CHEMISTRY

Discovery by Accident

A new process for making smokeless powder helps keep peak efficiency in all climates. A new speed record in powder production made possible by discovery.

➤ SMOKELESS POWDER that keeps up peak hitting power indefinitely in any climate is now ready for use by the armed forces. How a laboratory accident led to a new process for making stable nitrocellulose for smokeless powder was announced by Spencer T. Olin, vice president of the Western Cartridge Company.

Hundreds of carefully controlled experiments were made by Dr. Fred Olsen, technical director of the company, and his associates in attempting to purify nitrocellulose. Their aim was to remove the tiny particles of sufuric and nitric acids which remain in wood or cotton fibers after they are treated to produce nitrocellulose in the conventional manner.

One night in the laboratory, after Dr. Olsen had run out of distilled water, he filled a test tube containing nitrocellulose with water from the tap in the sink. To his dismay the water was filled with rust that had scaled off the inside of the pipes in the water heater.

Then he noticed that impure nitrocellulose treated with rusty water produced a more stable explosive than he had ever previously obtained.

Realizing that the rust behaved like a dye and that the instability of nitrocellulose was related to how tightly certain impurities were held by it, Dr. Olsen started a new series of experiments, based on stabilization by means of dyes.

After producing nitrocellulose in every shade of the rainbow, he hit upon a colorless amine compound, called diphenylamine, which worked perfectly.

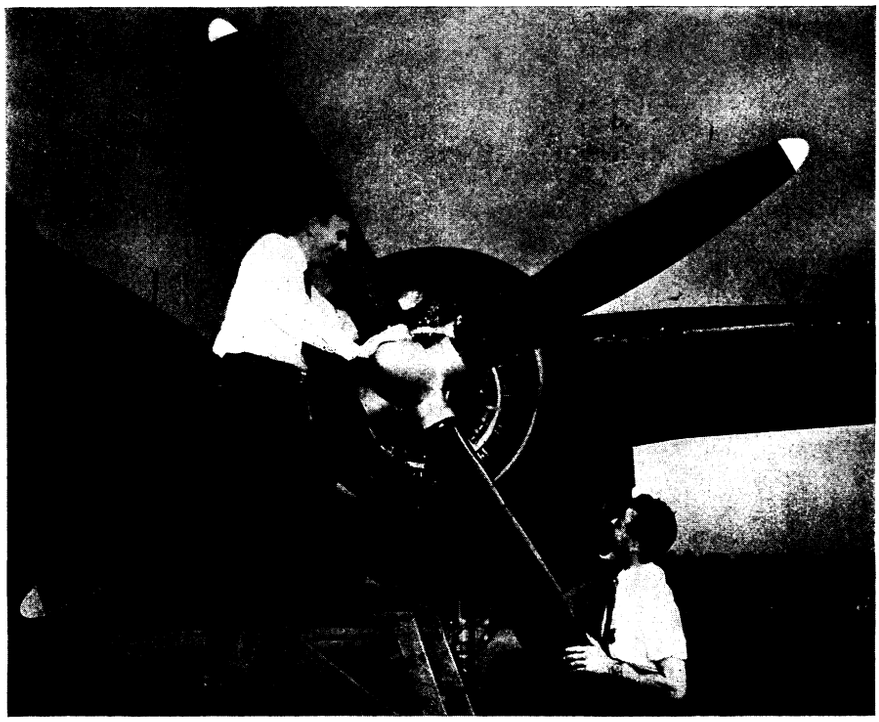
Although this chemical was always used in the later stages of smokeless powder production, it had never been used to chase the impurities out of the nitrocellulose in the early stages of manufacture.

Discovery of purified nitrocellulose in turn led to a five-fold speed-up in making smokeless ball powder.

Recently a batch of raw cotton was nitrated at nine o'clock in the morning and at three that afternoon cartridges loaded with the stable ball powder were fired on the testing range, an achievement claimed to be the fastest production of smokeless powder in history.

Now in production with the short-cut process, Western Cartridge officials report that more than a billion rounds of pistol, rifle, carbine and machine-gun ammunition for United Nations forces have already been turned out.

Science News Letter, July 10, 1943



SYNCHRONIZER—A simplified propeller control system, indicated by the Curtiss-Wright chief engineer on the left, enables a bomber pilot, by turning a single knob, to obtain the desired engine speed for maximum efficiency and at the same time automatically to synchronize all the four engines at this speed. Formerly four separate levers had to be manipulated.

PSYCHOLOGY—PHYSIOLOGY

Electrical Test Maps Area Affected by Nerve Injuries

➤ RECOVERY from war wounds and accidents in civilian life involving damage to nerves of arms or legs should be better as a result of a test reported by Dr. Curt P. Richter and Dr. David T. Katz, of Johns Hopkins Hospital (*Journal of the American Medical Association,* July 3).

The test maps the areas of the skin which have a higher electrical resistance than normal. A high electrical resistance over the skin area affected by a nerve shows that that nerve has been cut. If the surgeon performs the test before he starts to repair a wound, he can determine which nerves have been injured and how badly. Without such knowledge, the surgeon may not know that certain nerves have been cut. The wound may heal, but the patient be left with no feeling in part of a hand or foot and, worse still, without the use of fingers or toes.

Besides being "simple, accurate and practical," the test has the advantage of not requiring the patient's cooperation. This is important in case of war wounds and civilian accidents because the patients are usually too shocked to be able to tell accurately where they can feel a pin prick or the touch of a bit of cotton and where they cannot. The pin prick and cotton tests are common methods of trying to determine areas affected by peripheral nerve injuries.

The method of electrical skin resistance mapping is, roughly, to fasten an electrode on the lobe of one ear and

then move another electrode over the skin that might be affected by nerve injury. Meters measure the difference in electrical resistance between the normal and the affected part of the skin.

The test, it is pointed out, should be useful in determining which measures speed up nerve regeneration and which retard it and also in detecting suspected malingering.

Science News Letter, July 10, 1943

AERONAUTICS

Plane Changes Rapid

Airplanes of the future may be four-wheeled crafts with bigger engines housed within the wings, and capable of cruising satisfactorily at well above 20,000 feet.

➤ FOUR-WHEELED planes with bigger, more efficient engines housed within the wings are possible features of future air transports predicted by W. W. Davies, United Air Lines research engineer, in a report to the American Society of Mechanical Engineers.

Continued rapid development of all types of aircraft engines after the war should produce at least a horsepower for every pound of engine weight, due to better design and improved materials. Engines will be much more powerful. Current research projects indicate that specific fuel consumption at normal cruising power may be cut by nearly a fourth. Fuel of higher octane rating is one means of lowering fuel consumption, thereby cutting down the fuel load per trip.

War experience in the higher altitudes will undoubtedly make it possible to cruise satisfactorily at well above 20,000 feet, Mr. Davies declares, and yet keep fuel consumption to a reasonable figure.

Diesel engines may well power a good percentage of future aircraft, but Mr. Davies believes that fuel consumption will not be as amazingly low as enthusiasts have claimed.

Propeller efficiency will be pushed still higher and prop styles may look strange to oldtime fliers. Wide blades, multi-blades, dual or counter-rotating types and probably completely reversible units are some of the possibilities.

Into the discard will go conventional landing gears, generally speaking. In their stead will come increased use of the tricycle gear, main wheels plus a nose wheel, and future developments may well see the use of four wheels, one fore and one aft on each side of the fuselage.

Over-all drag of planes has been cut by a fourth through new developments already seeing service, Mr. Davies discloses.

Auxiliary high-lift devices coupled with improved wing design aid materially in maintaining desirable landing and maneuvering speeds.

"Considerable effort has been expended in research toward the production of new wing designs and airfoils," Mr. Davies stated. "The wing itself is responsible for a major portion of the over-all drag of an airplane."

Reduction in wing area has further lowered the amount of drag. This gives higher wing loadings, often looked at askance because of questionable effects on take-off and landing performance and because of troublesome icing difficulties.

However, larger airports of the future will solve the take-off problem, the engineers are told, while complete instrument landing control and better auxiliary high-lift devices will do much to permit increased landing and maneuvering speeds. Use of heat will nullify the icing problem.

For more economical operation of future transports the present bucket-brigade type of loading must be replaced.

"Future equipment must be so designed that, regardless of airplane size, complete loading, transfer, and unloading can be accomplished in five minutes," Mr. Davies maintains.

Movable ramps, conveyor systems and docking facilities are some of the possible solutions.

Further delay is due to trouble-shooting and repair work during airport stops.

"Future equipment will be so designed," says Mr. Davies, "that complete replacement of a malfunctioning assembly or unit can be made during a scheduled stop. This may apply even to the complete power plant."

Science News Letter, July 10, 1943

The output of *charcoal* in Sweden has trebled in the last couple of years, the by-products of carbonization being more fully recovered than ever before.

CHEMISTRY

Sea Water for Shipwrecked Made Potable by Invention

➤ MANY NATIONS have been striving to develop a simple, compact device for making sea water fit to drink. A welcome wartime invention which seems to meet these requirements has been patented by Dr. Alexander Goetz of Pasadena, Calif.

Neither expert knowledge nor accuracy are needed by war victims adrift on the ocean to use the two small boxes of chemicals recommended by the inventor.

Two salts make ordinary sea water unfit for human consumption: ordinary table salt or sodium chloride, and magnesium chloride. The amount of other salts present is not harmful.

To remove the pair of objectionable salts, Dr. Goetz adds a reagent compound of silver, preferably silver oxide. This reacts with the chloride part of the salts to form an insoluble silver chloride that settles out as a white powder, and the magnesium takes the chemical form of the hydroxide which is also insoluble.

The sodium part of ordinary salt remains in the water as a soluble hydroxide which is not tolerated by the human body. Rather than go through a complicated procedure to remove the sodium, a weak organic acid is added, such as tartaric or citric acid. A non-toxic compound is thus formed, making the water potable in two simple steps.

The chemicals will treat about ten times their weight of water. Exact amounts need not be used. Taste is a good guide to reveal when enough of the weak acid has been added.

A refinement may be added to the method by mixing a bit of chemical indicator with one of the chemicals. A color change shows when the water has been neutralized.

Science News Letter, July 10, 1943

Usually domestic animals avoid *poisonous plants;* when food becomes scarce they browse on plants they would not ordinarily touch.

● RADIO

Saturday, July 17, 1:30 p.m., EWT

"Adventures in Science" with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Dr. Gregory J. Comstock, Professor of Powder Metallurgy, Stevens Institute of Technology, will talk about "Scientific Advances of Powder Metallurgy."