SCIENCE NEWS

Science Service, Washington, D. C.

A NEW PROCESS FOR THE MANUFACTURE OF PHOSPHORUS

PHOSPHORUS, the chemical element which bursts into flames when exposed to air, is now being produced, and shipped, in tank car lots to open up a new field for chemical industry. This achievement, one of the outstanding chemical industrial developments of the year, is being recognized by the presentation on December 10 of the Chemical and Metallurgical Engineering award to the Monsanto Chemical Company.

In life and death, peace and war, industry and agriculture, phosphorus is an element interwoven with modern civilization. When you eat cakes or other bakery products made with baking powder, the action of phosphorus is entering your existence. When you strike a match the sparks and flame come from the phosphorus present. There is phosphorus in your bones and those of many animals. And the farmer requires phosphorus fertilizer to replenish his soil so that crops will grow. In war—in the air, on the ground or on the oceans—phosphorus comes into its own as the creator of dense smoke screens which shield a military force from its enemies. Poisons—used commercially to exterminate rats—contain phosphorus.

For years the phosphorus in animal bones was the principal source of this element. But gradually it was found that by heat-treatment the phosphorus in certain rocks could be removed as a vapor and condensed under water to yield the waxy-colored element. The newer way, and the method for which the Monsanto Chemical Company received the current award, is to obtain the phosphorus with the heat of an electric furnace. Sand, rock containing calcium phosphate, and coke are fed into the electric furnace. In this high temperature of the carbon arc, 6,620 degrees Fahrenheit, the three raw products react to create carbon monoxide and elemental phosphorus in the form of a vapor. Because the phosphorus readily and dangerously combines with air, the whole industrial operation must be carried out under reduced pressure or else in a vapor of hydrogen or nitrogen. Purification of the phosphorus vapor condensed under water can be accomplished by melting the element and stirring it. Or certain oxidizing agents like potash can be used to remove impurities. With the air still excluded, the purified phosphorus can be sealed in steel drums or even in tank cars and shipped to the chemical plants which turn the element into any of its many uses.

CHEMICAL INDUSTRIES

DURING the week of December 6 the Sixteenth Exposition of Chemical Industries was held in New York. But that exhibit was only the visible front for an industry which weaves its roots deep throughout the nation.

Few inhabitants of Enka, N. C., knew that the Chemical Exposition was in progress, but they all knew that the great rayon plant there has brought them a measure of economic wealth in the form of employment. All of them would be interested to know that $1,200,000 has been poured into new investment in that plant in the last two years.

Similarly, Amphill, Va., is the site of a new investment of $6,000,000 for a plant to make transparent cellulose wrappings. And Fernandina, Fla., sees a $7,000,000 paper plant rise in its midst to bring new workers to swell its 3,023 population. Neighboring Port St. Joe, Fla., finds a $1,000,000 paper plant building. Stone Mountain, Ga., has a $2,000,000 glass plant and Acme, N. C., a $3,000,000 paper plant.

Thus it is throughout the nation. The chemical expansion is by no means restricted entirely to the South. Small communities are finding a new stakehold in the battle of living, for it is mainly in the hinterlands that the chemical process industries have spread some $350,000,000 in the last two years. That, in brief, is the story which lay behind the exhibits shown in New York City. Leading the march into new territory is the chemical pulp and paper industry which is realizing—as did the textile industry in the 1920's—that the South is the place for paper making; a place where pulpwood is cheap and abundant and where a favorable climate permits better year-round operations. Ways of using the South's pines may soon enable that region to supply 60 per cent. of all the nation's requirements in pulp and paper. The paper industry heads the list of new investments with a total of $138,000,000.

Like pulp and paper the great rayon industry is moving to warmer climes to be nearer its source of supply—Old King Cotton—no longer just a fiber for making cheaper fabrics but a raw material from which comes silk-like clothing. The cellulose of cotton yields the transparent wrappings which, each week, appear in some new place in modern packaging. In the last two years the rayon industry has invested $49,300,000 throughout the nation in new plants and equipment.

Third ranking chemical investor is the "heavy" chemicals industry, the little-seen but vital supplier to all the other phases of chemistry—sulphuric acid, chlorine, ammonia, alkalis and the other basic products. These basic chemicals make possible the operations of other chemical plants which in turn make everything from glass to fertilizer and from soap to gasoline. Great industries like steel, motor cars, aviation, petroleum, textile, photography, explosives and countless others are all customers of the "heavy" chemicals, which have spent some $38,500,000 in the last two years in new equipment and plants.—ROBERT D. POTTER.

OPHTHALMOLOGICAL STUDIES

BABIES' eyes, far-sighted at birth, become more far-sighted up to the end of the seventh year of life. Studies showing this, which is the opposite of the generally accepted view, and which also contradicts the general notion that increased close work at home and school causes an increase in near-sightedness, was reported by Dr. E. V.

L. Brown, of the University of Chicago, at the Fifteenth International Congress of Ophthalmology meeting in Cairo, Egypt.

Dr. Brown's findings, which permitted a general survey of trends toward or away from short-sightedness, were obtained by repeated examinations made on the same eye at intervals of one or more years. These examinations, made on eyes at complete rest as a result of putting atropin in them, were carried out on 1,203 eyes. Dr. Brown believes that more accurate knowledge of eye changes can be obtained by watching them in the same eyes from year to year than by comparing conditions found in one group of eyes with those in another group. In his studies if 2 years elapsed between examination of the same eye, the amount of change was divided by 2. If 4 years had elapsed, the amount of change was divided by 4, and so on. In this way 8,820 yearly changes in individual eyes were computed.

After the seventh year eyes became less and less farsighted, tending toward near-sightedness. This change stops at 20 years, or is so slight as to be negligible. Between the ages of 34 and 42 Dr. Brown found another reversal, the average eye becoming slightly more farsighted, but the change each year is still negligible in amount. The change toward near-sightedness between 8 and 20 years is not, Dr. Brown believes, a result of an increase in near work because of increased school and home study. The rate of change toward short-sightedness in the eyes of the average person who comes to the opthalmologist is actually only slightly more than half as great between 14 and 20 years as between 8 and 13 years. A striking change toward near-sightedness occurs at about 12 or 13 years of age. This, Dr. Brown believes, is a result of or a part of the growing-up process which causes such striking changes in other parts of the body at this same age.

A plea for the good neighbor policy for the prevention of blindness will be made by Dr. F. Park Lewis, of Buffalo, N. Y. "The blindness that comes from negligence, from ignorance, from indifference, from malnutrition and low standards of living is universal," Dr. Lewis says. Fighting these causes of blindness, in his opinion, is a job for world-wide cooperation by physicians, sanitarians, governments and society itself. Such a world-wide fight against causes of preventable blindness would not only save the eyesight of hundreds of thousands but would raise the living standards of the undernourished, thereby making them assets rather than liabilities in their communities. "To better the economic conditions," Dr. Lewis points out, "is to make a satisfied and contented people, thereby taking away one of the chief incentives that lead to war."

CLIMATE AND INFANTILE PARALYSIS

THE virus of infantile paralysis is widely scattered throughout the world, existing even in places where epidemics of the disease rarely occur, according to a report by Drs. N. Paul Hudson and E. H. Lennette, of the Ohio State University and the University of Chicago, given at the recent meeting of the American Society of Tropical Medicine in New Orleans.

Climate may play a part in bringing about a natural immunity or resistance to the disease. The two bacteriologists examined the blood of small groups of persons living in such widely separated places as Nashville, Tenn.; Liberia; Peiping, China; the Philippine Islands; inland Brazil and Thursday Island, Australia. Most of these persons, at least four fifths, had in their blood substances which could neutralize the virus of infantile paralysis. Presence of such neutralizing substances in the blood usually means that the person has previously had the disease or at least has got some of the virus into his system and has developed immunity or resistance to the disease. Consequently it appears that the virus of the disease is pretty widely scattered around the world.

Epidemics of infantile paralysis are uncommon in the regions in which Drs. Hudson and Lennette made their blood studies, although occasional sporadic cases occur, or the disease may be endemic, a few cases always occurring but with no epidemics. Since most of these places are in the tropical or subtemperate zone, the two bacteriologists suggest that climate affects the relation between the virus and man. Man in these climates apparently can play host to the virus, which is a parasite, so that it does not die off, and at the same time is able to build up an immunity to it so that he rarely gets sick with infantile paralysis.

SULFANILAMIDE AND ANOTHER GROUP OF DISEASES

REPORTS of successful use of sulfanilamide in a new group of diseases were made by Drs. Perrin H. Long and Eleanor A. Bliss, of the Johns Hopkins Hospital, Baltimore, at the meeting of the Southern Medical Association in New Orleans. The first American report of the use of this powerful remedy was given by these same investigators at the meeting a year ago. At that time they reported cures of erysipelas, childbed fever and other streptococcus-caused ailments with sulfanilamide treatment. This year they reported its healing effect in the painful and generally stubborn illnesses due to infection of the urinary tract. Cases that had lasted for from five to seven years and in which all other forms of treatment had failed were cured by sulfanilamide. The drug, Dr. Long said, kills practically all of the germs which commonly infect the urinary tract.

The all important factor in treating these conditions is to obtain the proper concentration of the drug, that is, to get enough of it into the urinary tract to kill the germs. The amount necessary can be determined by laboratory tests. Laboratory tests, also, can show whether or not sulfanilamide will cure cases of streptococcus infections, the condition for which the drug was first tried. There are many varieties of streptococci. That not all are susceptible to the action of the drug is shown by a research reported by Drs. Long and Bliss and their associate, W. H. Feinstone.

Identification of the particular streptococcus that is causing illness in a particular patient is of prime importance. The investigators described how these germs may be identified and which ones can be killed by sulfanilamide. Group A and Group B hemolytic strepto-

coccal infections in man can be cured by the drug. Good results have been obtained in treating Group C hemolytic streptococcal infections in dogs and horses. Group D hemolytic streptococcal infections in man are unaffected by the drug. Alpha streptococcal infections, the kind found in the heart disease known as subacute bacterial endocarditis, are in general not affected by sulfanilamide treatment.

Cases of gonorrhea cured within three days by sulfanilamide were reported by Professor E. P. Alyea, of the Duke University School of Medicine, at the meeting. Professor Alyea treated 158 patients with this drug and four fifths made these rapid recoveries. Out of 1,000 cases treated by the generally accepted method of a few years ago, nearly half had complications. Sulfanilamide was only introduced into American medicine a year ago and so far 830 cases of gonorrhea treated with it have been reported in scientific journals. In these 830 cases not a single complication of gonorrhea has been reported. Professor Alyea called this "a most striking result."

HIGHWAY ACCIDENTS

THE accident-repeaters may only be less than four per cent. of the driving population, but they are mixed up in nearly two fifths of the auto accidents. They may be only a few but whether because they are careless or are not nearly such good drivers as they like to think they are or for any other reason, they still cause damage far out of proportion to their numbers.

This was the warning read before the Highway Research Board at its annual meeting in the National Academy of Sciences building in Washington by Dr. Harry M. Johnson, of the Highway Research Board. Basing his findings on a study of nearly 30,000 Connecticut drivers who had licenses and presumably operated cars straight through from 1931 to 1937, Dr. Johnson found that a small percentage of drivers, whom he labelled "accident-repeaters," tend to be involved in accident after accident.

Numbering less than four per cent. of the total number of drivers involved in accidents, they nevertheless manage to have 39 per cent. of the fatal accidents, 36 per cent. of the non-fatal personal accidents and 38 per cent. of the accidents in which no one was injured. Furthermore, Dr. Johnson found, accident-repeaters tend to shorten the time between accidents as their accidents accumulate. "The fourth accident, for example, tends to follow the third more closely than the third accident follows the second." Because this small number of drivers causes so much damage, employer, insurance company and the licensing authority ought, if possible, to have a record of all accidents whether their consequences are important or trivial, in order to establish a reliable basis of predicting the behavior of their drivers as soon as possible, he concluded. Dr. Johnson's findings are further interesting in view of the fact that other surveys indicate that industrial accidents tend to follow a pattern similar in one respect at least. There are accident-repeaters in industry as well.

A 32 per cent. increase in night traffic fatalities as against a 4 per cent. decrease in day-time fatal accidents was used by Kirk M. Reid, General Electric Company illuminating engineer, as an argument in favor of night-lighting highways. Accidents on well-lighted roads have been reduced from one half to one third, he indicated. Such lighting costs on an average less than one third the money value of the destruction caused by higher accident rates that prevail when proper lighting is not resorted to.—LEONARD H. ENGEL.

ITEMS

DR. L. M. BRODERICK, head of the veterinary department of the North Dakota Agricultural College, reports that the 1937 epidemic of horse sleeping sickness, encephalomyelitis, again the cause of heavy losses of horses, has run its course and died down. Believed to be spread by a mosquito, the horse brain fever arouses interest because of the parallel disease found among humans, encephalitis, which was recently epidemic in St. Louis. Decline in the number of cases of the horse disease was attributed by Dr. Broderick to cold weather which has put an end to mosquitoes for the time being.

THE uses of light in agriculture were discussed by Dr. Samuel G. Hibben, of the Westinghouse Electric and Manufacturing Company at the meeting in Chicago of the American Society of Agricultural Engineers. Sterilization with short-wave ultra-violet is proving especially useful. It kills germs in milk and other products, and also in the containers where heat sterilization is not practicable. It combats molds on seeds, bulbs, foods and wall surfaces, as well as the fungi that cause plant diseases. It is also used in the treatment of skin ailments and superficial wounds of farm animals. In the non-lethal wavelengths, ultra-violet radiation insures healthy bone growth in animals, increases vitamin content in milk, and improves egg production by poultry. In addition to its use for direct illumination in house and barn and over the farmyard generally, light is used to lure many insect pests to their doom and away from field and orchard crops they would otherwise damage.

BASING their conclusions on a long series of experiments, two chemists have presented a revised table of "explosive limits" of inflammable fluids that are widely used in industry, and when wrongly used, are dangerous explosives. Speaking before the convention of the American Institute of Chemical Engineers, at St. Louis, Frederick C. Mitchell and Harcourt C. Vernon, of E. I. du Pont de Nemours and Company, reported corrections in the listing of flammable chemical reagents and the conditions under which they form explosive mixtures with air. A substance which forms an explosive mixture with air at room temperature, for example, should not be moved from one container to another by an air blower. Their message is of general importance throughout industry, for on the observance of the indicated precautions depends the safety of countless workmen. Seven different methods of transferring liquids from one tank to another and for what materials they may be used were outlined.