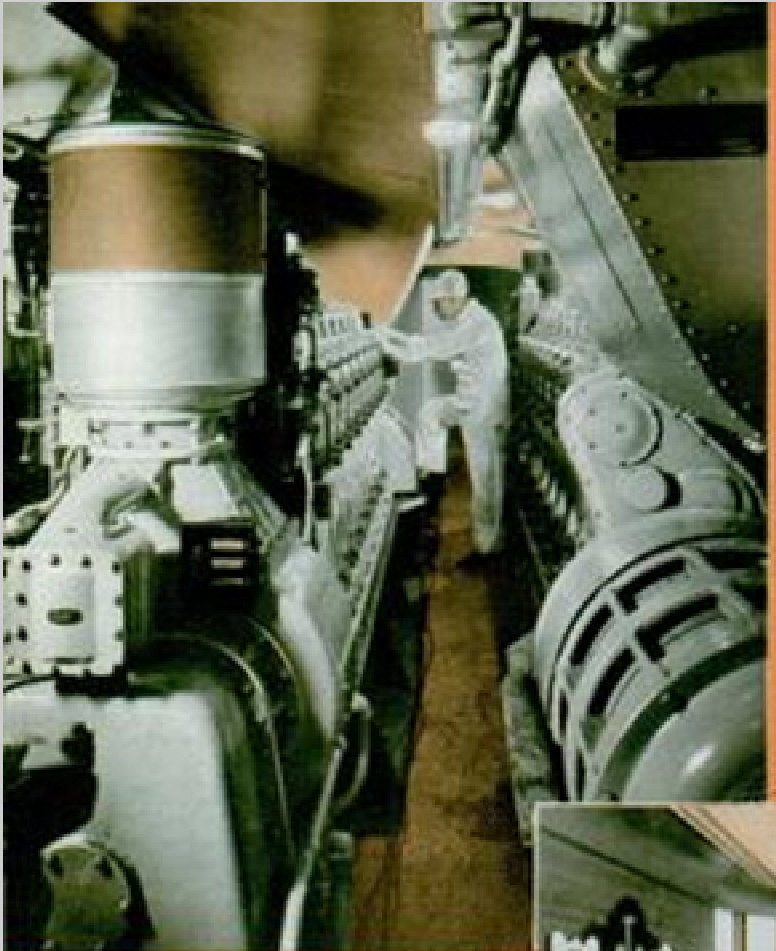
CLEAR TRACK AHEAD

Comfort and speed are being combined in the modern train. Top, unusual rear end of one of the streamline coaches. Below, the New York Central's majestic "Twentieth Century Limited"



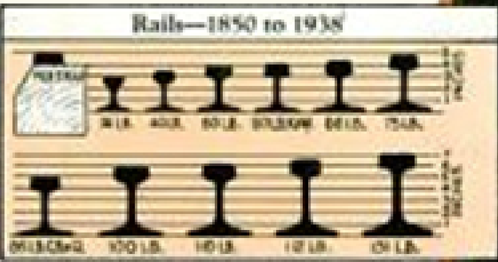
Diesel power, believed by some railroad operators to offer economical means of driving the super-trains, is illustrated at left. Here is the engine room of the "City of Los Angeles"

De luxe service is fast becoming common on America's lines. Below, the interior of dining car used on the Pennsylvania Railroad, looking toward buffet and pantry end of car

By F. E. Williamson
President, New York Central Railroad

MAN'S age-old struggle to conquer time and distance has reached its present astonishing approach to fulfillment through the discoveries and the resulting marvels achieved by modern science. This is particularly true in the case of the railroads.

To cite one example, the streamline lightweight trains which have captured the imagination of America and in a way have started what it is hoped will be a renaissance of rail passenger travel have been made possible largely by recent developments in metallurgy. Protracted and laborious research in the mills and laboratories has resulted in the creation of numerous new alloy steels and other metals which have lent themselves to novel uses. Even ten years ago many of these were either unknown or their production commercially was impracticable for varying reasons, one of these being, in some instances, the factor of cost. To show how fully the use of these new alloys has entered into the production of the modern train, I might say that lightweight high-tensile steel and at least six alloys were used importantly in the new Twentieth Century Limited.



Advancement in rails is illustrated in chart [above]. Right, control cab of a streamliner's power car. Note telephone [at left] on which driver may communicate with other trainmen. Below, double-decker coach which is operated by the Pennsylvania Railroad in New York suburban territory has exceptional passenger capacity

Such advances as these have been, in great part, the result of constant research and experiment, both in the field of theory, of day-by-day practice and in technical scientific laboratories. Too little has been realized by the public of the ceaseless efforts in this direction made both by the railroads themselves, as well as by the great equipment companies which serve them. Yet for many years, both branches of the industry have been engaged in intensive experimentation, often jointly, in an effort to create better equipment and facilities and to do this, if possible, at a lesser expense. So great has been the volume of equipment and so high the safety and service standards involved and so vast the expense that even when better materials or methods have been found and tested, changes from the old to the new often have had to be necessarily slow. Rapid wholesale replacement has not been economically feasible. After all, a steam locomotive is built for a useful life of at least twenty years and costs $60,000 to $145,000 or more. Hence, important though these changes may be, often they have lacked spectacular ap-

Progress of American railroads is demonstrated in these photographs of the latest locomotives. Left, giant steam-electric power car which the Union Pacific had built for service on long runs

Steam power is not lagging in the railroad parade. Left, we see the Pennsylvania's "Broadway Limited," which has streamline coaches fitted with close-fitting vestibules and curving "skirts"

Awe-inspiring are such trains as this, the Baltimore and Ohio's "Royal Blue," pictured here with a streamline "Bullet" steam locomotive substituting for Diesel-electric power car

Colorful to a degree never dreamed of in the early days of railroading is the Seaboard Railway's "Orange Blossom Special" (above). The Illinois Central's "Green Diamond" (right) averages a mile a minute

Zephyr trains, of which the "General Pershing" (pictured at left) is the latest, provide fast service on the Burlington. These streamliners, built of stainless steel, are propelled by Diesel engines

Modernized steam locomotives got the call to drive many of the nation's fast trains. Right, the Southern Pacific's "Daylight" rounds curve on a section of double-tracked line

Strength, without an increase in weight, is achieved by fastening "fluting" (top photo) to the gleaming surface of Budd-built stainless steel cars. Below, attractive interior of tavern coach on Seaboard's "Silver Meteor." Some of America's foremost designers participated in styling today's trains

peal and thus have met with meager public appreciation.

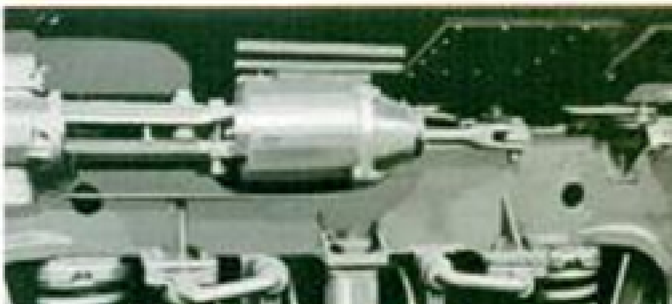
For many years the railroad industry has participated in both creative and applied research to improve its service and at the same time reduce its expenses. As examples of recent creative research I might mention the development of new means for detecting fissures in steel rails, as well as the development of methods looking toward the greater prevention of fissures; a ten-year program on air brakes which resulted in the development of a new and much more effective freight triple valve; the development of efficient systems for air conditioning passenger cars—11,027 cars already have been equipped with air-conditioning systems and this work is being expanded as finances permit; and the locomotive booster, a valuable auxiliary to increase a locomotive's power temporarily for starting or on grades.

The test departments of the railroads are chiefly concerned with applied research. Applied research results in greater efficiency, economy and safety in daily operations. It is, in essence, a constant search for better equipment, materials, supplies and processes, particular emphasis being laid on those factors that make for safety.

Among other subjects selected by the railroads for intensive research are the effect of fatigue on rolling stock axles; boiler feedwater studies, which include the testing of compounds designed to prevent caustic embrittlement; the development of disk-type driving wheels for locomotives; development of a device to indicate proper selection

and use of the cut-off necessary to produce the maximum drawbar pull and horsepower available in the locomotive at all incidental speeds and to avoid waste of fuel and power by the use of longer cut-offs; the development of roller bearings on both wheels and driving journals; the development of new automobile loading devices; the development of container cars and containers; drop-type couplers in combination with the steel pilot; experiments with longer rails and substitutes for the wood tie.

Luxury on rails is the objective which most operators have reached, and the photo above illustrates the point. Like a finely furnished home is this observation lounge which is a feature of the "Silver Meteor." Below, trucks of the Milwaukee Road's streamliner "Hiawatha" embody such innovations as coil springs, hydraulic shock absorbers, rubber mountings and roller bearings that free the cars from jars, jolts and sidesway



Literally hundreds of other subjects have been investigated. Much of this research has produced concrete results, making possible improved and safer service. As an example, in 1938, the railroads established a new record in fuel efficiency in freight service. In that year, to haul 1,000 tons of freight and equipment one mile required only 115 pounds of fuel, against 172

Speed is visible in every line of this steam locomotive, used by the Santa Fe to pull its high speed train, the "Chief," between Chicago and the west

pounds in 1920, a reduction of thirty-three per cent. In passenger service, fuel efficiency in 1938 improved twenty-one per cent, against 1920, a passenger train car being hauled one mile with fourteen and nine-tenths pounds of fuel.

Another result of research has been the increase, with safety, of regularly scheduled operating speeds both in freight and passenger service. In 1932, there were only a handful of trains operated at an average speed of more than sixty miles an hour. In 1938, 48,164 miles were being covered at speeds of sixty to eighty miles an hour and even higher. In six years this mileage increased about twenty-four times. Today, the United States has more high-speed trains than any other country.

Railroads differ from most other industries in that they do not make things to sell to consumers — they purchase things and utilize them in combination to produce service. Every year they buy more than 70,000 items of equipment, materials and supplies. It is only natural, therefore, that the makers of these items should engage in research to improve and perfect their products and that the railroads should often be a partner in this work, but always a beneficiary of it.

Ceaselessly railroad research goes on day after day. At Purdue University there is a railroad laboratory, maintained for years by the Association of American Railroads, where draft gear, couplings and brake shoes are under test continuously, and at the University of Illinois, in a laboratory operated jointly by the Association of American Railroads and the steel companies, steel rails undergo tests. In Maryland, Indiana and Illinois special track installations have been under study to determine their performance under traffic.

The problem of reducing in both

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Clear Track Ahead

(Continued from Colorate Section)

freight and passenger service the dead weight of passenger and freight cars has received considerable attention. By the use of high-tensile steel, alloys and aluminum, the weight of the new streamline trains has been reduced materially. Boxcars made of alloy steel and weighing approximately 8,000 pounds less than the previous standard cars are undergoing tests.

In steam-locomotive construction remarkable improvements have been made. Their net effect has been to increase the tractive power while maintaining or reducing weight and fuel consumption. The extension of engine runs from 100 miles to more than 500 has made for permanent economies in shop and maintenance work. On road and laboratory tests in air-brake equipment alone, more than $2,000,000 has been expended. From these tests has been evolved an air brake which requires only eight seconds from the time the engineman operates the brake valve until the brakes are set on the last car, as much as a mile and a half away. Tests are continuing, in an effort to develop still better brakes for use on high-speed passenger runs.

Today, the Association of American Railroads has 173 committees of technical experts constantly studying all phases of railroad operation to increase efficiency, effect economy and promote safety.

As one result of all this research, the operating cost of producing a ton-mile of freight went down from $10.78 in 1921 to $6.75 in 1935, a decrease of approximately forty per cent, while at the same time, the average speed of freight trains was increased sixty-one per cent. In 1938 the average distance per freight train per day was 398 miles, against 247 in 1920, including all delays en route. Because of this, California fruit growers are now four days nearer the Eastern seaboard than formerly, with service from Florida and Texas also bettered.

The railroads, today, move a ton of freight one mile at an average cost of less than one cent, the lowest rate in the world. Surely this could not have been accomplished if railroad managers were sleeping at the switch.

Above, "face" of newest Diesel streamliner, North Western's "400." Below, Southern Pacific cab-front locomotive