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THE INTERNATIONAL CONFERENCE ON BITUMINOUS COAL

WHAT shall we do with our soft coal? This is the question that was considered by the International Conference on Bituminous Coal during its sessions at Pittsburgh from November 15 to 18.

A few years ago scientists and economists were worrying over the whole future of the fuel supply; but recent surveys have shown the soft coal reserves of the world to be much larger than was originally thought, so that the search now is for means for making the relatively abundant supplies of this cheaper fuel help to eke out the rapidly vanishing anthracite coal and petroleum whose end is said to be definitely in sight. Efforts are also being directed to work out methods for the more efficient and economical use of soft coal which will at the same time make it less of a nuisance.

One of the most interesting of the groups of discussions, from the point of view of the fuel technicians, were the papers by three leading European chemists, Professor Franz Fischer and Dr. Friedrich Bergius, of Germany, and General Georges Patart, of France, on the production of gasoline or a practicable substitute from bituminous coal. All three of these men have worked out methods for synthesizing alcohols, petroleum-like substances and similar liquids of high fuel value.

Considerable attention was given to the discussion, both by American and foreign visitors, of low-temperature coking processes. Better grades of domestic fuel, as well as of cokes better adapted for industrial uses than the ordinary "hard" cokes now produced, are among the aims of the new methods. The processes distill various oils as well as tar from the cokes, and the problems and possibilities of these by-products will be among the subjects to be discussed.

MOTOR FUEL FROM SOFT COAL

A MOTORIZED Europe, in spite of the scarcity of oil wells and the consequent high price of "gas" on that continent, is held out as a possibility as the result of researches on processes for making a practicable motor fuel out of soft coal which have been going on for nearly a quarter of a century in Germany and France. Professor Franz Fischer, director of the Institute of Coal Research, Muehlheim-Ruhr, Germany, a leader in the search for a practicable synthetic motor fuel, spoke before the meeting of the International Conference on Bituminous Coal of the petroleum-like products he has been able to obtain by subjecting water-gas to pressure and moderate temperature, in the presence of finely divided iron or cobalt.

Professor Fischer uses as raw material the same mixture of hydrogen and carbon monoxide familiar in this country as a part of most city gas, under the name of "water-gas." This is made by passing steam over glowing coke. The gas mixture thus produced has high fuel value but can not be reduced to liquid form except at extremely low temperatures. How to build these small molecules into larger ones, which would be liquid instead of a gas at ordinary temperatures, and still be useful as an engine fuel, was the problem confronting the investigator.

He solved it by the use of what the chemist calls catalyzers, that is, substances which in some manner as yet not understood speed up chemical reactions without themselves entering into the compounds which they call into being. In this case Professor Fischer used finely divided cobalt and iron; an earlier investigator, he said, had used the allied metal nickel. With these chemical middlemen present, and using moderately high pressures and some heat, he has obtained three different classes of compounds.

The first of these, "synthol," is a mixture of about a score of inflammable compounds, including a number of the higher alcohols, ketones and esters, as well as organic acids and aldehydes. This has considerable value as a fuel. By varying the process, he has been able to obtain a second product, methanol, which is pure synthetic wood alcohol. Other investigators also have obtained methanol; but though it is highly useful in the arts and industries it has less value as a fuel than the petroleum-like products. A third product, "gasol," most recently obtained, is of the nature of an artificial benzine, which again has high fuel value.

These researches have been carried out on a technical scale, and it has been proved possible to obtain motor fuel from soft coal in commercial quantities, without troublesome by-products for which to find markets. But as yet the process is too costly to compete with imported petroleum fuels. As the latter become scarcer and more expensive, and the technique of fuel synthesis from coal becomes more refined, it is expected that practical manufacture may be undertaken.

RHEUMATISM

RHEUMATISM is a distinct and well-defined disease, though not responsible for all the aches and pains attributed to it, according to Dr. W. G. MacCallum, of the department of pathology of the Johns Hopkins University.

By the great mass of people any pain or swelling in the joints or muscles is called rheumatism. Many believe that rheumatism is not a disease at all but merely the common name for certain symptoms which may arise from many different causes.

Arthritis, an infection of the joints causing pain and swelling, sometimes destroying parts of the joints and causing bony deformation, is a symptom of various diseases: scarlet fever, pneumonia, tuberculosis, cerebro-spinal meningitis, dysentery, septicemia, etc., and is to be distinguished from rheumatism.

For many years, said Dr. MacCallum, it has been recognized that there is one condition in which painful swelling of the joints is variously combined with ton-

silitis, chorea, fever, subcutaneous nodules and especially with profound diseases of the heart that stands apart from all the rest and is most commonly known as acute rheumatic fever or rheumatism.

The most serious danger of rheumatism lies in its attack upon the heart. The whole heart is involved. But certain parts seem to be especially affected. The tissues are altered. The walls thicken and the valves become distorted.

The peculiar thickening of the wall of the left auricle characteristic of many cases of rheumatism was first observed by Dr. MacCallum.

THE ECLIPSE OF THE SUN

DR. S. A. MITCHELL, director of the Leander McCormick Observatory of the University of Virginia, and veteran of six expeditions to observe total solar eclipses, will make his seventh eclipse trip next summer.

This expedition will be to Norway, where a total eclipse of the sun will be visible for half a minute early on the morning of June 29, 1927. It will also be visible in England, but there it will happen at about 5:30 a. m. and the chances for clear weather will not be as favorable as in Norway. The duration of totality will be shorter, but for the research in which Dr. Mitchell is particularly interested this is not a serious handicap, for he is confining his attention to photographs of the "flash spectrum." Ordinarily, the spectrum of sunlight, obtained by passing it through a combination of prisms and lenses, is a band of various colors, crossed by a series of dark lines. Just before and just after a total eclipse of the sun, however, the light reaching the observer comes from a thin outer layer of the sun's atmosphere, and then the flash spectrum, consisting of a series of colored bands against a dark background, can be seen.

The expedition will be financed by a gift from John Armstrong Chaloner. The scientific importance of making the observations of the flash spectrum arises from the fact that it supplements knowledge obtained from daily work on the sun at such great observatories as Mt. Wilson in California.

"The sun may be regarded as the site of a great physical laboratory where high temperatures and minute pressures are displayed that can not be equalled or even approximated on the earth," Dr. Mitchell remarked. "There is no expense involved in utilizing the solar laboratory other than that of powerful telescopes and spectroscopes necessary for the work.

"In the sun's atmosphere at short distances from the solar surface, conditions are reached such as are displayed in a vacuum tube where the gases become ionized. In this process one of the external electrons of the chemical atom is detached, giving rise to an atom which radiates light very differently from the normal or neutral atom having its full quota of external electrons. The difference in radiation is displayed in the character of the spectrum, mainly by the increase in intensities of the spectral lines known to astronomers and physicists as ionized or enhanced lines.

"The ordinary spectrum of the sun consists of light of the photosphere absorbed by the cooler layers of the sun's atmosphere. These cooler layers are hotter than any blast furnace on earth, and at the time of a total eclipse they may be photographed as the flash spectrum. One of the important features of the flash spectrum is that it makes known the height in miles or kilometers that each atom in the atmosphere of the sun extends up above the solar surface.

"As the result of solar investigations made at eclipses and at other times it is no exaggeration to state that we know vastly more of conditions in the solar atmosphere, though the sun is over ninety millions of miles away, than we know of the atmosphere of the earth in which we live and move and have our being."

So far as Dr. Mitchell knows the McCormick-Chaloner expedition will be the only one from the United States to observe this eclipse. The short duration of totality makes it unfavorable for any study of the corona, which surrounds the sun, but is only visible at the time of a total eclipse; or for investigation of the bending of star-light when passing the sun, as predicted by the Einstein theory.

Dr. Mitchell has already traveled about 60,000 miles to places as widely separated as Spain and Sumatra to observe six eclipses, which lasted for a total of less than 15 minutes. The first one he observed was from Georgia in 1900.

ANTI-FREEZE MIXTURES FOR AUTOMOBILES

Now that the temperature is likely to drop below the freezing point, automobile radiators must be protected by filling them with some solution that stays liquid when water has changed to ice. What should be used? is a question that science can more easily answer this year than heretofore.

Denatured alcohol, or its poisonous brother, methanol (wood alcohol), will continue to be the usual and most common anti-freeze agent. Alcohol is cheap, effective and easily obtainable, but it has the disadvantage of evaporating and needing frequent replenishing. Glycerine will also be a favorite. For all who drive cars painted with Duco or other cellulose lacquers, glycerine is practically a necessity, for alcohol dissolves this new sort of finish and even a small amount of alcohol radiator solution spilled on the paint is likely to ruin it. Glycerine is more expensive than alcohol, but it does not evaporate very readily and one filling of the radiator should last a whole winter season if the radiator is free from leaks. Either the colorless chemically pure glycerine or the yellow distilled commercial grade can be used with safety but the crude product is dangerous because it usually contains salts that corrode the radiator. When placing either alcohol or glycerine in the radiator, it should not be filled above two inches from the top of the overflow pipe since the solution will expand when the radiator warms up.

Denatured alcohol is preferable to wood alcohol in spite of the fact that 10 per cent. less wood alcohol

is required for protection against freezing at any given temperature. Wood alcohol often contains free acids which will damage the radiator and its fumes due to its poisonous character may be harmful. Mixtures of alcohol and glycerine are often used as a compromise between the cost of glycerine and the volatility of alcohol.

A little-known chemical, ethylene glycol, which like alcohol and glycerine is one of the chemical group of alcohols, is being heralded in chemical circles as an almost ideal radiator anti-freeze material. Except in northern cities, it is not yet available in the open market because the demand is large and the supply is small. This chemical is used in the manufacture of Duco and other lacquer automobile finishes and the available supply is largely utilized in this way. Glycol does not evaporate readily, it lowers the freezing point more effectively than alcohol, and it is non-corrosive. Its cost is about that of glycerine and when it is available in sufficient quantity it should be widely used.

Many other radiator solutions have been widely exploited and tested but all of them are objectionable for some reason.

Salts, like calcium chloride, magnesium chloride, common salt, etc.—All solutions of salts are corrosive and practically sure to cause serious damage to engine jacket or radiator. They are particularly harmful to aluminum and solder. Calcium chloride solutions are often troublesome if they come in contact with spark plugs and electrical connections, as they cause short circuits. Both calcium and magnesium chloride solutions have been widely sold under trade names.

Sugars, such as honey, invert sugar and glucose—Although honey has been recommended as an anti-freeze agent, tests at the U. S. Bureau of Standards show that low percentage mixtures do not have sufficiently low freezing points and that high percentage mixtures are so viscous that they circulate very slowly, if at all. Invert sugar acts about like honey and glucose is of even less effect than honey.

Oil—Lubricating oil is used in some cooling systems on tractors. It is not suitable for use in ordinary automobiles, for oil cooling systems must be especially designed to give more rapid circulation to compensate for the low heat capacity and the high viscosity of oil.

Kerosene—Kerosene can be used in automobile cooling systems provided with mechanical circulation but the odor and inflammability of its vapor, the possibility of overheating due to high boiling point and its solvent action on rubber are objections to its use.

ITEMS

COMAS-SOLA'S comet, discovered on November 5 by Dr. J. Comas-Sola, of Barcelona, Spain, has been observed in America, according to an announcement made by Dr. Harlow Shapley, director of the Harvard College Observatory. Dr. Warren K. Green, of the Amherst College Observatory, observed it on the night of Sunday, November 7, in the constellation of Cetus, the Whale. It had moved to the southeast since it was discovered, but was still of the twelfth magnitude, too faint to be seen except with a large telescope.

A NEW method of inoculation against diseases of types represented by typhoid fever and Asiatic cholera is claimed by the Pasteur Institute. Its technique is based on the principle that since the small intestine is the organ chiefly affected in such diseases, the preventive vaccine should be able to do most good if introduced into its membranes directly. Acting upon this idea, Dr. A. Besredka has given laboratory rabbits preliminary doses of beef bile by mouth, that have the effect of rendering the cells of the inner lining of the intestine temporarily permeable. The vaccine chaser of killed typhoid germs that is administered afterwards is then absorbed directly into these cells and produces a temporary immunity. Such immunity in human beings is said to last about a year. Dr. Besredka reports that this sort of vaccination has been used successfully in dysentery epidemics in India and was found helpful in stemming a typhoid outbreak in Russia, during the past year.

YOUNG children are more truly individuals than older persons, largely because the schools tend to level out idiosyncrasies rather than to develop differences. This is the finding of Dr. Truman L. Kelley, professor of education and psychology at Stanford University, as a result of a statistical study of the influence of training upon native mental differences in school children. Over 200 children that are gifted mentally were compared with 1,700 normal children by Dr. Kelley. The gifted eight-year-old children were more individual mentally than normal eight-year-olds. But he found that between eight and eleven years the gifted children have their individual traits ironed out by the public school influence, so that at 11 years they have fewer mental idiosyncrasies than normal 11-year-olds. These gifted 11-year-olds are more like normal children of 14 years in respect to their peculiarities, just as they are like the 14-year-olds in other mental traits. Dr. Kelley advocates "a policy which preserves and utilizes individual peculiarity except where it is established that social stability demands otherwise."

AROUND 17,000 deaths and several millions of injuries occur every year in American homes. Accidents that endanger life and limb in industry and on the public highways are gradually being reduced by safety engineering and educational propaganda but domestic accidents have remained a problem as yet unattacked. To repair this gap in protection to human life, Louis I. Dublin, statistician to the Metropolitan Life Insurance Co., has recommended to the National Safety Council that it appoint a committee to investigate facts about the injuries and fatalities that occur in homes so that a constructive program can be arranged on this basis. More than a third of the deaths that happen in homes are those of children under fifteen while over a fourth are of elderly people over 65, it is stated.