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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • JANUARY 20, 1945

Ditching Machine

See Page 42

A SCIENCE SERVICE PUBLICATION

BELL TELEPHONE LABORATORIES

Exploring and inventing, devising and perfecting for our Armed Forces at war and for continued improvements and economies in your telephone service

RESEARCH, in the Bell Telephone System, has always been an expanding activity, growing with the scientific knowledge of the times and contributing to that knowledge.

The telephone, itself, was invented in the laboratory where Alexander Graham Bell was carrying on researches in speech and hearing and laying the foundation for the electrical transmission of speech. As time went on the telephone research program expanded to cover every science which gives any promise of improved telephony.

These researches and studies now include electrical communication of speech—both by wire and by radio—the transmission of pictures (television)—and many important projects for war.

There Is No End to Progress

Every new research gives rise to new inventions and to new lines for development and design. New inventions indicate new lines for more research. In the early years, this work was carried in part by the American Telephone and Telegraph Company and in part by the Western Electric Company, the manufacturing unit of the Bell System.

For many years, however, the work has been assigned to a specialized unit, Bell Telephone Laboratories, Incorporated. Theirs is the responsibility for the technical future of the telephone industry.

The policies and procedures of Bell Telephone Laboratories are distinguished by two characteristics. In the first place the Laboratories design for service. The consideration is not the profit of a manufacturer, but the production of equipment which will give the best service at the lowest annual cost when all factors are considered, such as first cost, maintenance, operation, and obsolescence. The Laboratories make no profit and the equipment they design is owned and used by the telephone companies; and the emphasis is upon that use.

Organized Co-ordinated Research

In the second place the Laboratories design always with reference to the complete communication system in which the equipment is to play a part.

Reliable, economical telephone service, which is the product of its efforts, is not so much an assemblage of excellent apparatus as it is an excellent assembly of co-ordinated equipment—all designed to work together.

4600 People in Bell Laboratories

Bell Laboratories contributions to the Armed Forces derive in large part from the technical background that the Laboratories had acquired through their steadily maintained program of research. The Laboratories had special knowledge and skill which could instantly be diverted to war problems.

At the time of Pearl Harbor, over a quarter of the 4600 people in the Laboratories had twenty or more years of service. This breadth of background made possible many engineering developments outside the strict field of communication and these have been of value to the Armed Forces. So far the Armed Forces and the O.S.R.D. have engaged the Laboratories on over a thousand major projects.

Most Laboratories developments, of course, have been in the field of electrical communication. Communication, not simply between individuals as in telephony, but also between mechanisms, as in the electrical gun director.

Leader in Electronic Development

The Laboratories techniques and electronic researches have produced many secret weapons for our country's Armed Forces. In World War I, they pioneered by developing radio telephone systems for talking between planes and between planes and ground stations. They also contributed methods and devices for locating enemy planes, submarines, and artillery.

In this war, Bell Laboratories have pioneered in the field of electronics. The Western Electric Company, which manufactures the designs of the Laboratories, is the largest producer of electronic and other war communication equipment in the United States and is now engaged almost exclusively in the manufacture of this equipment.

In war, Bell Telephone Laboratories devote their work to the needs of our Armed Forces. In peace, they are constantly exploring and inventing, devising and perfecting for continued improvements and economies in telephone service. Centralized research is one of the reasons this country has always had "the most telephone service and the best at the least cost to the public."

BELL TELEPHONE LABORATORIES

AERONAUTICS

Need More Airports

Only about 10 can accommodate planes of the B-29 Superfortress type; runways up to 7,000 feet long and 200 feet wide will be needed.

➤ AIRPLANES are at least 10 years ahead of airports and unless some means is found to provide airport facilities to accommodate giants of the sky currently used or contemplated, world air commerce is likely to suffer, reported Arthur Ayres, of Pan American World Airways, at the meeting of the Society of Automotive Engineers in Detroit.

Only about 10 of the 2,200 airports in the United States, and of the 250 military flying fields built around the world, can accommodate planes of the B-29 Superfortress type which will undoubtedly be adapted for postwar air travel, Mr. Ayres pointed out. He recalled that in 10 years the weight of commercial planes has increased about six and one-half times, so that runway length must be increased at least 3,000 feet.

The practicability of large aircraft is being solidly established by war-time air transportation, and the larger airports needed for an expanded civil air transportation system will require runways up to 7,000 feet long and 200 feet wide, Paul H. Stafford, of the Civil Aeronautics Administration, told the meeting. He stated that the present trend toward thicker airport pavements, using better materials and more exacting construction methods, may be expected to continue as aircraft size is increased.

Science News Letter, January 20, 1945

Reduces Fuel Consumption

➤ POSTWAR planes on flights around the world may be powered by an engine-turbine combination that is high in power, low in fuel consumption and generally more satisfactory than jet propulsion, C. F. Bachle, of Continental Aviation and Engineering Corporation, Detroit, told the meeting.

Reduction in fuel consumption will be a necessity for global transportation, he reported, and the engine-turbine now seems to provide an effective means of obtaining the greatest amount of propulsion energy from a given amount of fuel.

The turbine is fueled by the exhaust gas from the gasoline engine, Mr. Bachle explained. He rated the engine-turbine combination as having the highest efficiency for long-range flights at 300 miles per hour in that it provides a minimum weight of power plant plus fuel.

He predicted that jet propulsion turbines might replace piston engines when higher speeds become practical. Currently, the high-speed airplane is suitable only for special purposes because the larger proportion of its load-carrying capacity is occupied by the power plant.

Science News Letter, January 20, 1945

Two Engines in Trucks

➤ INSTALLATION of two engines in heavy trucks to give extra power was recommended at the meeting by Ralph M. Werner, United Parcel Service. Tests during the past 15 years indicate that dual-engined vehicles are efficient and economical, he said. The two engines may operate simultaneously at all times or one may be used only when extra power is required in hill climbing or in mud and snow.

The use of multiple power plants in trucks is by no means a new idea, he explained. It has been tried both in Europe and in America. A truck built in the United States in 1930 was a three-axle unit equipped with two 135-horsepower eight-cylinder engines. Others were built later. In one, which Mr. Werner himself designed, one engine was placed at the rear of the rearmost axle and the other just ahead of the first driving axle.

Costs of building and operating a truck equipped with a single 200-horsepower engine and one with two 100-horsepower engines were contrasted by the speaker. For the two-engine installation the cost will be only 30% of the cost of the single engine with twice the power, he said. When transmissions, clutches, and extra axles are taken into consideration there is still a saving.

"It is conceivable," Mr. Werner concluded, "that on a complete installation of this kind the saving might well run as high as 50%."

Science News Letter, January 20, 1945

Anti-Icing Equipment

➤ HEATED airplane wings are being tested as anti-icing equipment for aircraft by the Army Air Forces, Lt. Myron Tribus, of the Air Technical Service

WINGED LABORATORY—In a specially equipped B-24 Liberator "flying lab" research engineers of the Sperry Gyroscope Company are shown making instrument tests and performance records under actual flying conditions.

Command, Wright Field, told the meeting.

Army experiences and tests made with the B-17 Flying Fortress, B-24 Liberator bomber, and the Lockheed 12-A Light Bomber, have indicated that the amount of heat which must be supplied in flight is less than indicated by wind tunnel and dry-air flight tests.

Science News Letter, January 20, 1945

MILITARY SCIENCE

More News of V-2

Enough fuel is consumed by this Nazi terror-rocket in less than five minutes to supply eleven "A" card holders with gasoline for a year.

➤ GERMAN V-2 ROCKETS use up more fuel in less than five minutes than eleven "A" card holders receive in a whole year under present rationing regulations. This calculation is based on figures published in the British magazine *Flight*, which state that one V-2 uses up 8,000 pounds of fuel in the time of flight, which from launching to impact is about five minutes. That means they use up roughly 1,142 gallons. An equal amount of 100 octane aviation fuel would be enough to power one of our four-engine B-24 Liberator bombers, with 2.5-tons of bombs, on a five-hour bombing mission.

The report confirms earlier estimates that for the present range of about 200 miles from launching site to target the maximum altitude reached by the V-2 is over 60 miles from the earth's surface. However, it goes beyond the earlier reported maximum speed attained by the rocket, 3,000 miles an hour, to state that a velocity of 4,500 miles an hour is probably more accurate. At this high speed the friction developed is so intense that V-2's have been observed glowing a dull red.

The rocket is launched vertically under its own power. Only a concrete platform or a good road is required, with a simple structure to support it in upright position. In this respect it has an advantage over the V-1 "buzz bomb." The turbine is started up and pumps deliver fuels, alcohol and liquid oxygen, mixed with peroxide and permanganate, to the combustion chamber. The fuel is ignited by an electric spark, causing the mixture to burn violently. The steam and carbon dioxide, products of combustion, are projected at high velocity through the nozzle at the back of the rocket, giving it an initial thrust of about 26 tons.

After take-off the rocket makes a vertical, accelerating climb for about 60 seconds. Then a gyro comes into operation, under the control of a time mechanism, barometer, or perhaps radio control, and with the aid of a servo mechanism, a small motor, moves the steering vanes to alter the angle of flight from vertical to about 45 degrees in the direction of the target. As fuel is consumed, the rocket becomes lighter. The thrust is constant, and consequently the rocket is speeded up. At the same time the density of air is reduced, and this resistance is lessened, and the rocket further speeded up while under power. This explains the initial vertical flight, which is executed to take the shortest path through the relatively dense layer of air near the earth's surface. This factor of air resistance makes clear why the Nazis are reported to be setting up V-2 launching sites on mountains. Every increase in the initial launching altitude lessens the energy which must be expended in reaching the rarefied air where really high velocities can be attained. The article states that for this reason, reports that V-2's will be launched from the mountains of Norway should not be dismissed as impossible.

Science News Letter, January 20, 1945

AERONAUTICS

Fast Towing Tractor for Heavy Bomber Take-offs

➤ BIG BOMBERS and heavily loaded transport planes need a great deal more engine power for take-off than they do in normal flight. Their engines must strain until they are air-borne, then the pilots can throttle down. This means that a considerable part of the power-plant is dead weight except for the few minutes spent in thundering down the runway.

To avoid this overloading of the engines is the aim of a take-off system on which U. S. patent 2,366,892 has been issued to Maurice L. Donnellan of Ypsilanti, Mich. He provides a powerful, high-speed tractor, with a swivelled pillar to hold up the nose of the airplane while the vehicle races along, adding the traction of its motor to that of the plane's engines until the wings take hold on the air. Then the hookup is released and the plane leapfrogs over the tractor and is on its way. The vehicle can, of course, also be used for ordinary utility plane-towing jobs around the airfield.

Science News Letter, January 20, 1945

A new *hybrid corn* and several new varieties of sorghum in the United States are now producing special starch for adhesives and food of the tapioca type to replace cassava formerly obtained from the Dutch East Indies.

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MILITARY SCIENCE

Yankee Doodle Robomb

It can reach a speed of 400 to 440 miles an hour at an altitude of 6,000 feet and achieve a theoretical range of about 150 miles.

➤ USING A FIVE-PAGE Allied Command report, a photograph from a popular magazine, some badly mutilated engine parts, and America's best technical minds under the supervision of Col. D. J. Keirn, of the Air Technical Service Command, Wright Field, we began last August 9 to develop the Yankee Doodle robomb. Credited for a large part of the developmental work on the jet propulsion engine that powers our robomb is the Ford Motor Company, of Dearborn, Mich.

It took three weeks to complete the first robot bomb propulsion engine that could be successfully operated, once the work was begun on the basic design. Today America has a good robomb which can be used if needed, but we may never need it, for the Army Air Forces does not favor indiscriminate bombing attacks.

The Yankee Doodle robomb can reach a speed of 400 to 440 miles an hour at an altitude of 6,000 feet and achieve a theoretical range of about 150 miles. It is about 80 miles an hour faster than the Nazi V-1 weapon.

A feature of the Yankee Doodle robomb is its rocket-propelled launching car, announced for the first time in *Air Force*, the official service journal of the U. S. Army Air Forces. In operation the jet engine is started by a sparkplug in the top of its combustion chamber, with the power supplied from an outside source. It runs with a rich yellow flame until the external air supply is shut off. The engine then emits a blue flame as it develops greater thrust force. This change in color occurs when the oxygen content of the gases in the combustion chamber is reduced. Thirty seconds after the bomb engine has started the launching rockets are fired, and the robomb soars into the air, together with the launching car. When it reaches a speed of 260 miles an hour, the rocket-propelled launcher drops off and the flying missile continues on its way by jet propulsion.

The wingspan of the Yankee Doodle robomb is 17 feet 8 inches. From nose to tail the robomb measures 24 feet. It houses a magnetic compass, a 2,080-pound high-explosive charge, a fuel tank with capacity for 157 gallons of low-grade gasoline, compressed air bottles which supply air for operating servo motors and for pressurizing fuel, a radio transmitter, and an automatic pilot.

On the nose of the fuselage is an air log propeller, like a tiny windmill, which counts up air miles until a pre-determined number is reached. At this point the robomb is supposedly over the target. The air log then flips the controls, causing it to go into a dive.

Science News Letter, January 20, 1945

CHEMISTRY

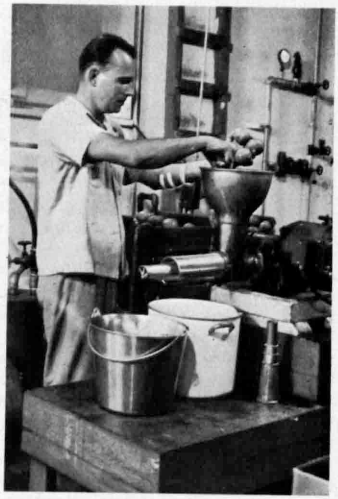
New Tangerine Syrup Developed by Chemists

➤ A TANGERINE SYRUP rich in sugar and vitamins, and two types of beverage bases have recently been developed by research chemists C. D. Atkins and E. L. Moore of the Florida Citrus Commission in cooperation with chemists of the Bureau of Agriculture and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture, at the Citrus Products Laboratory, Winter Haven, Fla.

The products have already attracted the attention of several local citrus-processing plants, that have available equipment necessary for their manufacture. The production of these concentrates, together with other existing commercial tangerine by-products, is expected to help return to the farmer some of the growing and picking costs.

Because difficulties have been encountered in the commercial canning of tangerine juice, a syrup with a light-brown color and a sweet fruity taste has been developed from the juice of tangerines. In preparing this syrup, firm cull tangerines are washed and passed through a screw press. Then the juice is screened to eliminate large particles of peel and pulp, neutralized and filtered, and vacuum concentrated.

The brown, honey-like product may be bottled attractively for home use as a table syrup rich in fruit flavor and vitamine C. Or it may be put in large containers for shipment to manufacturers of other products as a source of sugar and vitamin C, or as a substitute for glycerine.



VITAMINS—For use as a syrup or beverage base, this tangerine juice concentrate is being prepared in the laboratory by C. D. Atkins, one of the chemists responsible for developing the process.

Other tangerine juice concentrates of fine commercial possibilities are the tangerine beverage bases that contain all of the natural fruit acids. In the preparation of beverage bases, whether or not the screened juice is filtered out depends upon the transparency or type of product desired.

After it has been vacuum concentrated, the syrup is pasteurized, bottled and held in storage at 40 degrees Fahrenheit until used. It possesses a fine fruit flavor, excellent retention of vitamin C, and in addition a high acid content which is desired by the beverage industry.

Technical details of the process are reported by Mr. Atkins, Mr. Moore and J. L. Heid in the *Fruit Products Journal*.

Science News Letter, January 20, 1945

Magnesium has an unusual attraction for oxygen; because of this it is highly desirable for flares and incendiary bombs but harder to handle in engineering and construction materials.

Reductions recently made in the amount of *tetraethyl lead* going into civilian gasoline will save enough lead to produce over 200,000,000 gallons of 100-octane aviation fuel for the armed services.

ENGINEERING

Life-Size Copper Man

He reproduces the heating effect of the human circulatory system and will be used as a test machine for electrically heated flying suits.

➤ A LIFE-SIZE copper man that reproduces the heating effect of the human circulatory system, to be used as a test machine for electrically heated flying suits and other similar equipment, was exhibited in New York by the General Electric Company at the National Retail Dry Goods Convention. Later it will be used in a cold room with temperatures far below zero at the Bridgeport, Conn., plant of the company in research and routine testing.

Electrically warmed clothing is a vital necessity for members of bomber crews three to seven miles above ground, where the temperature may be 70 degrees below zero Fahrenheit, and much research and development has been carried out to produce satisfactory suits. Formerly human beings were used in the cold room tests but they were not entirely satisfactory because different human volunteers reacted differently and the same person differed in reactions at different times.

The copper man, which duplicates almost exactly the human temperature system, was developed to relieve human beings of the extreme discomforts and possible injuries of long hours during testing in extreme cold, and to assure uniform results because the reactions of the metal man are always the same. The copper man exhibited is the second one made by General Electric. The first is already in use at Wright Field, Dayton, Ohio, and has proved its worth.

The General Electric model is a perfectly formed human body five feet 10½ inches tall with a copper covering 1/16 of an inch thick. A complicated system of electric wires is connected with separate areas of the copper head, torso, hands and feet. The body is divided into 15 such areas, each being subject to separate control. The marvel of the copper man is that he is so wired and circuited that he practically reproduces the varied heat of different parts and members of the body. Even cold feet on a warm body can be simulated.

In testing, the copper man is left in the cold chamber but the wiring comes out to a control panel in another room. Here the engineers sit in comfort and take readings from the instruments as they regulate the copper man and the conditions in the cold chamber at will. The controls can be set so that the electric energy is equivalent to that of normal metabolism, less exhaled heat. Then the copper man represents a person at rest and can be used for testing electrically heated blankets.

Science News Letter, January 20, 1945

***COPPER MAN**—He will save human volunteers from the suffering of low temperature tests of electrically warmed clothing for the armed forces. Robert Sambleson, General Electric engineer, makes notes as the copper robot reproduces the human temperature system.*

MILITARY SCIENCE

Buzz-Bomb Defense

Tactics used by the British to knock the V-1 out of the sky is to attack at anywhere from 150 yards up to 440 yards. May be duplicated here.

➤ THE CHANCES are that the Nazis will use a smaller bomb than the 4700-pound V-1, which they have been using against England and in the European war theater since last June, if they fire on New York and Washington. It is probable that they may have found a way to reduce over-all weight and size but still carry 2,000 pounds of explosive in each bomb. If they use a smaller bomb it will be harder to knock out in the air by fighter plane or anti-aircraft fire.

The tactics used by the British to knock the V-1 bombs out of the sky, as the red flare of their jets advertises their presence, is to attack at anywhere from 150 yards up to 400 yards. The attacking plane often flies in from the rear and with 20-millimeter cannon fire either wrecks the jet engine, puts the gyro pilot out of action, or explodes the bomb. When the flying bomb is shot down and explodes on the ground, the pilots say that they can see a ring of blast as it streams outward from the explosion.

If the explosive is detonated in the air, the attacking fighter plane has to fly through the blast, which frequently is strong enough to turn the plane completely over. Pilots report that when one is exploded in the air it appears as if the sky erupts in a great orange-and-black flash. The blast waves travel at a speed greater than that of sound, and it is only because modern fighters are stressed to withstand compressibility effects that very little damage occurs to the plane.

The range of the present V-1 is over 150 miles, with a speed in level flight of between 300 and 350 miles an hour. The explosive is carried in the war-head, mounted in a thin casing (to achieve maximum blast effect) in the front part of the mild-steel fuselage. The projectile is painted dark green on top and light blue underneath.

Trained civilian spotters, watching from high buildings, report the location of each bomb as it crashes. A few moments later members of the National Fire Service, made up of rescue and medical personnel, are on the scene. Even after the worst incidents all victims are usually extricated within an hour.

British Civil Defense services have evacuated over 14,000 patients from hospitals in the London area during the big bombardment, and mobile first aid units

attended to 40,000 minor casualty cases.

Flying glass is one of the chief causes of casualties. The sound of breaking glass often follows the explosion of a flying bomb. Sometimes pieces of glass from splintered windows are hurled across a room and bury themselves like daggers several inches deep in the walls. This is all caused by the terrific blast effect which accompanies the detonation of the 2,000-pound warhead of the V-1's. The blast waves travel faster than the speed of sound, shattering windows and everything else that cannot withstand them.

On other occasions, observers report, glass will crumble into millions of tiny pieces. One woman, standing in front of a plate glass window when it was shattered by a bomb blast, was not injured at all by flying fragments.

Bomb blast effects are unpredictable, and sometimes freakish. A flying bomb is reported to have exploded less than six feet from a beech tree, left the tree untouched, but shattered the roof and windows of a house fifty yards away.

Some of the Nazi V-bombs that have been hit, but not exploded, by anti-aircraft fire have been known to turn in their tracks and head back towards the place from which they were launched, like boomerangs.

Science News Letter, January 20, 1945

MEDICINE

Mice Cancers Disappear

One of the new B vitamins has anti-cancer activity, mice tests indicate; no human application yet, but scientists are hopeful.

➤ DISCOVERY THAT one of the new B vitamins has anti-cancer activity is reported by four researchers of Mount Sinai Hospital (*Science*, Jan. 12).

The researchers are Drs. R. Leuchtenberger, C. Leuchtenberger, D. Laszlo and R. Lewisohn.

The discovery was made in studies with mice. It has not at present any application to cancer in humans. Of course the group hopes the discovery will turn out to be useful for treating human cancers.

The vitamin used has been called folic acid but at present scientists are calling it the L. casei factor. Tiny doses of this were injected into the veins of 89 mice that had spontaneous breast cancers. The injections were given daily for four to six weeks.

The cancers disappeared completely in 38 of the mice, or 43%, and 49 of the mice are still living. Of 60 cancerous mice that did not get the vitamin, no tumor disappeared, only 20 are living, and 14 developed new tumors. Only one new tumor was observed among the treated mice.

Whether the vitamin will have the same effect on cancer in humans is not known at present. At this time it is not possible to make tests on humans because there is not enough of the vitamin available. It is a relatively new vitamin. Its chemical structure is not known, so it cannot be manufactured in large quantities the way some of the other B vitamins can be. It is a difficult, costly procedure to extract it from natural sources and the yield is minute, about on the order of one part vitamin from 100,000 parts of source material.

How this vitamin acts to cause disappearance of cancer in mice is not known, either. The Mount Sinai researchers during the past seven years have found anticancer activity in a number of extracts such as material from spleen, yeast and barley. Suspecting that the anti-cancer material might be a vitamin, they investigated this rather new member of the vitamin B complex, the L. casei factor, with the results now reported.

Science News Letter, January 20, 1945

ZOOLOGY

Gory Dramas Enacted On Mouse-Sized Scale

➤ LIFE-AND-DEATH dramas of the animal world, as fierce and gory as a lion's attack on a zebra but reduced to a mouse-sized scale, take place nightly among the winter grassroots of our own land. The victims are field mice, the hungry predators are short-tailed shrews. Fragmentary evidences of these small tragedies have been collected and studied by Prof. W. Robert Eadie of Cornell University.

Shrews are sharp-nosed little animals which most of us never get to see; if we did see them we would probably suppose they were another kind of mouse. However, they are not members of the rodent family at all, but belong to a voraciously carnivorous zoological tribe that feed mainly on insects, and hence are called the Insectivora. So meat-hungry are shrews that if two of them are caged together over night, in the morning there will be only one—slightly bulgy around the middle.

Prof. Eadie has made a careful study of the winter nests of several short-tailed shrews and particularly of bones, skin fragments and hair of mice found in the undigested food remains scattered about.

In 56% of all samples analyzed there were evidences that the shrews had been feeding on field mice. During the period of greatest mouse-eating activity the field-mouse population of comparable areas dropped from 80 per acre to 12 per acre. Prof. Eadie considers that "short-tailed shrews might thus have accounted for at least 14 to 27 mice per acre during the winter months. Circumstantial evidence points to a higher figure."

Science News Letter, January 20, 1945

BOTANY

Last of Life Is Best for Russian Dandelion

➤ KOK-SAGHYZ, the Russian dandelion used as an emergency rubber source, grows root substance faster and produces most of its latex content during the second half of its life, after its main flowering period is past, Dr. G. Krotkov of Queen's University, Kingston, Ont., reported. This is a matter of practical importance, he pointed out, because it gives an index to the best time for harvesting the plant.

During the first year of its life, before the peak of flowering, the kok-saghyz plant is busy "just growing." It produces a maximum of leaves, and keeps these very busy synthesizing proteins; very little sugar is to be found in them at this time. It also lays the foundation for its later rubber-producing activity by forming the bulk of the latex tubes in its roots.

In addition to their 10% rubber content, the dry roots contain 50% by weight of a carbohydrate known as inulin—the same stuff that is found in Jerusalem artichoke tubers. Inulin can easily be converted into sugar, and this in turn fermented into alcohol, Dr. Krotkov stated.

Science News Letter, January 20, 1945

ZOOLOGY

New-Born Kangaroo Crawls Into Mother's Pouch

➤ ONE OF THE long-standing puzzles of the animal world has been solved. Thanks to the evidence of an on-the-spot observer, we now know how a new-born baby kangaroo gets into the pouch on his mother's abdomen, where he continues to grow until too big to be carried around.

A report of the actual birth of a gray kangaroo in a Bristol, England, zoo is given by Dr. L. Harrison Matthews of the University of Bristol in the Proceedings of the Zoological Society of London.

As soon as the baby is born, Dr. Matthews stated, the mother begins licking her abdominal fur in a two-inch path. With its eyes closed, and its mouth roundly open, the inch-long infant kangaroo starts crawling through the damp fur, using its forelimbs. When it reaches the end of a wet patch of fur, the mother begins licking again until another wet patch is prepared. This process is repeated until the baby has reached the pouch and crawled into it.

During most of the operation the mother kangaroo leans backward so that her abdominal wall is almost level, making it easier for the baby to crawl.

Until recent years, it was generally thought that the baby was deposited in the pouch by the mother, using her tongue to guide it along the surface of her abdomen.

Science News Letter, January 20, 1945

AERONAUTICS

Near Crash Results in Air Express Regulation

➤ THE NEAR CRASH of an Army Air Transport Command plane loaded with a ton and a half of rifle barrels for troops leaving for Attu has resulted in a new air express regulation. Today, when anything capable of influencing the magnetic field of a compass is destined to be flown by air, the words "Magnetic Material" must be plainly marked on the shipment, indicating that it requires special treatment.

Flying in Alaska with the cargo of rifle barrels, two United Air Lines pilots assigned to ATC operations discovered that their plane and Mount McKinley were about to have an argument. By skillful flying they avoided the craggy peak. Realizing that their compass must be off, the two flyers investigated and found that the large quantity of metal in the rifle barrel shipment had created a local magnetic field which deflected the plane's compass approximately 20 degrees from its normal reading.

Special procedures have been set up because products containing iron might deflect the plane's compass from the correct reading. All large quantities of magnetic materials must be carried in the rear cargo compartment, as far away from the plane's compass as possible.

Magnetic materials acceptable as air cargo include only those items containing magnets with fields not confined. Included on the list are ammeters, galvanometers, magnetos, permanent magnets, motors or generators incorporating permanent magnets, photo-electric light meters, thermocouple meters, voltmeters and ferrous materials.

Magnetic materials carried in the plane's cockpit and front cargo compartment must be demagnetized before being loaded aboard the plane. This procedure has been established for a long time in airline maintenance.

Science News Letter, January 20, 1945

CHEMISTRY

New Precise, Rapid Method For Determining Vitamins

➤ RECENT developments in chemical methods for the determination of vitamins in foods are far more precise, rapid and less costly than the biological techniques carried out with test animals such as rats and guinea pigs. This is the opinion of Drs. Daniel Melnick, Melvin Hochberg, and Bernard L. Oser of Food Research Laboratories, Inc., New York.

"However," they explained, "the chemical procedures for liberating the vitamins from the materials to be tested are not exactly duplicated in the human digestive system. Thus all of the vitamin found in a product by chemical analysis may not be completely available to the body, the unavailable portion being of no nutritional value."

These investigators described a new technique which allows direct determination on the human subject of the availability of vitamins in a given product. They reported that the kidney excretion of the water-soluble vitamins, thiamin, ascorbic acid, riboflavin and niacinamide, parallels the dietary intake in studies with normal well-nourished individuals on standardized diets.

Science News Letter, January 20, 1945

IN SCIEN

PHOTOGRAPHY

Marks on Negatives Identify Stolen Cameras

➤ IF YOUR CAMERA is stolen from you, it is possible for police to identify it when later recovered even if you do not have any markings on it to show that it is yours. The identification, by an ingenious method devised by Constable R. Anthony, of the North Battleford City Police, Saskatchewan, Canada, makes use of the pictures taken with the camera.

Now that you can't buy cameras, the recovery of stolen cameras has become much more important, Constable Anthony points out in his report to the FBI Law Enforcement Bulletin published by the Federal Bureau of Investigation.

In one case he was able to recover a camera believed to be the one stolen from a car, but the camera had been well cared for and did not even have a scratch on it by which the owner could identify it. He asked the man who had lost his camera to bring in some of the negatives made with it. It was found that each negative had a peculiar mark on it like the impression of a hair or fine thread. Negatives made with the recovered camera were found to have the same imperfection. This established the identity and the owner got his camera back.

Nearly every camera, Constable Anthony has observed, leaves some sort of unusual mark on its negatives which can be easily spotted by a person trained in police laboratory methods.

Science News Letter, January 20, 19

INVENTION

Coal Identified for Protection Against Theft

➤ AS A MEANS for sure identification of coal, crushed rock and similar bulk materials, R. E. Miskelly of Plymouth, Mass., proposes to spray them with a chemical that fluoresces on being irradiated with ultraviolet light; he has received patent 2,367,040 on this invention. The ordinary daylight appearance of the commodity is not changed, yet a means is thus provided for protecting it against theft, adulteration and other abuses.

Science News Letter, January 20, 19

E FIELDS

PHYSICS

Thermal Cloth Developed To Line Aviators' Suits

➤ WARM, SOFT thermal cloth has been developed to line aviators' suits and for evacuation blankets for the wounded. Hundreds of pile tufts are woven on each side of the cotton warp, making the fabric exceedingly warm despite its light weight. The tufts tend to trap the warm air from the body and keep it from escaping.

The cloth was designed to replace sheep's wool in the jackets of aviators' flying suits since it does not harden in high altitudes as does the natural product. When used as a lining inside an outer shell of tightly-woven windproof fabric, it makes one of the warmest and most comfortable of flying garments.

To seal upholstery against the infiltration of dirt and to anchor more firmly the cotton warp and filling threads, fabric used to cover the seats of modern streamlined trains is coated with a latex compound. A coating process has been developed which permits air to pass through the fabric despite the coating: this makes the seat cooler and more comfortable.

Specimens of automobile upholstery, through which you can blow smoke even though the back has a rubber coating; of thermal cloth with the soft pile on both sides; and of upholstery for airplanes where light weight as well as durability is important, are only a few of the samples of upholstery fabrics made by Collins and Aikman Corporation which are contained in a kit prepared by Science Service.

The unit tells of the manufacture and care of upholstery fabrics and the various uses to which specialized fabrics have recently been put as well as postwar prospects for them. The Upholstery Unit of THINGS of science, containing the specimens and museum labels for their display, as well as suggesting a number of experiments, can be secured by sending 50c to SCIENCE NEWS LETTER, 1719 N St., N. W., Washington 6, D. C., and asking for unit No. 50.

Science News Letter, January 20, 1945

CHEMISTRY

Luxuries from Coal Include Perfumes, Nylon

➤ DIAMONDS SPARKLED, perfume sent its gentle fragrance through the room and nylon stockings were encased in a locked display case. The label on these was "coal."

Since diamonds are made of carbon, one of the principal elements in coal, brilliant cut stones highlighted the "black magic" exhibited in New York. A pair of real nylon stockings, made of coal, water and air, was marked, "authentic nylons, circa 1939."

A perfume bar gave guests an opportunity to compare the odors of roses, carnations, gardenias, and violets, while a chemist showed how they are mixed individually. Lilacs and lily-of-the-valley perfumes as well as the woodsy and bouquet types all result from the chemist's utilization of coal tar to reproduce nature's product.

A table with a coal-finished top that will not burn was offered to the guests for use as an ash tray, and a fabric made spot-resistant by a coal treatment was demonstrated. Plastics at the show included a picture frame, woman's handbag and compact.

A few of the 10,000 colors and shades of dyes made from coal were shown. The red of a woman's lipstick and the black of her mascara, as well as part of the shine on a man's shoes, are derived from coal. The display was arranged by the Bituminous Coal Institute, which wanted the public to know that coal is used for something besides burning.

Science News Letter, January 20, 1945

GENETICS

Genes Sometimes Function Along With "Primers"

➤ GENES, the submicroscopic entities that determine the course of heredity within the cell, do not always reign alone, Prof. T. M. Sonneborn of the University of Indiana announced. He has found instances in which genes that determine certain factors or courses of events could not operate except in the presence of at least traces of other substances which he called "primers." He gave them this name, he explained, because their action is rather like priming a pump: you put a little in and you get a lot out.

Although primers are found in the general protoplasm of the cell, their origin is still tied up closely with that of the genes themselves; they arise with them if not indeed actually out of them. Prof. Sonneborn has also found evidence for the existence of primers in the cell nuclei, therefore in intimate association with the genes themselves, which are commonly conceived as chemical units in or on the chromosomes of the nucleus.

Science News Letter, January 20, 1945

STATISTICS

WAC's Daintier Appetite To Save Army $2,700,000

➤ TAKING INTO consideration the fact that the average WAC has a daintier appetite than her GI brother will save the Army $2,700,000 on its yearly food bill, a report from the War Department indicates.

The average WAC can be adequately fed on 650 calories per day less than her brother soldier, a difference amounting to about a quarter of a pound of steak and three medium-sized potatoes, or about a quarter of an apple pie. She eats nearly this much, 600 calories, more per day than the minimum recommended by the National Research Council for the moderately active woman, presumably because she is more than moderately active.

The $2,700,000 saving expected by the menu adjustment to be made for the WACs will not, however, deprive them of beefsteak or apple pie. It will be accomplished by changes such as elimination of fried potatoes at breakfast. WACs don't go for potatoes at breakfast, the Quartermaster Corps finds, though they like them for other meals as well as the men do.

The average WAC prefers salad oil and French dressing for salads, whereas the male soldier prefers mayonnaise. The men want two eggs fried or boiled for breakfast and a second helping of sausage cakes. The WACs take one egg and 55% less sausage cake.

The average WAC drinks 25% less coffee, eats 25% less pastry (she prefers fruit for dessert), and eats 50% less assorted dry cereal, using, consequently, 15% less granulated sugar and 30% less syrup. Menus will be adjusted to these differences in eating habits and preferences.

Science News Letter, January 20, 1945

CHEMISTRY

Naphtha Is Made into Aviation Gasoline

➤ CATALYTIC chemistry scores another advance in the process on which Alexis Voorhies, Jr., of Baton Rouge, La., was granted patent 2,361,138. It consists in the cracking of naphtha, and the re-arrangement of its atomic fragments into aviation gasoline, in the presence of a synthetic silica alumina catalyst, at pressures around 250 pounds per square inch and a temperature of 958 degrees Fahrenheit.

Science News Letter, January 20, 1945

ENGINEERING

Fuel Travels by Pipeline

Coal, as well as oil, may flow from mines to markets soon after the war by way of a system of "highways" hidden under the landscape.

By A. C. MONAHAN

See Front Cover

➤ COAL MAY BEGIN to flow from mines to markets soon after the war by way of a system of "highways" hidden under the landscape. Today crude oil, gasoline and natural gas are carried to their destinations by a great network of pipelines which covers much of the United States and has a greater mileage than railroads.

Pulverized coal, mixed with water, kept in agitation and onward motion by great pumps, passes readily through pipelines over great distances. At delivery plants the mixture can be dried and briquetted for burning in home and other furnaces.

The success of transportation through pipelines is due to American scientists, engineers and construction men, for pipeline transportation for fluid fuels originated in America. It is usually cheaper than cartage by railways and highways.

Three Great Pipelines

Wartime conditions forced the construction of three great pipelines for fluid fuels from the great production fields in the Southwest to the eastern seaboard or to other industrial areas. They forwarded the construction of shorter lines also but these three, because of the length and size, hold the limelight. They are the government constructed Big Inch, the Little Big Inch, and the privately owned natural gas line just completed from Texas to the Pittsburgh-Cleveland industrial area. The picture on the front cover of this SCIENCE NEWS LETTER shows a ditching machine gouging a trench through the fields of Mississippi for this newest pipe line. The Big Inch carries crude oil, and the Little Big Inch transports gasoline from southern refineries.

The Big Inch and the new natural gas line are both 24 inches in diameter and each is over 1,250 miles in length. The Big Inch delivers some 300,000 barrels of crude oil each day to the refineries in the Philadelphia-New Jersey-New York area. The Little Big Inch is made of 12-inch pipe and carries gasoline 1,500 miles from Texas City, Texas, to New York. The new natural gas line exceeds in length by nearly 300 miles the famous Texas Panhandle-Chicago 24-inch line which, when completed in 1931, was the largest natural gas pipe-line in the world.

Many of the oil and gasoline pipelines in the United States are "common carriers" in the same sense as are the railroads, and are under the jurisdiction of the U. S. Interstate Commerce Commission. Approximately 90% of the total of some 130,000 miles carry crude oil. Some 70 companies operate common carriers.

Successful pipeline transportation of oil is the result of many years of work by scientists, engineers and construction men. The scientific problems to be overcome were numerous. The right kind of iron pipe had to be determined. Satisfactory joints were hard to obtain before arc-welding was developed.

Outside corrosion and rust protection for piping in acid soils, alkali soils, swamp lands, desert areas, and rocky mountain sides required special attention. Cutting to the lowest possible amount the inside friction to the onward passage of the oil was an essential. Then there were the hundreds of problems connected with the efficient working of the great pumping stations necessary at intervals of from 20 to 75 miles to keep the crude petroleum in motion.

Some crude oils are so viscous that they must be heated before they can be pumped and others require heating only in cold weather. However, the greater part of the crude oils transmitted by long pipelines are of moderate viscosity because they contain a relatively high percentage of gasoline. These require no heating except perhaps in extreme cold weather in sections where the pipelines cross high hills and mountains. Efficient and economical heating equipment for the oils constituted another job for the scientists.

As a result of much scientific study and practical experience the laws that govern the flow of crude oil through

WILL CARRY GAS—Before it is dropped into the trench, a protective coating is put on the pipe of the Tennessee Gas and Transmission Co., destined to carry natural gas to the Appalachian industrial areas

Do You Know?

A mold, *Aspergillus niger,* is found to be a valuable new test plant because it requires for growth the same minerals as green plants with the exception of calcium, silicon and boron.

A 75-year-old *limestone mine,* with some 12,000,000 cubic feet of space, near Atchison, Kans., is in use for the cold storage of government lard, eggs and other perishables; some refrigeration equipment will be required.

To make sure that the fuel line to a furnace is cut off when the blaze goes out, an *electric-eye* device focussed on the heating flame or pilot light is sometimes employed; if the fire goes out a warning signal is given.

New strains of *safflower* developed in the United States yield as high as 34% oil, a satisfactory substitute for linseed as a drying oil in paints; safflower grows at rather high elevations and requires little rain.

Army mules, still used as pack animals in spite of motorized equipment, weigh from 1,000 to 1,150 pounds and carry from 200 to 250 pounds; they are sure-footed on rough mountain trails and not seriously disturbed by battle noises.

From Page 42

pipes are now well known to petroleum engineers. A basic flow formula has been determined which takes into consideration the viscosity of the crude, its specific gravity, the diameter of the pipe, and other factors.

The quantity of oil that can be put through a pipe varies with the initial pressure on the petroleum, the pressure loss per square inch per mile, the density of the oil, the viscosity and other characteristics of the fluid handled, the diameter of the pipe, and to a certain extent the character of the terrain where the pipe is laid.

A pressure of from 800 to 1,000 pounds per square inch is the usual initial force put behind the oil. The pressure drop per mile varies from 10 to 30 pounds per square inch. Pumping stations must be placed along the line to keep the pressure well up. Usually this means every 40 to 45 miles, although often they must be much closer and sometimes may be placed much farther apart.

The capacity of a pipeline can be greatly increased, perhaps doubled, by doubling the number of pumping stations and increasing their installed horsepower. The cost of pipe in place and the cost of power are factors that the engineer must take into consideration.

The total investment cost per mile of pipelines varies with the diameter, terrain and other factors. Roughly it ranges from some $10,000 per mile, including pumping stations, for six-inch pipe to $60,000 for 24-inch pipe. While the large pipes cost much more than small pipes in total investment outlay, they cost much less when considered on a capacity basis. The cost per barrel per mile delivered through the 24-inch pipe is only about one-sixth the cost through a six-inch pipe.

From figures of the Interstate Commerce Commission it appears that the cost of transporting oil by pipelines owned by the larger companies coming under its jurisdiction is in the neighborhood of five cents per barrel per 100 miles. A barrel is approximately 300 pounds. In a 24-inch line the cost should be much lower.

In most cases the cost is much less than comparable railroad freight rates but is considerably higher than water shipment by tankers. For this reason most of the oil from the great Southwest oil-producing country in prewar days was piped to shipping points on the Gulf of Mexico and from there brought by boats to the eastern coast refineries.

FOR AVIATION FUEL—Pipelines make it possible for such refineries as the Baltimore plant of the Standard Oil Co. of New Jersey to continue turning out tremendous quantities of aviation fuel.

The first petroleum pipeline in the United States was probably a four-mile line laid in western Pennsylvania in 1865 to bring oil to the railroad from the wells in America's first important commercial field. The total oil pipeline network in America now includes some 130,000 miles.

The first real trunk line was constructed in 1879, connecting the west Pennsylvania fields with refineries on the seaboard. Its success led to the construction of others across the Appalachians. These were extended to gather oil from Ohio, Indiana and Illinois, and later pipelines were constructed to bring petroleum from the Oklahoma-Kansas area to the east coast and to Chicago, where a large refinery center had developed.

Prior to about 1920 the principal movement of crude petroleum from the Mid-Continent to the Atlantic seaboard was by these pipelines. The years following saw the development of the great Texas oil fields and of transportation by tankers from the Gulf and from California ports. Pipelines carried the oil to these ports, and the amount of oil carried direct to the east by pipelines decreased to a comparatively small figure.

Because of this decline, a number of eastern lines were taken up and one line was altered so that it could be used to take oil westward from the coast, an-

other was made over into a gasoline line, and several were converted to transport natural gas from the west to the east.

The mileage of natural gas lines in the United States is about equal to that of oil pipelines. These lines make it possible to save and market much of the gas that would normally be lost in oil fields where gas is found in combination with petroleum, and also to bring to industrial centers for blast furnaces and boilers gas from wells that yield no oil.

Few householders realize the important part natural gas plays in industry. The first use of this fuel in the United States was industrial. It was put into use in 1820 in Ohio to evaporate brine in the manufacture of salt. Iron, steel, and ceramic industries are among the present heavy users. Early use by industry or for lighting was restricted to places near the source of supply. Scientists, however, changed the situation by developing a light steel pipe suitable for delivering natural gases over thousands of miles.

Natural gas fields are located in three principal sections, the Appalachian area, the Southwest, and in California. It is now available in the majority of the states in the Union, thanks to pipelines and the men who developed them.

Science News Letter, January 20, 1945

AERONAUTICS

Aircraft Bus Service For 1,000 Cities

➤ THE BUS industry proposes to establish scheduled helicopter-bus air service operating between bus stations in downtown sections of approximately 1,000 cities and towns, and between nearby towns, Agnew E. Larsen, president of RotaWings, Inc., has announced.

Numerous applications have already been made to the Civil Air Board for certificates of operation for helicopter-bus service by the nation's leading motor coach lines, Mr. Larsen remarked.

The engineering of helicopter buses, Mr. Larsen stated, is moving at a pace which should assure the operators and the public of a reasonably wide choice of air-buses. He cited the work of Igor Sikorsky, Platt LePage and Bell Aircraft. With a lessening of wartime restrictions, he pointed out, many models yet to be heard of should be taking flight.

Pointing to the statement of the CAB regarding helicopters, he said that that agency has taken ". . . happily a broader-minded, view . . . with regard to both the surface carriers and the helicopters."

The CAB regulations to which he referred state that the air transport services will be auxiliary, supplementary, and incidental to the other transport operations of an applicant for a certificate of operation. Continuing, the CAB points out that it cannot be expected to grant an application for service which cannot be performed except by the use of a helicopter which will not be obtainable for a number of years. The CAB will favor proposals for limited experimental services when aircraft like the helicopter will be available reasonably soon.

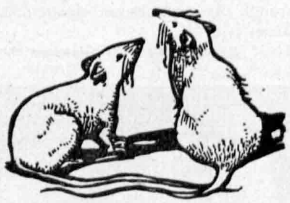
"Transportation people are prepared to embark upon this new medium—the helicopter—and live with it through the admittedly experimental phases—such as the air transportation interests did through the 'twenties and thirties,'" Mr. Larsen said.

Science News Letter, January 20, 1945

ZOOLOGY

NATURE RAMBLINGS

by Frank Thone



Undomestic Animals

➤ BESIDES the animals he keeps in or about his house as working partners, food sources or pets, man has an assorted array of hangers-on that have lived with him so long that their common names reflect the association. As a rule, these names are indications of the part of man's habitat they have chosen to be their habitat as well.

"House," the widest and most inclusive of man's habitat-names, has been added as an adjective to the names of quite a diverse list: house mouse, house cricket, housefly, house sparrow, house wren, and (in the tropics at least) house snake.

Parts of the house, or of its outbuildings, have also been incorporated into animal names: chimney swift, wall lizard, bedbug, barn owl, barn swallow, stable fly. And since a ship is in a sense a floating house, perhaps shipworm should be included in this category.

Some smaller animal forms have become so characteristic as infestants of man's prepared foods and fabrics that they are named for them. One thinks readily of such disconcerting beasties as cheese skipper and cheese mite, flour beetle and mealworm, and that humble worm dignified as the vinegar eel. Add also clothes moth, carpet beetle and booklouse.

Many persons, too squeamish to call a cockroach a cockroach, call it a waterbug, not so much because of any aquatic preferences on its part as because this particular pest seems to invade houses by way of plumbing lines and sewers. Apparently one of its other names, crotonbug, dates from the opening of water supplies to New York from the Croton reservoir, years ago, when many New York houses received their first blessings of plumbing—and their first curse of cockroaches.

Less artificial than houses and barns but still man-made rearrangements of nature are his gardens, orchards and other plantings. These parts of the human habitat also have their characteristically-named fauna; orchard oriole, garden snail, garden snake, garden spider, hedge sparrow, hedgehog and field mouse.

Obviously, these unbidden guests in and around man's house receive the widest imaginable degrees of welcome. Orchard oriole and house wren we are always glad to see; house mouse and house sparrow are barely tolerated nuisances; housefly and clothes moths are intolerable pests. But whether we like them or not, most of them have been with us a long time, and with us they are likely to remain.

Science News Letter, January 20, 1945

ENGINEERING

Lubrication Engineers Organize New Society

➤ THE IMPORTANCE of proper lubrication in machines of all types, from tiny wrist watches to giant locomotives, and in gigantic war aircraft operating through desert dust and stratosphere cold, is now recognized to such an extent by technicians and chemists that a national organization has been formed with headquarters in Chicago, and the first technical meeting is planned for Feb. 8 and 9. The new association is known as the American Society of Lubrication Engineers.

The objective of the association "is to put on a sound basis the fundamental precepts of lubrication," which it is believed will be of benefit to all phases of industry with their related problems. The society will also attempt to promote the training of lubrication engineers in engineering schools. C. E. Pritchard, Republic Steel Company, is president of the society, and B. H. Jennings, professor of mechanical engineering at Northwestern University, is secretary and treasurer.

Science News Letter, January 20, 194

METEOROLOGY

Antarctic Continent To Have Weather Stations

➤ A CHAIN of postwar weather stations around the Antarctic continent to make possible long-range weather forecasting for the whole southern hemisphere was forecast by Lieut. Comdr. Lincoln Ellsworth, USNR, at the tenth anniversary meeting of the American Polar Society when he accepted honorary membership in the society.

The Antarctic ice cap influences the weather of the southern hemisphere, he declared, citing as an example the weather data gathered by whalers in the Antarctic region show that a cold winter in the Weddell Sea generally precedes a drought in the cereal belt of Argentina 1,500 miles away.

Comdr. Ellsworth also declared that the mineral resources of the Antarctic regions would some day be exploited and used despite the many difficulties that would be encountered.

Science News Letter, January 20, 194

AERONAUTICS

P-47 Improved

➤ PROBABLY the biggest, heaviest single-engine fighter in the world, the P-47 Thunderbolt, has many new design features that improve its performance and cut production costs. Facts about the new developments were made known when the 10,000th P-47 came off the assembly line of the Republic Aviation Corporation.

The Thunderbolt has increased its radius of action to 637 miles, twice the previous Army rating. Through water injection it has added several hundred horsepower for emergency operation. Improved paddle propellers have added 400 feet a minute to the climbing speed. It has double the Army's strength requirement for armorplate protection for the pilot. Finally, it has increased internal fuel capacity in addition to modifications for carrying auxiliary wing fuel tanks. On missions of destruction, 1,000-pound bombs may be carried under each wing as a substitute for the auxiliary fuel tank.

Cost of the Thunderbolts to the Army has dropped $23,150 in the past two and a half years. Omitting government furnished equipment, such as engine, guns, radio, and so on, the cost for the first Thunderbolts was about $68,750. Today, these same planes, as a result of improved design and efficiency in production, cost approximately $45,600.

A long-range model of the P-47 is now ready to go into production. Known today as the XP-47N, the new plane has been specially designed for use in the battle of the Pacific. By February the new model will be in full production. Officials of the company refused to discuss the changes that have been made in the new model to equip it for use against the Japs.

It is likely that the new Thunderbolts will be operated from island bases close to Japan, since the plane is too big for operation from an aircraft carrier, and is not equipped with folding wings.

Today, Thunderbolts fitted with rocket guns beneath the wings are being used effectively against German armor. In Africa and Italy its high altitude characteristics proved it to be as good or better than any planes the Luftwaffe could muster. It has also been used as a dive bomber and for ground strafing.

Science News Letter, January 20, 1945

• Books of the Week •

➤ FOR SOMEONE GOING into the Navy or Merchant Marine, NAUTICAL MATHEMATICS AND MARINE NAVIGATION, by S. A. Walling, J. C. Hill, and C. J. Rees (*Macmillan*, $2.75), will prove interesting and constructive reading. An excellent guide to navigation mathematics as applied to the seaman with self-testing questions and answers. Small boat owners, voluntary coastal patrol workers and others interested in sailing the sea should also find it helpful.

Science News Letter, January 20, 1945

➤ PATIENTS HAVE FAMILIES seems such an obvious fact that you might wonder why anyone should write a book about it. But, as Dr. Henry B. Richardson, author of the book with that title (*Commonwealth Fund*, $3), explains, about the only signs showing the staff of large city hospitals that patients do have families are the occasional baby-carriage parked outside the entrance or the long lines of relatives waiting for elevators at the start of visiting hours. It is time, Dr. Richardson believes, that doctors learn the importance of the family in the patient's illness and recovery, just as they have learned to think of the patient as a sick person and not the gallbladder in ward five. Physicians, social workers, nurses and "the informed lay reader" will find this account of the family study method informative and interesting.

Science News Letter, January 20, 1945

• Just Off the Press •

AMERICAN AVIATION DIRECTORY, AVIATION OFFICIALS AND COMPANIES, UNITED STATES, CANADA AND LATIN AMERICA, Fall-Winter, 1944-45—Wayne W. Parrish, ed.—*American Aviation Associates*, Inc., 680 p., paper, $5 (Vol. 5, no. 2), Correction.

BASES OVERSEAS, an American Trusteeship in Power—George Weller—*Harcourt*, 434 p., $3.50.

COMMERCIAL METHODS OF ANALYSIS—Foster Dee Snell and Frank M. Biffen—*McGraw*, 753 p., illus., $6.

COMMERCIAL WAXES, Natural and Synthetic, Including Properties, Uses, Methods of Handling and Formulas for Making Commercial Wax Compositions—H. Bennett, ed.—*Chemical Pub. Co.*, 583 p., illus., $11.

FAMILIAL SUSCEPTIBILITY TO TUBERCULOSIS—Ruth Rice Puffer—*Harvard Univ. Press*, 106 p., illus., $2.

FORMALDEHYDE—J. Frederic Walker—*Reinhold*, 397 p., illus., $5.50.

MATHEMATICAL AND PHYSICAL PRINCIPLES OF ENGINEERING ANALYSIS—Walter C. Johnson—*McGraw*, 346 p., illus., $3.

WEATHER HEADLINES IN OHIO—George W. Mindling—*College of Engineering, Ohio State Univ.*, 124 p., paper, 75 cents, (Engineering Experiment Station, Bull. no. 120).

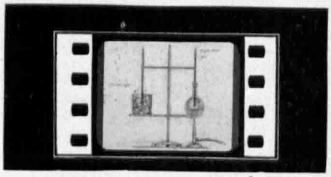
Science News Letter, January 20, 1945

CHEMISTRY

Plastics Made Lighter By Puffed-Grain Principle

➤ TO MAKE thermosetting plastics lighter in weight for certain purposes, Philip S. Turner of Williamsport, Pa., has applied to them the puffed-grain principle, long familiar in breakfast-cereal manufacture, in a process on which he has received patent 2,361,438. Moist starch grains are mixed with the plastic mass. When heat is applied, the water turns into steam, which puffs innumerable little cavities into the matrix. When the plastic cools and sets, the water condenses, but the lightening cavities remain.

Science News Letter, January 20, 1945



From S.V.E. Slidefilm "Water", part of General Science Series on Foundations of Chemistry.

•New Machines and Gadgets•

⚙ *NOVEL CHAIR, recently patented, has a flat saddle-shaped seat and a paddle-shaped vertical back so that a sitter may sit at ease facing the wrong way. Arms project from the back but are unsupported from below so that they do not interfere with the legs of the sitter in reverse.*

Science News Letter, January 20, 1945

⚙ *MOBILE airport lighting unit used in battle areas by the armed forces consists of a truck with an electric generator powered by the truck engine, and four 3,000 watt floodlights. The lamps sweep through a half circle arc and light up the field for a mile-long strip.*

Science News Letter, January 20, 1945

⚙ *TREE-PLANTER for setting seedlings and small stock in shelter-belt and reforestation areas is a tractor-drawn device mounted on a two-wheel frame. A double plow opens a furrow, a single plow deepens it; the planter, riding on a low seat, sets out the trees, and press wheels pack soil about them.*

Science News Letter, January 20, 1945

⚙ *CRUTCHES for the lame, with headpieces which can be turned slightly under the arm, lessen shock in use. The head is made in two pieces, separated by coil springs, with flanges on the upper bowed armrest by which it is fastened on each side to the lower piece. This permits angular motion between the two parts.*

Science News Letter, January 20, 1945

⚙ *DRY CHEMICAL fire-extinguisher, illustrated here, distributes dry powder through a flattened nozzle into the flames*

where it immediately turns into a dense fire-smothering cloud. A replaceable cylinder of carbon dioxide shown on the right furnishes the pressure to drive the powder into the flame.

Science News Letter, January 20, 1945

⚙ *STEPLADDERS, with lateral braces that spread out when the ladders are opened, are safe from tipping sideways. The lateral legs are hinged to the top and are swung out by jointed braces at their centers which are connected with the braces of the ordinary stepladder.*

Science News Letter, January 20, 1945

⚙ *AN ALLOY STEEL, recently developed, may be coated directly with white or light pastel vitreous enamels on kitchen stoves, refrigerators and other household appliances. The alloy contains the rare metal titanium in combination with the carbon in the steel, forming stable titanium carbide.*

Science News Letter, January 20, 194

⚙ *ANTIFRICTION door latch resembles the ordinary latch but has two parallel rollers inserted in recesses in the elongated latch bolt. The recesses open through the front and side edge respectively of the head of the bolt. The rollers touch each other.*

Science News Letter, January 20, 194

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 242.

BOOKS

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Question Box

AERONAUTICS

How great is the need for airports? p. 35.

CHEMISTRY

What is the value of the new tangerine juice concentrate? p. 37.

What luxuries come from coal? p. 41.

ENGINEERING

What is the "copper man"? p. 38.

INVENTION

How may coal be protected against theft? p. 40.

MEDICINE

How successful has one of the new B vitamins been in treating mice cancers? p. 39.

MILITARY SCIENCE

How much fuel does the V-2 consume? p.36

What is the Yankee Doodle Robomb? p. 37.

PHOTOGRAPHY

How can stolen cameras be identified? p. 40.

ZOOLOGY

How does a new-born kangaroo get into its mother's pouch? p. 40.

What are shrews? p. 39.

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