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THE CAUSES OF SPONTANEOUS COMBUSTION

A CONFERENCE to discuss the facts, clues and unknown quantities in the case regarding spontaneous combustion has been called by the National Fire Protection Association in cooperation with the U. S. Departments of Agriculture and Commerce, in Washington on November 14 and 15.

When fire gets an insidious start in a dry, well-managed place where no human being has been wandering about with matches or other fire-making materials, the usual explanation is spontaneous heating and ignition, said David J. Price, chief of the division of chemical engineering at the Department of Agriculture, in outlining the situation faced by the conference. But the usual explanation, he continued, is almost as unsatisfactory as writing down a mystery on a police blotter under the heading "unsolved," for the process which sets up spontaneous heating and ignition is still unknown.

The undetected process manages to start $20,000,000 worth of fires each year, according to insurance figures, and there is $200,000,000 more lost in fires vaguely attributed to causes unknown.

The conference is not to be limited to a few experts, Mr. Price emphasized. All who can shed light on the case or who are interested in the problem in any way are invited. The meeting will attract representatives of the railroads, marine transportation lines, manufacturing industries, the sugar industry, feed and cereal manufacturers, producers of hemp and other combustible fibers and of animal and vegetable oils, the paint and varnish industry, the fertilizer industry and insurance companies.

The problem is to discover the law of nature under which the destructive process operates and then to prevent the circumstances which make the process possible. A prominent government chemist, Dr. Charles A. Browne, holds the theory that the process is both bacterial and chemical.

Describing conditions in a haystack which catches fire, he points out that first of all bacterial action causes fermentation. This heats the hay, but not enough to cause ignition, for at 150 degrees Fahrenheit the bacterial process is mostly destroyed by heat, and 600 degrees would be necessary for ignition. His theory is that a chemical process enters the situation. The bacteria produce gases, and as the haystack is heating, the gases press out from the centers of chemical activity and form channels in the hay. When a channel reaches the surface of the stack, air rushes in suddenly, and the hot, unsaturated products are oxidized and the temperature rises to such a point that fire is readily produced.

It is hoped that the conference will start action toward an organized study of the causes and conditions that produce these presumably preventable fires, Mr. Price stated.

DETERMINATION OF THE HEIGHT OF AIRPLANES

DIFFICULTIES in the construction of apparatus for telling the height of a moving airplane were described by Lieutenant Leo P. Delsasso, U. S. Naval Reserve, physicist in the University of California at Los Angeles.

The maintenance of regular schedules by commercial fleets now requires flying in all kinds of thick weather. The ground may be out of sight, but the pilot must know his clearance. The barometer, time-honored altitude gauge, falls short of satisfaction on at least two counts. In the first place, it measures altitude from sea-level, not from the ground, and thus gives scant information in mountainous country. Furthermore, natural air-pressure conditions may change during a single flight so much that the barometer dial setting is thrown off as much as 500 feet, or in exceptional cases 1,000 feet or more.

The sound-resonance method of altitude detection, developed in the Navy some years ago by Lieutenant Delsasso and others, is regarded as the best prospect. When used in ordinary navigation, the depth of the sea-bottom is readily measured from a vessel.

If a loud, sharp sound be emitted downward from a flying airship, its return echo may easily be received and timed with proper chronometric apparatus. From the known speed of sound in air one may calculate the distance to earth. This scheme works fairly well with a lengthy craft such as the *Graf Zeppelin,* where the delicate sound receiver can be mounted far from the noise of motors. With the airplane, however, the noise of operation is so great that the pilot finds it almost impossible to analyze the echo returning from the earth. He is unable to tell which returning sound is the tell-tale signal.

Research in progress in Lieutenant Delsasso's laboratory indicates that a sound filter will solve the difficulty. A very sharp sound—preferably one generated by a whistle—is chosen to give one simple frequency of vibration, but in great amplitude or intensity. Such a selected sound is sent downward from the plane, and its echo received in apparatus adjusted to receive the least possible direct sounds from the nearby motors.

In the receiving apparatus the desired sound is built up by a suitable resonator which does not respond to the miscellaneous motor noises. The extraneous sounds may then be damped considerably without loss of the specific sound which is desired.

The use of such a sound filter and detector would have prevented a disaster like that suffered some time ago near Beaumont, California. In this accident the pilot, headed for the Colorado desert, was flying blind in a fog. He missed the San Gorgonio Pass and collided directly with the mountain barrier at one side. With proper sounding equipment he could have measured his distance to the ground below, or to possible obstructions on either side,

according to the direction in which he might set his instrument.

THE PREVALENCE OF ILLNESS

ON an average, each person in the country has at least one disabling illness every year, the Committee on the Cost of Medical Care has reported after a survey of various sickness reports compiled by the U. S. Public Health Service and other organizations.

Men have a disabling sickness about once a year, women about twice and children over twice during the school year. Colds, bronchitis, grippe, influenza and pneumonia are oftenest the cause of these disabling illnesses and cause the longest disability. On the same basis of the number of cases and total time lost digestive disorders and diseases also take a high place.

About 130,000,000 cases of disabling illness occur in the United States each year. Adding non-disabling illnesses more than doubles the figure, the committee reported. The 36,000,000 wage earners in the country lose at least 250,000,000 work days per year, and the 24,000,000 school children lose 170,000,000 school days per year. These figures account for only one half of the total population.

"Authorities have stated that there are at all times approximately 700,000 persons with tuberculosis, 10,000 with pernicious anemia and 110,000 addicted to narcotic drugs," the report said. "In any one year there are in the United States over one million cases of malaria. Syphilis and gonorrhea at any one time appear to be causing nearly one person per 100 to place himself under the care of a physician. Over 36,000 cases of smallpox were reported in a recent year. While childbearing is not a disease, it does cause a large amount of disability. In 1928 there were nearly 2,000,000 births in the registration area, many of them followed by complications and a considerable number (a larger proportion than in most civilized countries) by death.

"Hospitals for mental and nervous diseases contain over 350,000 patients, and this figure is far below what the total would be if those not hospitalized were included. Of the children now attending school and college, 'over 960,000 will enter a hospital for mental disease at some period in their lives if present rates for first admissions continue.' These figures include only the more serious mental diseases and take no account of the large numbers with lesser mental disturbances.

"Hospitals other than those for nervous and mental diseases contain, on the average, over 350,000 patients at all times. The total in all hospitals on a single day is about 700,000."

THE DISTRIBUTION OF PHYSICIANS

AN enormous army of practitioners and assistants exists in this country for the purpose of caring for the sick people and preventing illness among the well. The actual and estimated figures, showing that more than one out of every hundred in the population are engaged in such activities, have just been compiled by the Committee on the Cost of Medical Care.

"There are in the United States more physicians per 100,000 people than in any other country in the world," the committee reported as a result of one of its surveys which showed that there are 143,000 physicians in the country.

About 1,500,000 people, enough to make a city bigger than Detroit, are employed in connection with the care and prevention of illness, the committee estimated. This figure includes physicians and their attendants, dentists with their assistants and technicians, trained and practical nurses, midwives, physiotherapists, hospital superintendents and personnel, pharmacists and drug clerks, opticians, health department and clinical laboratory personnel, chiropodists, masseurs and all the "healers," such as Christian Science practitioners, osteopaths and others.

Of these, the 550,000 workers in hospitals, exclusive of nurses, physicians and superintendents, make up the biggest group. The next largest is the group of practical and trained nurses, totaling 351,996, and the third largest comprises the 143,000 physicians.

Uneven distribution of physicians exists throughout the country, which, more than the total number, affects the sufficiency.

"In 1927 South Carolina and Montana had only 71 physicians per 100,000 people; California, at the other extreme, had 200," the report says. "Various state surveys show clearly that the larger cities are over-supplied with doctors relative to population, whereas the smaller towns and rural districts are relatively under-supplied. Comparatively few recent graduates of medical schools are located in the small communities; the proportion settling in the larger cities is becoming progressively larger."

THE MOOSE IN SWEDEN

THE moose, usually called "elk" in Europe, is rapidly increasing in Sweden, under the protection of strict game laws. This year's brief open season of four days has just drawn to a close, and preliminary reports indicate that approximately 3,500 animals were killed, as compared with 3,700 in 1928.

This protective legislation has, however, not proved wholly popular with farmers and foresters in certain parts of Sweden, because the moose is causing some damage to the crops and the young trees. Moreover, the moose, which was formerly a shy and elusive animal, has recently become extremely bold and in some cases ferocious. They are not easy to drive away from fields and gardens and in some instances they have attacked the farmers who tried to protect their crops.

The influence of civilization has also been harmful to them, as in the case of "Jeppe," a young moose that became so domesticated that it lived for years around a little village in northern Sweden. It went from house to house begging food, like a dog, and when it at last was turned back to the forest to join its wild brethren, it was unable to cope with the life in the open and was discovered shortly afterwards dead from starvation.

That even the monarch of the Swedish forests can at times bring forth abnormal specimens is shown by the

fact that a hermaphrodite moose was killed this year in Vaester Faernebo in the province of Vestmanland. It had the shovel-shaped horns of a bull, but other characteristics were those of a female animal. Last year another strange moose, a pure albino with pink eyes, was killed in Sweden, the first in more than twenty-five years. It was later mounted and is now exhibited at the Museum of Natural History in Stockholm.

PREHISTORIC MEN IN CZECHOSLOVAKIA

RELICS of men who inhabited Czechoslovakia between 3000 B. C. and 300 A. D. have been unearthed by a joint expedition from the University of Pennsylvania Museum and the Peabody Museum of Harvard.

In the course of less than a month's preliminary search, nineteen archeological sites were uncovered, the director of the expedition, Vladimir J. Fewkes, reports. His first official statement says: "Results obtained justify a belief that many of the most important problems relating to the antiquity of mankind may be more closely approached, and possibly solved, by extensive excavations in Czechoslovakia."

The preliminary expedition worked only in the province of Bohemia. Three of the sites containing traces of early inhabitants were dated as being of the Eneolithic, of Copper Age, to 2100 B. C. and 1800 B. C., a period just before the discovery of bronze. Three graves of these people were found, and also part of a settlement where the earth still holds quantities of their pottery, bone awls and chisels, stone knives, clay spindle whorls and loom weights used in making textiles.

"A huge house pit with two fireplaces and an unusual ash pit with stone slabs for heating and pebbles for cooking also were found," Mr. Fewkes states. "These latter discoveries are of an unusual character and it is believed that a careful analysis of them will add considerable to our knowledge of the Eneolithic Age."

Eight graves of the Bronze Age, encased in limestone slabs and containing highly contracted skeletons and bronze and pottery objects, were among the expedition's discoveries. At these sites, too, were twenty-two urn burials containing cremated remains and accompanied by scores of pottery vessels and metal objects.

Remains of a settlement of the early Iron Age dating between 800 and 500 B. C. revealed several house pits and the impressions and decayed parts of some of the wooden posts that originally supported the house construction.

An urn burial from the Roman period, about the third century A. D., is pronounced representative of the true "Barbaric" or "Teutonic" culture.

The material found is to be divided between the two museums which conducted the expedition.

ITEMS

A SMALL reptile, less than a foot in length, has been found embedded in a block of soft, cannel coal, in an abandoned mine near the Ohio River near the town of Linton or Yellow Creek, long since deserted. This discovery is of such interest to geologists, especially since numerous fossil fishes and amphibians were associated in the coal with the reptile, that Western Reserve University has excavated further. Examination of many tons of coal, however, has revealed no new reptiles. Geologists regard this as unfortunate since the first skeleton lacked the head, a part which is of the greatest interest on account of the arrangement of the bones. A similar reptile of the same age has been found in France, but it likewise lacks the head. The animals were apparently adapted to swamp dwelling, the broad hind feet serving as effective paddles in the lagoons.

THE spawning grounds of the common sardine in America, long sought by fisheries men, have been discovered recently by E. C. Scofield, scientific assistant in the California State Bureau of Commercial Fisheries. Fishermen have long noted that sardines would disappear just before they were ready for spawning but could never locate their spawning grounds. Mr. Scofield made a long search, covering the entire coast of California from San Diego to Eureka, and finally found schools of sardines spawning and large numbers of their eggs and larvae five miles off Point Vincent in the southern part of California. Mr. Scofield's discovery is important from a scientific standpoint and will also be of practical benefit to the sardine canning industry. His search was sponsored by the hydrobiological survey, which is a cooperative investigation with the Hopkins Marine Laboratory of Stanford University and the State Bureau of Commercial Fisheries.

NEARLY one hundred different mammals, birds, reptiles and fish were regarded as sacred to various gods in ancient Egypt, and their bodies were mummified by thousands, Professor Roy L. Moodie has found while investigating this subject for the Field Museum of Chicago. The cost of this religious procedure was enormous. More than two hundred yards of fine linen cloth, a half yard wide, were needed for the wrapping of a single bull. As bulls were held in extreme veneration by the ancient Egyptians, great numbers of them were preserved. Expensive sarcophaguses, carvings and statuary show the further care of the African bull. Birds of the hawk and falcon type were also abundantly preserved. All of the animals mummified are known to be still living, and the mummies provide evidence that such animal species have existed over many thousand years.

LOW concentrations of ozone are not of much use in treating tuberculosis in guinea-pigs, Dr. H. B. McDonnell, of the University of Maryland, has reported to the Association of Official Agricultural Chemists. Dr. McDonnell's report was based on results of five years of work. The pigs were inoculated with tuberculosis and given ozone in concentrations ranging from one part per million to one tenth part per million. The weaker concentrations had little or no effect on either the pigs or the course of the disease. The stronger concentrations did not ameliorate the disease nor did they prolong the lives of the pigs. In fact the stronger concentrations of ozone seemed to have the opposite effect of shortening the pigs' lives.