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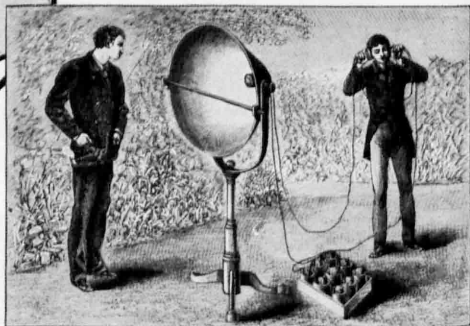


Cumulus Clouds

See Page 106

A SCIENCE SERVICE PUBLICATION

Words that rode on a beam of light



If Alexander Graham Bell could look at the microwave antenna in the illustration, how quickly his mind would go back to his own experiments, 67 years ago!

For in 1880 the inventor of the telephone had another new idea. Speech could be carried by electric wires, as Bell had demonstrated to the world. Could it be carried also by a *light beam*?

He got together apparatus—a telephone transmitter, a parabolic reflector, a selenium cell connected to

handphones—and “threw” a voice across several hundred yards by waves of visible light, electromagnetic waves of high frequency.

Bell's early experiment with the parabolic antenna and the use of light beams as carriers was for many years only a scientific novelty. His idea was far ahead of its time.

Sixty years later communication by means of a beam of radiation was achieved in a new form—beamed

microwave radio. It was developed by Bell Telephone Laboratories for military communication and found important use in the European theater. In the Bell System it is giving service between places on the mainland and nearby islands and soon such beams will be put to work in the radio relay.

In retrospect, Bell's experiment illustrates once again the inquiring spirit of the Bell System.

BELL TELEPHONE LABORATORIES



MEDICINE

Streptomycin Checks TB

Streptomycin, available for everyone now, stops tuberculosis germs and gives cavities and ulcers a chance to heal. It is not a cure for the disease.

FOR THE FIRST time in history, tuberculosis has met its chemical conqueror.

A chemical drug, streptomycin, checks the progress of the "white plague" in human beings.

A little group of sick veterans who would have died are alive today because they were treated with medicine's latest germ-fighter.

The doctors are frankly quite excited, in a quiet, conservative, restrained way. This seems to be the new TB weapon they had been hoping and striving for.

Because there are half a million Americans alone suffering with tuberculosis, what has happened should be the biggest world news of today.

The drug that is making this big news, streptomycin, like that other "miracle" drug, penicillin, comes from a microbe that is between a mold and a bacteria and lives in the soil. It is a kind of sister to penicillin. It was discovered three years ago after laborious searching by Dr. Selman A. Waksman and associates at Rutgers University and the New Jersey Agricultural Experiment Station.

Today, you can get streptomycin on your doctor's prescription at your drug store. When first discovered and for some time after, only tiny amounts were available and it was almost prohibitively expensive. Now enough to treat a TB patient can be bought for from five to 10 dollars per day. The patient gets the drug for from four to eight weeks.

Patients with lung tuberculosis, the most common kind of TB, often begin to get well quickly. Fever goes down within the first few weeks. The sometimes racking cough that produces dangerous, germ-laden material stops. The patient's appetite comes back, he feels much better and begins to regain weight. When he does cough, the material no longer has germs. X-ray pictures show how the cavities, or spots on the lungs, are healing.

These are among the good results doctors are now talking about openly. The streptomycin push against tuberculosis started secretly, two years ago,

at the Mayo Clinic and Foundation. There Drs. H. Corwin Hinshaw and William H. Feldman started trials of it, first on guinea pigs, then on a few desperately sick TB patients in mental hospitals.

Now several thousand patients are getting the drug. More than 200 are veterans in VA hospitals around the country. Almost 50 were treated during the past year by Drs. Walsh McDermott and Carl Muschenheim of Cornell University Medical College and New York Hospital.

The same good results in some patients, and the same disappointments in others, are being reported from all these places.

The drug stops the germs on their rampage through the body, gives a chance for cavities and ulcers to heal and for the surgeon in some cases to help speed the healing. To the doctors, streptomycin is not a "cure" for TB, but a germ-stopper, or suppressive as they term it.

The disappointments come when the drug stops checking the germs because

they have grown resistant to it. Then the patient who was on the way to getting well relapses and sometimes dies. This is the biggest problem doctors still have to lick. They have also to learn how much streptomycin is the right dose in each case, and how to prevent the dizziness, deafness and skin rashes that sometimes come from the drug.

Tuberculosis is not just one disease but many. It can attack bones, joints, the eyes, and any organ of the body. In some kinds of tuberculosis the drug helps more than in others. Doctors have barely started trying it in bone and joint TB. They frankly do not know yet what effect it will have. Many of the patients with this kind of tuberculosis are children who may be badly crippled by the disease. Streptomycin may save them from stiff hips, short legs, twisted spines. It is still too soon to say.

In bringing streptomycin through its first trials, private laboratories and clinics, the manufacturers, the National Tuberculosis Association and the American Trudeau Society, the Veterans Administration and the U. S. Public Health Service have all helped. Brains and money from these sources have gone into the common task of building what looks like the atom bomb for the war on tuberculosis. More of both are still needed.

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TB FIGHTERS—Scanning reports of human cases of tuberculosis checked by streptomycin are Dr. C. J. Van Slyke, medical director, U. S. Public Health Service and chief, research grants division, National Institute of Health; Dr. Walsh McDermott, Cornell Medical College; Dr. Paul A. Bunn, Veterans Administration tuberculosis fighter and Dr. H. Corwin Hinshaw, Mayo Clinic.



RESEARCH LEADER—Dr. Selman A. Waksman, of Rutgers University and the New Jersey Agricultural Experiment Station, heads research on streptomycin, which he discovered.

PHYSICS

Cosmic Ray Exploration

Neutral meson plays important part in Dr. J. Robert Oppenheimer's latest cosmic ray theory. Short-lived, they split into rays that bombard the earth.

► THE SCIENTIST who put together the atom bomb has explained the way in which the most powerful projectiles man knows—cosmic rays—do their stuff.

An unappreciated sub-atomic particle, the neutral meson, plays a major role in the latest cosmic ray theory of Dr. J. Robert Oppenheimer of the University of California, former director of Los Alamos atomic bomb laboratory.

Neutral mesons live but a mere one ten-quadrillionth of a second after they are created by mysterious primary proton bombardment from outer space. Even so, they are responsible for the astounding showers and cascades of powerful radiation that continuously rain upon the earth, even penetrating your body as you read this.

Mesons, which may be positive, negative or neutral in electrical charge, sort of lurk in the nuclei or hearts of nitrogen atoms in the rare air in the upper reaches of the atmosphere. Along comes a ten billion-volt particle, a proton, from somewhere in the cosmic depths of the universe. It smacks the nitrogen atom's heart. Mesons by the many thousands

fly out. Each neutral meson disintegrates into a pair of gamma rays, powerful X-radiation, that literally bombard the atmosphere below creating all sorts of effects there.

"I am glad this has nothing to do with atomic energy," said Dr. Oppenheimer. This is not a theoretical prelude to a new kind of atomic bomb, so far as can be seen now.

It may be more important than atomic energy. For it may explain the fundamental character of matter and energy. Science may be now making its "last great push" in exploring the realm of theoretical physics, mother science of the atomic bomb.

There is evidence, Dr. Oppenheimer told the American Physical Society, that the same laws that govern the ten billion-volt particles rule the ten quadrillion-volt particles of the even more powerful cosmic radiation. There was apprehension that new particles and new laws would be needed to explain what happens in these higher energy realms.

So far the most powerful particles accelerated by human control are the two

hundred million-volt deuterons (hearts of heavy hydrogen atoms) in the new big Berkeley cyclotron first operated a few months ago.

More powerful atomic particle accelerators are building now. In a few years man will match the cosmic rays and produce mesons at will. Scientists are using rockets to get nature's cosmic rays recorded 20 to 100 miles above the earth. Science is in the midst of one of the greatest explorations of all time.

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Calcium chloride is often used in the cement for making concrete building blocks; it gives high early strength.

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AERONAUTICS

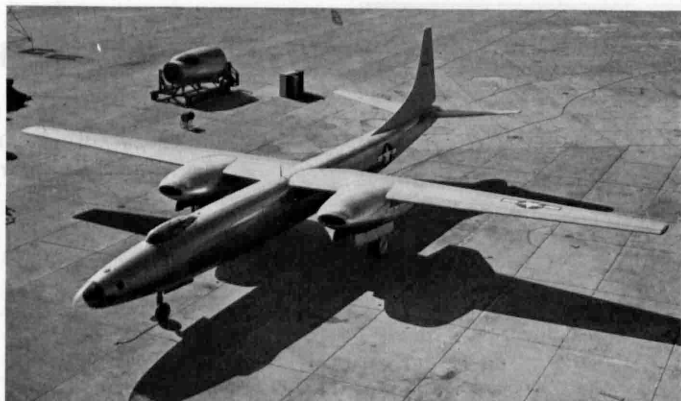
Army XB-46 Has Four Jet-Propulsion Engines

➤ FOUR jet-propulsion engines in a single plane is something new for the U. S. Army Air Force, but that is the equipment of a new bomber undergoing ground tests by Consolidated Vultee Aircraft Corporation.

Its first air flight is a couple of months off. In general appearance the new plane, to be known as XB-46, is similar to ordinary craft with two engines in the wings on opposite sides of the fuselage, but without the visible propellers. Its long, slender body extends nearly 106 feet from nose to tail, and it has a wing-span of 113 feet.

Its four engines, General Electric gas turbines, are placed in pairs, each pair in a single housing space, or nacelle, one on each side of the body, and fitted into the wing construction with a minimum of bulge. Further details will not be revealed until a flight test is made.

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XB-46—This four-jet bomber is being built for the Army Air Forces by Consolidated Vultee Corporation.

MEDICINE

Hidden Infections Mystery

To control virus diseases it is necessary to know more about latent infections, states scientist. Present concepts about effects on patients are inadequate.

➤ VIRUS DISEASES cannot be adequately controlled until scientists have formulated a better understanding of latent, or hidden, infections, says Dr. Karl F. Meyer, noted University of California epidemiologist.

Dr. Meyer points out that there is actually little known about the latent process, which plays an important role in all virus diseases, including influenza, poliomyelitis, encephalitis and psittacosis.

Latent infections are classified by Dr. Meyer into three general categories: low order ones in which the victim is unaware of his condition and it cannot be diagnosed clinically; dormant conditions which precede serious illness; and those persisting in the body during recovery from serious illness.

In epidemics latent infections assume importance when carriers whose condition is not recognized act as a reservoir for transmission of the virus to those who may become seriously affected.

Families of virus diseases, some deadlier than others, are generally accepted by scientists, Dr. Meyer points out, but adds that this is not sufficient explanation for the marked differences in the effect of diseases on individuals. This is ap-

parent in areas where yellow fever is common, the disease being routinely mild among children and routinely severe among adults. Poliomyelitis is a similar example, in some respects.

Dr. Meyer described as inadequate present concepts of the differential effects of viruses on individuals, these being attributed to variation in chemical reactions in the body, the action of enzyme systems, differences in the permeability of cell membranes, disturbances in sugar metabolism, or lack of cell proteins essential for proper growth of the virus.

The reaction threshold—the physiological conditions which are present when the disease ceases being mild and severe symptoms show up—offers a promising approach to the problem, the scientist says. "Until we understand the mechanism of the reaction threshold, the causes of latency will remain a mystery," he states.

Another phase of the problem of major importance is the latent condition persisting during convalescence from virus diseases. This type of latency plays a role in the perpetuation of viruses, Dr. Meyer says.

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CHEMISTRY

Artificial Sillimanite Can Replace Kyanite

A GERMAN artificial sillimanite, a substitute for the natural product with which Americans are familiar in certain automobile sparkplugs, was made during the war to use in place of the unobtainable Indian kyanite for refractories and electrical insulation purposes.

The German formula and process are now made available to American industry by the U. S. Department of Commerce.

Large quantities of domestic sillimanite and imported kyanite are used in America in refractories, electrical installations, sparkplugs and laboratory porcelain. Kyanite is used for heavy-duty refractories, and the demand for Indian kyanite will continue unless a domestic deposit is found of kyanite or sillimanite which contains recoverable material in grain sizes similar to the Indian product.

Sillimanite is an aluminum silicate. The German process of making the substitute requires, by weight, 60% of kaolin, 27% of aluminum hydroxide, 10% of fused alumina, and 3% feldspar.

Copies of the report, either in photostatic or microfilm form, from the Office of Technical Services, U. S. Department of Commerce, Washington, D. C., are available for \$1.00 each.

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SPARK SHOWER—Two ends of a rotor ring for a huge generator are being melted in a General Electric laboratory for welding together at temperatures approaching 3,000 degrees Fahrenheit. The apparent shower is caused by the fact that sparks and molten steel particles move too fast for the camera.

ENGINEERING

Russia Reopens Gigantic Hydroelectric Plant

► **RUSSIA'S** gigantic hydroelectric plant on the Dnieper river in the Ukraine is in operation again, after a nearly six-year interval since its destruction in 1941 by the Soviet troops to prevent its use by Hitler's Nazis.

The new equipment is American-built. The first of three new General Electric generators has now been successfully operated at full speed, it is revealed, and the other two are far advanced in assembly.

GE engineers state that the new generators are the largest ever built, being 90,000-kva, the kilovolt-ampere unit of power which is equal to 1000 volt-amperes. They will be driven by three 100,000-horsepower hydroelectric turbines built by the Newport News Shipbuilding and Dry Dock Company.

Rebuilding the Dnieper Dam was begun in 1944 by Soviet Union engineers and workmen soon after the Nazi forces had been driven back. It will have greater power-generating capacity than before, although it was rated before as Europe's largest hydroelectric dam.

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METEOROLOGY

Weather Control Predicted

With a machine that speeds up computations from hours to minutes, weather can be predicted in time to curb it with artificial fog and other measures.

► **WEATHER CONTROL** is predicted. It is not the type of control that would bring about climatic changes over vast areas, but a modification of local weather disturbances such as breaking up dangerous storms.

Other applications would be in causing rainfall when needed, preventing local killing frosts, eliminating fog on local areas and breaking up a hurricane, or changing its path.

The possibility of such weather control was discussed at the meeting of the Institute of the Aeronautical Sciences by Dr. V. K. Zworykin of the Radio Corporation of America. It would all depend, he said, upon information derived from very rapid calculations made from weather reports from regular observatories, the calculations being now possible by an electronic computing device.

The application of electrical and electronic methods to weather calculations, he stated, presages an enormous reduction in the time required for accurate weather forecasting. Although the devices in question stand only at the beginning of their development, it is quite conceivable that, ultimately, electronic devices specially designed for weather forecasting may yield predictions for days ahead in a matter of minutes.

The device itself would not predict weather; neither would it be used in control steps taken. It would merely compute, in minutes instead of the hours now required, the probabilities from data collected from extended areas regarding pressure, temperature, humidity, wind velocity at different altitudes and other information used by the weather forecaster. The control steps would follow the predictions.

Dr. Zworykin reminded his hearers of the many attempts made in the past to affect weather by explosive charges to dispel hail clouds, scattering electrified sand and ice "seeds" from airplanes to induce rainfall, burning smudges to protect citrus groves, and clearing fogs from airport runways with heat.

"The hope for effective weather control rests in the fact that the condition

preceding many of the weather processes which it may be desirable to control is essentially unstable or metastable," he explained. They are "characterized by the accumulation of large amounts of potential energy during an extended period."

"Thus, while the energy finally released may be enormous, that required to trigger the release may be quite modest. Furthermore, the magnitude of the triggering energy required will greatly depend on the time and place at which it is applied. Since the electronic forecaster should make it possible to observe the effect of applying given amounts of energy at different points of the weather map almost instantaneously, it will point the way to the most economic measures which will lead to the desired change in the evolution of the weather."

"Essentially two different methods are available for providing the energy for altering the evolution of weather changes," Dr. Zworykin continued. "The first consists of spreading a combustible substance, such as oil on water, over a considerable area and igniting it. This will cause an updraft of the surface air and condensation at a higher level, modifying, at the same time, the motion of the air masses in the surrounding region."

The second method depends upon the reflection and absorption characteristics of a particular surface area, thus using solar energy itself to modify weather conditions. Examples in nature include the clouds that form over southern islands at fixed times of the day, and large burned-over, blackened land areas which act as centers for thunderstorms.

The latter "immediately suggests the establishment of weather control patches, eventually blackened by deposits of carbon, at strategic points," he said. "These highly absorbing areas could at will be converted into highly reflecting areas by the deposition of artificial fog, employing techniques which received wide application during the war."

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ENGINEERING

Sodium Soap Gives Mud Oil-Drilling Efficiency

► OIL-WELL drilling, a messy, muddy business, might be considered a most unlikely candidate for feminine attention; yet a Bakersfield, Calif., high school girl, Cecilia M. Self, has done something to make it more efficient without making it any less muddy. In fact, it is the mud itself that 15-year-old Miss Self has worked on; she has made a better and gozier mud, calculated to facilitate the work of the well-driller.

In oil-well-drilling jargon, "mud" is a mixture of powdered solid with a liquid, forced into the hole alongside the drill, partly to cool the bit, partly to prevent blow-outs due to underground gas pressure. There are certain disadvantages in existing formulae, both the earlier ones that were mixed with water and the oil-containing muds now coming into use. Miss Self's invention consists in the addition of a sodium soap to the mixture, which gives it viscosity and other properties nearer to the driller's ideal of what a really proper mud ought to be.

Miss Self reports on her work in this highly practical branch of science in an essay submitted along with other qualifications that have won her a place among 40 winners of all-expense trips to Washington, D. C., to take part in the annual Science Talent Institute there from Feb. 28 through March 4.

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GENERAL SCIENCE

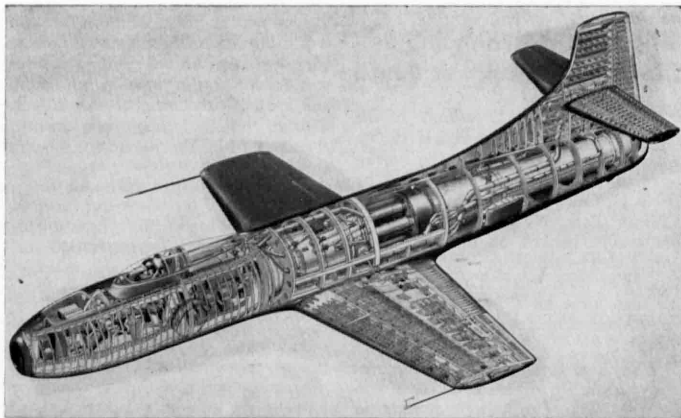
Miss Anne Hersey Named Science Talent Winner

► MISS ANNE HERSEY, 17, a student of Walton High School, New York City, has been named one of the 40 winners of the Sixth Annual Science Talent Search for the Westinghouse Science Scholarships. She will attend the Science Talent Institute in Washington, Feb. 28-March 4. The other winners have been previously announced by Science Service (see SNL, Jan. 25).

Honorable mention has been awarded to Miss Rosetta Victoria Natoli, 15, of Cathedral High School, New York City, at one of 260 mentions awarded.

Miss Katherine Virginia Anthony of Hunters, Wash., was found to be ineligible for competition in the search.

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SPEED RACER—The Navy D-558 is designed for a test plane to explore the needs of transonic aircraft.

AERONAUTICS

Navy Transonic Test Plane

► ANOTHER PLANE designed to best the atmospheric shock waves, that to date have prevented piloted craft from traveling as fast as sound, will be ready for field tests soon, the U. S. Navy reveals. It is the Douglas Skystreak, the D-558.

As soon as ready for flights, this new experimental plane will join the Army XS-1 at Muroc Field, Calif., where the advantages of Army facilities are available. The D-558 is a jet-propelled craft, a single-seater, powered with a General Electric TG-180 axial-flow turbo-jet engine. The turbo-jet depends upon atmospheric oxygen. That is why one important feature of the turbo-jet engine is the powerful compressor that gathers in enough air for the combustion.

The speed of sound at sea level is approximately 760 miles an hour. Supersonic speeds are actually those faster than sound, but the term transonic is frequently applied to speeds of from roughly 600 to 900 miles an hour. The new Navy plane is announced as a craft to explore transonic speeds.

The D-558 will be an air-borne laboratory to help investigate the many unusual conditions encountered by a plane at extreme speeds. The extreme thinness of its wings is experimental. Pressure on the outside of the plane will be recorded at 400 points. The recorded data are expected to provide information about the flow of air around the

plane, and particularly the information and location of the so-called shock-waves that grip a plane at high speeds, creating a heavy drag.

Outstanding reasons why aircraft have met with disaster at high speeds have been loss of control and structural failure. The instruments in the new plane will give airplane engineers performance figures concerning the great increase in drag encountered when the plane approaches the speed of sound. They will also provide information to determine the effectiveness of conventional control surfaces at the speeds when the shock waves tend to throw a plane out of control.

In the development of the Bell Aircraft Army XS-1 and the Douglas Navy D-558, the National Advisory Committee for Aeronautics played an important part. It is this organization that has carried on the research in aerodynamics that may lead to breaking down the present supersonic barrier. Engines for extreme high speeds are available. The search is for construction that can withstand the shock in the higher speeds, and the design of airfoil that furnishes minimum drag. This applies to both fuselage and wings.

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Gasoline can now be made from natural gas at a cost competitive with petroleum products.

ELECTRONICS

Mathematical Formulae Drawn with Electronic Pencil

► MATHEMATICAL formulae of the electronic age are appropriately drawn with a pencil of electrons, in an ingenious piece of apparatus constructed by Irwin H. Cole, 17, high school senior at Cliffside Park, N. J. It consists of an oscilloscope hooked up to a circuit of Mr. Cole's own designing, and built largely of junk parts. It took much of his spare time for a year and a half to make the machine work to his satisfaction.

When two equal voltages 90 degrees out of phase are impressed on the instrument, the image of a circle appears on the screen. The figure can be changed to an ellipse by changing either the horizontal or the vertical voltage. By expressing the terms of any suitable mathematical formula in terms of voltage variations, it is possible to trace a graph representing it in lines of light.

Mr. Cole is one of 40 winners in the Sixth Annual Science Talent Search, conducted by the Science Clubs of America under the auspices of Science Service.

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CHEMISTRY

International Meeting Of Chemists in London

► THE FIRST international gathering of chemists since the war will be held this summer in London, July 16 to 24. This Congress will follow immediately the centenary meeting and celebrations of Great Britain's Chemical Society.

Like the actual 100th anniversary of the formation of the Chemical Society, the Eleventh International Congress of Pure and Applied Chemistry should have been held in 1941 but it was postponed because of the war. A large delegation of American chemists to the July congress will be led by Dr. Marston T. Bogert of Columbia University who is president of the International Union of Chemistry.

The congress, under the presidency of Viscount Leverhulme, will have sections devoted to inorganic and geo-chemistry, physical chemistry, organic chemistry, biochemistry, chemistry in relation to agriculture and applied botany, chemistry in relation to applied zoology and veterinary science, chemistry in relation

to food and nutrition, chemistry in relation to medicine and therapeutics, chemistry in relation to fuel, power and transport, chemistry in relation to natural and artificial textiles, chemistry in relation to plastics, glass and ceramics, chemistry in relation to metals, chemical engineering.

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PHYSICS

Photoelectric Apparatus Inspects Many Things

► PHOTOELECTRIC apparatus for the automatic inspection of all kinds of things—cigarettes and cartridges, doughnuts and doorknobs, oranges and onions—is the subject of six new U. S. patents, 2,415,174 to 2,415,179 inclusive, issued to Samuel C. Hurley, Jr., of Danville, Ill.

Core of Mr. Hurley's system is the use of pairs of phototubes, so spaced that when the object to be inspected for size is passed between them and a light source, one of the tubes has a shadow cast upon it while the other remains illuminated, provided the article is of the right size. This throws the electric circuit of the apparatus into a state of imbalance, actuating a selector mechanism that puts the object into the accepted class. If shadow falls upon both tubes, the object is too large; if both tubes remain unshadowed, it is too small; in either case it is automatically tossed into the box of rejects. Variants of this idea permit inspection for fidelity to standard shape as well as for proper size.

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CHEMISTRY

Sulfur Dioxide Dried In Acid Production

► SULFURIC ACID, which may fairly be said to be the keystone in the arch of chemical industry, is made with greater efficiency and economy through a process on which two Canadian chemical engineers, I. R. McHaffie and H. R. L. Streight, both of Montreal, have received patent 2,415,142. In this, the initial input of wet sulfur dioxide is thoroughly dried by passage through concentrated sulfuric acid before it is converted into sulfur trioxide preliminary to final conversion into sulfuric acid. The water absorbed by the acid in the drying towers is removed by contact with the hot, dry waste gases coming off at the final stage of the process.

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IN SCIENCE

BACTERIOLOGY

Mucus Protects Cold Germs In Air Against Attack

► A NEW BARRIER to success in air disinfection to stop the spread of disease has been discovered by Dr. K. B. DeOme, University of California veterinary scientist.

Fresh support for warnings against spitting and sneezing except into disposable handkerchiefs also appears.

The mucus from noses and throats protects bacteria in the air from the lethal effects of high temperature and humidity, glycol vapors and ultraviolet radiation. Dr. DeOme reported to the Pasteur Society of Central California meeting in Berkeley.

The survival rate of unprotected bacteria in the air decreases as the temperature or relative humidity or both increase. Glycol vapors and ultraviolet radiation easily kill bacteria unprotected by mucus except at very high or very low humidity.

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RADAR

EAGLE Radar Antenna Distinguishes Targets

► DETAILS of revolutionary radar equipment, used on B-29 Superfortresses in bombing Japan late in the war, were revealed by Army Materiel Command officers. The equipment was designated EAGLE.

The unique feature of the EAGLE bombing system is a 16-foot linear antenna structure, housed in an auxiliary vane or wing carried beneath the B-29 fuselage and parallel to the wing of the aircraft. Differing from the usual rotary dish or spinner antennas used on other airborne bombing radars, the EAGLE has a row of 250 minute individual antennas spaced along the 16-foot framework.

This unusual antenna arrangement enables radar bombardiers to distinguish targets from surrounding terrain and to drop bombs with greater precision. It has civilian applications and can be used as electronic aids in all-weather flying.

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THE FIELDS

MINERALOGY

Titanium to Be Used In Construction Field

▶ ANOTHER LIGHT metal, titanium, may soon join aluminum and magnesium in the construction field. The principal present use of this abundant, but little known, metal is as a chemical compound, a white pigment in white paint.

Now, because of an improved process of reduction of its ore, it will be available for use as a pure metal in machinery and in structures.

Until about 1900, practically no pure titanium had ever been made except in laboratory experiments. Since then, several methods for reducing the ore have been developed, but none entirely satisfactory for commercial production. By a modification of some of these methods the U. S. Bureau of Mines has developed a process that promises to make the metal relatively plentiful.

A pilot plant of the Bureau is making 100 pounds a week. A commercial plant, with improved engineering, can produce far greater quantities.

The process used by the Bureau of Mines consists of reducing titanium tetrachloride with pure molten magnesium in the presence of helium gas under pressure. This non-combustible gas prevents oxidation in the process.

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PLANT PHYSIOLOGY

Baby Orchids Stay Infants With Barbiturate Dope

▶ INFANT ORCHID plants, that grow but never grow up, have been produced in the botany laboratories of the University of Wisconsin by "doping" them with barbiturate drugs of the too-familiar chemical family of sleeping compounds against which warnings are frequently issued nowadays. Prof. John T. Curtis reports on the strange behavior of these permanently juvenile lumps of plant tissue in *Science* (Jan. 31).

He chose orchids for his experiments because orchid seeds, unlike all other seeds, contain only the embryo plants, without reserve food supply of any kind.

As horticulturists know, orchid seedlings have to be carefully nursed for months on a carefully prepared synthetic diet.

Prof. Curtis' "doped" embryos grew in flasks on regular orchid baby-food, which nourished into normal seedlings control lots of undrugged embryos. They came to be bigger than the seedlings, but showed practically no signs of differentiation into regular plant parts like roots, stems and leaves. They resembled in many ways the artificially cultured, detached pieces of roots and wound callus first grown at the Rockefeller Institute, Princeton, by Dr. Philip White, now of the Cancer Research Institute in Philadelphia.

Prof. Curtis states that he does not know why the barbiturates should have this strange effect, but is continuing his studies in an endeavor to find out.

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ENGINEERING

Process Makes Steel Flow; May Reduce Cost of Objects

▶ GREATLY REDUCED costs for the production of many common steel objects such as machine parts for airplanes and automobiles are possible for American industry with the use of a German process to make cold steel "flow" under tremendous pressures, an American investigator to Germany said.

W. W. Galbreath of the Commerce Department's Office of Technical Services described the German production of extruded steel parts and shapes with special dies and the application of a phosphate bonderizing treatment.

"If American manufacturers are able to use the bonderizing process to the same extent that it is being used by the Germans, and if they are also able to reduce the number of drawing and annealing operations, the savings will run into unbelievable amounts," Mr. Galbreath declared.

Pressures of from 170,000 to 230,000 pounds per square inch are used on common soft bar stock steel by the Germans. The investigator said the cold-extruded steel parts require little or no machining.

American work on the process is now underway at the Heintz Manufacturing Company, Philadelphia, under contract with the U. S. Army Ordnance Department, it was reported.

Science News Letter, February 15, 1947

MINERALOGY

Copper, Lead, Zinc May Be Scarce Throughout World

▶ COPPER, lead and zinc, metals which may become scarce in the United States within a few years as reserves are diminished, will probably be in short supply throughout the world in less than 40 years.

Statistician William P. Shea, C. Tennant Sons and Company, estimated that copper reserves in the world outside the U. S. will last only 36 years at current production rates. Lead reserves are only 24 years and zinc 30 years, he reported in the *Engineering and Mining Journal* (Jan., 1947).

The life of U. S. reserves of these metals has been estimated by the Bureau of Mines and Geological Survey at 34 years for copper, 12 years for lead and 19 years for zinc.

Commenting editorially, the *Journal* said that Mr. Shea's figures showed the U. S. could not depend on foreign sources of the three metals without depleting foreign reserves faster than our own. Despite the threat of shortage in this country, the U. S. is estimated to have 21% of the world's commercial copper reserves, 14% of the lead and 19% of the zinc.

Science News Letter, February 15, 1947

AERONAUTICS

Jet Engines May Provide Wind Tunnel Gales

▶ JET ENGINES may in the future provide the swift artificial winds that are needed to test and provide design data for supersonic jet planes for war and peace in the coming years, Dr. Francis Clauser of Johns Hopkins University told the American Physical Society.

Wind tunnels of very great cost and power are being built for research upon flight beyond the speed of sound, he explained. Modern aircraft and missiles that have jet propulsion systems supply large amounts of power with relatively simple installations.

In analyzing whether ram jets, turbo jets, pulse jets, and other such devices can be used to speed up the air in a wind tunnel, Dr. Clauser found that a ram jet can not be used, but he hopes that combinations of other jet thermodynamic systems will do the job.

Science News Letter, February 15, 1947

METEOROLOGY

Weather Forecasts Ahead

New instruments and techniques make accurate long-range forecasts possible. Predictions are made from lower atmosphere and stratosphere observations.

See Front Cover

By A. C. MONAHAN

► GIGANTIC forward steps in the science of weather have been taken in the past decade, and more developments are yet to come from intensive studies being made with new instruments and techniques. World-wide weather observatories also are important, and promise to play an even greater part as international cooperation progresses.

More accurate weather forecasts, both immediate and for days ahead, are available now than ever before, but still more accurate predictions are hoped for. A number of astronomers believe that accurate weather forecasts several months in advance may result from the study of relations between the weather and solar activities. For the present, however, forecasts will be made from observations in the lower atmosphere and the stratosphere.

A wedge of cold air that meteorologists call a cold front produced cumulus clouds shown in the Air Transport Command photograph on the cover of this SCIENCE NEWS LETTER.

Credit for Forecasts

Aviation deserves much credit for the increased interest in weather forecasting but not all. Military and industrial activities are much concerned. Modern warfare requires reliable weather predictions before combat activities are initiated, and thousands of industrial products are now produced under controlled temperature and humidity conditions, and factory management studies daily forecasts in order to regulate properly their operations.

Much credit is due to the U. S. Army and Navy for their wartime weather services which cooperated with each other and with the U. S. Weather Bureau. Many of their activities in weather research and reporting are being continued. The Coast Guard also deserves credit, particularly for its work in maintaining floating weather stations on the ocean.

Some of the new instruments now used in weather detection and in assisting forecasting were developed for the armed forces for entirely different purposes. This is particularly true for radar, for infra-red receivers, and even for ENIAC, a coined name for a rapid calculator which should make speedy weather forecasts possible from data collected at far-flung observatories.

Radiosonde and sferics are purely weather devices, as are also special instruments developed for use in airplanes which make weather records and in some instances transmit weather conditions by radio code.

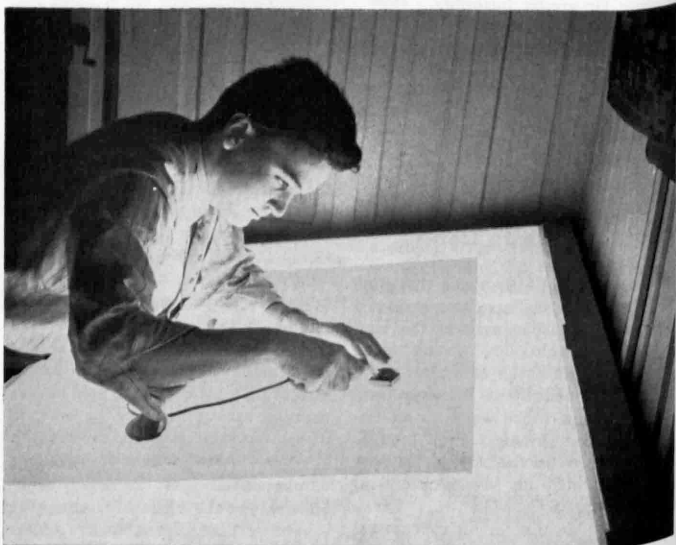
The discovery that radar could be used in weather observation is credited to American bombers en route to Pacific islands to bring devastation to Japanese war plants. Their navigators soon learned that strange spots on their radar scopes were storm clouds ahead. The discovery was immediately put to practical use and undoubtedly many

B-29 bombers made safe trips because they were able to avoid storm areas which their radar had detected.

A notable example of peacetime application of radar to weather is the cooperative work during the past thunderstorm season in the Florida region in which the Weather Bureau, the Army and Navy worked together in studying electric storms, hurricanes and other atmospheric formations. Other instruments were used, of course, and sferics played an important part.

Sferics can locate a thunderstorm 1000 miles away. The term is a liberal contraction of "atmospheric electricity." Sferics are atmospheric electrical discharges, either actual thunderstorms or non-visible disturbances associated with air movements that may form rain clouds. They are dependable indicators of bad weather. The word is applied to the electrical discharges as observed by special radio equipment. Two stations are necessary to fix the position of a storm, which is located accurately by triangulation.

Radiosonde is an instrument for making vertical weather observations from the ground upward through the atmo-



MAP-MAKING—A junior meteorologist assembles plotted sectional weather map prior to analysis by forecasters at the U. S. Weather Bureau.

sphere and stratosphere, usually to an altitude of 12 miles. The device is carried aloft by a hydrogen-filled balloon that bursts when the atmospheric pressure becomes sufficiently low. The apparatus then descends to the earth by parachute. It is often lost, but this is not a serious matter because during its ascent it sends out continuously code signals to its station.

These signals indicate temperature, relative humidity and barometric pressure. A refined form of the instrument provides a radio signal suitable for tracking by radio direction-finding equipment on the ground. By this wind velocity and direction are revealed.

Cloud Detection

The infra-red device will serve its principal use in detecting invisible cloud formations in night-flying. Heavy clouds radiate a certain amount of heat. Heat radiation consists largely of infra-red rays, often called "black light" because it is invisible. The infra-red receiver used in the plane is a type of a telescope within which the invisible rays are converted into visibility by use of electrons and a fluorescent screen. It was a vital part of the Army sniper-scope.

ENIAC is a coined name applied to a high-speed electronic device which enables very rapid calculations to be made. The machine was used during the war to compute complex bombing trajectories. In weather forecasting it is a help because mathematics plays an important part. Ordinary methods used in the mathematical computation of weather data from scattered observatories are too slow to give rapid results.

One great lesson of the war was the value of world-wide weather observatories, particularly for forecasting a few days ahead. World-wide weather forecasting, based on reports from widely scattered observatories encircling the globe, promises to become one of the



CHECKING UP—A pilot's flight plan is checked against a weather map produced every six hours. Weather reports received since the map was made up are shown on each side of the map at the U. S. Weather Bureau at Blackland Army Flying School, Waco, Tex.

first important steps in international co-operation. Weather conditions affect international communication and trade whether by plane, radio or surface ships.

An important step in international co-operation was taken at the recent London conference when nine nations agreed upon a plan for weather reporting from floating stations in the North Atlantic. The agreement was reached on Sept. 26, 1946. Belgium, France, Norway, Sweden, the Netherlands, Eire, Britain, Canada and the United States signed. Four others may in the near future.

Under the plan 13 vessels of the various nations will serve as floating weather stations between Newfoundland and Europe. They will not only take observations and make frequent reports by radio, but also will be available for search and rescue missions. Their reports will tie in with others from Iceland and Greenland. The Greenland station is now maintained by the United States with the permission of Denmark to which Greenland belongs.

Of significance also is the string of weather observatories to be established soon in Arctic regions across northern Canada. These will mean much to the United States because northwestern Canada is the originating point for many frigid masses of air that invade the states. These stations are being erected to secure data for the Canadian-United

States Joint Defense Board, but they will serve a wider purpose. Some of them will undoubtedly become permanent to help in daily forecasting in both America and Canada.

These northern Canadian stations will form the connecting link between the North Atlantic stations and those already established in Alaska proper and on the Aleutian islands. Reports from these latter are now being supplemented by Army observatory converted bombers flying daily from Castle Field, Calif., to Anchorage, Alaska.

These planes, equipped with all sorts of weather instruments, make hourly reports during the 12-hour flight on their 2400-mile trip. They fly at about a 500-foot altitude, well off the western coast from California to Vancouver, when

(Turn to page 108)

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Do You Know?

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Mine telephone systems that allow trapped miners to communicate with rescuers are lessening the dangers of this hazardous occupation.

The four enemies of paint on metal surfaces are rust and scale, oil and grease, moisture, and salt deposits; unless removed before paint is applied the coating will soon need renewal.

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From Page 107

they ascend to 10,000 feet. The region covered is the breeding place of many storms that finally reach the West Coast and the western slopes of the Rockies.

Weather reports from the Aleutians are further supplemented by Russian reports from Siberia. During the war the United States maintained two stations in eastern Siberia. American operators have now been withdrawn from them, but the U. S. Weather Bureau exchanges daily reports with Russia. The Soviet Union, the Bureau states, also has been cooperative in converting its reports for use in American historical maps of the northern hemisphere which are used in long-range forecasting.

Siberian weather conditions are of interest to American planes and surface ships following the Great Circle route to Asia. They are essential in forecasting in the Japan-Okinawa area because much of the weather there depends upon Siberian conditions. Cooperation with the Soviet Union is highly desirable in this matter.

Mid-Pacific routes to the Far East now have the benefits of American weather stations on Guam, the Philippines, Wake and other Pacific islands. South American trade is helped by stations in the

Caribbean region, and Mid-Atlantic routes are warned of storms by weather planes flying from Florida to the Azores. Soviet stations from Norway to Bering, reported soon to be established, will complete the Northern Hemisphere coverage.

Science News Letter, February 15, 1947

CHEMISTRY

Benzol Vapor Oxidation Process Produces Phenol

PHENOL, basic alike to plastic resins and disinfectants, is produced by the oxidation of benzol vapor in the presence of heat and a catalyst, in the process on which patent 2,415,101 has been granted to R. H. Kriebel of Schenectady and W. I. Denton of Woodbury, N. J., assignors to the Socony-Vacuum Oil Company. An essential step in the process is continuous addition of fresh benzol with impurities containing paraffin, cyclohexane, etc.

Science News Letter, February 15, 1947

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METEOROLOGY

NATURE RAMBLINGS

by Frank Thone



Snow Significances

► SNOW'S importance to the crops has long been recognized even to the extent of embodiment in proverbs and folk-sayings. There is, for example, an old English rime:

"A foot deep of rain
Will kill my and grain,
But three feet of snow
Will make them grow moe."

Before that jingle was written, in the seventeenth (or possibly the sixteenth) century, generations of farmers had known from first-hand experience that the gradual melting of deep snow at the beginning of spring, moistening the soil just when reviving plant life needed it most, could be an excellent thing, whereas torrential downpours of rain a little later might very easily bring calamity.

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This old-time folk-wisdom was distilled on the spot, at a time when climate and its significance had local significance only. But in these times of long hauls of almost all products, you may be getting the good out of snowfalls hundreds of miles away without ever realizing it.

For example: Do you like baked Idaho potatoes? Most of them are raised on irrigated lands, with the water coming from the previous winter's snows in the northern Rockies. Do you eat California oranges or avocados? These again are from irrigated orchards, whose ditches are filled with snow water from the high Sierra. Do you use sugar in your coffee? Quite likely it's beet sugar, from somewhere in the Great Basin area, or perhaps from fields on the eastern slope of the Rockies—in any case, the 11 water molecules represented in each molecule of sugar most probably drifted down as snowflakes onto some mountainside before they found their way into the irrigation system. Do you like Western beefsteaks and roasts? The steers that supplied them may have been fed on snow-nourished alfalfa, and got their daily drinking-water from a snow-supplied creek in Montana before being moved to an Iowa feed-lot to be fattened on corn before going to the packing-house.

If you live in a frame house, the wood of which it was built came from forest trees that took good care of its winter snows, building their melt-water into their woody stems, through spring after

spring for many years before they were felled and sawed into lumber. If on the other hand you live in a brick structure, the clay from which the brick were made probably came from a moraine deposit left by a glacial ice sheet—which was formed of consolidated masses of snowflakes that fell a million years ago.

Science News Letter, February 15, 1947

PHYSICS

Transmitted Waves Detect Flaws in Metals, Plastics

► FLAWS WITHIN metal can be detected with certainty by means of transmitted waves, similar to those of sound, that vibrate at a rate of millions of times a second, General Electric scientists revealed.

The method may be used to detect flaws in plastics and ceramics, as well as in metals, and is claimed to be more satisfactory in some cases than the technique that employs X-rays.

The instrument used in the new testing method is a single unit of what is called a complete ultrasonic wave transmitting-receiving system. It sends out sound waves at a frequency rate too high to affect the human ear, but which are affected by such flaws as internal cracks, voids, porosity, poor bonds and others. The instrument receiver notes any wave modification.

Science News Letter, February 15, 1947

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Books of the Week

A62 GUIDE FOR MODULAR COORDINATION—Myron W. Adams and Prentice Bradley—*Modular Service Assn.*, 271 p., illus., \$10. American Standards Assn. project for coordination of dimensions of building materials and equipment.

ABC'S OF VISUAL AIDS AND PROJECTIONISTS MANUAL—Philip Mannino—*Published by the author*, 83 p., paper, \$1. The physical handling of films and equipment with special emphasis on mechanical difficulties that may be encountered.

THE ANATOMY OF THE NERVOUS SYSTEM; Its Development and Function—Stephen Walter Ranson—8th ed. rev., Sam Lillard Clark—*Saunders*, 532 p., illus., \$6.50. A textbook of neurology.

BULLETIN OF THE SEISMOLOGICAL SOCIETY OF AMERICA—Vol. 36, No. 3, July 1946—George D. Louderback, ed.—*Univ. Calif. Press*, 322 p., paper, \$4 per year, single copies \$1. This issue is a catalogue of Philippine Earthquakes from 1589-1899.

COLLEGE ALGEBRA—Thurman S. Peterson—*Harper*, 334 p., \$2.50. A textbook for college students who have had at least one year of secondary school algebra. It contains a complete review of elementary algebra.

COLONIAL AGRICULTURAL PRODUCTION—Sir Alan Pim—*Oxford Univ. Press*, 190 p., \$3. A survey of the two systems of colonial agricultural enterprise—both plantation and small holding—and an attempt to reconcile the two into modern agrarian economy.

DROUGHT, Its Causes and Effects—Ivan Ray Tannehill—*Princeton Univ. Press*, 264 p., illus., \$3. A new point of view underscoring the importance of the problem of drought and a need for more of the basic facts on the weather on a worldwide scale.

FERNS—William Alphonso Murrill—*Published by the author*, 96 p., illus., paper, \$2.40. Based upon an intimate association with ferns for over sixty years in many lands.

HARVARD COLLEGE OBSERVATORY, The First Century, Harvard College Observatory, 94 p., illus., paper, \$1. A review of the past and a preview of the future of this institution.

I MARRIED A RUSSIAN; Letters from Kharkov—Lucie Street, ed.—*Emerson*, 331 p., \$3. Letters from an English girl who married a Russian scientist, which tell of the Soviet country as it went through violent changes in peace and war.

INTERNATIONAL CONTROL OF ATOMIC ENERGY; Scientific Information Transmitted to the United States Atomic Energy Commission, Dept. of State Publ. 2661—Bernard M. Baruch—*Govt. Printing Office*, 195 p., paper, 30 cents. Collection of six volumes of scientific information prepared to assist in providing a reasonable understanding of the problems before the Commission.

INTERNATIONAL CONTROL OF ATOMIC ENERGY; Growth of a Policy, Dept. of State Publ. 2702—*Govt. Printing Office*,

281 p., paper, 45 cents. An informal summary record of the official declarations and proposals relating to the international control of atomic energy between Aug. 6, 1945, and Oct. 15, 1946.

NEW WORLD OF CHEMISTRY—Bernard Jaffe—*Silver*, rev. ed., 710 p., illus., \$2.88. A high school text covering up-to-date topics as well as fundamentals.

THE PACIFIC SPECTATOR—John W. Dodds, ed.—Vol. 1, No. 1, Winter 1947, *Stanford Univ. Press*, 132 p., paper, \$3.50 per year; single copies \$1. Quarterly journal of opinion sponsored by twenty Pacific Coast universities and colleges.

PRESSURE COOKERY—Leone Rutledge Carroll—*Barrows*, 171 p., illus., \$2. Recipes for every household; discussion of this new time-saving way of cooking.

QUANTITATIVE CLINICAL CHEMISTRY, Interpretations, Vol. 1—John P. Peters and Donald D. Van Slyke—*Williams & Wilkins*, 1040 p., \$7. A second edition covering overall energy changes, and the chemistry and metabolism of the three major foods—carbohydrates, lipids and proteins.

TIME FOR SCIENCE INSTRUCTION; Yearbook—National Science Teachers Assn., 51 p., paper, 50 cents. How teachers and school officials can find sufficient time for the important task of teaching science in and out of school hours.

UTERINE CONTRACTILITY IN PREGNANCY—Douglas P. Murphy—*Lippincott*, 134 p., illus., \$5. A study of the contractions of pregnancy and labor under normal and experimental conditions.

Science News Letter, February 15, 1947

ENTOMOLOGY-BACTERIOLOGY

Insects Carry Bacteria That Fix Nitrogen of Air

➤ INSECTS of several widely different kinds keep in their bodies colonies of bacteria that have the ability to fix atmospheric nitrogen, and thus keep their hosts supplied with a necessary type of food which they would otherwise not get, states Dr. Jaroslav Peklo of the Phytopathological Institute of Prague, Czechoslovakia, in *Nature*.

Among the insects studied by Dr. Peklo are aphids and thrips, which suck the sap of plants; flour-moth larvae, which feed practically altogether on starch; and larvae of bark-boring beetles, which eat mainly cellulose. All these diets are lacking in proteins, which are supplied by the nitrogen-fixing bacteria.

The bacteria found in all the insects have been identified as belonging to the genus *Azotobacter*, long known as a nitrogen-fixing organism in the soil.

Science News Letter, February 15, 1947

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Science News Letter, February 15, 1947

❁ **MAGNESIUM** steak platters, designed for serving at the table as well as for broiling and frying, eliminate separate serving dishes and keep the meat hot because of their massive yet light construction. They are made for individual servings.

Science News Letter, February 15, 1947

❁ **ADHESIVE** for sealing corrugated paper boxes produces a permanent bond resistant to extremely high and low temperatures. It is easy and economical to use because it can be applied with a spray gun.

Science News Letter, February 15, 1947

❁ **ALUMINUM SOLDER**, developed in Switzerland, which requires no flux or flux substitute, is now available in America. With it aluminum equipment can be soldered with greater simplicity than by conventional methods, and joints are relatively free from damage by corrosion.

Science News Letter, February 15, 1947

❁ **PREFABRICATED hog houses**, of the type in the picture, are steel-sheathed, insulated with fiber glass, and ventilated



by means of an adjustable turret top. They are light enough to be skidded from place to place by a farm horse.

Science News Letter, February 15, 1947

❁ **POSTWAR truck** with front-wheel drive can be built in any reasonable length because of the absence of a power shaft to the rear and the ordinary differential on the rear axle. The arrangement makes possible a low-level floor only 16 inches from the road.

Science News Letter, February 15, 1947

❁ **ERRORLESS typewriter**, electrically driven, sets up a line of type visible just

above the keyboard for correction before actually printing. If there is an error, pressure on a button eliminates the line, which can then be rewritten. The next line is typed while the first one is printing.

Science News Letter, February 15, 1947

❁ **TELEVISION receiver** has a swivel mounting so that it can be pivoted to the right and left, and a rotatable switch for the selection of up to eight television channels. Flexible antenna, a special type of balanced input circuit, an aluminum screen cathode tube, and a germanium crystal to detect the signal are other features.

Science News Letter, February 15, 1947

If you want more information on the new things described here, send a three-cent stamp to SCIENCE NEWS LETTER, 1719 N. St., N. W., Washington 6, D. C., and ask for Gadget Bulletin #19. To receive this Gadget Bulletin without special request each week, remit \$1.50 for one year's subscription.

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