

THE CONTINUING MOTIVE POWER DEBATE

An extract from "The Twilight of Steam Locomotives" by Ron Ziel (1970)

By 1960 the general public and most rail-fans had come to accept the idea, repeated by diesel locomotive manufacturers and railroad motive power departments, that the steam locomotive was technologically obsolete, an anachronism held over from the 19th century. Then H. F. Brown, Ph.B., Fellow of the American Institute of Electrical Engineers and a railroad man since 1910, presented a paper entitled "Economic Results of Diesel Electric Motive Power on the Railways of the United States of America," before a meeting of the Institution of Mechanical Engineers in London in November of 1960. This skillfully researched paper attacking the arguments of the defenders of the diesel may prove to be quite an enlightening experience to those interested in railroad motive power economics as it becomes more widely circulated¹.

To put it bluntly, Mr. Brown contends, the American railroads fell for a well planned sales campaign - and fell hard! Beginning in 1946, a number of U.S. railroads began a series of tests - pitting modern steam power against new diesels. These tests were well programmed, executed under controlled conditions, and closely chronicled in a thick volume entitled "Study of Railroad Motive Power," (File No. 66-A-11. Statement No. 5025) published by the Bureau of Transport Economics and Statistics of the Interstate Commerce Commission in May 1950.² Perhaps the most famous of these tests was the New York Central's series which set 4-8-4 Niagaras against diesels. The steam engines performed beyond expectations, some averaging nearly 30,000 miles a month and conceding little to the diesels. Years later, Norfolk & Western's superb Y-6b's were to run diesel demonstrators off the property in overall performance. Nickel Plate's Berkshires operating costs showed a "paper thin" difference compared with the diesels, and the diesel's claim to long-run superiority had long since been demolished by an oil-fired Santa Fe 4-6-4 which had made the 2,200 mile-plus trip from Chicago to Los Angeles in December 1938, without replacement.

How, then, did the diesel locomotive manage to completely annihilate steam from Class One revenue service within fifteen years after the latter was still performing 90% of all railroad work? First of all, the I.C.C. study was accepted at face value by many operating departments. This study was based largely on new diesels performing against modern, but war-weary, steam locomotives, usually under ideal conditions for the diesel - fast schedules, through freights, etc. The statistics were projected to diesels having a service life of 20 years (in 1950, only a few dozen early yard diesels had been in existence for 20 years), and steam locomotives having a life of 30 years. A decade later, virtually all diesels were being retired after only 12 to 14 years service, while a number of steam locomotives over 40 years old were still puffing about their daily work. The earliest use of diesel locomotives was in yard service, where they did show a substantial saving over existing steam power. It may be noted that Mr. Brown's findings were based on I.C.C. statistics which by 1960 had invalidated much of the 1950 report.

According to Mr. Brown, his paper was not intended to prove the superiority

¹ As long ago as 1943, Lucius Beebe, in his book *High Iron*, (D. Appleton-Century Company, Inc., New York), recognized the very essence of this diesel-steam controversy and wrote of it on pp. 156-159.

² This study, issued as information, was not considered or adopted by the I.C.C.

of one form of motive over another, but "simply to explore the fantastic economic claims which had been made for diesels." Those claims and Mr. Brown's findings follow:

1. "Each diesel had replaced two steam locomotives, and could do the work formerly performed by two steam locomotives." Perhaps; if the steamers happen to be 1905-vintage Moguls. The fact is that a 1,500 horsepower diesel unit never could out-perform a modern steam engine. It would take 2.41 diesel units to equal one 3,650 horsepower steam engine (the average modern steamer). Today as many as five diesel units are required to pull trains formerly requiring one 4-8-4!
2. "Diesels, by multiple unit operation, had enabled the railways to reduce the number of trains, by their ability to haul longer trains." Train lengths have changed little since World War II. The reduction in numbers of trains corresponds to the reduction in branch line and local freight, and in all passenger business.
3. "They were responsible for large savings made in wages of train and engine crews, due to the reduction in number of trains operated." No credit due the diesel here; same as above. The railroads maintain that the diesel turned firemen into "featherbedders" in yard and freight service. This is the basis for a large amount of the present controversy between the brotherhoods and management.
4. "They had greatly increased the speed of trains." The U. S. speed records are still held by 4-4-0's, 4-4-2's and 4-6-2's. The 20th Century Limited still takes 16 hours on the run from New York to Chicago; as when the Hudsons were on the head-end. Modern steam locomotives wheeled freight at 60 mph - comparable to present fastest runs. Schedules on some commuter runs had to be lengthened after diesels had bumped forty-year-old K-4's off the Pennsylvania's lines, because of the superior acceleration of the old 4-6-2's.
5. "They were responsible for a great reduction in locomotive repair costs." Elaborate filter systems, multiplicity of internal reciprocating parts, operating under high temperatures and pressures, expensive new facilities, and highly paid technicians show this to be a fallacy. (When the author visited the shops of the Lake Superior & Ishpeming Railroad in Marquette, Michigan, he found one of the two serviceable steam locomotives switching in the yard. A roundhouse man pointed to a stripped diesel chassis, saying: "It's been laid up for days awaiting a new part. In the old days we could have sent a man with a hammer and a piece of iron into the blacksmith shop, and a half hour later it would have been fixed.") Expensive replacement parts are another diesel maintenance factor.
6. "They had enabled the railways to make operating savings of up to 30 per cent annually, in the investment made in them after interest and depreciation charges, or enough to return the investment in three years." This claim was originally made in 1946 as an estimate. If the then existing total investment in steam motive power of \$1.8 billion were to be replaced with diesels, the savings were estimated to be \$550 million. The claim has been repeated each year since. In 1957, with but 69 per cent of the 1946 traffic, with its required diesel motive power, which had become an investment of \$3.9 billion, it would have indicated a saving of \$1 billion. Mr. Brown, in his paper, estimated diesel operation, (including an estimated 6.6 per cent savings with yard diesel motive power) cost the railroads over \$28 million more than equivalent modern steam

power might have cost in 1957.

7. "They had saved the U. S. railways from bankruptcy, and had enabled the railways to increase their dividend payments since 1935." Did diesels save the New Haven Railroad from bankruptcy in 1961? U. S. railroads in general are now worse off financially than at anytime except during the Great Depression, because of lack of traffic which has nothing to do with motive power. The claim that diesels attracted more shippers and passengers is ludicrous. Who cares whether his goods are hauled by one 2-10-4 or four GP-9's? Passenger and freight traffic is still declining. The 80,000,000 tons of coal which steam locomotives once consumed annually, accounted for quite a few jobs in West Virginia and Kentucky; but these facts were ignored in diesel advertising.

Track damage was an important claim for dieselization. To quote E. L. Pardee, president of the National Railway Historical Society in a speech referring to steam power which he delivered in Baltimore in November 1960: "... they had to straighten 22,000 rails, (in one year on one railroad) nearly all of which were engine bent, ... one engine, on one trip of 55 miles, damaged three track miles of 90-pound rail, three miles of 110-pound rail, and four miles of 130-pound rail." (Such track damage was the result of dynamic augment - the vertical pounding of a locomotive created by the action of the pistons and rods, which can be balanced only for one speed.) Mr. Pardee, in reference to an Atlantic Coast Line 4-8-4, continued: "motion pictures. .. disclosed that the engine wheels were actually bouncing on the rails." However, the I.C.C. study (pages 119-120; and in Appendix I, page 240), stated that the small diameter driving wheels of diesels also cause track damage. Increased slippage of diesel wheels creates more "burns," weakening rails. Mr. Brown, in his paper reports no change in the relative costs of maintenance-of-way and structures between the years 1940 and 1959.

While the diesel proponents were claiming their product hauled 10,000 to 15,000 ton trains (few trains are over 5,000 tons), Missabe's big Yellowstones, (page 38) in their last show of might in the late 1950's, singlehandedly rolled ore trains nearly 20,000 gross tons in weight!

Diesel-men frequently point to Norfolk & Western as their supreme accomplishment. N&W had built one of the finest fleets of modern steam locomotives in the world. There were 143 articulateds of the 2-8-8-2 and 2-6-6-4 types. Their 4-8-4's held down some of the finest on-time passenger train performances in the country, while perhaps the best steam switch engines ever built did the yard chores. (The last of their S-1 0-8-0's, No. 244, rolled out of Roanoke in 1953 as the last steam locomotive built for a common-carrier in the United States.) Six years later, N & W was totally diesel-powered and the last S-1 was awaiting the torch! Although their Roanoke shops built the N & W engines, they depended on suppliers for a myriad of vital parts: pumps, feedwater heaters, stokers, injectors, boiler stay bolts, to name a few. All of these suppliers had discontinued their steam locomotive business several years before, leaving N & W no choice; when they needed more power to handle increased traffic, diesels had to be ordered. The combination of depleting reserves of spare parts and a new management cut short the lives of Norfolk & Western's modern steam locomotives when, in 1957, the decision to dieselize was made. The improvements in the already phenomenal operating ratio of the N & W are probably more attributable to the business genius of the railroad's president,

Stuart Saunders, than to the diesel roster, the purchase of which got the company into debt for the first time in its history.

The totally opposing view of dieselization in the U.S., which is held by railroad management, also refers to reliable statistics, and the ideas of Mr. John W. Barriger, president of the Pittsburgh & Lake Erie (NYC), who is respected as one of the nation's foremost authorities on railway economics, are worth pondering. When asked by the author if diesel locomotives have saved the railroads money, Mr. Barriger replied: "Any rail profits realized since World War II are the result of diesel power." He also contends that diesel operations have saved the carriers one billion dollars. Freeman Hubbard, editor of Railroad Magazine, wrote a provocative editorial in the August, 1961 issue entitled "Why do the Railroads buy Diesel Locomotives?" After mentioning the criminal indictment filed against General Motors Corporation for "monopolizing the production and sale of diesel locomotives," he delved behind the immediate charges leveled by Attorney General Robert F. Kennedy, and provided some thoughts as to why the railroads dieselized in the first place, scrapping thousands of modern steam engines in their prime of life. Mr. Hubbard quoted the indictment in reference to the vast amount of freight (12 million tons, January to September, 1960) shipped by GM; "because of this huge volume, the Corporation was able virtually to order railroads to buy its locomotives." By 1960 Electro-Motive Division of General Motors had turned out 84.1 per cent of all diesel locomotives manufactured in the United States. EMD contends that since they have sold the greater number of diesels, their product is superior to other diesels.

On the Electro-Motive indictment, John W. Barriger also offered some knowledgeable insight. He maintains that GM diesels are so superior to other diesels that they naturally dominate the market. As to the charges in the indictment, Mr. Barriger, who once sold diesels for a competitor of GM, calls them "pure bunk," and says that GM's "hands are perfectly clean." He has volunteered his presence as a witness for the defense in the trial.

These sharply conflicting points of view from reliable sources in railway economics and motive power, leave the situation so confused that an objective observer can arrive at no definite conclusions - even if the government were to win its case against General Motors. All arguments, accusations and claims fade in light of the great fact of railroading now and in the future; the steam locomotive is gone beyond the limits of all recall, and since the carriers have spent billions of dollars on the changeover of their motive power and servicing facilities, there is little prospect of a reciprocating steam locomotive ever being constructed for service on a Class One railroad.

Regardless of future indictments, types of motive power, engineering papers, politics and accusations, the issue will probably never be resolved to the satisfaction of all parties in this great railroad debate. However, H. F. Brown's reply to his critics must, of necessity, cast doubt upon any ultimate conclusions; "the comparative analysis made in the paper showed [the diesel's] economic performance to be about on a par with that of steam on its overall application to the United States Railways - no better, no worse."