

much interested, as nothing closely resembling the character has ever been reported out of the millions of muskrats that have been trapped for fur.

Unfortunately, the two animals were

killed in the trapping, so that breeding experiments are not possible. If living duplicates can be secured and the new type of fur fixed by breeding, it might prove valuable in the fur trade.

Science News Letter, March 7, 1942

GEOPHYSICS

Hoover's Son Invents Way To Locate Oil Deposits

Invention Uses Artificial Earthquake Method of Prospecting; Seismic Wave Produced by Explosion

HERBERT HOOVER, JR., son of the former President, has been awarded U. S. Patent 2,272,201 for an invention that will make for the more accurate location of oil or other mineral deposits buried deep in the earth. Mr. Hoover has assigned his patent rights to Consolidated Engineering Corporation of Pasadena, California, of which he is president.

The invention applies to the seismic or artificial earthquake method of prospecting. The earthquake wave is produced by an explosion of dynamite. The seismic waves travel downward and are reflected back to the surface from harder or softer layers at different depths. Receptors placed at different points along the ground pick up the waves and record them on a moving strip of photographic paper. From the times of arrival of the different "reflections," the depths of the various reflecting beds can be calculated.

The invention consists of an electrical network which Mr. Hoover calls a "dispersion compensator." It corrects for the fact that seismic waves of different frequencies travel at different velocities through the earth—an effect called dispersion.

The original impulse produced by the explosion consists of a mixture of many frequencies. These become strung out into a "spectrum" as the pulse travels through the earth. Thus, if the high frequencies outrun the low frequencies and arrive first at the receptors, followed by the others in succession, the result on the photographic record is a long-drawn-out, indefinite wave that may not be distinguishable from the general commotion that is always present. In short, it is a blur.

The compensator, which is inserted between the receptors and the recorders,

retards the waves in proportion to their frequencies. Thus, the high-frequency waves which arrive first are retarded the most, the others less and less. The stretched-out wave is pushed up together again. The result on the record is a sharp definite wave, easily distinguished from the general commotion, a wave whose time of arrival can be accurately measured (to a thousandth of a second or better) and the depth of the reflecting bed from which it came, accurately calculated.

This is important now that all the easy prospecting for oil has been done. The days when an error of a hundred feet or so didn't matter are gone. Today a difference of ten feet may be significant.

Due to dispersion, Mr. Hoover states in his patent, low frequency waves from one reflecting bed may arrive at the receptors at the same time that high frequency waves arrive from another reflecting bed separated from the first. Without the compensator they are hopelessly mixed and indistinguishable.

Mr. Hoover's method of correcting seismic dispersion is exactly analogous to the correction of an optical lens for chromatic aberration. In this case, a second lens is added, the dispersion of which is opposed to and equal to that of the first lens, and therefore corrects it.

Since the dispersion of a seismic impulse will be the greater the longer its path in the earth, Mr. Hoover provides a control box which by the corrective effect of the compensator may be regulated to suit the conditions.

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Army quartermasters required glass-makers and designers to figure out a special kind of jar for preserves—soldiers had to be able to clean it out with a spoon!



SIMPLE CAMERA

These few common objects enable the metallurgist to look into steel and see what's wrong with it.

METALLURGY

Coffee Can Camera Aids Improvement of Steel

See Front Cover

ATIN CAN, two small brass disks and a screw clamp compose a camera that sees into steel with the aid of radioactive atoms, and may point the way to better steel making.

The camera was devised by Dr. William E. Shoupp of the Westinghouse Research Laboratories to find out whether phosphorus added to molten steel is well distributed or bunched together in spots. To disclose its location, the phosphorus was made artificially radioactive by bombardment in an atom smasher before it was added to the molten steel. A small disk was then molded of this steel.

In a darkroom a piece of photographic film was laid on each side of the steel disk, two small brass plates were placed outside the film and the whole stack was clamped together and put in the tin can to keep out the light. After being left overnight, the film was developed.

The result of one such test is shown on the front cover of this week's SCIENCE NEWS LETTER. The light and dark blotches are caused by rays from the tracer phosphorus atoms. The light areas correspond to little air pockets or blowholes in the steel and show that the phos-

phorus had concentrated on the surfaces of these pockets. This simple camera thus furnished the information sought.

The same method, Dr. Shoupp said, can be used to reveal the location of other substances, as for example, sulfur, carbon, manganese and silicon, for any of these substances can be made into tracers with an atom-smasher.

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MEDICINE

Add to Explanations of Sulfanilamide Action

NEW research confirming earlier evidence that sulfanilamide attacks bacteria by literally starving the germs may provide a hopeful method of "making drugs to order" for specified germs.

Until recently, pharmacologists, the scientists who develop new drugs, have worked mainly on a hit-or-miss basis. Ehrlich, for example, tried 606 times before he hit on salvarsan, the specific drug for the organism of syphilis.

The new research is reported (*Lancet*, Jan. 10) by Dr. Sydney D. Rubbo and Dr. J. M. Gillespie of the University of Melbourne, Australia. They found that a chemical called p-aminobenzoic acid is needed by a certain type of bacteria for growth. This acid is similar in its chemical structure to sulfanilamide. When the sulfanilamide is present, the bacteria are tricked into using it instead of the necessary acid. Since sulfanilamide does not promote growth, despite the similarity in chemical structure to the acid, the bacteria cannot develop.

However, only one part by weight of the acid will offset the growth inhibitory qualities of 26,000 parts of the sulfanilamide, the report states. This is a possible explanation of why such large amounts of the drug are needed in treatment of bacterial infections.

Dr. D. D. Woods and Dr. P. Fildes, British scientists, had earlier discovered evidence that the acid was necessary for bacterial growth, and that sulfanilamide inhibited growth by interfering with the bacterial use of the acid. The present research confirms their evidence, while an editorial in the same issue of the *Lancet* comments that "one new and more rational method has been added to those already available in (drug) research."

This new method is the search for compounds similar to substances known to be essential to the growth of bacteria.

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ASTRONOMY

Study of Distant Galaxies Gives Hints on Milky Way

Exploring Outward in Time and Space, We Should Be Able To Work Out Destiny of Our Own Galaxy

EXPLORING outwards in the time and space of the universe, Dr. Harlow Shapley, director of Harvard Observatory, in an address before the Inter-American Astrophysical Conference, declared that by studying hundreds of thousands of great systems of stars, each comparable to our own Milky Way, it should be possible to work out whence our own system of stars came and where it is going.

Already Dr. Shapley has directed a census of these galaxies out to a distance of 100,000 light years (600,000,000,000,000 miles). More than 400,000 new systems have been discovered. About a thousand million million stars are involved in this gigantic study of the whole sky, now two-thirds complete.

Mexico's new Schmidt-type telescope, just dedicated at Tonanzintla, largest of its kind reaching southern regions of the sky, is specially well suited to the study of these faint external galaxies.

Three-quarters of these great aggregations of stars have spiral arms which hitherto have been thought of as streams of stars thrown off from the central portion of the galaxy. Dr. Shapley told the conference that these arms actually appear to be condensations within the systems rather than ejections from the center masses.

Measuring photographic plates with electrical measuring instruments more sensitive than the human eye, Harvard measurements reported by Dr. Shapley show that only a fifth of the light of a spiral galaxy is in its arms and most of it is in the little-noticed background of the galaxy.

Recent Harvard studies show that our own galaxy, the nearest stars of which we see in the night sky, is larger than supposed. Variable stars, used by astronomers as yardsticks, have been found as distant as 30,000 light years on the other side of the center of the galaxy.

Evidence that the Small and Large Magellanic Clouds may be physically connected was presented by Dr. Shapley. An extension or wing of the Small Magellanic Cloud was discovered and has been

shown to be attached to it. This wing extends outward to the Large Cloud.

Out of such studies, Dr. Shapley predicted, will come more information on deeper problems, such as the age of the universe, and whether it is finite in size and material, or limitless in one or both of these quantities.

Science News Letter, March 7, 1942

Meteorites Age of Earth

EVERYTHING on earth, even the meteoritic importations from outer space, are the same age, about two to two and a half billion years, Dr. Robley D. Evans of the Massachusetts Institute of Technology told the conference.

This suggests that the "pebbles from heaven" as well as the earthly elements themselves were formed at the same time.

Dr. Evans used a new method of determining age. He estimated ages from the relative activities of long-lived radioactive isotopes or varieties of some elements. In terrestrial samples the radioactive isotopes of uranium, potassium, carbon, oxygen and others always occur in the same proportions, suggesting that they were all formed at the same time. Measurements of meteorites show the same relative abundance of the isotopes.

This checks well with earlier age determinations upon iron meteorites and earthly rocks by measuring the amounts of helium produced as by-products of radioactive disintegration.

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● RADIO

Saturday, March 14, 1:30 p.m., EWT

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

Dr. Kirtley F. Mather, of Harvard University, will predict the organization of all human beings after the war and a planned coordination of all sorts of human activities.

Tuesday, March 10, 7:30 p.m., EWT

Science Clubs of America programs over WRUL, Boston, on 6.04 and 11.73 megacycles.

One in a series of regular periods over this short wave station to serve science clubs, particularly in high schools, throughout the Americas. Have your science group listen in at this time.