Tomorrow's Railroad Today

★ How the Milwaukee Road has eliminated all intermediate slowdowns on an important high-speed line.

By A. C. Kalmbach.

LET'S preview the railroad of tomorrow.

"The super-railroad," says John W. Barriger III, "is a route so intensively developed that maximum-sized freight and passenger trains can cross entire engine districts without consequential intermediate speed reductions." The railroad engineering departments of today know how to develop their routes to such a standard and, in a number of outstanding cases, the job has been done. The Santa Fe has reduced curves and relocated tracks through groups of curves on its Illinois and Missouri divisions to permit more consistent high speed for both passenger and freight trains. The tough spots of the Union Pacific-Southern Pacific Overland Route were ironed out years ago by E. H. Harriman. The Pennsylvania electrification was far more than merely stringing trolley wires; it was the rebuilding of the entire main lines east of Harrisburg into railroads of maximum capacity and consistent high speed. Today, under wartime pressure, the Pennsy is improving its Indianapolis-St. Louis line into a super-railroad by line relocation, centralized traffic control and other means.

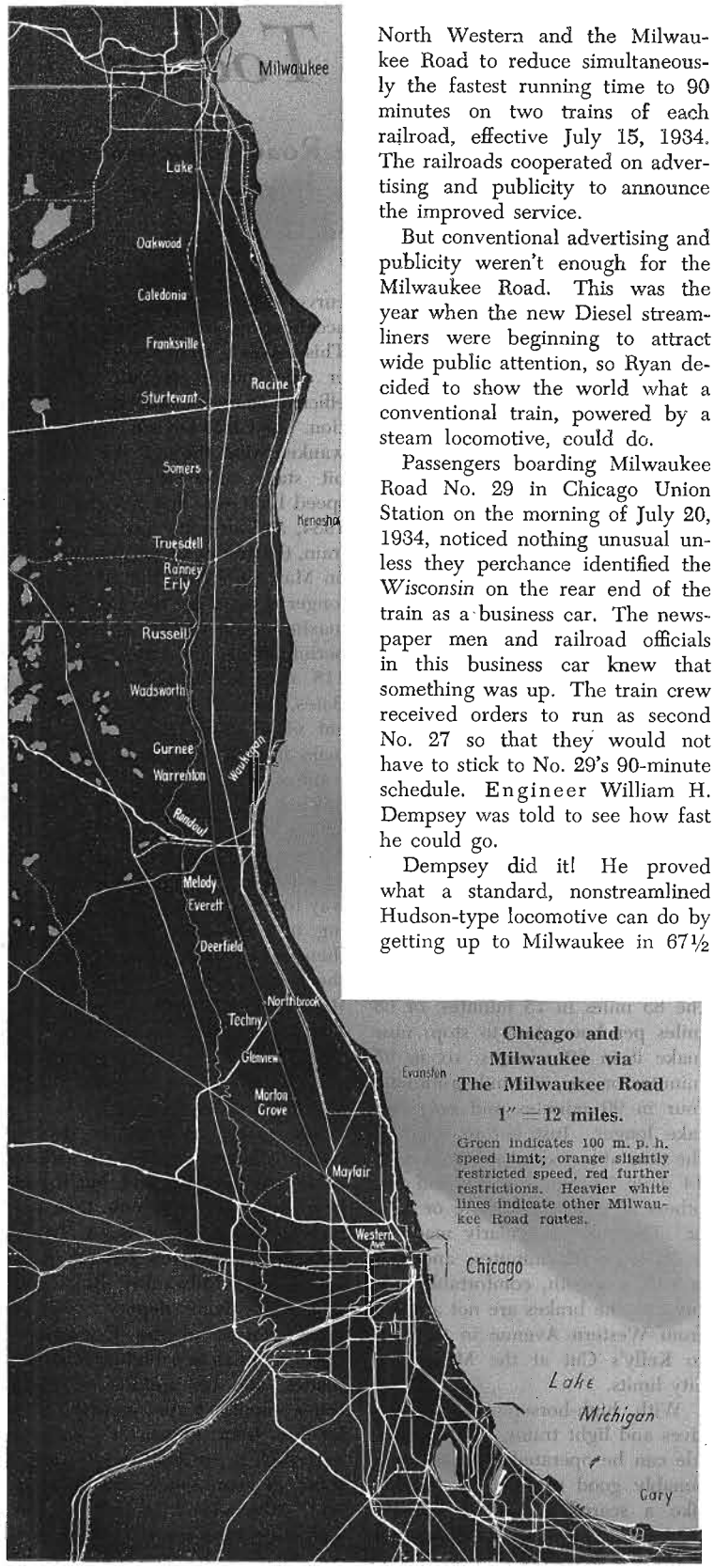
Tomorrow the super-railroad will be common-place. The primary main lines of the nation will then follow the prototype of the major improvement programs of today. The story of what railroads everywhere will be doing to their lines after Victory is the story, for instance, of what the Milwaukee Road has already done to provide between Chicago and Milwaukee the country's fastest stretch of track between metropolitan centers.

The C&M Division was not always fast. Although built through gently rolling country with no major obstacles to good alinement, curves of as much as two degrees were freely used in the original construction. As early as 1907 track was extensively relocated to eliminate and reduce curvature, and in the days of the Eight-Wheelers a track pan was installed at Wadsworth near the midpoint to eliminate a water stop and so permit more consistent speed. Larger tenders took care of the water situation as the years went by and automatic block signaling, installed in 1907, assisted in the speed-with-safety which is the goal of railroad operation. Nevertheless, the fastest schedule over the 85 miles 10 years ago was 1 hour 45 minutes or an average of 48.6 miles per hour, and several trains took two hours. It was a smooth, comfortable run, but very slow by 1944 standards.

After 10 years of intensive improvement, four trains a day make the 85 miles in 75 minutes, or 68 miles per hour start to stop; nine make it in 80 minutes, six in 85 minutes or an even mile-a-minute, four in 90 minutes and only five take longer. Just before the war the timetable was even better. with 14 daily 75-minute trains and five others at a mile a minute or faster. The run is regularly made in as little as 70 minutes, and this is still a smooth, comfortable ride because the brakes are not applied from Western Avenue in Chicago to Kelly's Cut at the Milwaukee city limits.

With high-horsepower locomotives and light trains, a fast schedule can be operated over any reasonably good railroad by running like a scared rabbit on straight (tangent) track, slowing down for curves and crossings, and quickly accelerating after the slowdowns. This makes a seemingly much faster ride, but it is not the most efficient or most comfortable operation. The C&M Division of the Milwaukee went through the jackrabbit stage after the 70 m. p. h. speed limit was first lifted in July, 1934, and after the first 75-minute train, the *Hiawatha*, was established on May 29, 1935. But there is no longer a need for the 116 m. p. h. maximum clocked by Division Superintendent Jack Valentine or the 118 m. p. h. clocked by W. W. Bates, assistant to the superintendent of motive power. Like most main lines of the future, the Milwaukee's crack division is a 100-mile-an-hour railroad on which trains accelerate smoothly out of one terminal to 100 m. p. h., run consistently at that speed all the way to the speed-limit boards coming into the other terminal, and then evenly pull speed down as they come into the yards to the station. No longer are there the famous "Reduce Speed to 90 M. P. H." signs before curves, and no longer may engineers run as fast as they dare on tangent track.

The matter of train speeds between Chicago and Milwaukee came to a head in 1934, but it had been simmering for some time before in the mind of N. A. Ryan, then assistant to the general manager of the Milwaukee Road and now Col. Ryan, deputy chief of transportation in the European theater. Ryan is a high-speed railroader, and he couldn't see why trains shouldn't run nonstop in a lot less than 1 hour 45 minutes over such a potentially busy traffic route as that connecting Chicago and Milwaukee. An agreement was made between the Chicago &



North Western and the Milwaukee Road to reduce simultaneously the fastest running time to 90 minutes on two trains of each railroad, effective July 15, 1934. The railroads cooperated on advertising and publicity to announce the improved service.

But conventional advertising and publicity weren't enough for the Milwaukee Road. This was the year when the new Diesel streamliners were beginning to attract wide public attention, so Ryan decided to show the world what a conventional train, powered by a steam locomotive, could do.

Passengers boarding Milwaukee Road No. 29 in Chicago Union Station on the morning of July 20, 1934, noticed nothing unusual unless they perchance identified the *Wisconsin* on the rear end of the train as a business car. The newspaper men and railroad officials in this business car knew that something was up. The train crew received orders to run as second No. 27 so that they would not have to stick to No. 29's 90-minute schedule. Engineer William H. Dempsey was told to see how fast he could go.

Dempsey did it! He proved what a standard, nonstreamlined Hudson-type locomotive can do by getting up to Milwaukee in 67½ minutes with a 326.8-ton train. The average speed from the Chicago terminal limits to the Milwaukee terminal limits was 89.92 miles per hour, setting a new world record for sustained steam-train speed. The high spot of the run, however, came when the speedometer in the business car hit 103.5 miles per hour at Oakwood, Wis. The newspaper men and the railroad men alike let themselves go at this, and the sole restraining comment was by Columbus Crawford, the porter, who could think only of "Boys, be careful of dem glasses. Dey cost de railroad 35 cents apiece!"

The faster Chicago-Milwaukee service was off to a flying start, publicized in newsreels and newspaper front pages. But occasional stunts do not make a railroad consistently fast. The job had hardly begun. It was not to be a huge improvement program like the Lackawanna Cutoff with miles of new track, tremendous fills and cuts. It was to be, instead, a gradual process of polishing and perfecting a line which already could, for stunts, sustain such record-breaking speeds. Every detail of this 85 miles of railroad had to be checked and rechecked to the nth degree to permit further reductions in the Chicago-Milwaukee running time, for the railroad realized that a 90-minute schedule was not a goal but a step toward a goal.

Before the next faster schedule could come, and it did come on January 20, 1935, with the inauguration of 80-minute trains, curves most obviously needed attention. The banking or superelevation of the outer rail was increased from 2½ inches to 3½ inches. This allowed 90 miles per hour on the one-degree-maximum curves of which the division has quite a number. (A one-degree curve is 5730 feet in radius.)

Before the *Hiawatha* followed some four months later, on a still faster schedule, speed-limit boards began to appear along the division. These were a novelty. Trains had operated under a flat speed limit with special timetable in-

structions for speed over interlockings and other slow spots. Now that speeds were increasing, it became more necessary to give the engineers specific notice in advance of each speed restriction and to insist that the restrictions be obeyed literally. Thus it was that a curious traveler on a 75-mile-an-hour railroad one day spotted freshly painted black and yellow reduce-speed-to-90 signs in advance of many of the curves, symbols of the forthcoming *Hiawatha* era. The new timetable provided for no speed limit on tangent track, but for reductions to the indicated maximum speed at railroad crossings, curves, and other points where speed-reduction boards were placed.

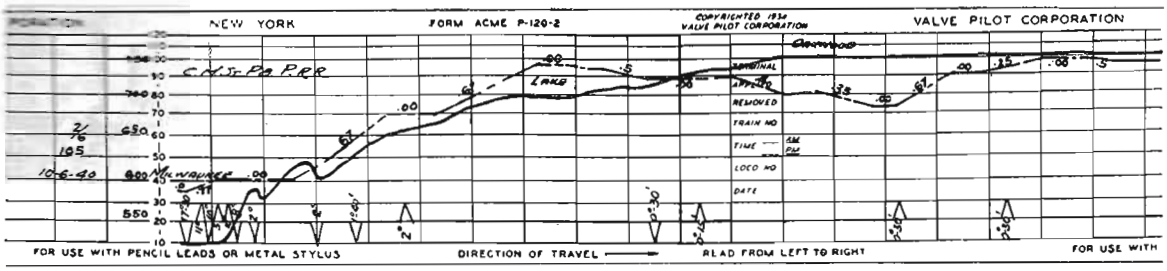
The polishing and perfecting continued. It is not only the degree of curvature and the amount of superelevation which determines how fast a train can comfortably run around curves, but it is the even more important spiral or easement curve which connects the straight track and the curve proper. The term "spiral" is taken from the cubic spiral equation which properly correlates a gradual increase in the banking of the curve and a gradual increase in the curvature itself with the centrifugal force caused by the speed of the train. The superelevation must increase gradually enough so that the passenger doesn't notice any uncomfortable tipping, and at any point during this increase in superelevation the curvature must be just exactly right for the amount of superelevation. As the improvement of the railroad progressed, the length of the easements at each end of every curve was increased so that, at maximum speed, trains were tilted only one-half inch a second as they entered the curve. This was one of the finest points in the polishing process.

To bring the curves finally from 90 to a smooth 100 miles per hour, and thus to eliminate many of those yellow speed boards, the superelevation was changed in 1940 to a maximum of four inches. But this was not the only way to increase the safety and reliability of high-speed operation. Ten years ago switches led off some of the mainline curves between Chicago and Milwaukee. Railroad trackwork used to be rather a cut-and-try proposition. If a switch was needed for a new industry or house track, it was cut into the main line siding wherever it seemed necessary. If a 100-car siding ended at a curve, the switch led into the main track right on the curve. But this is not the way of the modern super-railroad. All six of the switches on C&M Division mainline curves have been removed. Where sidings happened to end at a curve, they have been extended so that the switch can be in the tangent track beyond the curve.

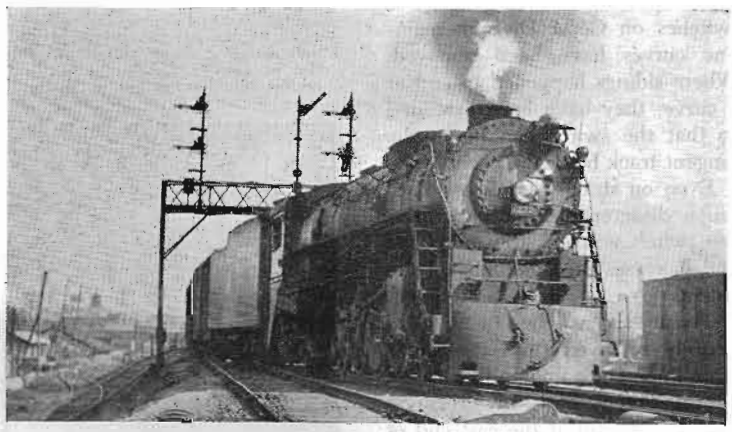
Even on straight track, switches are a disagreeable necessity. Every switch weakens the main line and increases the possibility of accidents.

Twenty-six switches in all were entirely removed from the C&M main line. Once upon a time when a train crew said "A crossover would be useful at the east end of Sturtevant Yards," the crossover was installed. Now, the need for every switch is checked and double-checked. Every crossover or switch to an industry or passing track must definitely prove its value before it can be allowed to interrupt the smooth flow of mainline high iron. Nine pairs of facing- and trailing-point crossovers at strategic intervals between Chicago and Milwaukee provide ample opportunity for special moves. All of these are controlled and protected by interlockings, and the facing points have been electrically locked to eliminate more of the yellow reduce-speed boards which had been necessary when the fast trains were first put on.

Of course, 70-mile-an-hour signaling is not adequate for 100-mile-an-hour trains, and the block signals deserved and got early attention in the improvement program. The speed capacity of a block-signaling system can be increased in two ways: either by spacing signals farther apart or by providing them with more indications, so that the engineer gets his



Above and at bottom of page: Typical speedometer tape made by a Hiawatha locomotive on a regular run from



Henry J. McCord, 112 N. Washington St., Batavia, Ill.

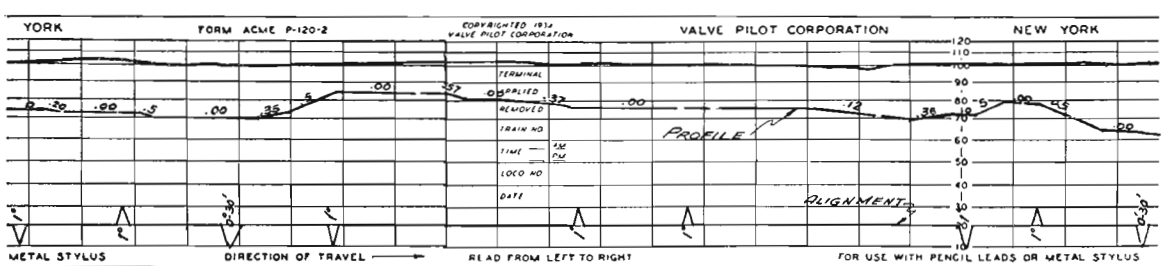
Freight rolls smoother too.

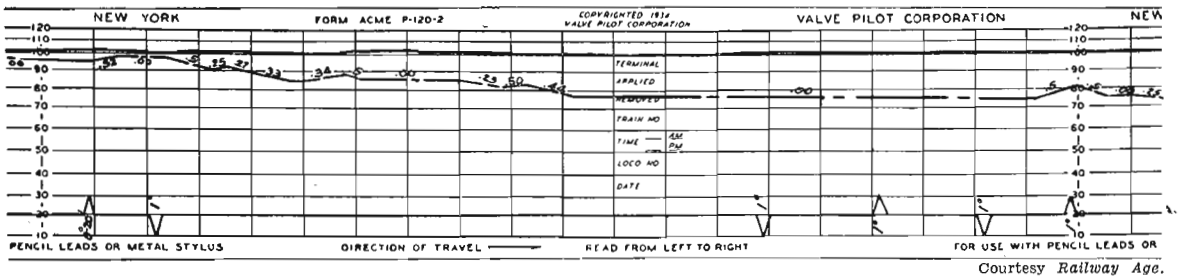
The effects of roadway improvements are most spectacular on passenger schedules, but freight operation is likewise much improved. This 4-8-4 is taking 5000 tons out of Milwaukee.

first warning of an obstruction more signals in advance. The first and simpler method was chosen on the Milwaukee. The three-indication block signals which had been spaced every mile were in most cases respaced at every two miles, simply by removing every other signal. Thus the engineer was given two miles between a yellow caution indication and the red stop signal. The semaphores were provided with focused electric lighting units, so that their color-light indications became visible from a great distance in daylight as well as at night.

Even at the dispatcher's desk the effect of the speed-up was felt. With the faster schedules, minor obstructions and delays to trains become of far greater importance, for it is as hard to make up a one-minute delay now as it was to make up a 10-minute delay 10 years ago. As the physical characteristics of the roadway were perfected, it became more and more necessary to speed up the delivery of orders between dispatcher and train crews, so that the freight trains, especially, could more readily be kept moving without delaying the high-speed first-class traffic. The north end of the division between Sturtevant and Milwaukee has always been particularly busy, since it carries not only the Chicago-Milwaukee trains but also those bound from Milwaukee to Kansas City and Omaha. At Sturtevant, Tower A-68, and Lake, the complicated dispatcher's orders authorizing left-hand track movements of freight or passenger trains were all too frequent. The signal department perfected and modernized this process by installing centralized traffic control between Lake and Sturtevant. With remote control of all switches and signals on this stretch, it's now a simple matter to order trains around each other on the adjacent main strack, and train dispatching is in step with the rest of the super-railroad development.

Even the track structure itself has had to keep pace with the increasing impact of speed. Seventy-





Courtesy *Railway Age.*

Milwaukee to Chicago. Solid black line indicates speed; dotted line, profile of division; angles indicate curvature.

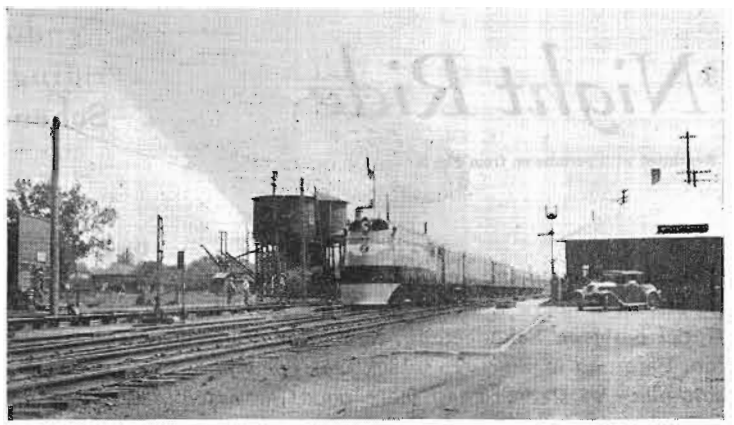
seven track miles of new rail has been laid since 1934 with steel weighing 131 pounds per yard. Some 1.4 miles of 112-pound steel has been laid for test purposes on the high-speed stretch between West Lake Forest and Deerfield, once a race track where derisive motorists would pass up the 60-mile-an-hour trains on the parallel highway. This new rail makes up 51 per cent of the total track of the division. [Part of the mileage into the Chicago terminal is owned by the Chicago Union Station Company.] Now all of the rail is 130-pound or heavier, except for the short-test section. Along with the new rail has come a complete re-ballasting of 97.9 miles with four inches of brand-new gravel. All ties are creosote-treated, giving them longer life and greater strength.

All of the safety planning and all of the modern track of the finest of railroads can, however, be spoiled by something outside the railroads' control—an automobile driven in front of a train at a grade crossing. Ten grade separation projects have removed the possibility of accidents at as many important highway crossings on the C&M main line. Fifteen sets of automatic crossing gates protect traffic at streets in the Chicago suburban areas. Ask the engineer. He'll tell you what peace of mind good crossing protection brings in fast train operation.

It has taken attention to all these little details to make the C&M Division what it is today. Not a single item is spectacular, and yet the schedules of 1944 could not possibly be maintained on the railroad of 10 years ago. The primary factors of improvement have been the increased spacing of signals for higher speed, the proper super-elevation and spiraling of the curves and the heavier rail. These are the same factors which are being polished and perfected the country over to make many ordinary railroads of today into the super-railroads of tomorrow.

On the EJ&E crossing at Rondout.

During the early days of high-speed running between Chicago and Milwaukee, speed reductions were in effect over interlockings, including Rondout, 32 miles north of Chicago, where the Milwaukee crosses the Elgin, Joliet & Eastern at grade. Electric facing-point locks now assure safe operation right through Rondout at 100 miles an hour.



Howard Christiansen.