

Oil Burning Airplanes for Future

Aviation

America's first Diesel or oil-fueled airplane engine which flew from Detroit to Langley Field for its first public inspection by leading aeronautical experts may be the first of a new breed of aeronautical power plants that may drive the gasoline-carburetor sort of engine out of the sky.

For several years the Packard engineers under the direction of Capt. L. M. Woolson have been developing the new engine that has just been allowed to perform in public. The ordinary person would not give it a second glance, so conventional does it seem in outward appearance. But to the engineer who has seen Diesel engines capture the propulsion of sea-going ships from steam turbines, who has watched the application of oil engines to power plants and sizable construction machinery, who has even seen the coming of Diesel powered automobile trucks, the Packard engine consuming the sort of oil that



CAPT. L. M. WOOLSON, Packard engineer, under whose direction the oil-burning engine has been perfected, as he appeared at Langley Field after flying from Detroit in one of his planes.

is burned in furnaces and driving a standard type airplane for six hours across country comes as a portent.

Little wonder then that the pilots, research scientists and airplane manufacturers visiting the Langley Memorial Aeronautical Laboratory crowded around the Packard engine when its locked covers were unfastened.

Nine cylinders, air cooled, arranged radially, compose the Packard airplane engine. The familiar spark plugs and the carburetor so necessary on a gasoline engine are lacking. One valve in each cylinder head acts as air inlet and burned fuel exhaust. The fuel, oil instead of gasoline, is sprayed into the cylinder instead of being mixed with air and vaporized in a carburetor. The heat of compression of the squeezed air in the contracting cylinder ignites the oil sprayed into it. Thus electrical ignition is dispensed with. The engine is of the four-stroke type and operates at from (Turn to next page)

Nitric Acid Forming Gas Spread Death

Chemistry

Nitrogen oxide, reddish brown corrosive gas that is first cousin to nitric acid, was the deadly substance that spread disaster in the Cleveland Clinic explosion, in the opinion of explosive experts. When the mass of X-ray film stored in the basement exploded and burned in its confined quarters it gave off great volumes of at least two dangerous gases, nitrogen oxide and carbon monoxide. The explosive sort of photographic film is made of cellulose nitrate and is practically identical in composition with smokeless powder. Such films have been known to explode spontaneously on various occasions in the past and they can be easily ignited.

The most probable explanation of the cause and progress of the explosion was given by Dr. Charles E. Munroe, veteran chief explosives chemist of the U. S. Bureau of Mines, who is the inventor of the smokeless powder used by the Navy and who has investigated all the major explosion accidents of the past four decades. Basing his figures upon smokeless powder explosion experiments made at Edgewood Arsenal to ascertain the cause of powder disasters on Navy ships, Dr. Munroe

explained that within less than a half minute after the explosion of photographic film the resulting gases must have been composed of over a third deadly carbon monoxide and about a tenth of corrosive nitrogen oxide. These gases, produced in large quantities, spread through the building. The secondary explosion was probably due to the ignition of an explosive mixture of the carbon monoxide with air.

Three forms of nitrogen oxide result from the burning of cellulose nitrate. First a colorless, harmless gas, nitric oxide, composed of equal parts of nitrogen and oxygen (NO), is given off, but this on contact with air oxidizes to the reddish brown active gas, nitrogen dioxide, which is composed of one atom of nitrogen united to two atoms of oxygen. Mixed with the nitrogen dioxide is another form of the same compound, nitrogen tetroxide, similar in color and evil properties and containing two atoms of nitrogen combined with four of oxygen. Nitrogen dioxide mixed with water forms nitric acid, one of the most vigorous of the acids.

Carbon monoxide is the colorless, odorless gas that is responsible for

deaths when auto engines are allowed to run in closed garages. It is the product of any sort of incomplete combustion. How much damage can be attributed to it in the Cleveland Clinic disaster is problematical.

Bromine was blamed in early newspaper reports for the damage but experts can not see how it could have been present except in very small quantities in chemical laboratories. The nitrogen oxide gases look very much like bromine fumes and the effect on the victims is similar. Erroneous reports of the presence of phosgene, a colorless war gas, were flatly repudiated by chemical warfare authorities and the confusion probably arose in the minds of observers whose experience with gas attacks was obtained in the war. No war gases were stored in the Cleveland Clinic.

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A strange provision of nature protects the knob-cone pine of the Pacific coast: seeds of the cones are rarely discharged until the tree has been destroyed by a forest fire, when the heat liberates the seeds to establish new growth.