

phenomenon of light striking differently on different surfaces will modify the general look of a fabric, and so two green objects may appear disturbingly different.

The darkest material produced is velvet dyed black, due to the fact, already mentioned, that velvet contains thousands of pockets that trap the light.

Black, of course, is simply a general name for any color of low reflecting power. A great many blacks in fabrics are made from dyes of complementary colors—that is colors that mix to produce black, such as purple and green. You hear people speak of a black suit that faded or turned green. That happens when one part of the dye fades. If the purple fades before the

green, the black garment takes on a greenish tinge. If the green fades first, it leaves a purplish black.

Because of the importance of light in creating color, colors becoming to an individual in the day may be unbecoming at night. This is particularly worth watching in the range of colors between blue and green, due to the yellowing effect of most artificial light.

In feminine make-up, most women know that it takes more rouge at night to produce the same effect of red as in daylight. If a woman desires her skin to look white under yellowish artificial light, she might have the powder slightly more blue than would be possible in a daylight make-up.

*Science News Letter, March 28, 1936*

## ENGINEERING

## Streamlined Steam Locomotive Uses Airplane Principles

THE SCIENCE of aerodynamics, and airplane construction itself, were called upon in the design of the new ultra-streamlined locomotive of the Pennsylvania Railroad.

For the first time horizontal "fins," designed like airplane wings, have been placed around the smokestack of a locomotive so that the smoke issuing from it will rise upward, away from both locomotive and cars. While this means added comfort to passengers, the big advantage is in insuring visibility at all times for the engineer.

Exhaustive tests showed that smoke descended on a train in fast motion because of low pressure areas, created by the previous design of steam locomotives. The present arrangement of "fins" obviates these low pressure areas and thus the smoke is swept upward at an angle clear of the train.

Vertical fins had been used in England and abroad, but the narrow gauge of American railroads, compared to foreign tracks, caused these vertical fins to interfere with the engineer's view.

The designer, Raymond Loewy, working with seven-foot models in a wind tunnel, conceived the idea of working with clay instead of wood models.

The clay models were suspended in a wind tunnel, above a moving belt, and thus approximated actual running conditions. Smoke bombs were used to simulate smoke from the locomotive and in

this way 24 models were tested and "moulded." From these four were picked, and finally the chosen design.

The smoke deflectors are only one feature of this ultra-streamlined engine, however. With the clay models the very last word in streamlining could be achieved, and the present locomotive has shown that, by virtue of its "nose" and general lines, at maximum speed more than one-third of the wind resistance has been cut down; equivalent to a saving of 300 horsepower.

The model tests were carried out in the aerodynamic laboratory at New York

## RADIO

March 31, 4:45 p. m., E. S. T.  
THE EARTHQUAKE—MENACE AND TOOL—Captain N. H. Heck of the U. S. Coast and Geodetic Survey.

April 7, 3:15 p. m., E. S. T.  
THREE IMPORTANT INITIALS—U. S. P.—Dr. E. Fullerton Cook of the Philadelphia College of Pharmacy.

In the Science Service series of radio discussions led by Watson Davis, Director, over the Columbia Broadcasting System.

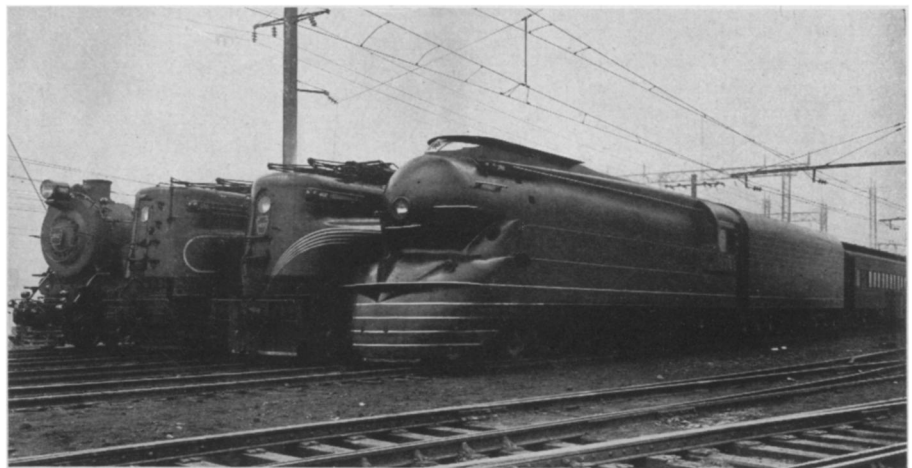
University, where silken threads were suspended in the tunnel to study the air currents. If the threads remained firm in the "slip-stream" the streamlining was correct. A vibrating thread showed imperfect streamlining and the clay model was worked until the desired perfection was attained.

The "nose" of the new locomotive conceals an old-fashioned "cow-catcher" and is covered with one-inch steel. The coupling is covered with an arrangement like a roll top desk. This smooth front is expected to minimize accidents should any object be struck, for the old-fashioned exposed coupling had a tendency to drag objects under when struck.

The new locomotive is of the "4-6-2" wheel arrangement. It has a four-wheel front truck, six drivers eighty inches in diameter, and a two-wheel rear truck. The locomotive weighs 337,850 pounds, and the tender loaded 289,700 pounds. The coupled length of the tender and locomotive is 95 feet.

The ultra-streamlined locomotive is to be used where there is no electrification.

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### MODERN STREAMLINING

*The newest in this series showing the evolution of the most modern streamlined locomotives showed how the steam locomotive is borrowing from the airplane principles of air deflection in order to rid the train of smoke.*