

SCIENCE NEWS

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THE PRODUCTION OF RADIUM-LIKE SUBSTANCES

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ARTIFICIAL production of substances like radium, which can probably be produced much less expensively than the natural material, yet have the same qualities that make it useful in medicine, is covered in United States Patent 2,206,634. This has just been granted to five Italian physicists, who were at the University of Rome when application was made for the patent on October 3, 1935. They are now widely scattered.

Chief of the group is Dr. Enrico Fermi, Nobel laureate in physics in 1938. At the end of that year he came to the United States to join the faculty of Columbia University, New York City. His co-patentees are Edoardo Amaldi, still in Rome; Emilio Segre, University of California, Berkeley; Franco Rasetti, Quebec, and Bruno Pontecorvo, now in South America. The patent is assigned to G. M. Giannini and Co., Inc., New York City.

Most chemical elements consist of several "isotopes," which have similar properties except that they differ in atomic weight. In radium, and other substances naturally radioactive, there is a disintegration into various isotopes of other elements. This is accompanied by the emission of the alpha, beta and gamma rays, which produce the effects of radium.

In 1934 the French physicists, F. Joliot and his wife, Irene Curie-Joliot, daughter of the Curies, discoverers of radium, found that radioactivity could be started artificially. They bombarded light elements, like boron, with alpha particles from radium. After the bombardment ceased, the boron itself gave off some of the radium rays. Later, other ways were found of producing the same effect. By bombarding with other rays or particles of high energy, isotopes of different elements can be converted into other isotopes. These may be of the same or of other elements. Some of them are so unstable that they quickly decompose. In doing so, they show radioactivity.

The first efforts were to get bombarding particles or rays with energies as high as possible, but Dr. Fermi found this desirable only when the particles were electrically charged. Then high energy was needed to break through the barrier surrounding the nucleus of the atom. With neutrons, electrically neutral particles, the greatest efficiency is obtained with low energies.

Neutrons can be produced in various ways, chiefly by the use of the cyclotron, invention of Dr. E. O. Lawrence, of the University of California, who was awarded the Nobel prize last year. These neutrons, however, have very high energy, so Dr. Fermi's problem was to slow them down, and reduce their energy.

"We have found it possible to achieve the desired results by passing the neutron radiation against or through a screen of a suitable material," states the patent. "The materials which have been found best suited to this purpose are those containing hydrogen (including all its isotopes, but the light isotope which predominates in natural

occurrence being most efficient) and especially water and the hydro-carbons, such as paraffin for example."

In use, the screen may be either solid or liquid. In the latter event, the material to be treated can be dissolved or suspended in the liquid itself. The new patent covers the use of neutrons, with such an energy-reducing screen and the production of radioactive isotopes thereby. Since this is so far the only satisfactory method of producing artificial radioactive substances, and these have begun to find medical use, the patent seems to be quite basic.

Sodium has been one of the most widely used elements, but many others show the effect. The patent specifications list all those that have been tried, including most of the 92 known. Platinum, gold, iodine, potassium, copper and chlorine, among others, can be made more or less radioactive. Certain elements, including hydrogen, carbon, tin, thallium, lead, bismuth and mercury, showed no activity. With these, it is supposed, the neutrons produce a change to a staple isotope.—JAMES STOKLEY.

THE COST OF WAR PLANES

THE thousands of warplanes ordered for defense by the government will cost about \$7.50 a pound. The announced goal of 50,000 a year means the production of 500,500,000 pounds of airplanes, engines and propellers. Cost will be about \$3,500,000,000, a sizable slice of the nation's income. And this does not include the men to pilot them, the bombs they will carry, the extensive ground crews to maintain them, and hundreds of other incidental and essential costs.

These figures are from an authoritative analysis of the program by T. P. Wright, engineering vice-president of Curtiss-Wright Corporation, now specialist to the National Defense Commission, published in the journal, *Aviation*.

Time is of the essence. But there are no wild dreams of great flocks of warbirds overnight or even in a few months. It took Germany four years to go from 4,300 to 31,000 total air strength. It is estimated that an airplane production rate of approximately 2,000 a month, or 24,000 a year, can be achieved in 2½ years or by January, 1943. Over 4,000 planes a month, or 50,000 planes a year, can be realized in 5 years or by July, 1945.

It will require about \$500,000,000 invested in new plants—some 75,600,000 square feet—to carry out the program. Men needed will be about 800,000 compared with 100,000 now employed in the aircraft industry. Research will have to be speeded and amplified, because if we do not improve designs as we go along, the planes will be obsolete and easy prey to more advanced production. As we build airplanes we shall have to recapture aviation research leadership from Germany and Italy.

Comparison figures: The cost of aircraft plant expansion, half a billion dollars, is what France spent on her ineffective Maginot line. The cost per pound, delivered, of ordinary popular priced automobiles is about 30 cents, contrasted with the \$7.50 per pound for airplanes.—WATSON DAVIS.

A NEW CANCER SERUM

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A SERUM that may aid diagnosis of cancer and may even have value for treatment of the malignant disease has been developed by Professor William H. Welker and Dr. Lawrence S. Mann, of the College of Medicine of the University of Illinois. Announcement of the serum is made to the medical profession in the current issue of the *American Journal of Cancer*. The serum gave positive reactions with the blood of cancer patients in a high percentage of cases. In cancer of the stomach the percentage was 57 per cent. In cancer of the womb the percentage was 87 per cent., or seven positive reactions in eight cases tested.

No cures nor attempt to cure cancer are mentioned in the technical report which describes the preparation of the serum. Professor Welker, in a communication to Science Service, expressed the hope that the report would not have the "cruel" effect of raising false hopes in laymen who might expect more of the serum than can be guaranteed on the basis of present knowledge about it.

Blood tests with the serum were made by stratifying diluted human blood serum, from either normal persons or cancer patients, over the rabbit cancer antiserum. A white ring developing at the zone of contact after a period of one hour indicated a positive reaction. The serum is prepared from the blood of rabbits injected with aluminum cream (aluminum hydroxide) containing ground and specially treated cancer tissue. This has the effect of mobilizing in the rabbits' blood the defensive troops called antibodies. The particular accomplishment in preparation of the serum, which has been attempted many times before, was to cause mobilization of antibodies specifically capable of dealing with the protein of cancer tissue.

The difficulty in the past in preparing such a specific antiserum for cancer protein has been that when cancer cells were injected into rabbits, not only cancer-fighting antibodies but also antibodies for handling foreign blood were mobilized. This was because of the difficulty of separating cancer proteins from the blood proteins. As a result, the reaction of the serum with the blood of cancer patients might be a reaction with the blood and not just with the cancer proteins, if any were present in the blood. Consequently the previously prepared serums could not be used successfully in cancer diagnosis tests. According to the tests made, the serum prepared at Chicago is specific for cancer protein. It reacts only with cancer tissue or with the blood of cancer patients. It does not react with the normal tissues nor with the blood from normal patients.—JANE STAFFORD.

THE TREATMENT OF MUSCULAR WEAKNESS WITH HORMONES

"CLOSE to miraculous" results from the hormone bank treatment of the chronic progressive disease of muscular weakness, myasthenia gravis, are reported by Dr. Robert C. Moehlig, of Detroit, in the current issue of the *Journal of the American Medical Association*.

The treatment consisted in burying under the patient's skin little pills of desoxycorticosterone acetate, a synthetic chemical believed to be the same as the cortical hormone

produced by adrenal glands. The pills or pellets of this substance act like a bank of the hormone material on which the body can draw for its daily needs. This treatment with the synthetic adrenal hormone chemical was first used for patients suffering from another ailment, Addison's disease, which is an adrenal gland disorder.

The case Dr. Moehlig reported was that of a 32-year-old physician. Like other sufferers from myasthenia gravis, this patient got out of breath, weak and tired on the slightest exertion. The history he wrote of his own case states that he "could hardly raise his arms to shave or comb his hair. The weight of the head and shoulders and the effort to hold himself upright seemed intolerable." He had trouble in swallowing and talking, and felt "utterly exhausted" and drowsy most of the time.

Injections of the synthetic hormone chemical definitely relieved the weakness and fatigue, starting five hours after the injection. The effect, however, was only temporary, so it was decided to give the patient a more lasting supply by implanting pellets of the chemical to create a hormone bank. Dr. Moehlig states that "The effect of the pellet implantations has been close to miraculous in its sustained and complete relief of symptoms." No symptoms of the disease were noticeable three and one half months after the pellet implantation. The supply implanted last October was calculated to last 450 days.

"Naturally," Dr. Moehlig cautions, "further experiences with other patients as well as the continued progress of this patient are desirable before final conclusions concerning lasting benefits are made." He gives several reasons for trying the Addison's disease treatment in the case of myasthenia gravis. For one thing, loss of strength and fatigue are in a general way outstanding symptoms of both conditions, although in myasthenia gravis the tiredness comes only when the muscles affected by the disease are called on for sustained effort. The patient's past history furthermore indicated muscular weakness and a congenital predisposition to disturbance of muscle metabolism, and both the pituitary gland and the cortex of the adrenal glands are concerned with muscle metabolism.

FINGER PRINTS

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THOSE who operate their own transmitters may have to register their fingerprints at the post office.

The Post Office Department has been requested to take the fingerprints of all radio operators at the same time that they register aliens. As yet they have not accepted the invitation.

The alien fingerprinting, which is to start on August 28, will be done in post offices and possibly also in schools or other places. It is expected that standard fingerprint cards for all ten fingers will be used, such as those already in use for criminals by the Federal Bureau of Identification. Aliens' prints probably will be filed with the bureau. The details of the plan have not, however, been definitely settled as yet. Probably black ink like printers ink will be used.

Although the post offices are already taking fingerprints in connection with their postal savings accounts in some 690 of the largest offices, it is not anticipated that the

post office fingerprinting system will be used in registering aliens. For postal savings only the first three fingers of the right hand are printed. A stainless system developed about 20 years ago by the National Bureau of Standards is used instead of the rather messy ink. The applicant dips his fingers in a paste of lead soap and ferric chloride to make the prints which are then developed in sodium sulfide and sodium carbonate. Fingerprints are also used for identification purposes by the Civil Service Commission, which fingerprints all government employees under Civil Service. The Army, the Navy, Coast Guard, Marine Corps and the Veterans Administration identify their personnel by fingerprinting.

All applications for the soldier's bonus were required to be accompanied by the prints of the five fingers of the right hand of applicant. These were checked with the prints in the files of the Army. Then at settlement, the fingerprints were taken again to insure that the right person collected the money.

The U. S. State Department uses fingerprints in an unusual way. Passports for use of Americans in Europe these days must bear a fingerprint, but it is not the fingerprint of the person holding the passport. It is the imprint of the thumb of an official in the U. S. State Department, and it is assurance that the passport is genuine.

COMBATting FOREST FIRES

STREAMLINED fighting units instead of old-time mass formations are coming into use in combatting one of America's worst economic menaces, the forest fire. Tried out for the first time last year by the U. S. Forest Service, the new tactics proved so satisfactory that their use is now being extended.

The traditional method for stopping a forest fire has been to round up casual laborers and even hoboes by hundreds, arm them with tools which they hardly know how to use, and send them to the fire front. Unsited for the work, usually in poor physical condition, these men naturally work inefficiently, especially under the terrific stress and danger of a forest fire battle. Furthermore, the method of recruiting involves delay, frequently of days, while the fire rolls forward unchecked.

The new tactics involve the building of what amounts to a small standing army, skilled in the use of their weapons, kept in perfect physical trim and ready for instant action. Formations are in companies of 40, each divided into squads of 10. The men are permanently on the payroll; when not fighting fires they are kept busy building roads, bridges, etc. The original 40-man crew, that went into action last year, averaged nearly six feet in height and 170 pounds in stripped weight.

Instead of having each man try to clear and hold one short section of line, such a company moves steadily forward. Each man strikes one blow, with ax or other tool, for every couple of strides he takes. Those following do the same, so that by the time the 40 have passed there is a swath of ground cleared of everything combustible, and the fire can not pass.

The forties constitute a corps d'elite, sent into the toughest spots and taking pride in their ability to lick the hungriest fire. Last season's performance indicates that one of these professionals can clear five times as

much fire line in a given time as the untrained fighters hastily recruited after the fire has broken out.—FRANK THONE.

ITEMS

TEN regular cycles in variation of the radiation of the sun, six of which at least seem closely related to the large eleven-year period over which the sun-spots wax and wane, have been found by Drs. Theodore E. Sterne, Karl F. Guthe and Walter O. Roberts, of the Harvard Observatory, who have made an intensive mathematical analysis of observations obtained over a fifteen-year interval by the Smithsonian Institution. A report on the work has been made to the National Academy of Sciences. Variations in the radiation are very small, and it has been suggested that they are due to chance differences in the atmospheric blanket which surrounds the earth. It is extremely improbable, however, that accidental errors would produce the fluctuations found. Most significant is that six of the variations are submultiples of 10.2 years. The length of the sun-spot cycle, over which these solar tornadoes become very numerous, then die out again, has had an average length of 11.3 years in the past century. It varies, however, and the average of the two cycles which were included in the data analyzed was 10.1 years. This indicates that the six fluctuations are components, or "overtones," of the main cycle, and due fundamentally to the same cause.

GLASS rods, light green in color, which turn purple when exposed to daylight, now afford a simple means of measuring the intensity of ultra-violet rays, which cause sunburn. Dr. Helmut Landsberg, assistant professor of geophysics at Pennsylvania State College, has developed the method. As used in this region, the rods complete the color change in about six hours of summer midday sun, but in the winter a longer time is needed. There is also a difference depending upon location, as shown by tests made in many parts of the country. In general, the southern states showed 30 per cent. to 50 per cent. more ultra-violet than the northern. Rio Piedras, Puerto Rico, gave the highest value, with Tucson, Arizona, a close second. Reno, Nevada, also scored high, but New York and Pittsburgh were quite low. In these large cities, ultra-violet light is reduced by dust in the atmosphere. Very short wave-lengths in ultra-violet light produce painful burns. The longer waves, just a little too short to be visible as violet light, produce tanning without burning.

A CASE of relapsing fever, a tropical disease rarely seen in the United States, is reported by Dr. W. P. Neilson, of Enid, Okla., to the *Journal* of the American Medical Association. The case is the first ever reported in Oklahoma. The disease is caused by the kind of germ known as a spirochete and is generally transmitted to man by the bite of an infected louse or tick. Dr. Neilson's patient did not remember being bitten by any insect and did not show any signs on her skin of such a bite. She lives on a farm, but does no outside farm work where she might be bitten by ticks, and there are no rats or other rodents around to harbor the germs. She had not been away from her immediate vicinity and no foreign guest had visited the home. She was cured of the ailment by the chemical, neosarsphenamine.