

of the good material, and the question naturally has arisen how to get it out.

Unfortunately distillation, the stock-in-trade process of the oil refiner, does not separate good oil from bad, although it does separate light from heavy. Recent researches show that propane, a normal constituent of liquefied natural gas, can be made to turn the trick. This remarkable substance, cheaply available, looks like gasoline but has a boiling-point of 48 degrees below zero Fahrenheit. It has the ability to dissolve out, or extract, the Pennsylvania type of ingredient, but not the asphalt, paraffin wax and other undesirable components which mar the cheaper lubricants.

Lubricants extracted with propane have the pleasing habit of constancy in viscosity during the process of warming up of a motor. They are thin enough to permit the starter to turn over a cold motor—and at the same time remain sufficiently viscous in a hot motor for proper lubrication.

The new refining method opens wide new resources for manufacture of really good motor oil, since Texas, Oklahoma and California oils, previously thought unsuitable, are available as raw materials. Entirely new and peculiar refining apparatus must be devised, however, to take care of the propane in view of its extremely low boiling point. The whole process will have to be conducted under pressure.

Science News Letter, January 27, 1934

GENETICS

Broody and Non-Broody Hens Produced By Breeding

BROODINESS in hens, described in old-fashioned rural terms as "always wantin' t' set," can be increased or diminished by selective breeding, it has been shown by experiments reported by Dr. Frank A. Hays of Massachusetts State College.

Dr. Hays bred two lines of Rhode Island Reds for the opposite tendencies in hen-maternalism, and carried on his experiment for nine years. The broodiness of the line encouraged in this tendency was little less than double that of the non-broody line during the time of the experiment. The annual egg-laying records among the non-broody hens were, as might have been expected, significantly higher than those of their broody relatives.

Science News Letter, January 27, 1934

ASTRONOMY

200-Inch Telescope Mirror To be Poured of Special Glass

THE DISC of the great 200-inch mirror of the new Mt. Wilson Observatory telescope now being built will be made of a superior sort of pyrex glass and it will be poured at Corning, N. Y., in about a month.

Early plans called for a mirror of fused quartz, but now a superior pyrex glass, which has a small volume change with temperature, has been developed for the special purpose of the 200-inch mirror. When a few years hence the new giant telescope is placed in operation on a southern California mountain peak, it will be the world's largest, doubling in one gigantic step the diameter of the world's present largest, the 100-inch on Mt. Wilson, Calif.

At the Corning Glass Works, when the step takes place, the glass will be taken from the furnace at 1500 degrees Centigrade, trucked to the mold and poured at about a thousand degrees. It will be allowed to cool to below 500 degrees and kept until the temperature is uniform throughout. For an ordinary disc 30 inches thick, 24 days would be enough to equalize temperature, but the thick mold which will hold the glass will require a longer time, probably over four months, before the cooling process can begin. This subsequent stage will take about the same time.

Dr. J. A. Anderson of the Mt. Wilson Observatory told how the problems involved in the annealing of glass were solved by American scientists when our European sources of optical glass were shut off during the World War. The staff at the Geophysical Laboratory of the Carnegie Institution of Washington was especially effective. Their work has made the production of the enormous disc feasible.

The oven for the large reflector has already been used to make the 120-inch test plane required for the larger concave mirror. Dr. F. G. Pease, who watched the pouring, said the result was most successful. Preliminary tests for strain showed it to be superior to the excellent 60-inch mirror now used on Mt. Wilson. It was perfectly clear and almost free of bubbles.

The test plane will have the same type of construction as the big mirror.

A hexagonal system of ribs will give rigidity without bulk. Nineteen points of support will be provided in these ribs. The supporting levers will be attached in ball bearings so that frictional and elastic distortions will be minimized. The holders will work so that the mirrors can hang upside down.

Science News Letter, January 27, 1934

PHYSICS

Heavy Hydrogen Born In Neutron-Proton Smash

AN ATOM of heavy weight hydrogen is born with an exhibition of gamma ray fireworks when a neutron smashes into a proton.

This is the latest drama of the atomic world of the minutely small now being explored by physicists. D. E. Lea of famous Cavendish Laboratory, Cambridge University, working with the aid of Dr. J. Chadwick, discoverer of the neutron, reports his experiments and interpretations to *Nature*.

The actors:

PROTON—The kernel, heart or nucleus of an ordinary hydrogen atom.

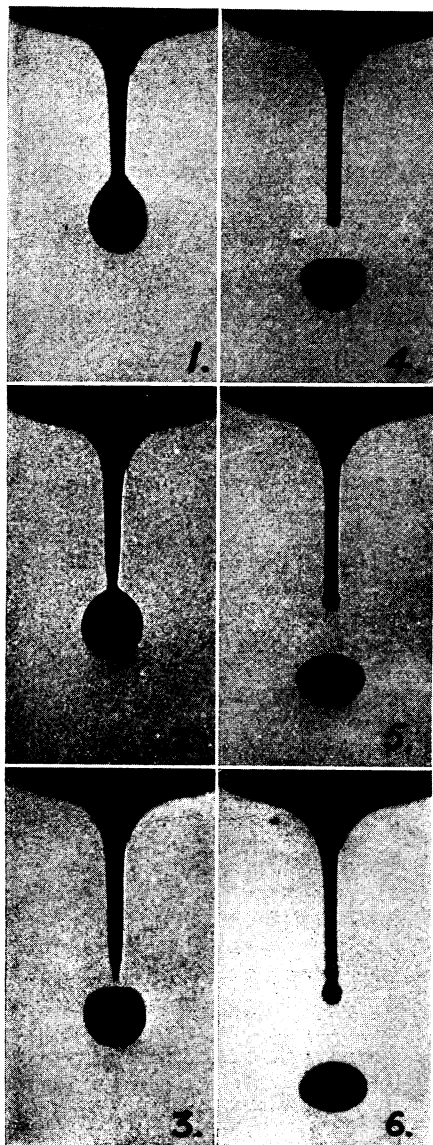
ELECTRON—The famous and ubiquitous unit of negative electricity and, at one and the same time, a fundamental building block of all atoms and matter.

NEUTRON—An electrically neutral particle, probably consisting of a close combination of proton and electron, discovered in England in 1931.

HEAVYWEIGHT HYDROGEN—A variety of hydrogen that is twice the weight of ordinary hydrogen, discovered in America in 1932. Various called hydrogen isotope mass two, deuterium, and (in England) diplogen.

The drama:

Neutrons given off from the elements, polonium and beryllium, were allowed to smash into paraffin, and the scientists were surprised to find that some gamma radiation, waves such as given off from radioactive substances, was shot backwards. They explain that unusual happening by supposing that in some of the collisions between neutron and proton (contained in the hydrogen of the paraffin), these particles



NO ELONGATION HERE

High speed photographic proof that a falling drop of water does not elongate into the conventional "raindrop" shape, but instead tends to maintain a spherical form, is contained in these photographs showing a drop of inky water falling from a wet electric light bulb. The pictures were taken at the rate of 500 per second with the fast stroboscopic motion picture camera developed at Massachusetts Institute of Technology.

combine to form heavyweight hydrogen. That combination would result in the emission of energy in the form of gamma rays, equal to the loss of weight experienced in the transmutation. This conversion of mass into energy should give rise to million volt gamma rays and this would require the attacking neutrons to have two to six million volt energies, which is about what they have.

Science News Letter, January 27, 1934

PHYSICS

Atomic Bullets Aimed At Secrets of Matter

Preparations Being Made for New Attacks With Powerful Weapons and Recently Discovered Projectiles

CONCENTRATED streams of atomic bullets are being made ready in experimental laboratories for attacking non-living and living matter.

There will be:

1. Attacks upon atoms, investigations of the constitution of matter and transmutations of energy and matter.
2. Explorations of the effect of the newer radiations upon living matter, specifically in the treatment of cancer and upon germplasm with consequent changes in heredity.

The atomic projectiles used are:

Electrons—Units of negative electricity, given off when anything becomes hot, propelled from disintegrating radioactive substances with high speed they are called beta rays, propelled by high voltage they are called cathode rays.

Protons—Nuclei or kernels of hydrogen atoms, units of positive electricity, about 1800 times as heavy as electrons.

Neutrons—Electrically neutral particles, close combinations of proton and electron, discovered 1932.

Deutons—Nuclei or kernels of deuterium or heavy hydrogen atoms, constituted of two protons and one electron. Deuterium discovered 1931.

Alpha particles—Nuclei or kernels of helium atoms, disintegration product of radioactive substances.

Canal Rays

Positive ions—Nuclei or kernels of the various chemical elements. Protons and alpha particles are special kinds of positive ions. Streams of positive ions, propelled by high voltage, are called positive or canal rays.

High-voltage electrical machines constituting "atom guns" of great power are being perfected to speed the atomic particles and make them hit harder and perhaps more effectively.

Most common are the conventional evacuated tubes for producing cathode rays, X-rays, positive or canal rays, etc. They range from a few thousand up to hundreds of thousands of volts. One of the largest of X-ray tubes of more

or less conventional type, rating a million volts, is at the California Institute of Technology, Pasadena, Calif.

A whirling electrical machine, in which reversing magnetic polarity of 85-ton magnets accelerates particles until they obtain speeds equivalent to as much as 3,000,000 volts, has been developed by Prof. E. O. Lawrence and associates of the University of California.

In an airship hangar at Round Hill, Mass., there is a giant electrostatic direct current generator of the Massachusetts Institute of Technology, designed by Dr. Robert J. Van de Graaff, which has generated 7,000,000 volts potential and is capable of 10,000,000.

Atomic Energy Tapped

In addition to these man-made atom guns for speeding atomic particles, the scientists have learned how to tap energies within the atom so as to augment the electrically induced energies.

Most striking are the streams of neutrons produced when the light metal beryllium is bombarded with deuterons. Here is an atomic particle unknown a relatively few months ago that can be used to produce unusual streams of another atomic particle also unknown a few months ago.

The research group consisting of H. R. Crane, a graduate student, Dr. C. C. Lauritsen, who developed the C. I. T. million volt X-ray tube, and Dr. A. Soltan, an international research fellow from Poland, working at the Pasadena laboratory, were astonished to find that deuterons flung at beryllium metal released many more neutrons than alpha particles (helium nuclei) either artificially speeded or produced by radioactivity. At Berkeley, Calif., Prof. E. O. Lawrence and his colleagues, Drs. M. Stanley Livingston and Malcolm C. Henderson, discovered the same effect.

Both sets of scientists realized that here is a case of transmutation. Dr. G. N. Lewis of the University of California furnished both groups of physicists with some of his very pure heavy water containing deuterium or heavy hy-