ENGINEERING

New Type Locomotives

New powerful high-speed coal-burning steam turbine engine has been designed. The cab and boiler section is between coal and water compartments.

➤ A NEW type of steam turbine locomotive, a coal-burner with great power and high speed, has been designed in an unusual arrangement having its coal compartment at the forward end, a combination cab and boiler section, with the smokestack at its rear, for its central part, and a water compartment following. The coal and the cab-boiler sections are supported by a single cast-steel frame mounted on two swiveling trucks, one under the coal compartment and the other under the boiler. Behind the boiler is coupled the water compartment.

This new turbine locomotive, which will be known as the "Triplex", is a development of the Pennsylvania Railroad, which recently put into service the first direct-drive steam turbine locomotive built in this country. The Triplex is approximately 137 feet in length, with a wheel base of 122 feet, but because of its swiveling trucks will be able to operate around any curve that a standard passenger car can negotiate.

The new locomotive, like the steam turbine already in use, does not have the familiar piston rods and other reciprocating parts of the conventional steam engine. This makes it possible to use smaller driving wheels, which permits larger boiler capacity for the same road clearances, and improves the locomotive's efficiency.

A unique feature, to maintain weight in the coal compartment over its driving wheels as coal is consumed, is an arrangement by which water from the water compartment automatically flows to a tank in the coal compartment, and returns to the water tender automatically when a new supply of coal is taken on. Mounting the coal compartment on the same frame as the boiler keeps alignment between the boiler and the coal pile and thus simplifies the operation of the mechanical stoker.

An electrically driven locomotive powered by a coal-burning steam turbine engine has been designed, and three of them will soon be constructed for the Chesapeake and Ohio Railway by the Baldwin Locomotive Works and the Westinghouse Electric & Manufacturing Company. No electrically driven locomotive powered by steam turbine is in operation in the United States at the present time.

In the new locomotive, in a single self-contained unit, the coal is carried in the head instead of in a tender, the engineer's cab is next, then the boiler, and last the electric motors that drive the wheels. The engine is designed to develop 6,000 horsepower and the locomotive will be capable of running more than 100 miles an hour under full load even on grades. Smoothness of operation is one of the results fully expected.

Science News Letter, April 7, 1945

GENERAL SCIENCE

Franklin Medal Will Go to Dr. Harlow Shapley

➤ The FRANKLIN medal, the highest award of the Franklin Institute, will be presented to Dr. Harlow Shapley, director of the Harvard College Observatory, at the Medal Day dinner on April 18. The award is made for his valuable contributions to the science of astronomy, and especially for his work "in the measurement of the vast distances necessary for the determination of the nature and extent of our galaxy, as well as those of other galaxies external to ours."

Walter J. Coppock of Moyland, Pa., and Greer Ellis of Chicago will receive Franklin Institute certificates of merit at the same dinner. Mr. Coppock designed a novel and theoretically sound motor base which gives automatic belt tension under varying load conditions, and Mr. Ellis developed brittle lacquers for strain measurement and a technique for their use.

Science News Letter, April 7, 1945

EDUCATION

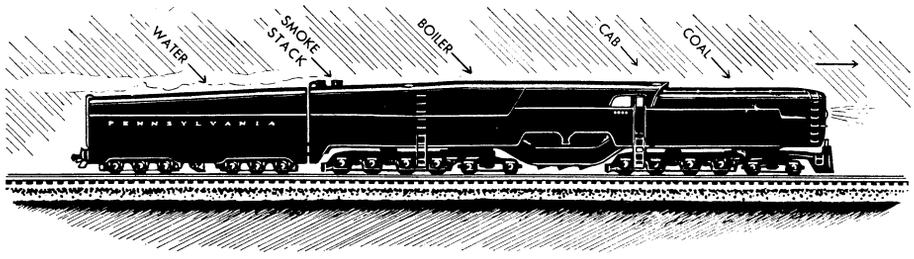
Rockefeller Grant for Postwar Graduate Degrees

➤ WAR RESEARCH workers in and out of uniform will be able to go back to graduate school through a Rockefeller Foundation grant of $335,000 to the National Research Council, recently announced.

This temporary, nation-wide program for postwar pre-doctoral fellowships is intended to encourage resumption of graduate study in the natural sciences by those who had to interrupt their education to engage in war work. The money value of the fellowships will be sufficient so that those given them will be able to devote essentially full time to working for their Ph.D. degrees.

"The almost complete cessation of consecutive professional training which has occurred in scientific fields will make impossible for some time the normal accession of additional highly trained personnel," the announcement explained. "These losses, in the face of sharply increasing demands for such personnel, will inevitably retard to the danger point the resumption of scientific progress after the war. The resulting handicap to postwar industrial recovery, public health, and military security is a matter of national concern."

This program as announced is intended to help alleviate the very serious set-back to American scientific competence resulting from the war's interference with normal educational processes.



THE "TRIPLEX"—This ultra-powerful type of steam turbine locomotive has been designed by the Pennsylvania Railroad for fast, heavy duty freight and passenger service. Coal will be carried in the front, shown to the right of the picture, and water supply in the rear. The cab will be ahead of boiler and smoke stack, reversing the usual order.

Although the program will not be inaugurated immediately, it is being announced now so that those in war work will stay on their war research jobs without fear that they may not be able to continue their graduate training later.

The new program will be able to furnish assistance to only a fraction of all graduate students. It is planned so as not to divert to full time study those who in the postwar year will be needed part-time to help teach in over-burdened colleges and universities.

Science News Letter, April 7, 1945

AERONAUTICS

Take-Offs in 4 Seconds

"Rato" puts airplanes into the air in record-breaking short time, only 200 feet from starting point on the deck of carriers. Long runways may be thing of the past.

➤ BRITISH naval planes literally leap from the decks of the Royal Navy's aircraft carriers these days. The secret is new and powerful rockets that can put planes in the air in four seconds after a run of only 200 feet from a dead start. Only recently developed through the cooperative efforts of British government and industry, rocket-assisted take-off will probably soon be nicknamed "RATO", since it is a close relative to jet-assisted take-off, commonly called "JATO."

Unlike JATO, which is now used to lift the weight of heavy flying boats off the water during take-off, RATO is a successful solution to the problem of reducing take-off time and distance which has puzzled aeronautical engineers for years. In a detailed description of rocket assisted take-off, published in *Flight* magazine, C. B. Bailey-Watson predicts that RATO will do away with the long airport runways, which it is now believed tomorrow's giants of the sky must have.

In using RATO, a rocket firing point is plainly marked on the carrier deck several feet ahead of the point where the take-off run begins. The actual footage in many cases is around 100 feet but it varies with the weight of the plane and the velocity of prevailing winds. When ready, the pilot moves his plane down the deck of the flat-top exactly as he would do in making an unassisted take-off. The moment he comes abreast of the rocket firing marker, he presses an electric button in the cockpit. This sets off two to four rockets. Split seconds later he is in the air, where he proceeds to jettison the spent rocket tubes before setting out on his mission.

Weighing 66 pounds, each standard RATO rocket consists of a cold-drawn steel tube with a wall about as thick as a pie crust, 41 inches long, and five inches in diameter. This tube is loaded with 26 pounds of cordite, a smokeless powder, used as the propellent charge. In operation, the gases generated by the rapidly burning cordite after it is fired are expelled at high velocity through a venturi tube incorporating a four-inch nozzle.

RATO equipment is constructed so that when the airplane takes to the air four seconds after the rockets are fired the propellent charge is completely consumed, and the tubes can be dropped. If the tubes were not jettisoned they would interfere with the speed and efficient operation of the plane. The maximum thrust of the rockets is developed about a tenth of a second after firing. The mean thrust developed by the rockets is about 4,400 pounds. This almost equals the thrust produced by several high-horsepower airplane engines.

RATO rockets produce no flame, and very little smoke during the take-off, although an onlooker will hear a loud crack, like the snap of a whip, when the rockets are set off electrically, and a very little flame can be seen from their nozzles just before the propellent charge is exhausted.

In the United States, naval aircraft are using rocket-assisted take-off equipment, Mr. Bailey-Watson stated, but did not explore the matter further. Following a successful experimental installation of RATO on a Vought-Sikorsky Chesapeke, the British adapted it for use on the single-engine carrier-based Seafire, Swordfish, and Barracuda planes.

The Seafire uses two rockets mounted in a box container on the top of each wing near the fuselage; four rockets in all. The rockets are set at such an angle that their lines of thrust pass near the plane's center of gravity, and so that the hot rocket gases cannot damage the airplane tail structure. The rocket mechanisms are attached to the fuselage just ahead of the cockpit by tubular struts extending from the forward end of the box container.

The Barracuda carries two pairs of rockets attached beneath the wing on either side of the fuselage, with the rocket tubes extending well beyond the trailing edge. Swordfish require only two rockets to lift them from the deck.

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A hundred gallons of crude *petroleum* yields approximately 44 gallons of gasoline, 36 gallons of fuel oils, 6 gallons of kerosene, 3 gallons of lubricants, and 8 gallons of coke, asphalt, wax and other products.

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