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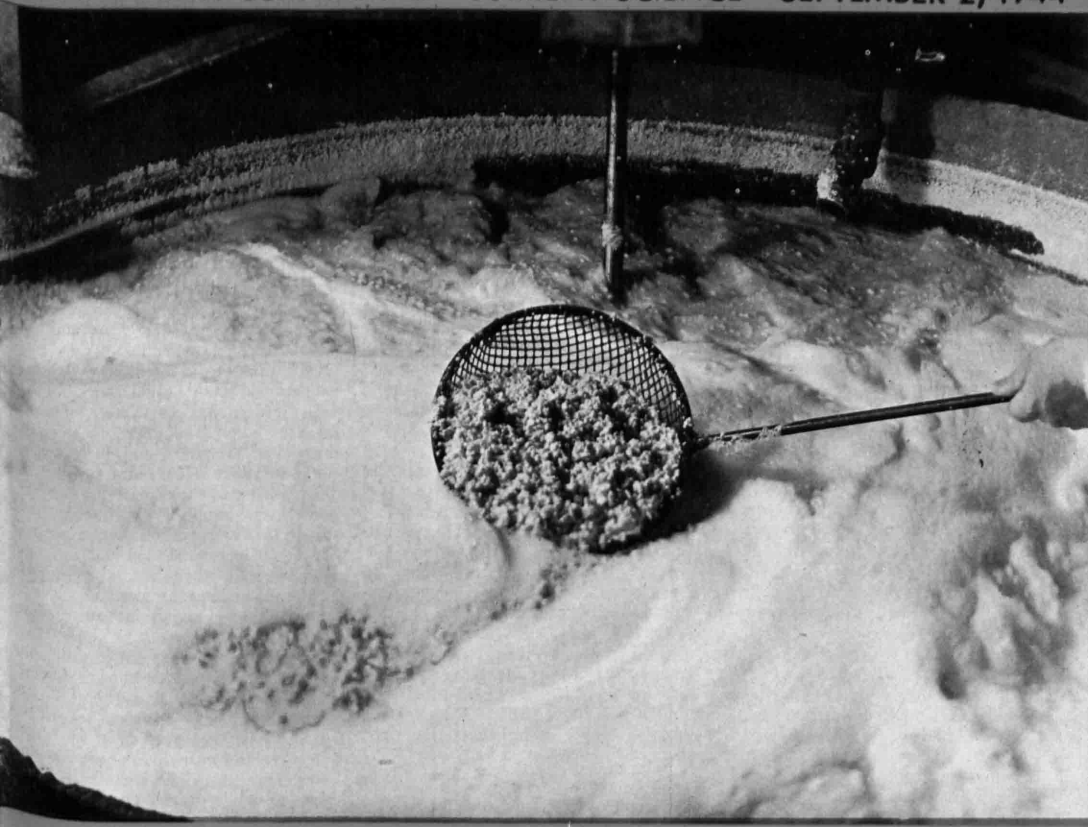
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE • SEPTEMBER 2, 1944



Rubber Curds

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A SCIENCE SERVICE PUBLICATION

MEDICINE

Pain of Polio Relieved

Patients do not suffer as they did before the Kenny treatment was introduced. Hot packs are put on the affected muscles every hour.

➤ INFANTILE PARALYSIS patients do not suffer as they did before the Kenny treatment was introduced. The hot packs relieve the pain. The discomfort of being held rigidly by frames and splints is also a thing of the past.

This change, which should relieve the fear many children have of this disease, was emphasized by a group of physicians treating child victims of the current infantile paralysis outbreak in Washington, D. C.

The happy expressions and cheerful talk of small patients in the polio ward of Children's Hospital in the capital amply confirmed the doctors' statements. Only when the physiotherapist raised a leg or arm to see where a "tight" muscle was still hampering free movement did any of the children show signs of pain.

The hot packs are put on the affected muscles every hour, and left on for the rest of the hour, through a 12-hour day. This calls for a lot more nurses than formerly were needed to care for infantile paralysis victims, and trained physiotherapists are needed for other phases of the Kenny treatment. The National Foundation for Infantile Paralysis, however, is making every effort to see that sufficient nurses and physiotherapists are available in epidemic regions.

Reassurance about the paralysis, another feature of the disease which frightens children as well as parents, was given by the doctors at a conference in the city. They compared it to a Mississippi River flood. Like the flood water, the paralysis may spread over wide areas of the body but again, like flood waters, it subsides and the child may largely or completely recover. These doctors feel that the Kenny treatment helps greatly in recovery from the paralysis, although doctors throughout the country are not generally agreed on this point.

Suggestions for trying to escape the disease vary. Your doctor may tell you one thing, your neighbor's doctor may tell her another. The reason is that, so far, no one knows exactly how infantile paralysis spreads.

It is caused by a filtrable virus. This virus has been found in the intestinal discharges of healthy persons who lived in the same house with infantile paralysis patients. This suggests that healthy carriers of the virus may be a source of the disease, but how they spread the virus is still not known.

Good personal hygiene and general cleanliness are stressed by the National Foundation for Infantile Paralysis as measures that should help in escaping the disease, just as they help in escaping other germ-caused diseases. Children should be taught to keep their fingers out of their mouths and not to swap pencils, whistles, apples, lollypops or any other objects they are likely to put in their mouths. They, and grown-ups, too, should always wash hands before meals.

Keeping children out of crowds, keeping them out of towns or rural areas where the disease is epidemic, and keeping them from getting overtired are other measures generally advised for protection.

Some doctors advise boiling drinking water to avoid infantile paralysis. Others see no reason for this, since there is no evidence that the virus of the disease has ever been found in drinking water in this country.

The National Foundation urges parents to be alert to any signs of illness in children during the epidemic season. Infantile paralysis may start with symptoms of a cold or upset stomach or headache, stiff neck and fever. A doctor should be consulted promptly. The child may not be getting infantile parlysis, but it takes a good diagnostician to tell that in the early stages. In about half the cases, paralysis never develops, and the early, vague symptoms of a feverish, headachy cold or stomach upset are all there is to the sickness.

Many parents wonder whether they, themselves, should stay out of crowds to avoid bringing the germs home to their children. Authorities, however, do not think that the disease is spread by this chance third-person contact.

The question of whether names or addresses of patients, or both, should be published in the newspapers was raised at the conference. Local feeling is apparently the only point that need be considered. Quarantine and placarding of homes of patients is practiced in some communities, not in others. It has never been established that quarantine stopped infantile paralysis.

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PUBLIC HEALTH

Insulin Recommended For All Precox Patients

➤ RESULTS with insulin shock treatment for patients with the mental disease, dementia precox, during the past five and one-half years at the Brooklyn State Hospital have led the Temporary Commission on State Hospital Problems to recommend making the treatment available to all dementia precox patients in New York State Hospitals for the Insane. The recommendation was made in a report submitted to Governor Dewey by Homer Folks, chairman of the Commission.

"The insulin-treated patients did substantially better in all respects than the non-treated patients," the report states.

Of the insulin-treated patients, 79.5% were able to leave the hospital, 58.9% were at home at the end of the study between five and one-half years and six months after release, and 55% were useful members of the community. Among patients not given insulin shock at the same institution, 58.8% were able to leave the hospital, 44% were at home at the end of the study, and 40.5% were useful members of the community.

Of interest to the taxpayers is the report that the insulin shock treatment had saved 286,695 days of hospital care, $80,274.60 in cost of food and cothing, a substantial though undertermined amount in maintenance costs, and a still larger ultimate saving in construction costs.

Insulin shock treatment consists in giving the patient a large enough dose of insulin to make him unconscious. After two or three hours, he is brought back to consciousness by a very sweet beverage whose sugar content offsets the insulin effect. This "shock" is given daily in the morning, while patients are seen in the afternoon by the psychiatrist in treatment interviews. About 42 treatments are given at the Brooklyn institution.

Insulin shock treatment was developed by Dr. Manfred Sakel in Vienna in 1930 and was introduced in this country in 1936. No one knows exactly how it achieves its results in the patients who are helped, or why it fails with others.

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MILITARY SCIENCE

Movies That Kill

The Waller Trainer teaches men to shoot down enemy airplanes by actually reproducing combat conditions by use of a movie screen.

➤ MOVIES that kill, in which the men in the audience actually become actors in the scenes that they witness, are now used to train aerial gunners to shoot down enemy airplanes by actually reproducing combat conditions. The new training technique, now used by the Army Air Forces, Navy, Marine Corps, and the Royal Air Force, centers around an ingenious motion picture projector and screen combination called the Waller Trainer.

Since nothing is more realistic than the real thing—actual combat—aerial gunners training with the Waller machine actually step inside the movie screen and become a part of the action projected on it. Gunners are not aware of screen, but actually have the illusion that they are sitting in the gun turret of a bomber, flying at a speed of well over 200 miles an hour. Each man gets the look and feel of being thrust through the clouds, moving swiftly over the ground below. The gunner is confused by the same noises, the same sensations he would have in combat.

All of this is accomplished in the Waller Trainer through the use of three-dimensional photographs projected on the screen of the trainer room, which is very much like the inside of a huge rubber ball.

Basically, the Waller Trainer consists of five synchronized motion picture projectors which flash the images of attacking airplanes on five different sectors of the huge spherical screen, 150 degrees long by 75 degrees high, creating a three-dimensional effect. The rounded shape of the screen reproduces the attacking planes in their correct perspective and they cross the screen with normal angular displacement.

Perched on high 10-foot stands behind realistic photoelectric guns, that work like the guns in a modern penny arcade, the gunners are actually inside the huge curving screen that curls over them like the interior of a globe more than two stories high. Hits are recorded by four registers. These same registers also record the length and effectiveness of each burst of a gun. The student knows that he is dead on the target when he hears a high-frequency screech through the earphones he wears. Through these earphones he also hears the throb and roar of an airplane's engines.

Directly in front of each gunner looms the huge tail of a B-17 bomber, projected to scale. In order not to hit this, the tail of his own plane, he must stop shooting at a predetermined angle.

The instructor sits at a control board, or "console," high above the students. Before him are the controls for the motion picture films, the recorders which give a visible check on each student's score, and aids which help him correct mistakes a student is making. He can talk to the students collectively or individually through an intercommunications system.

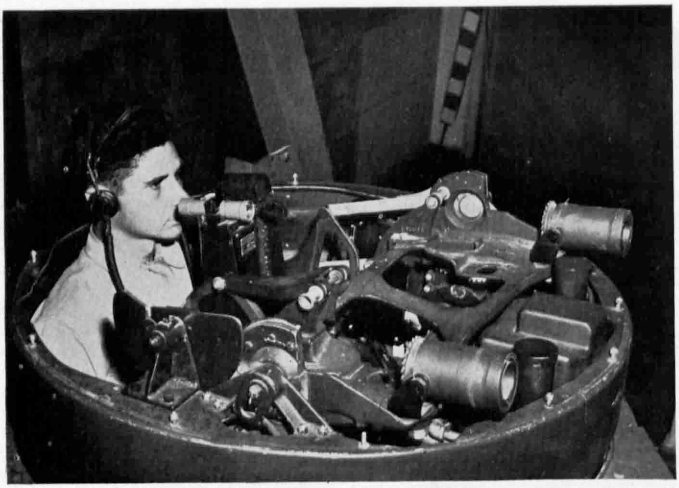
The man responsible for the new trainer is Fred Waller, who also staged the Perisphere show and the Eastman Kodak exhibit at the World's Fair. He started working on the idea in 1937, and delivered the first seven machines to the Air Forces Training Command a year ago, at a cost of $8,000 each.

If placed end to end, the film projected in Waller Trainers in one week would encircle the globe nine times. Every 24 hours of operation nearly 50,000,000 feet of film pass through its five projectors. This represents over 650,180,000 individual pictures.

The Army has the job of making the special films. Using a camera that is really five cameras in one, in order to assure perfect synchronization for the five projectors of the trainer, special pictures are taken. Consulting on the preparation of the films are pilots recently returned from combat, and who are, therefore, combat-wise to the enemy's new methods of attack. As these methods change, the instruction films are altered.

The Waller Trainer is absolutely accurate and is believed to indicate exactly the number of hits a gunner would get in identical combat conditions. The standard Air Corps 30-to-1 gunsight is

COMBAT GUNNERY—Aerial gunners of practically all Allied nations now get their first shots at the enemy in the Waller Trainer, an ingenious device that reproduces combat conditions, even to the noise of airplane motors. Perched on a high 10-foot stand, the gunners shown in this Army Air Forces photograph wait for an enemy plane to appear in the gunsights while the instructor at the console checks the scores and corrects any mistakes.



REALISTIC TRAINING—The student, seen here operating one of the two turrets that each Waller Trainer building has in addition to the two dummy guns, will know what to do when he encounters a real enemy plane.

used. Not only its jarring shutter but the actual rate of burst is timed to the rate of an actual .50 caliber machine gun, which fires at the rate of 740 rounds a minute. The synchronized film clicks through the projectors at the rate of 740 frames a minute.

One battle-wise veteran from the 19th Bombardment Group tried out the trainer recently. He was completely enveloped by the illusion created, and became interested only in getting the movie airplanes before they got him.

He missed one attacking plane, and whistled nervously, "Whew! That was too close for comfort."

And it was.

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NUTRITION

Frozen Concentrated Milk

➤ INTEREST IN FROZEN concentrated milk manufactured by a process developed by F. J. Doan and J. G. Leeder, research workers in dairy products at the Pennsylvania State College, has roused the interest of supply officers in the United States armed forces. They hope to use this product to supply wholesome fluid milk to hospital ships.

Properly processed, concentrated frozen milk can be reconstituted into a product that can hardly be distinguished from fresh milk by the average consumer. It is defrosted and diluted to fluid consistency by putting the frozen block directly into hot water. By using an equal amount of water, a product resembling coffee cream or cereal cream is produced. By adding twice as much water, milk for beverage or general purposes is produced. Frozen milk as formerly manufactured resulted in an oily product when thawed.

The new frozen concentrated milk may be manufactured in any dairy plant that is equipped with an evaporator, homogenizer, and ice cream freezer. The process is the same as evaporation for canning, followed by freezing to a mushy consistency in the ice cream freezer, and further freezing in a storage room at 10 degrees below zero after packaging. For best results the frozen milk must be held at low temperatures.

In evacuating sick and wounded servicemen from foreign countries, hospital ships could be stocked with frozen concentrated milk at American ports. Since it will keep for several weeks, the ships will have available a milk supply comparable to fresh milk until they return. Another use for this product might be in the storage of surplus milk from early summer, when supplies are large, to midwinter, when milk usually is produced in lesser amounts. At some future date it may be merchandised in the same manner as other frozen food products.

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Fish liver *vitamin oils* are being made by four factories in the Union of South Africa.

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MEDICINE

Fewer Parachute Injuries

Better selection of men for this training and new instruction methods and apparatus are credited for the sharp decrease.

➤ INJURIES to men in training as parachutists have decreased although jumps at the Parachute School have increased progressively, Maj. C. Donald Lord, surgeon, and Lt. Col. James W. Coutts, assistant commandant, at the Parachute School, reported (*Journal, American Medical Association,* Aug. 26).

Better selection of men for parachute training and new training techniques and apparatus are credited for the decreasing injury rate by Maj. Lord and Lt. Col. Coutts, both of whom are medical officers and also qualified parachutists.

Injuries have decreased so that now a jumper has roughly only 1% chance of being injured in any way in any one jump, they report.

Broken ankles are considerably fewer now that the men are taught to hold their feet together on contact with the ground, instead of the old method of holding them 18 inches apart on landing. In windy weather, a man dangling from a parachute sways like a pendulum, the medical officers point out. Under such circumstances, if he holds his feet 18 inches apart when he lands, a sideward swing of his body would bring the landing shock of all the body's weight on one foot. This increases the chances of sprain or fracture. When the jumper lands with both feet held together, the landing shock is distributed almost equally to both feet and legs even when he comes in for an oscillating landing.

Four typical parachute injuries corresponding to the four training stages are described by the medical officers. In stage A, during which physical hardening is accomplished, the most frequent injury is a strain or tear of the right rectus muscle. The condition, with definite sharp pain in the abdomen, seems much like appendicitis. Many with this injury were sent to the hospital and one operated on in the belief that they had appendicitis. The injury occurs in rope climbing.

Typical of stage B in the parachutist's training, when emphasis is being placed on tumbling, is injury to the tip of the shoulder. In a proper tumble the shoulder tip does not touch the ground. The body rolls over the forearm which is held rigidly like a bar.

Two leg injuries, both caused by landing via parachute, are typical of stages C and D of the training. One is a double fracture in which both bones of the leg between knee and ankle are broken. Since the change to feet-together landing position, this injury now more commonly involves a break in the upper third of the outer, smaller leg bone or a dislocation of its head, instead of breaks in both leg bones nearer the ankle.

The higher break on the outer bone only has been called the "silent fracture," because it causes few if any symptoms. The soldier may not report for medical care until several days later and then complains only of "a little" pain.

Physically perfect men are less prone to injury in training, the medical officers are convinced. They therefore credit some of the decreasing injury rates to the increasing severity of standards in selecting men for parachute training.

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MEDICINE

Mold May Be Effective In Fighting Tuberculosis

➤ THE POSSIBILITY that a mold, perhaps related to Penicillium, may be effective in fighting tuberculosis appears in research reported by Dr. D. K. Miller and Dr. Albert C. Rekate, of the University of Buffalo School of Medicine (*Science,* Aug. 25).

Tuberculosis germs growing in test tubes stop growing and disappear from the culture medium when suspensions of a green mold are put with them. Guinea pigs inoculated with material from the tuberculosis germ-mold suspension failed to develop the disease.

The mold has not yet been identified but is believed to belong to the Penicillium group. It was discovered growing on a culture of tuberculosis germs which had been stored in an ice box. The discovery led to tests of the mold's action on the tuberculosis germs.

Tuberculin, an extract of tuberculosis germs used in diagnostic tests, loses its activity under the effect of the mold suspension, though filtrates of the suspension have no effect on tuberculin. Inactivation of tuberculin by molds and modification of the germs by these molds have previously been reported.

Penicillin has no effect on tuberculosis infection, according to reports up to the present time. Whether the mold studied by the Buffalo scientists will turn out to be a weapon against tuberculosis in humans is not even hinted in their report and, doubtless, cannot be told until much more work has been done.

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PUBLIC HEALTH

Closing Schools for Polio Is Individual Question

➤ WHETHER to delay the opening of schools, or close those holding summer sessions, in the hope of preventing the spread of infantile paralysis, has to be settled in every case on its own merits and on the basis of mathematical probability.

Exactly how the disease spreads is not yet known. Many authorities think it is spread by direct contact between healthy children and those coming down with the disease or with healthy carriers of the virus that causes it. That theory is the reason for advice to keep children out of crowds during an epidemic.

In rural regions, where the children live relatively isolated in their own homes without even close neighbors, it might be wise to keep them out of school. Their chances of contact with the polio virus carried by others would be less, because staying out of school would mean staying home away from people, young and old, except members of the family.

In towns and cities, healthy children kept out of school may be likely to have more contacts with others on the streets, in shops and movies and through visits than they would if they were in school.

To settle the question, one authority suggests figuring the mathematical probability of whether the children will have more or fewer contacts in school or out.

On this same general subject, the National Foundation for Infantile Paralysis states:

"Attempts to stop the spread of the virus by closing places where people congregate have been uniformly unsuccessful. The resulting disturbance to community life is a disadvantage. Today there is no way by which the spread of infantile paralysis can be completely stopped."

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ENGINEERING

New Engine Questioned

Opinion is divided on the subject of jet propulsion for aircraft engines. Big disadvantage is the high fuel consumption.

➤ AIRCRAFT design is progressing at a remarkable rate. Within recent years the speed, operational ceiling, rate of climb, and load-carrying capacity of planes have all been improved. The demand for greater power in a single unit, with reduced dimensions and lighter weight, has brought forth the jet propulsion engine.

Opinion among airplane designers is divided on the subject of jet propulsion. On one side are those who believe that the jet engine will soon be exclusively powering high-performance, short-range airplanes, and that as the engine is further developed, jet propulsion will encroach on the longer-range aircraft. On the other side are those who agree that while the jet-propelled plane has a place in the flight spectrum it will be limited to military uses, and it will be some years before the public will be able to accept it as a practicable means of transportation.

The jet plane flies smoothly, with none tion, and is made up of only a few moving parts, while the gasoline engine is made up of thousands of parts. The jet engine weighs much less than the conventional motor, thus reducing the total weight of the plane and making it more maneuverable, a vital factor in military flying.

The jet plane flies smoothly, with none of the vibration of the conventional engine and propeller so objectionable to some passengers in the present commercial airplanes. This argument is of no great concern to the proponents of gasoline engines since they point out that another power unit—the gas turbine—can be used to supply power to the propeller, with a minimum of vibration.

The serious disadvantage of the jet engine is its high fuel consumption at low speeds. Over a 400-mile flight course and flying at 100 miles an hour, the jet engine consumes 70 gallons of fuel, while the gasoline engine uses only 16 gallons. But if speeds of 500 miles an hour or more are reached, the jet becomes more economical. At 600 miles an hour, over the same course, the jet engine will use up 770 gallons of fuel, while the gasoline engine will consume 850 gallons.

However, the jet engine becomes more powerful for its weight and size at higher speeds. In a tug-of-war at 600 miles an hour, one jet engine can pull as much as five propeller-type engines of equal weight.

Those who favor the gasoline engine point out that the demand for travel at speeds above 550 miles an hour would have to be considerable to make commercial transportation in jet planes feasible.

It is entirely possible that if speeds below and just above that at which the jet engine becomes superior to the gasoline engine become desirable for commercial transportation in the postwar era, a cross between a jet plane and a propeller plane may be developed. This plane would use a gas turbine to drive the propeller, and use the exhaust gases to produce a form of jet thrust.

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PHYSIOLOGY

Much Forebrain Activity Governed by Food-Getting

➤ SINCE in animals most "thinking" is concerned with food getting, the chief regions of the body which send information to the cortex of the brain seem to be related to the habits of the animal, how it obtains its food and how it is eaten, concludes Dr. Edgar Adrian, professor of physiology at Cambridge University, England, and Nobel Prize Winner.

In man and monkey, who use their hands as well as their faces for eating, the brain is bombarded by messages coming in from these areas.

The snout dominates a good part of the pig's brain. Following a series of experiments, Dr. Adrian believes that the pig's snout has powers of discrimination little inferior to those of the human hand. In the pig the "snout has important executive as well as sensory functions," since it is used for digging as well as feeding.

In those animals that have an underslung jaw, like the pig, cat and dog, the lower lip which plays little or no part in gathering, selecting and getting the food into the mouth, sends very little information. In the goat and sheep, on the other hand, the lower lips which are well in front and are used in selecting food to be chewed do transmit trains of impulses to the brain.

More information comes to the brain from the forelegs of carnivorous animals who use them in preying upon other animals for food than is the case of such animals as sheep, rabbit and pig.

Various parts of the faces of all animals studied act as antennae, or specialized organs of reception that transmit information to the brain. It is only in the monkey and man that the receptors for sensation in the hands are sufficiently concentrated to have become as important to the cerebrum as those of the face.

In recording the messages received by the brain from those parts of the body that are most closely related to the outside world, the method employed is suggestive of wire tapping. Since nervous impulses reaching the brain are electrical in nature, it was possible by the use of amplifiers and a loud speaker to listen to these messages and signals.

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MEDICINE

One Penicillin Problem May Have a Solution

➤ A POSSIBLE step toward solution of one of the difficult problems attending the use of penicillin has been made in the discovery that the usual rapid elimination of the drug from the body via the kidneys can be very greatly slowed down by the simultaneous injection of a complex organic compound known as para-aminohippuric acid.

This discovery is reported (*Science*, Aug. 4), by a research team consisting of Dr. Karl H. Beyer, Roland Woodward, Dr. Lawrence Peters, W. F Verwey and Dr. P. A. Mattis, of the Medical Division of Sharp and Dohme, located at Glenolden, Pa.

When dogs were given heavy "shots" of penicillin, the drug soon appeared in their kidney excretions and within a couple of hours was almost wholly absent from their blood plasma. However, when para-aminohippuric acid was administered along with the penicillin, the loss of the valuable germ-stopping drug through the kidneys was much slower, and blood tests indicated its far longer retention in the plasma, at effective concentration.

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AERONAUTICS

Air Commerce in Paraguay

Will supplement rail, water and highway transportation, and make the development of vital sources of supply for many products possible.

➤ AVIATION, supplementing rail, water, and highway transportation, is the key to unlock the door for shipments from South America of a virtually untapped supply of natural resources. Paraguay with no land bordering on the sea, will benefit especially from the development of air commerce.

For centuries the Rio Paraguay and other rivers have carried all her commerce. Although about twice the size of Great Britain, this South American republic has less than 800 miles of railroads. Great Britain has over 20,000 miles of track.

Today Paraguay has international air connections through five air lines owned and operated by companies outside the Republic. A weekly domestic air-mail service was inaugurated last April by the Paraguayan Air Force, connecting the cities of the Republic with world aerial trade routes.

Travel by water from Buenos Aires to Asuncion requires 76 hours, while the airways require but four hours. There is similar saving in time between all major South American points.

Like most South American countries, Paraguay has industrial, agricultural, and mineral wealth with possibilities of developing into vital sources of supply for many products.

In addition to producing cotton, sugar, tobacco, and oranges, Paraguay serves as one of the world's chief sources of quebracho extract, used in the leather industries. It is also the source of 70% of the world's supply of petitgrain, an oil distilled from wild bitter orange leaves and used in flavoring and perfumes.

There are reported to be 4,000,000 head of livestock on the grassy plains, and salted hides and beef products are important exports.

Iron, manganese, copper, quartz, marble, limestone and graphite are a part of the mineral wealth of the Republic.

Today, with only limited air service, the air cargoes consist primarily of quebracho extract, petitgrain oil and cattle hides. As more and bigger giants of the sky become available, heavier cargoes, including the important manganese ore, will be transported out of the republic by air.

As yet, Paraguay has no well-developed manufacturing facilities for engines, aircraft, motor cars, refrigerators, radios and other vital goods which will be demanded by her people after the war. Until such a time as the necessary factories can be built and the machinery set up for producing these and other items, they will probably be flown into the country. With recent reports of military cargo planes carrying heavy machinery, it is possible that essential factory equipment may also take up a big part of Paraguayan imports.

Air travel in South America will enable peoples from all nations to see some of the world's scenic spectacles, until now observed only by those who have endured the discomfort of long journeys through tropical forests.

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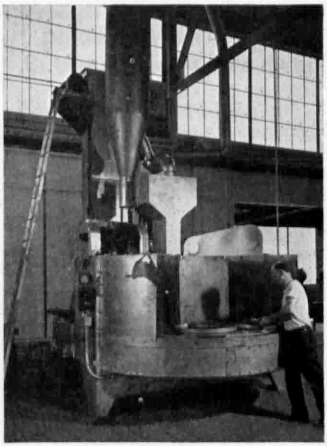
METALLURGY

Machine Rains Metal Shot To Increase Life of Tools

➤ A NEW MACHINE, which rains metal shot at high speed against fabricated metal tools and machine parts in the process of surface treatment to increase fatigue life, is now in successful use at the plant of the American Foundry Equipment Company in Indiana. The surface treatment is to decrease the danger of failure in use of these objects under bending and twisting strains resulting from fatigue.

Fatigue is a term applied to the weakening of metals in use in machinery resulting from long-continued or frequently repeated stress. Metals, tested for tensile strength, often break after a period of use under loads much less than the tests show they should stand because of this fatigue.

The new apparatus is called a shot-peening machine. Shot-peening is a method of cold-working the surface of a metal part by hammering, or peening, it with small metallic shot driven against it at a relatively high speed. The shot



FOR SURFACE TREATMENT— This machine rains metal shot at a high rate of speed onto metal tools and machine parts to increase fatigue life. It is now in successful use at the plant of the American Foundry Equipment Company

act as tiny hammers, making small pits in the surface, and stretching the surface particles and fibers as they hit. The result of the peening action is to put the surface fibers under a compression stress which tends to offset later tension stress set up in use.

In the new machine the part to be treated is placed on a revolving table, turned under the shower of shot in a special chamber, and rotated on its own center under the shower so that the rain of shot strikes all surfaces of the object uniformly.

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PHARMACOLOGY

Penicillin for Local Use Produced by New Method

➤ A NEW METHOD of producing good yields of penicillin in hospitals for local application is reported by Dr. Sara A. Scudder, of the City Hospital on Welfare Island, New York (*Science*, Aug. 25).

The mold is grown on a solid agar base containing substances which favor rapid production of penicillin in enough big drops so that they are precipitated like rain when the growth container is turned upside-down.

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MEDICINE

Whole Blood Now Being Flown to Europe From U. S.

➤ WHOLE BLOOD for our wounded fighting men is now being flown to Europe in addition to the blood plasma and serum albumin regularly supplied, the American Red Cross has announced.

Plasma and albumin are used to fight shock from wounds and burns. When wounds cause great loss of blood, however, the red cells must be restored to the blood as well as the proteins of the fluid portion, or plasma.

Blood for this use has in the past been obtained from able-bodied men aboard ship or from troops in rear areas overseas who are near base hospitals or, in some instances, from civilians in combat zones, as in England. The reason whole blood was not sent from civilians at home was because it is highly perishable and requires cumbersome refrigeration. Dried plasma and serum albumin keep without refrigeration and can be given without typing.

Recent developments in preservation and transportation of whole blood, however, now make it possible to ship this perishable and precious material from the United States to Europe by air.

The first shipment of whole, typed blood, made in response to an urgent Army-Navy request, is on its way, Basil O'Connor, national chairman of the American Red Cross, reports.

Daily shipments of 1,000 pints of whole blood, in addition to the 100,000 pints a week for processing into plasma, are needed, the Surgeons General of the Army and Navy told Mr. O'Connor.

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PUBLIC HEALTH

Deaths of Three Babies Blamed on Lactic Acid

➤ A WARNING following the deaths of three babies, that "due care must be exercised" in the use of lactic acid in infant feeding formulas, is issued by Dr. E. Gordon Young and Dr. Ralph P. Smith, of Dalhousie University, Halifax, N. S. (*Journal, American Medical Association,* Aug. 26).

The babies died in from 45 minutes to 15½ hours after feeding with a formula of milk, water and acid sugar solution containing lactic acid. Post mortem examination of the babies, the doctors report, showed that they died of acute hemorrhage and gangrenous inflammation of the stomach.

The corrosive action of the acid was blamed. It had the same effect on the stomachs of rabbits who died after being fed the infant formula.

The three babies who died had been born prematurely but were healthy at the time of the fatal feedings which were given by stomach tube. A 10-day-old baby who was not born prematurely was given the same formula by bottle, but after one mouthful, it choked, got red in the face, spit out the formula and refused to take any more. Its refusal to take the formula is believed to have saved its life.

Science News Letter, September 2, 1944

MEDICINE

Ultraviolet Lamp Protects Wound During Operation

➤ ALMOST like an old-time magician drawing a magic circle past which harm cannot come is the ultraviolet lamp for operating rooms devised by J. W. Kolbert and F. G. A. Haegele of Cippenham, Slough, England. By means of an ingenious system of reflecting surfaces, it throws a hollow cone of ultraviolet radiation around the area of a surgical operation, so that germs cannot pass and get into the wound. At the same time, it keeps the ultraviolet rays away from the exposed internal tissues themselves, which might be harmed by over-long exposure to them.

Rights in the patent, No. 2,356,592, have been assigned to an American firm, the Hanovia Chemical and Manufacturing Company.

Science News Letter, September 2, 1944

ENGINEERING

Army Heater Simplifies Problem of Hot Water

➤ A NEW immersion-type water heater that simplifies the soldier's problem of heating water is now being distributed by the U. S. Army Quartermaster Corps, replacing the older-style heaters.

The new heater can bring a 24-gallon can of water to a boil in 30 minutes. It operates on any type of petroleum base fuel that may be available, such as gasoline, light fuel oil or kerosene.

Requiring fewer replacement parts than older heaters, it consists of a burner, a water-tight combustion chamber, 8 feet 4 inches tall, and a fuel tank with a valve which allows the fuel to drip into the burner. It hooks onto and sets down inside the water container. The unit weighs a little more than 50 pounds.

Science News Letter, September 2, 1944

IN SCIEN

AGRICULTURE

Broccoli Leaves Prove Excellent Chicken Feed

➤ IF JUNIOR is balky about eating his broccoli, still insisting that it's spinach, he may nevertheless get it back again some day—as fried chicken. For broccoli leaves, dried and ground into meal, have been found to be an excellent addition to chicken feed mash, in tests at the U. S. Department of Agriculture Eastern Regional Laboratory.

At the suggestion of Prof. G. L. Schuster of the Delaware Experiment Station, the Regional Research Laboratory made up leaf meals of five kinds of plants: broccoli, lima bean, carrot, turnip and pea. Of these, broccoli proved to be the best, showing high vitamin content and a percentage of protein substantially higher than that of alfalfa meal. Flavor of the meat of broccoli-fed chickens is stated to be definitely improved.

Science News Letter, September 2, 1944

ASTRONOMY

Reports on Recent Meteor Needed by Scientists

➤ EVERYONE who saw the big meteor of Friday, Aug. 18, flash across midwestern U. S. skies is being asked to report what was seen so science can chart this phenomenon and determine how big it was and whether it fell to earth.

Reports are requested by Dr. Charles P. Olivier, president of the American Meteor Society, Flower Observatory, Upper Darby, Pa.

Each report should tell from where the person saw it, where in the sky the meteor was first seen and last seen, stating how high in the sky and direction, what is called altitude and azimuth or bearing. Information on the meteor's train or smoke trail is particularly desired, especially its shape and changes and which way it drifted. Any sounds heard should be described.

A meteor comes into the earth's atmosphere from outer space, traveling at tremendous speed. The flash is caused by the frictional heat and burning generated when the object passes through the air.

Science News Letter, September 2, 1944

CE FIELDS

CHEMISTRY

Double Salts of Nicotine For Use As An Insecticide

➤ MUNITIONS for front-line fighting in man's endless defensive war against insects are supplied in the form of a series of new double salts of nicotine, prepared by Claude R. Smith of Philadelphia, chemist at the Northern Regional Research Laboratory of the U. S. Department of Agriculture. Rights in U. S. patent 2,356,185 are assigned royalty-free to the government.

Simpler nicotine compounds, like nicotine sulfate, have long been used for insect-fighting purposes. They have the disadvantage, however, of not remaining effective very long when dusted on plants. Efforts to "fix" nicotine, as by mixing it with bentonite, so that it will spread its poisonous action out over a longer period of time, have often resulted in locking up the nicotine too tightly. The metallic double salts which Mr. Smith has developed in his researches seem to be a happy medium.

As one example, copper acetate, sodium benzoate and nicotine benzoate are mixed in suitable proportions. The resulting compound is a copper nicotine benzoate. Similarly, iron, zinc, cobalt, nickel and other metals have been combined with nicotine, using benzoic, acetic and other acids.

Science News Letter, September 2, 1944

AERONAUTICS

Robot Pilot Is Successful For Testing Airplanes

➤ AUTOMATIC flight control through the robot pilot exceeds the precision flying of the most skilful human pilot and cuts the time required to set up and run through a flight test, reported Robert J. Kutzler and Orin B. Johnston, of the Aeronautical Division of the Minneapolis-Honeywell Regulator Company at a meeting of the Institute of the Aeronautical Sciences. The results of a flight test may be a day-after-day matter of life and death to the persons who fly in a plane after it has been tested.

During a test flight a human pilot may be unable to maintain precise control and an alert mental attitude under the extreme stress of holding stable flight and power conditions, the authors pointed out. However, the robot pilot is not subject to fatigue and the resultant decrease in efficiency.

The robot pilot, the authors stated, can detect deviations in the control of the plane and correct them immediately. It will fly the airplane straight, level or through any desired maneuver, functioning like the eyes, brain, and muscles of the human pilot, leaving the test pilot free to analyze and make necessary decisions as the flight test progresses.

An accurate test flight requires precision recording of various performance factors of an airplane, such as temperature readings of the engine cylinders, pressure readings in fuel lines and manifolds, propeller bearings and many other pertinent factors.

Science News Letter, September 2, 1944

INVENTION

Waterproof Flashlights For Use on Lifebelts

➤ A SIMPLE, compact, waterproof flashlight for use in connection with lifebelts is the invention on which H. M. Slocum of New York City won patent 2,355,247, assigned to Colvin-Slocum Boats, Inc.

The flashlight is placed within a screw-closed, waterproof case, preferably of molded plastic. A short line and big safety-pin provide means for fastening to the lifebelt, and a spring clamp further permits it to be secured to the wearer's clothing or other convenient objects. The current is turned on simply by giving the end of the case a slight twist, and as long as the battery holds out the light will tell seeking rescuers, "Here I am!"

Science News Letter, September 2, 1944

CHEMISTRY

Dr. Blum to Receive Electrochemical Award

➤ THE EIGHTH Edward Goodrich Acheson Medal and $1,000 prize will be awarded to Dr. William Blum, chief of the section of electrochemistry of the National Bureau of Standards, by the Electrochemical Society when it meets for its fall convention at Buffalo, N. Y., in mid-October.

The award is made in recognition of Dr. Blum's contributions to the standardization of electroplating methods and of plating formulas. He has been associated with the Bureau of Standards since 1909.

Science News Letter, September 2, 1944

CHEMISTRY

Lead Salts Recommended As Ammunition Primer

➤ A NEW EFFORT to get away from time-honored but scarce mercury fulminate as a primer for ammunition is represented in patent 2,356,211, obtained by P. H. Burdett of Bridgeport, Conn., and G. M. Calhoun of Fairfield, Conn., assignors to Remington Arms Company.

The mixture they recommend for primer caps contains four salts of lead: styphnate, nitrate, sulfocyanate and triazoacetate, together with powdered glass. Key to its effectiveness is the lead triazoacetate, which sensitizes the lead styphnate and makes the latter an effective igniting agent for the powder in the cartridge.

Science News Letter, September 2, 1944

ENGINEERING

Electronic Instruments May Be More Compact

➤ TELEVISION sets, electron microscopes and other electronic instruments, both scientific and industrial, can be built more compactly if they take advantage of a novel cathode-ray tube, just patented in U. S. Since the inventor, Karl Kohl of Berlin, is a citizen of an enemy nation, his patent, No. 2,350,774, is vested in the Alien Property Custodian and may be used by any American citizen upon payment of a small license fee.

Heart of any electronic apparatus that converts electromagnetic waves into visible light images is a large vacuum tube called a cathode-ray tube. In its conventional form, it is shaped more or less like a trumpet, except that the mouth is closed over. In the small end is a source of electrons, which are sped toward a target about midway of the tube's length. When they strike this, streams of secondary electrons are given off from the other side of the target. Suitably focussed by electrical or magnetic means, these form the image on a screen at the wide end.

The German inventor's improvement on this pattern is simple, but important. Instead of using a straight tube, he bends it at right angles, with the target at the bend, set at a 45-degree angle so that it sends the deflected electron stream down to the screen at the wide end. This effects a considerable saving in space, and permits more compact construction of apparatus in which the tube is used.

Science News Letter, September 2, 1944

CHEMISTRY

Man Makes Rubber

All America may look forward to plentiful supply as synthetic production surpasses prewar imports. Product closely resembles that of nature.

By MARTHA MORROW

See Front Cover

➤ ALL AMERICA may look forward to a plentiful supply of rubber products once again, thanks to man's ingenuity. An adequate supply of girdles, garters and similar products made of synthetic elastic thread will be in stores, possibly by January. Rubber heels to help stretch shoe coupons will once again be of the best quality. And if you are caught wearing your best shoes in the rain, overshoes can probably be procured at a neighboring store. Even tires for automobiles are promised for the not-too-distant future.

Synthetic rubber in the meantime is taking care of our war needs. Supplies and equipment are rolling to our fighters on synthetic tires. Bullet-sealing fuel cells and hose, landing boats, gas masks, life rafts, barrage balloons, wire and cable, and a multitude of similar articles are going to the front—thanks to synthetic rubber.

U. S. Biggest Consumer

The United States uses more rubber annually than all other countries combined. When our natural rubber was cut off by the war, Uncle Sam was forced to search for other sources of rubber. But today synthetic rubbers are being made at a rate greater than that at which crude rubber was consumed in this country in any year prior to 1941. By the end of 1944 all synthetic rubbers will probably be made at the rate of 1,027,000 long tons per year.

The picture on the cover of this SCIENCE NEWS LETTER shows one step in the process of making synthetic rubber. The curds are solidified by coagulation with dilute acids, and are then washed in large vats.

Approximately 86 per cent of the war-born synthetic rubber program is devoted to the production of GR-S—which stands for Government Rubber, type S (Styrene). Sometimes called buna S, this rubber is known as GR-S in this country because the American product differs from and is superior to the German buna S.

GR-S, most of which is used in making tires, is the type of synthetic rubber which most nearly resembles natural rubber. The materials from which it is made can be produced in large quantities at relatively low cost. They are butadiene and styrene. Butadiene is made either from petroleum or alcohol (which is one reason why there is a shortage of whisky). Styrene is made from benzene (from coal tar) and natural gas, petroleum or alcohol. Large GR-S plants were built and are being operated for the government by such rubber companies as U. S. Rubber Company, Firestone Tire and Rubber Company, B. F. Goodrich Company, and Goodyear Tire and Rubber Company.

Neoprene Developed First

Neoprene was the first successful synthetic rubber produced in commercial quantities. Developed by E. I. du Pont de Nemours & Company, it can compete with natural rubber in resiliency, elasticity and resistance to abrasion. It resists deterioration by oils and other substances that destroy natural rubber very quickly. Made from coal, limestone and salt, it is more expensive than GR-S or butyl, but has a place of honor in the government program as an outstanding special-purpose rubber.

Next to buna-S and Neoprene, buna-N is the rubber most widely used in this country. Made from petroleum, soap, natural gas and air, buna-N differs from GR-S largely in the fact that the butadiene, instead of being combined with styrene, is co-polymerized with acrylonitrile, a product made from ethylene (from petroleum) treated with hypochlorous acid and sodium cyanide. The principal synthetic rubbers included in this group are Goodrich's Hycar, Goodyear's Chemigun, Firestone's Butaprene, and Perbunan of Standard Oil Company of New Jersey.

Butyl rubber may eventually be one of the most useful synthetic rubbers for general purposes, but at present it is restricted because of small scale manufacture. Its impermeability to gases is excellent and it is partly because of this that butyl is resistant to mustard gas and is one of the few materials resistant to Lewisite. This property also makes it particularly desirable for tire inner tubes.

Butyl rubber, the production of which is controlled by Standard Oil of New Jersey, depends upon the petroleum industry for its materials, the two principal ingredients being made from oil.

Oil Refinery Product Used

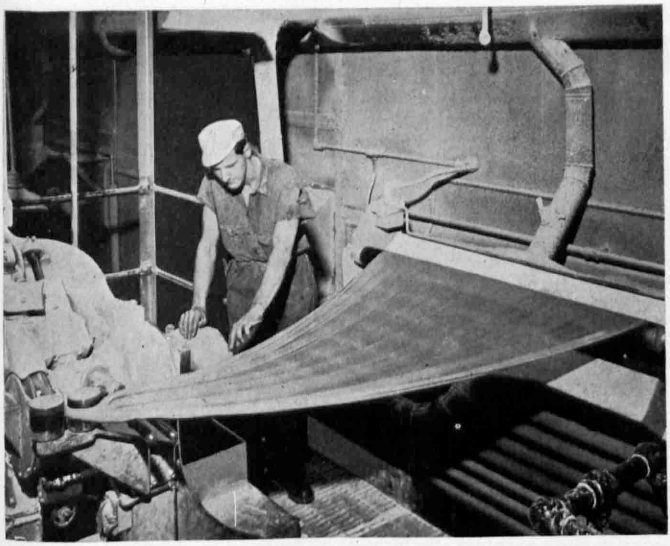
Large quantities of isobutylene, an oil refinery product, are mixed with small amounts of isoprene, a chemical which is found combined in natural rubber, but can also be made from petroleum or turpentine. It is also possible to make butyl by mixing isobutylene with small amounts of butadiene, a by-product in petroleum cracking.

Development of artificial rubber in recent years has been motivated by different aims in various countries. In Europe, natural rubber supplies have been curtailed, and artificial rubber was needed as a substitute, hence cost became a secondary consideration.

In the United States the need for a substitute for natural rubber was not so important. Instead, the effort has been more to find a synthetic material which would have advantages over the natural product and so justify the increased cost. But war suddenly changed this situation.

Synthetic rubber is similar in its chemical structure to natural rubber, but is not identical with it. Many different kinds of synthetic rubber have been produced. Both synthetic rubber and natural rubber are composed of giant molecules consisting of long chains of carbon and hydrogen atoms. A single molecule of natural rubber is thought to contain about 75,000 atoms of carbon and 120,000 of hydrogen — altogether 195,000 atoms.

No one knows exactly how these are put together by nature to form a rubber molecule. No wonder it is so difficult to try to duplicate this complex material in the laboratory. In the giant rubber molecule, a pattern consisting of several atoms is repeated thousands of times. Such patterns are called polymers and the process of causing them to form is polymerization.



RUBBER FILM—Neoprene, developed by E. I. du Pont de Nemours and Company, is twisted into the form of a rope as it leaves the drier, and is then cut into short lengths for shipment.

Most of the artificial rubbers can be vulcanized, as can natural rubber. This process consists of adding sulfur atoms to the chain. These combine with loose chemical linkages present in the molecule. Neoprene, in contrast with the other synthetic rubbers, does not require sulfur for vulcanization.

An advantage claimed for butyl rubber is that it has just enough loose linkages to combine with the necessary sulfur, and then they are all used, so none is left to combine with oxygen from the air. It is this oxygen combination that causes the deterioration of natural rubber when exposed to the air.

Four-Fifths Is GR-S

More than four-fifths of our present synthetic rubber production is GR-S. It mixes readily with other rubbers, including natural, so that it blends well in the tire compounds commonly used today. It has high resistance to abrasion, which means that it wears well—as well as natural rubber. But it does not have natural rubber's ability to take endless bounding and bending.

On the average the mixture used in making GR-S is about three-fourths butadiene and one-fourth styrene. The ingredients are mixed in big pressure vessels into which water, soap, styrene, butadiene and "seasoning" chemicals are pumped. The mixture is cooked for about 16 hours, the ingredients being continually mixed all the while. The chemicals gradually unite to form the synthetic rubber GR-S.

A small part of the raw materials, which does not polymerize in the time allowed, is separated and piped back to join the supply lines. The rest, in the form of milky latex, is run into the coagulating vat with some brine and acid, and stirred to form curds of rubber. These are carried through a wringer which squeezes out the liquid. They then go through a drier, later being pressed and baled for shipment.

Synthetic rubber is not the development of any one man, or even of any one nation. Over a period of years important contributions have been made by chemists of Great Britain, France, Germany, Russia and the United States.

In 1826 Michael Faraday helped establish the fact that the chief constituent of rubber is hydrocarbon, and that natural rubber was composed of a multiple of five atoms of carbon and eight of hydrogen.

Grenville Williams broke down natural rubber by heat in 1860 and derived from it a liquid, named isoprene, which had the same chemical composition as rubber. About 20 years later G. Bouchardat had the "bold idea" that isoprene was the foundation stone of rubber, an observation which led to our present synthetic rubber industry.

The isoprene used by Bouchardat was obtained from rubber. In 1892, Sir William Tilden made isoprene from turpentine. After standing in a bottle for a while, large yellow pieces formed which somewhat resembled rubber. Though the material was useless, it was the first time synthetic rubber had been made.

Originally the goal of those working in the field of synthetic rubber was to synthesize a product that would equal natural rubber in those properties that have contributed to make rubber such an important structural material.

The more recent trend, however, has been to synthesize materials closely resembling nature's product in some respects, but surpassing it in others. Buna-N, for instance, is practically immune to oil. Neoprene will not burn.

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If you would like to have samples of four typical types of synthetic rubber, you can secure the Rubber Unit of THINGS of science, a kit prepared by Science Service, by sending 50 cents to SCIENCE NEWS LETTER, 1719 N Street, N. W., Washington 6, D. C. and asking for Things unit No. 46.

FORESTRY

Serious Shortages Exist In High-Quality Timbers

➤ THERE ARE real shortages of high-quality specialty timbers such as yellow birch, yellow poplar, Port Orford cedar, airplane spruce and ship-building oak, scientists of the U. S. Forest Service declare. Although it is a popular belief that there are no timber shortages, but only shortages of labor and equipment to get out the timber, the truth is that there are no longer adequate saw-timber supplies accessible.

Records show that the total volume of standing timber in the United States was reduced nearly 40% between 1909 and 1938. Nearly 17 billion cubic feet, or 50% more than the total growth of timber, was cut or destroyed in 1943. In saw-timber alone the drain was almost twice the annual growth.

In spite of the fact that millions of trees are planted, all agencies, public and private, established only 3,500,000 acres of successful plantations, while the National Resources Planning Board sees a 25-year, 32-million acre planting program as necessary to meet the nation's "most urgent" tree-planting needs.

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Do You Know?

The most extensive lumber resource in Honduras, Central America, is *pine.*

The U. S. *Army Air Force* was 37 years old on Aug. 1 this year.

Tetraethyl lead is contained in all gasoline used by the American air forces.

Copey oaks in Costa Rica sometimes measure eight feet in diameter at breast height and 80 feet up to the first limb.

Aluminum and *magnesium* look so much alike that the layman can hardly tell them apart, but the magnesium is one-third lighter than the aluminum.

The consumption of industrial alcohol for making *synthetic rubber* is triple the total prewar consumption for all purposes.

Vinegar, long advocated by many for use in combating coccidiosis in poultry, has been proved by scientific tests to be valueless for this purpose.

Some $20,000,000 a year are saved by wooden ship owners by use of *ship bottom paint* which discourages entrance of two species of wood-boring marine creatures, the teredo and limnoria.

Because of the greatly increased use of *electricity* on farms, extension schools in the repair and maintenance of electrical equipment have been established by some of the state colleges of agriculture.

Polaroid goggles with eight-inch window-like plastic lenses protect the eyes of aircraft combat men; their flexible frame fits the face and cuts out side light and danger from flying fragments and flames.

Salt, used for centuries to preserve food, draws water, sugars, proteins, and other nutrients from the food so that the sugars may be fermented by certain desirable bacteria to form acids which, along with the salt, act as preservatives.

Among the *fireproofing agents* used to impregnate wood are ammonium, calcium, zinc, cupric and magnesium chlorides; ammonium, aluminum and nickel sulfates; certain borates and nickel, zinc, magnesium, and mono and di-ammonium phosphates.

TRANSPORTATION

Helicopter License Refused

The Canadian government has refused to honor applications from bus lines for operation of this service after the war.

➤ TAKING the view that if the helicopter has merit it should be permitted to develop on its own and not be tied up with surface transportation, the government of Canada, through the Hon. C. D. Howe, Minister of Munitions and Supply, has refused licenses to bus companies for the operation of helicopter services after the war. Previously the Canadian government had announced a new policy of separating airlines from railways, as soon as the war is over. Trans-Canada Airlines and Canadian Pacific Air Lines are both tied up with Canadian railroad interests.

Canada's policy for divorcing air and surface transport companies after the end of the war is likely to interest transportation men in this country, since the same problems that confront Canada are also confronting the United States. Applications have already been made to the Civil Air Board for helicopter-bus service by many U. S. motor coach lines.

The CAB has not been as drastic in its attitude towards a tie-up of helicopter and bus services. It believes that air transport services should be auxiliary, supplementary, and incidental to other transport operations of an applicant. This seems to indicate that the CAB would not refuse the application of a bus or railroad company for commercial air services, where these would increase the efficiency and better the service that they could give by their established railroad or bus line.

Neither Canada nor the United States governments are overlooking the very important fact that the commercial helicopter has yet to be invented. Every indication points to the fact that it will be some years before the rotary-wing aircraft can be used on a commercial basis.

No helicopter built today can carry more than two or three passengers including pilot, and most of them will carry only the pilot. Aeronautical engineers have stated that the helicopter today is in the stage of development that the airplane was at the end of the last war.

Mr. Howe, according to a report in *Flight* magazine (London), informed the Canadian House of Commons that the idea of the bus companies in applying for helicopter service was to prevent competition with their surface services. This may be true. On the other hand, far-seeing aviation men state that the air services and the surface transports will supplement each other after the war, rather than compete.

Surface carriers cannot approach the speed of an airplane, nor can a slow flying airplane be operated economically. In order to get the most out of the speed of air transport, railroads, trucks, and buses will have to be used to pick up cargo and deliver it to airports, and to distribute air cargo at the delivery point. Cooperating by inter-meshing their regular schedules, surface and air carriers can probably set up a speedy transportation scheme that will benefit both services.

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CHEMISTRY

Navy's Fire Extinguishers Produce Foam Mechanically

➤ A NEW LIQUID foam fire extinguisher for combatting fires at sea has a special nozzle attachment where the foaming charge of soy-bean meal or other protein base is mixed with a foaming agent and water by action that is basically mechanical rather than chemical, to produce a fire-smothering blanket.

The new foam extinguisher, perfected by the Bureau of Ships, Navy Department, is more fluid and therefore flows around and over objects better. It will retain its consistency for more than two hours. It eliminates danger to property and fire-fighter alike by reducing the hazard of re-ignition and flashback, which occurs when flames retrace their path.

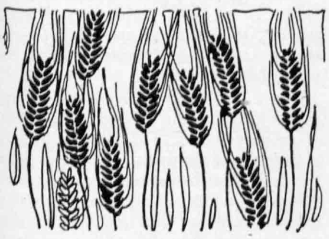
Liquid foam equipment is standard on United States Navy aircraft carriers, and its use has reduced the number and intensity of carrier fires. Navy officials predict that the foam fire fighting equipment may have an extensive effect upon the overall industrial fire protection requirements after the war.

Science News Letter, September 2, 1944

AGRICULTURE

NATURE RAMBLINGS

by Frank Thone



Seven Fat Years

➤ "ARE WE facing seven lean years?" asks Dr. Carl F. Taeusch, of the U. S. Department of Agriculture *(Scientific Monthly,* August), and he answers himself, "Not necessarily."

Because this country has just been blessed with seven successive bumper crops in the principal foodstuffs and fibers there is some tendency to expect a reversal, with a succession of scanty yields and consequent hard times all round, Dr. Taeusch states. He warns against letting our thinking be ruled by catch phrases and traditional ideas.

Increasing farm yields in this country have in the past been tied to increasing acreages planted. During recent years, however, there has been an actual decrease in number of acres planted; yet the continued increases in total harvests of corn, cotton and wheat have been astonishing. Yields per acre have gone up steeply, especially in corn and cotton.

It hasn't been altogether a matter of luck, or of consistently favorable growing weather since the bad drought years of the mid-thirties, Dr. Taeusch contends. Factors independent of the weather, and more subject to human control, have also been at work, and they will continue to work in our favor whatever cyclic weather changes may be in store.

Part of the gains have been due to better cultivation methods, in particular the water-saving and erosion-preventing techniques developed by the Soil Conservation Service, which increasing numbers of farmers have been adopting in recent years. Part have been due to increased power and efficiency of farm machinery, making possible the more intensive cultivation of fewer acres instead of the less productive "extensive" farming.

Even more important, perhaps, has been the increased efficiency of the crop plants themselves, brought about by recent developments in plant breeding. Heavier-yielding strains of cotton have boosted the national per-acre average from 180 pounds before 1937 to 248 pounds now. Wheat gains have been more modest: from a figure between 13 and 14 bushels per acre before 1937 to 15.3 bushels during the past seven years; a high national average of 18.65 bushels per acre was attained in the wonder-year of 1942.

Corn is the crop that has made the most outstanding showing, due largely to the general adoption of hybrid seed corn in the important corn-growing areas. Dr. Taeusch characterizes the results as "nothing short of phenomenal." For some 70 years prior to 1937, he states, corn had a relatively constant yield of less than 26 bushels per acre for the United States as a whole; minimum average yield during the past seven years has been 28 bushels, with a high of 35 bushels in 1942. In Iowa, the seven-year average has been 50 bushels per acre, with a high 60-bushel average in 1942.

Dr. Taeusch concludes on an optimistic note: "From the standpoint of physical production, therefore, aside from economic events and policies that may disturb the situation, there is every reason to believe that the past seven-year record of abundance can in large part be continued in the future by increasingly intelligent farming."

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MEDICINE

Radio-Active Sodium Aids Circulation Diseases

➤ AID IN DIAGNOSING diseases of circulation, including the shipwreck casualty condition of immersion foot, and in telling about the probable outcome of the diseases and what effect treatment is having can be had by the use of radio-active sodium, Dr. Edith M. Quimby and Dr. Beverly C. Smith, of Columbia University College of Physicians and Surgeons, report (*Science,* Aug. 25).

The radio-sodium is made by bombarding sodium metaborate in the cyclotron with deuterons. A sterile solution of this material is injected into a vein in the arm. The clicking of a Geiger counter held against the sole of the foot tells when blood containing radioactive sodium has reached the foot. In this way blood circulation time can be measured.

For eight normal persons, the arm-to-foot circulation time was between 45 and 55 seconds. The highest among 35 persons studied was 90 seconds in an elderly diabetic woman with hardening of the arteries and a heart disorder.

When the test was given to a patient who had presumably recovered from immersion foot, normal values for one foot but abnormal values for the other were discovered. This patient had been certified as fit for duty and his feet appeared normal, although he complained of pain on walking, standing or being chilled.

Use of the test, the scientists suggest, should be extended to a study of the acute type of frostbite suffered by aviators in short exposures to very low temperatures, in contrast to the long exposures at not such low temperatures but accompanied by soaking endured by shipwreck victims.

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PHYSICS

Jet-Propelled Torpedoes May Produce Greater Speed

➤ THE jet-propulsion principle is applied to torpedoes in a patent granted to D. G. Fawkes of Chicago. He proposes to do away entirely with the turbine-driven propellers now used, and to place in the tail of his torpedo a combustion chamber into which compressed oxygen and a liquid fuel are released and ignited. He claims greater speeds are possible with this type of weapon than with the conventional torpedo.

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ORDNANCE

Bigger Role For Rockets

➤ ROCKET weapons, now in general use by the Navy, promise to play an even more important role as the war progresses, the Naval Bureau of Ordnance has reported.

Most of the Navy's rocket weapons have been developed in an extensive rocket research program conducted by the Navy, a committee of scientists known as the National Defense Research Committee, and engineers at the California Institute of Technology.

To date, rockets have been used in the invasions of North Africa, Sicily, Italy and France, in the island seizures in the South Pacific. They have become standard equipment for all amphibious operations, and in anti-submarine warfare.

New air-borne rockets as armament for carrier-based and amphibian planes have been used successfully against German submarines in the Atlantic and against Jap shipping and land installations in the Pacific.

Research on rockets was concentrated at the California Institute of Technology in September, 1941, under contract with the Office of Scientific Research and Development and under the technical supervision of the National Defense Research Committee.

At that time, rockets were not by any means new weapons of war. The British had had experience with artillery rockets early in the nineteenth century but abandoned the idea in favor of rifled cannon.

Rockets have greater fire power and mobility than guns, and since they have no recoil they are particularly well adapted to installation on light landing craft, airplanes, and motor vehicles. Launching devices are cheap and lightweight.

The problems involved in rocket development are many. Perhaps the first is a suitable propellant—some form of powder that burns rapidly, generating a large quantity of hot gas. A satisfactory propellant material must have stability through a wide temperature range and a desirable rate of burning.

"Arming" devices for the fuses in rocket bodies present still another problem. Artillery shells, for safety in handling, have a device which keeps the fuse from operating until after the shell is fired. The release of this device is called "arming" the fuse. New mechanisms have to be worked out for arming the fuses of rocket projectiles.

Accuracy of fire presents another difficulty. All of these problems are being studied, and solutions are being found, at the California Institute's rocket research laboratories.

The most recent rocket developments must remain for the present in the realm of military secrets. The magnitude and importance of the work can be seen from the fact that rocket research and development stands almost at the top of the list of manpower and materials priorities, and the fact that the Army and Navy have placed rocket production contracts totaling many millions of dollars.

In addition to conducting rocket research and development the California Institute of Technology also has a rocket manufacturing project. This project is one of the few manufacturing programs ever undertaken by a school of higher learning, in wartime.

Science News Letter, September 2, 1944

NUTRITION

Corn Oil And Butterfat Found Equal for Growth

➤ FURTHER knowledge to help in determining the relative nourishing values of margarine and butter appears in a report by L. P. Zialcita, Jr., and Dr. H. H. Mitchell, of the University of Illinois (*Science,* July 21).

"Apart from differences in vitamin content, corn oil and butterfat are essentially equal in growth-promoting value for the rat," they conclude from their studies.

Baby rats, paired according to litter, sex and weight, were used. Their diets, containing all vitamins and other essentials, were the same except that one of each pair got butterfat, the other corn oil.

The rats were force-fed with a medical syringe adapted to the purpose. This was done to rule out the possibility that the butter-fed rats would eat more because they liked the flavor of the butter. This preference had been advanced as the reason why Wisconsin investigators found young rats grew better on butterfat when the only carbohydrate in the diet was lactose, or milk sugar.

Science News Letter, September 2, 1944

• Books Off the Press •

ARGENTINE DIARY: THE INSIDE STORY OF THE COMING OF FASCISM—Ray Josephs—*Random House*, 358 p., $3.

CLIMATE AND THE ENERGY OF NATIONS—S. F. Markham—*Oxford*, 236 p., illus., $3.50.

COMPASS OF THE WORLD: A SYMPOSIUM ON POLITICAL GEOGRAPHY—Hans W. Weigert and Vilhjalmur Stefansson—*Macmillan*, 365 p., illus., $3.50.

MANUAL FOR EXPLOSIVES LABORATORIES—G. D. Clift and B. T. Fedoroff—*Lefax Society*, 3 vol., $5.75.

MARINE AND AIR NAVIGATION—John Q. Stewart and Newton L. Pierce—*Ginn*, 472 p., illus., $4.50.

MARRIAGE AND FAMILY RELATIONSHIPS—Robert Geib Foster—*Macmillan*, 314 p., illus., $2.50.

MEN OF SCIENCE IN AMERICA: The Role of Science in the Growth of Our Country—Bernard Jaffe—*Simon & Schuster*, 600 p., illus., $3.75.

PAPERS OF THE MICHIGAN ACADEMY OF SCIENCE, ARTS AND LETTERS—Eugene S. McCartney and Henry Van Der Schalie—*Univ. of Mich.*, 608 p., illus., $5.

PHYSICS OF THE 20TH CENTURY—Pascual Jordan, Eleanor Oshry, trans.—*Philosophical Lib.*, 185 p., $4.

RIFLES AND MACHINE GUNS: A Modern Handbook of Infantry and Aircraft Arms—Melvin M. Johnson, Jr.—*Morrow*, 390 p., illus., $5.

A SHORTER HISTORY OF SCIENCE—Sir William Cecil Dampier—*Macmillan*, 189 p., illus., $2.

STEAMBOATS COME TRUE: American Inventors in Action—James Thomas Flexner—*Viking*, 406 p., illus., $3.50.

A SURVEY OF LITERATURE ON POSTWAR RECONSTRUCTION—Adolf Sturmthal—*Inst. on Postwar Reconstruction*, 100 p., paper, $1.

Science News Letter, September 2, 1944

ENGINEERING

Transportation Problem

Airlines of the future will not compete with railroads, buses, and trucks in the transport of cargo. Will supplement each other.

➤ THERE CAN be no direct competition between the transport of cargo by air and by railroads, buses, and trucks, R. D. Kelly, superintendent of development, United Air Lines, told the national transportation and maintenance meeting of the Society of Automotive Engineers in Portland, Ore.

"There seems to be no possibility, in the immediate future, that surface carriers can approach the speed wherein the aircraft begins to operate at its most economical figure. There seems to be no way to build a slow flying airplane that can compete with the surface transportation in a speed range consistent with surface travel," Mr. Kelly stated.

Therefore, he concluded, the two services are supplementary and they should cooperate with each other in order to take advantage of the swiftness of air transport for the carriage of goods to distant areas.

Railroads, trucks, and other types of surface transportation are better suited to picking up cargo and delivering it to the airport, and to distributing cargo at the delivery point, Mr. Kelly declared.

Recommending that aircraft manufacturers take steps to design planes that will reduce the time that the plane is on the ground for scheduled stops, Mr. Kelly pointed out that the success of the air transport system depends upon the overall speed made good from producer to consumer. Every possible moment, from initial pickup at the producer's door to the ultimate consumer, should be utilized in movement toward the objective as rapidly as possible consistent with safety, accuracy, efficiency, and economy.

Success of future air cargo service will depend upon the frequency of service both on the part of air and surface carriers, the reliability of schedules by both carriers, and the development of equipment for swift, accurate handling of cargo, eliminating unnecessary lay-overs.

Science News Letter, September 2, 1944

More Oil-Producing Land

➤ IT IS unlikely that petroleum will be practically non-existent in the United States 15 years from now as some authorities have stated because there are well over a million square miles of unexplored possible oil-producing land in the United States, Prof. W. H. Paul, of Oregon State College, told the meeting.

"Taking into consideration our proven reserves of 20 billion barrels and all of the oil that has been taken from the ground to date (48 billion barrels) there still remains in the earth beneath the United States a known quantity of crude oil amounting to something like 100 billion barrels," Prof. Paul stated.

Now that science has developed the art of uniting gaseous hydrocarbons to form liquid hydrocarbons of higher molecular weight, it is possible to produce motor fuel from our large reserves of natural gas, he pointed out. This process would not deplete the normal supply of natural gas as only the unwanted constituents are removed for motor fuel. It has been estimated, he said, that there are the equivalent of 17 billion barrels of petroleum in the proven reserves of natural gas in the United States.

Few new discoveries of deposits of oil have been made during the past three years, Prof. Paul declared. This is due in part to the curtailment of exploration during a war emergency.

"The possibilities of petroleum discovery are enormous and will be limited only by our ability to devise means and equipment to adequately explore and develop these undiscovered resources," Prof. Paul remarked.

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•New Machines and Gadgets•

❁ *MIRRORS that can conveniently be supported from the neck by a detachable neck-hook so that both hands are free when applying make-up, can also be rested partly upright on a table by means of the angled handle. They can also be used as hand mirrors, the neck-hook being folded in place around the mirror.*

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❁ *CONDIMENT HOLDER for the table, with four separate compartments for different seasoning substances, will deliver any one of them by rotating a top with holes in one quarter-section. Each compartment has its own perforated top. When the openings in the two tops coincide the seasoning may be shaken out.*

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❁ *SKATE CARRIER protects the skate blades or rollers while being carried to or from the rink. Elongated slots in a wood base hold the blades, or rollers, and a curved slot at one end forms a convenient handle.*

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❁ *PORTABLE bowling alley, complete with bed base, gutters, ball grooves and side rails, is made in sections held together with dowels and clamps. The sections of the bed of the alley are further secured to each other with beveled tongues that fit snugly into sockets.*

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❁ *BUG BOMBS, which hold under high pressure an effective insecticide for the use of American soldiers throughout the world, are tested for leaks with compressed air before the freon-pyrethrum-sesame oil mixture is put into them. The picture shows a battery of the cans being filled with air under high pressure, and the water-tank into which they are plunged to detect leaks.*

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❁ *SAFETY RAZOR, with a guard and blade assembly of such simple construction that both are discarded when a blade becomes dull, is used with a screw-threaded handle. The guard is thin sheet metal stamped out and bent upon a single edged blade so that the blade is permanently held by it.*

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❁ *SAFETY PIN of an improved type holds the point of the pin inside its sheath until a spring lever with a holding lug is manually drawn back. The head structure, made of sheet metal, is in the form of a hood. The flat lever spring is a part of the hood and its free end extends beyond the back of the pin.*

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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 223.*

Question Box

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