

NATURAL RESOURCES

Waste of Metals, Coal and Oil May Starve Machine Age

Consumption Increased Thousand Fold in Past 100 Years Prompts Prediction of Exhaustion Almost Immediately

THE MACHINE AGE may starve to death in the almost immediate future, victim of today's profligate use of metals, coal and oil.

To the scientists and engineers of the American Association for the Advancement of Science, Prof. Ross Aiken Gortner, University of Minnesota biochemist, observed that precious, irreplaceable stores of natural resources absolutely essential to modern industrial civilization are disappearing into the maws of industry and dissipated wastefully.

"In the last hundred years this lusty infant, applied science, has increased its food consumption perhaps a thousand fold," he said, "and unfortunately for mankind already the shelves in some of nature's cupboard show signs of exhaustion of specific food supplies."

While the publicity of technocracy calls attention to the part played by mechanical energy in remaking economic conditions, Prof. Gortner warns that the coal and oil supplying this energy will be exhausted within the next thousand years, which is but a second in the history of mankind.

More menacing is the approaching exhaustion of copper, antimony, tin, lead, zinc, chromium, manganese, nickel and iron stored in parts of the earth accessible to man.

These metals will probably be exhausted in less than one thousand years if used at their present rates of consumption, Prof. Gortner estimated. And the rate of use of some of them is doubling each decade.

In the past hundred years the tools of science have wrested from the earth from a tenth to half of the available natural resources. Man has enjoyed them for a moment, then destroyed them or cast them aside in a form useless to coming generations.

"In spite of the fact that the world's resources of tin are exceedingly limited, we still demand tinfoil around candy bars and packages of cigarettes," Prof. Gortner charged, "and the world's available sulfur supply is being rapidly ex-

hausted in the demand for cellulose products that have a silken sheen."

Iron will be exhausted at present mining rates in the following times: Germany, 40 to 50 years; Scandinavia, 100 years; United States, 100 years; Russia, 150 years; all the mines of the world, 250 years.

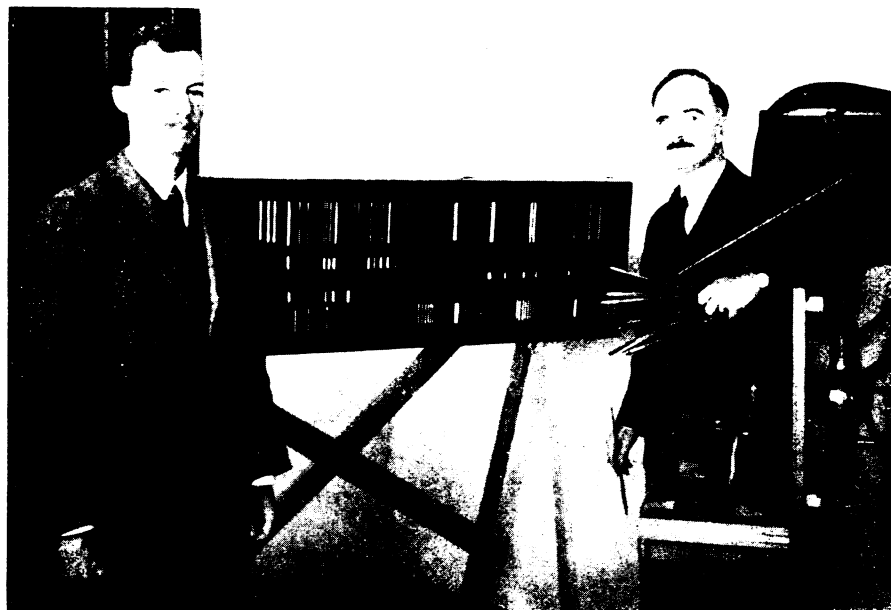
Copper, zinc, lead and tin will have been exhausted long before the iron is gone. America's supply of elemental sulfur will fail in fifteen years.

At present rate of consumption the coal of England will last about 50 years, that of France less than 300 years, that of Belgium less than 800 (*Turn Page*)

PHYSICS

Artist Paints Spectra of Light in Upper Atmosphere

CHARLES BITTINGER, Washington artist-physicist, (right, in accompanying photograph) has painted the spectra of the lights that shine in the upper atmosphere of the earth and sun. Dr. E. O. Hulbert, physicist at the Naval Research Laboratory, Bellevue, D. C.



RAINBOWS OF THE UPPER ATMOSPHERE OF EARTH AND SUN

(left) collaborated with Mr. Bittinger.

The upper spread of colored spectral lines in the picture is that of the aurora that occurs in the upper air of the earth. Next are portrayed the bands of nitrogen as seen at the negative poles of a discharge tube, showing a close relationship to those of the aurora and supporting the idea that the northern lights are due largely to excited nitrogen.

The moonless night sky as seen through a spectroscope is next shown and next to the bottom is the spectrum of a meteor, based on information just obtained by Harvard College Observatory. The lower spectrum is that of the beautiful corona that is seen surrounding the sun only during total eclipse.

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ENTOMOLOGY

Caterpillars Hear Sounds Audible to Man

CATERPILLARS can hear. They hear sounds audible to human ears. This was reported to the meeting of the American Society of Zoologists by Dr. D. E. Minnich of the University of Minnesota.

He held tuning-forks of several pitches within the range of the middle piano keyboard over a sound box in which were caterpillars of fourteen different species. When he struck the forks the caterpillars served notice that they heard, either by stopping their movements or by vigorously contracting their longitudinal muscles.

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years, that of Germany less than 1000 years and that of the United States, including our vast lignite deposits, less than 1500 years. Petroleum will have vanished many years earlier.

Water power, alcohol from vegetation, and solar energy are totally inadequate to replace oil and coal.

Even if natural resources last twice or three times as long as predicted, Prof. Gortner feels that the applied science of the white man may have raised up a Frankenstein which will ultimately destroy him, if the scientists of the future do not solve these problems which appear to us insoluble.

"Will future civilizations look back upon the industrial civilization of the twentieth century not as an age of progress but rather as an age of despoilation," Prof. Gortner asked, "as today we look back upon the Tartars and the Vandals and the Huns who destroyed the civilizations of Greece and Rome? Will the wheel of time turn man backward to a more primitive and isolated existence, with the horse and the wooden sail-boat again his only means of transportation?"

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ARCHAEOLOGY

London's Main Street Of First Century Found

WORKMEN digging foundations for a building have discovered the "Main Street" of London of Roman days.

The Roman road, believed to have been London's most important thoroughfare in the first centuries of the Christian era, was encountered sixteen feet below the present street level.

The main street of Roman London ran from a timber bridge that crossed the River Thames into the heart of the city to the Forum and the Basilica that was the administrative center of the entire province. From there the road continued north out of the city, where it joined the great Roman road leading to the north of England.

The road dated from the time when London was rebuilt after its destruction by the rebelling British queen, Boadicea, in 60 A. D.

Traffic from the coast of Britain must have tramped over this thoroughfare for more than three centuries. How frequently the road had to be repaired is shown by layer upon layer of gravel to a depth of eight feet. The road is 30 feet wide.

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BOTANY

Secrets of Energy Source Sought in Chlorophyll Study

WHILE TECHNOCRATS sounded the trumpets of a new economic-industrial revolution based on energy uses and physicists debated the nature and source of the still-mysterious cosmic radiation at the American Association for the Advancement of Science, botanists told of equally intense though less-heralded efforts toward the understanding of chlorophyll, the world's greatest means of capturing radiant energy of the sun.

Chlorophyll, the stuff that makes plants green, was certainly the key to coal production in the distant past, probably the key to oil production as well, and will have to supply fuel for Diesel engines after the coal beds and oil wells are emptied. The intense concern of plant scientists with chlorophyll is therefore not to be wondered at.

At the meeting of the American Association for the Advancement of Science, several scientists reported advances in the understanding of this world-distributed but still little known substance, chlorophyll. Prof. O. L. Inman, of Antioch College, told of experiments that show the action of chlorophyll to be independent of the presence of actually living matter. He ground up green clover leaves to a fine pulp, filtered the mixture through close-meshed cloth to remove all living cells and leave nothing but the chlorophyll and the once-living cell contents in a mixed and fluid condition, and then turned light upon it, under various conditions of temperature, acidity, etc.

Luminous Bacteria Detectors

Luminous bacteria, that shine when oxygen strikes them, were used as sensitive detectors of chemical activity of the chlorophyll mixture. Their shining showed that the mixture, though certainly dead by all common criteria, was still able to work with light to produce the raw materials of food and fuel.

Prof. G. Richard Burns, of the Vermont Agricultural Experiment Station, told of testing the ability of two evergreen trees, Norway spruce and white pine, to use special colors of light. The darker half of the red end of the sun's

spectrum, part of the blue and all of the violet at the other end, were useless to these trees, but all the rest of the light was grist for the chlorophyll's mill. He also found by careful energy measurements that the plants follow closely the predictions of Einstein's photochemical equivalence law in their energy absorption during the conversion of carbon dioxide and water into plant material and oxygen.

At a demonstration booth in the Association's exhibition hall, Dr. E. S. Johnston and Dr. F. S. Brackett of the Smithsonian Institution showed one of the methods of attack on the problem being employed in their laboratory. They have set up a large glass tube with living plants growing inside it. The light they need is supplied in exactly measurable quantities from artificial sources, and the atmosphere, which may be either natural air or any mixture of gases desired, is passed in and out by tubes, being measured and analyzed as it passes. In this way a close check-up of the plant's life processes is made possible.

Corn Production Speeded

Chlorophyll speeds the production of corn in proportion to its concentration in the leaves, reported Dr. Howard B. Sprague of Rutgers University, who worked with various inbred strains and hybrids. And the more chlorophyll the whole plant had, the more it produced of both grain and stalk.

Major attacks upon the chlorophyll problem are being conducted at the Fixed Nitrogen Laboratory of the U. S. Department of Agriculture, at the Smithsonian Institution, at Harvard University, at Antioch College under the auspices of the C. F. Kettering Foundation for the Study of Chlorophyll and Photosynthesis, and at the University of Munich as well as in numerous other educational institutions and experiment stations. Each group of research workers is digging into some special part of the field, and meetings like those of the American Association for the Advancement of Science give them opportunity to meet and compare notes.

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