which takes only five seconds of a customer's time and yet which sets into operation robot mechanisms that give a store a constant check on the merchandise it sells. The time-consuming process of making out sales slips is completely done away with. The new system is an extension to a new and difficult field of the well-known punch card system of accounting which has been used for some years. By punching holes in coded positions on cards it is possible to record thousands and millions of separate data. Large corporations, the U. S. Census Bureau and other agencies handling millions of individual units find the punch-card method extremely valuable. Literally billions of these cards are used yearly in the nation. Their advantage lies in the fact that by feeding them through automatic machines one can—in the case of the census—adjust the machine so that all persons whose names begins with W–A–L, who are married, have two children, have a job and who were born on June 12, 1907, can quickly be sorted out from the millions of individual cards for each person in the nation. Such sorting machines can handle 400 cards a minute and other machines which tabulate results can operate at speeds of 150 cards a minute. Such is a typical prior use of these cards and their accessory machines. The new adaptation operates such a system by remote control, electrically. It makes possible practically an instantaneous and continuous recording of sales of all varieties.

A SEPARATE and new branch of the government, a Federal Department of Public Works, was urged by speakers

addressing the opening sessions of the American Society of Civil Engineers. In normal prosperity years construction is the second largest industry in the nation. From 1926 to 1933 the yearly average expenditure for construction was $9,000,000,000, and directly or indirectly employed five million men. As the bottom dropped out of private construction, the Federal Government, through WPA and many other agencies, stepped into the breach and gradually assumed a larger and larger place in the nation's construction industry. The function of a Department of Public Works, said Alonzo J. Hammond, Chicago consulting engineer and a past president of the society, would be to coordinate and effect economies in the ramified building of the government which is now scattered through many departments. Surveys made in the past estimate that $50,000,000 might be saved for every billion dollars spent for public works by a unified and coordinating control. Virtually every type of building by the government, except the military works of the War Department, would be in the province of the proposed department. In 1924, representatives of 60 separate engineering organizations met in Washington and recommended such a department. Herbert Hoover, then Secretary of Commerce, urged the formation of the department not only because it affected saving in planning and operation costs, but also because its value "would be more in leadership for the great balance wheel of construction which lay in government construction work."

THE RADIOACTIVE DISINTEGRATION OF POTASSIUM

NATURE "changed the rules of the game" of radioactivity ten billion years ago, probably long before the earth was formed. It was then that potassium, an element essential to life, began disintegrating radioactively, Dr. A. K. Brewer, chemist of the U. S. Department of Agriculture, has determined. Measuring the rate of breakdown of potassium into a kind of calcium, a component of limestone, then determining the time that this breakdown has been going on from the amount of this calcium now existing, Dr. Brewer finds that the process has been going on for about ten billion years. In reaching this figure, he assumes that all this special calcium, which has an atomic weight of 40 instead of 40.08 as does ordinary calcium, was derived from the breakdown of potassium, and that the breakdown rate has been uniform since it started. A similar time has elapsed since a variety of rubidium, a rare earth, started to break down into a kind of strontium, another rare earth.

Attempts to determine our planet's age by studying the end products of radioactive breakdown, such as calcium derived from the decay of potassium, may be as futile as trying to find out how old a stove is by weighing the ashes. What the method will show, Dr. Brewer believes, is how long the disintegration has been going on, or more simply, how long the fire has been burning. Dr. Brewer's new studies in no way affect the ages determined for a number of rocks by radioactive methods. The amount of uranium, another radioactive element, in rocks is measured and then compared with the lead which it has added to the rock by uranium's previous decay. The oldest rocks, dated by this method, are about one billion, five hundred million years old.

With earth age estimated from a number of sources at not more than 2,500,000,000 years, some of the breakdown of potassium must have occurred before earth was formed. Under present theories, the breakdown began on the sun, seven or eight billion years before the little star was torn apart to create the solar system. How matter behaved under the old rules, in force until ten billion or so years ago, before the formation of the solar system, Dr. Brewer will not state. His studies give no clue to older, now-nonexistent states of matter. Studies of the ages of rocks, using radioactive potassium as the "clock," indicate to Dr. Brewer that their age can not exceed six billion years, and probably they are very much younger. Disintegration long ago of other elements, now completely broken down, may make this age entirely too large. More work on radioactivity, leading to a more exact, and probably smaller value for rock age, is suggested by Dr. Brewer.

WILDLIFE PRODUCTION ON PRIVATE LANDS

WILDLIFE must be produced on privately-owned farm land as well as on lands publicly owned if America's bird and game resources are to be perpetuated, Dr. Ira N. Gabrielson, chief of the U. S. Biological Survey, states in his annual report to the Secretary of Agriculture, made public recently.

Publicly owned lands, despite the fact that large additions have been made during recent years, are not sufficient to perpetuate species of wildlife.

Dr. Gabrielson's report, which covers the year ended June 30, notes that 600,000 acres of refuge land were purchased during the fiscal year covered in the report, while more than half a million acres were held pending title conveyance. Almost a million acres were added by executive order.

Tons of duck-food plants and millions of food-bearing trees and shrubs have been placed in refuge areas to make the area attractive to wildlife, the survey director continues in explaining the wildlife rehabilitation work, which has been one of the survey's chief activities during the past few years. Despite the wide program being carried out, however, a study of wildlife management as a farm enterprise indicates that state and federal lands alone can not supply sufficient wildlife or adequate facilities for its use and enjoyment by the public.

The necessity for severe restrictions on hunting has not passed. Benefits of strict regulation are shown in the fact that some waterfowl increases have now been noted for two consecutive years. On June 30 there were 216 federal refuges in the United States with an acreage exceeding 7,000,000 and 15 refuges in Alaska, Hawaii and Puerto Rico raised the total above 11,500,000. Acquisitions during the last year included areas for 70 refuges in 32 states and Alaska. Wildlife populations of the refuges have already increased threefold. Planting and transplanting, building water-conserving structures and other activities by the Civilian Conservation Corps and Works Progress Administration have aided the program.

Since July 1, 1933, when the present program began, the survey has purchased 1,500,000 acres of refuge lands. In the same period more than 4,000,000 acres have been acquired by executive order. Increase of wildlife depends, providing hunting is regulated, on the amount of land available for wildlife. It is for that reason that the use of private lands for wildlife production is urged.

ITEMS

LIKE a giant toadstool, with a copper top and an insulating-tubing stem, a baby atom-smasher, designed to work at only 450,000 volts, less than one tenth the power of the larger models, has been demonstrated by Dr. Phillips Thomas, research engineer of the Westinghouse Company. Charges of electricity, carried up to the copper top by a moving belt, just as a water tank is filled by a bucket-type chain conveyor, slowly load the insulated metal electrode, until the charge is enough to force sparks out into the air. In the larger atom-smashers, the charges are used to push sub-atomic particles through a long vacuum tube and into atoms at the other end, disrupting them, and giving clues to the construction of matter. Another device demonstrated by Dr. Thomas is called the Precipitron. It "electrocutes" dust by charging it with electricity and then attracting the charged particles to a metal plate. Smoke particles blown past a charged wire took up an electric charge and stuck to metal plates oppositely charged as though glued. Already in experimental operation in several cities, the Precipitron is designed to remove more than 99 per cent. of dust, smoke and bacteria from the air it treats.

SPONGY iron that is soft and malleable like lead and employable for some of the same purposes has been developed in Berlin by a physicist, Dr. Hans Vogt, after many years of effort. The material has the further advantages that it is much lighter, lower in price, and can be produced from native ores instead of being expensively imported from abroad. One of the common uses of lead is for packing around iron plumbing; it is hammered into joints between the pipes. The new spongy iron is very well adapted for this use. This "kneadable" iron is made by sintering powdered iron at a temperature of from 1,200 to 1,300 degrees Centigrade, in an atmosphere of hydrogen to prevent the formation of oxides. The product is full of tiny cavities, to which it owes its plastic properties.

A PATENT has been granted by the U. S. Patent Office on an electric light which, its inventor claims, will not blacken during its lifetime of use. A built-in screen to prevent vaporized metal from the filament from reaching the inner glass surface of the bulb features the invention, patented by Richard E. Smith, of East Cleveland, Ohio, and assigned by him to the General Electric Company. Blackening of the bulb surface, which cuts down on the amount of light given out by the bulb, is considerable, particularly in the gas-filled type in general use. The surface becomes blackened through the fact that molecules of the metal filament, heated to incandescence by the electric current, are carried by convection currents in the gas until they are deposited on the relatively cold glass surface.

A NEW remote control device for radio receivers which can turn on or off a set, raise or lower the volume and select any of six stations was demonstrated at the New York meeting of the Institute of Radio Engineers. The significant point is that this robot control involves the use of no bulky wires lying on the floor as are now needed for apparatus with equivalent ability. Engineers S. W. Seeley, H. B. Deal and C. N. Kimball, of RCA License Laboratory, New York City, demonstrated the new equipment. The robot control device is essentially a tiny radio oscillator generating a radio wave longer than those used for ordinary broadcasting. The long waves are impressed on the 60-cycle alternating current power line operating the radio receiver and thus reach the set. There they activate suitable relay mechanisms which can do different jobs. By using three frequencies between 200 and 400 kilocycles and two phase relations it is possible to have the robot control do 26 different things. Impressing radio signals on a wire already carrying current is the basis of the so-called "wired radio" which has proved experimentally successful but never put into commercial broadcasting. It is the basis, too, of the enormous message-carrying capacity of the new coaxial cables to be used in television.

JACKRABBITS, prairie dogs, gophers and kangaroo rats which destroy forage intended for livestock which roam the 142,000,000 acres set aside for conservation purposes have been almost entirely eliminated from many tracts in the grassland area, according to Director F. R. Carpenter, of the Division of Grazing, U. S. Department of Agriculture. Extermination work on more than 5,500,000 acres of public domain in nine western states has reached the point where the depredations of the pests no longer constitute a major menace to the well-being of the animals feeding off the pastures, it was stated. Members of the Civilian Conservation Corps, who have cooperated in carrying out the rodent-exterminating program, and the Division of Grazing will need to make only minor clean-ups during the coming year to keep those sections of the range free of rodents. Studies, indicating the economic value of the campaign, show that 80 kangaroo rats or gophers will eat more forage than a 750-pound cow or three sheep. During one invasion of grassland areas in Arizona 80 per cent. of the blue grass crop was destroyed.

ILLITE, a mica-like mineral, resembling ordinary mica, but occurring in sedimentary rocks, is announced as a new mineral by Drs. R. E. Grim, R. H. Bray and W. F. Bradley, of the Illinois Geological Survey, reporting in *The American Mineralogist*. Long mistaken for other minerals which it resembles, illite has been called mica, sericite, hydro-mica and glimmerton. Now, as a result of an exhaustive study, in which an x-ray determination of the crystalline structure was made, illite is found to be a new mineral. Illite is a common constituent of many shales, silts and sandstones. Its discovery may lead to a better understanding of the causes of the formation of mica in old sediments after they have been heated and compressed.