



No. 2 THE GREAT WESTERN "CORNISH RIVIERA" EXPRESS

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A record breaker of no mean order is the "*Cornish Riviera Express*" of the Great Western Railway, for daily it makes the longest non-stop railway run in the whole world! Before the first halt is made, at the North Road Station at Plymouth, this famous "flyer" has bridged the gap between the Thames and the Tamar, travelling westward and southward for 225 $\frac{3}{4}$ miles.

Even across the vast spaces of the American continent no actual run can be found of greater length than the 183 miles, made by the west-bound "*Twentieth Century Limited*" between Buffalo and Cleveland; while the longest European run, outside our own country, is over the 193 miles between Paris and Brussels.

Thus, by the enterprise of the Great Western Railway, Great Britain takes a handsome lead over the rest of the world in the matter of non-stop train running, just as she does in the high-scheduled train-speeds with the 75-minute run over the 77 $\frac{1}{4}$ miles from Swindon to Paddington.

Formation of the "Limited"

A British record is also very nearly established by the weight to which the "*Limited*" – as she is affectionately known all over the Great Western system – is made up at the busier times of the year. In the height of summer this famous train runs in two parts, but in the spring and the autumn the formation is run up to fourteen of the biggest and heaviest 70-foot steel-panelled cars, weighing empty all but 500 tons, and with the full complement of passengers and luggage quite 530 tons behind the engine tender. "*Unlimited*" would, I think, be a more suitable title than "*Limited*" for a train of this character!

Like its near neighbour, the 11 a.m. out of Waterloo, the "*Cornish Riviera Express*" is a train of many portions. Next to the engine you find the real "*Cornishman*," destined to travel as far westward as

the iron trail has yet been laid – to Penzance, 305 miles away. This section consists of three coaches and a restaurant car. The St. Ives through coach will keep these company to St. Erith Junction, and the Falmouth coach or coaches as far as the cathedral city of Truro. Then comes the Newquay coach, which parts company with the main train at Plymouth and is taken on from there to the Newquay branch junction, at Par, by a slower train.

But what of the Six Coaches on the Rear of the Train?

We shall find them labelled successively Torquay (two), Ilfracombe, Minehead and Weymouth (two).

Cylinders (4) Diameter	...	16 in.
" Stroke	...	26 in.
Driving Wheels, Diameter	...	6 ft. 8½ in.
Heating Surface, Tubes	...	1,886 sq. ft.
" " Firebox	...	164 "
" " Superheater (14 elements)	...	262 "
" " Total	...	2,312 "
Firegrate Area	...	30½ "
Working Steam Pressure	...	225 lb. per sq. in.
Tractive Effort (at 85% wkg. press.)	...	31,825 lb.
Water Capacity of Tender	...	4,000 gallons
Coal	...	6 tons
Adhesion Weight of Engine	...	58½ "
Total Weight of Engine (in working order)	...	79½ "
Total Weight of Engine and Tender (full)	...	126½ "
Length of Engine and Tender (over buffers)	...	65 ft. 2 in.

How are these to reach their destinations, if the "Limited" does not stop before reaching Plymouth? It is obvious they are not destined to travel to Plymouth and then back again to the various junction stations! No; they are going to be "slipped." The two hindmost will be quietly dropped off at Westbury, 95 ½ miles from London. Then the Minehead and Ilfracombe coaches will come off together as the "Limited" flies through Taunton, 142 ¾ miles out; and last of all the Torquay coaches will be slipped at Exeter.

Thus the engine will have been relieved of half-a-dozen of her fourteen coaches ere she draws up at her first stopping-place, and one might quite easily get into the

middle of the train at Paddington and, to one's astonishment, find oneself in the last coach on arrival at Plymouth, without having stopped anywhere in between!

"Slip" Coaches

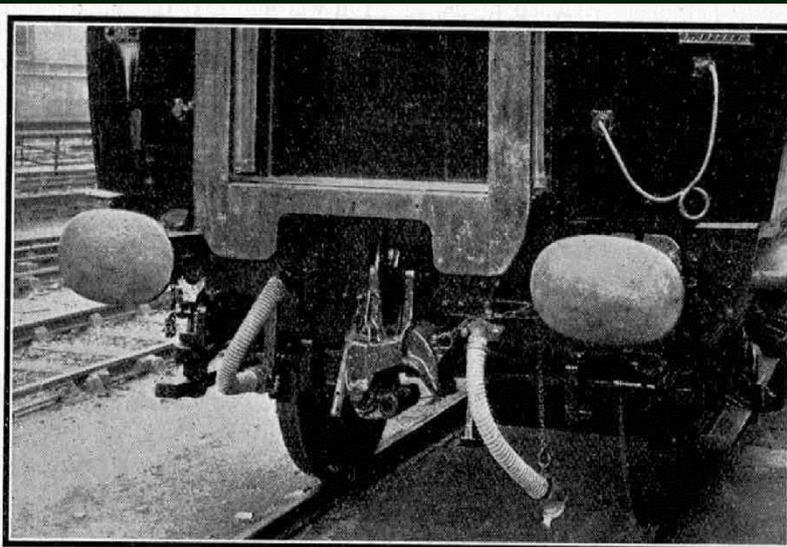
Just a word here about this business of slipping. The advantage, of course, is that it is possible to set down passengers at any intermediate station without the loss of time occasioned by stopping the express for the purpose. But against it, from the railway point of view, are the expense – for each slip portion must have its own guard – and the trouble of providing specially-fitted slip vehicles in the train formation. On the Great Western Railway, to which line with but a few exceptions all the slip coaches of to-day are confined, "safety first" is always the main consideration, and in order that no one shall interfere with the slip guard in the performance of his responsible duties the slip portions are not connected by vestibule with the main train. So one may be travelling as far as Exeter in the "Limited" and yet find it impossible to get lunch on the journey, although the restaurant car is only a few coaches away!

The mechanism of slipping is quite simple. At the "business" end of the vehicle is a special form of coupling, by which the slip portion is attached to the main train. At this end also is the compartment in which the slip guard rides, with a good look-out window in front. The hook of the coupling just referred to is hinged in the middle and is held securely in position by means of a sliding bar of steel, which can be withdrawn at the right moment by a lever, worked from inside the guard's compartment. Provision is made, too, for the guard to "seal up the vacuum" in his slip portion.

On the main train an appliance is carried that automatically seals the vacuum; other-wise, when the flexible brake-pipe joining the coaches is severed, both halves of the train would come to a sudden stop! In the winter, steam-heat connections are arranged to sever automatically as they are pulled apart, and to seal themselves up in order to prevent escape of steam.

How the Slipping is Effected

As the train nears the slipping station the guard makes his preparations. First of all he seals up the vacuum of the brake. Then he applies his hand-brake, lightly pressing the wheels of the slip-coach. Finally, at the right place – usually about half a mile from the station, but governed in exact distance by the gradients, the customary speed of the express, and other factors – he pulls over his slipping lever. The wedge is withdrawn, the coupling from the last coach of the main train falls out, brake and steam-heat pipes pull apart and the severance is complete.

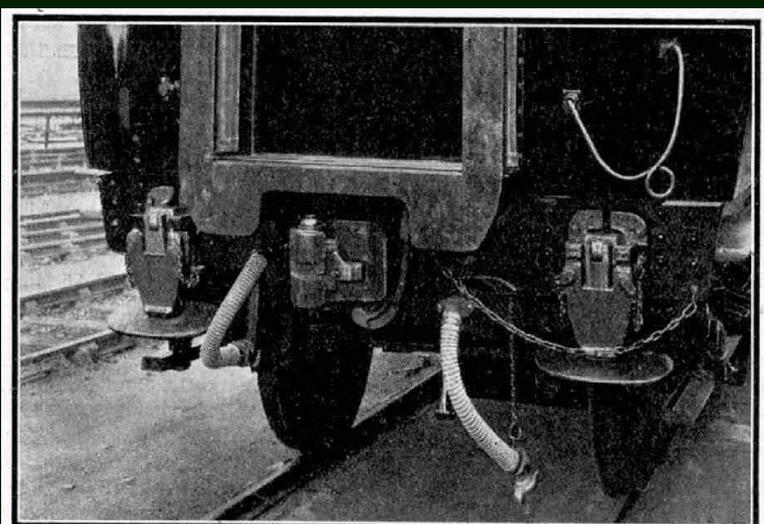


End View of lower portion of C.W. 70 ft. Restaurant Car, showing Automatic Coupler, swung out of position for coupling coach by ordinary screw coupling

The light pressure of the brake soon draws the slip well behind the main train. The hand-brake is then taken off and the slip is allowed to roll into the station, where the guard applies his vacuum brake and brings it to rest. Immediately after slipping he has waved a green flag out of his side window in order that the engine crew may know that the slip is safely "off."

Needless to say, the working of the slips is hedged about with the most careful restrictions, owing to the possible danger of the slip running into the main train after the severance if the latter should be stopped for any reason before it is clear of the station. In fog or thickly falling snow all slipping is suspended, and the express stops instead to detach the slip.

A special horn is fixed to the front of the slip brake, so that the guard may warn any railwaymen, who might be tempted unthinkingly to step on to the line after the passage of the express,



Photos courtesy] AS ABOVE, but with Automatic Coupler in position, and side buffers swung out of use [G.W.R.

that the slip is coming just behind. Special tail lights, too, are carried by slip portions, consisting of

red and white lamps encircled with red and white discs, arranged in various ways. You will find that the innermost or Exeter slip on the *“Limited”* carries on its back a pair of red and white lamps side by side. The second or Taunton slip carries the red lamp above the white; while the outermost, or Westbury slip, has an imposing array of three lamps, two red and one white carried in a triangle. The object of these special indications is to inform signalmen and others that no slip portion has become detached before reaching its rightful destination.

70-ft Coaches

The Great Western Railway uses the longest coaches in England. For many years now their standard for long-distance work has been 70 ft., and occasionally as much as 73 ft. 6 in. over buffers. This allows of third-class corridor coaches being made with no less than ten compartments, as well as lavatories at both ends, so that each coach of this type thus seats 80 passengers. Every seat in the *“Limited,”* by the way, is numbered, and many are reserved in advance. The latest Great Western coaches, in the handsome chocolate and cream livery, are panelled with thin steel plates, both at the sides and ends and over the roof as well, steel being found to wear better than wood.

Another recent Great Western innovation has been the use of one combined central coupling and buffer, like two hands coming together in a firm grip, which helps the train to ride more steadily, in addition to being a valuable safeguard against the dreaded *“telescoping”* of coaches in the unlikely event of a derailment. This is not a new idea, however, having been introduced on the East coast trains of the L.N.E.R. as far back as 1897, and having since become standard on that line. The *“Limited”* is coupled up in this manner except, of course, the slip portions. These newest coaches are tremendously heavy, scaling from 35 to 37 tons apiece.

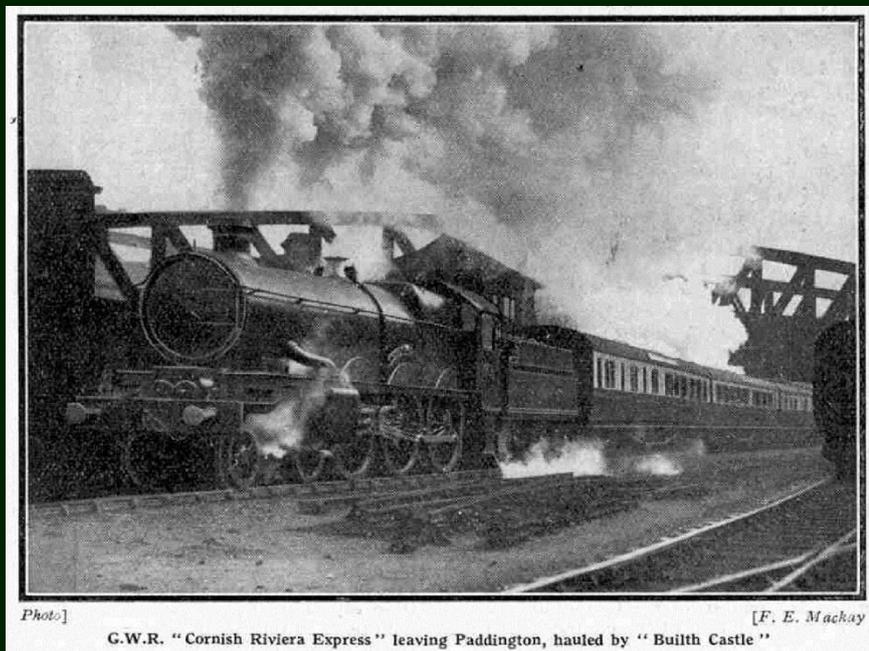
So, at last, when we have walked up the whole length of this vast train at No. 1 platform Paddington – the 14 coaches alone measure all but 1,000 ft. in length and the extreme front of the train is probably out of sight round the curve at the outward end of the station – we come to the engine. There is no question as to what type it will be. There is only one class of locomotive on the line capable of keeping time with the *“Limited,”* and that is the famous *“Castle”* class. It is safe to say that no other type of locomotive in the world has done more wonderful work, in the proportion of its weight and size, than the Great Western *“Castles.”* It is not only the haulage of enormous loads at high speed that is in question here, but the low consumption of fuel and water on which these feats are carried out.



In the exchange of locomotives between the G.W.R. and the L.N.E.R. in 1925 it was proved that, although the L.N.E.R. "Pacific" could work the down "Cornish Riviera Express" to time without difficulty, yet the G.W. "Castle," of 12 tons less weight, burning less coal on exactly the same duty. Last year, again, on the L.M.S. line, "Launceston Castle" succeeded in gaining time with 500-ton trains, whereas the L.M.S. engines are limited to a maximum of 360 tons. Moreover, she did her work on a lower coal consumption per horse-power developed than had ever been recorded previously on L.M.S. metals.

"Castle" Class Engines of the G.W.R.

The Great Western "Castle" class engine has the 4-6-0 wheel arrangement and weighs, without tender, 79 $\frac{3}{4}$ tons in working order. The latest type of six-wheeled tender, with accommodation for six tons of coal and 4,000 gallons of water, brings the total weight up to 126 $\frac{1}{2}$ tons. Many reasons have been advanced for the extraordinary capabilities of these Great Western locomotives, but there is little doubt that their success lies largely in



Photo]

G.W.R. "Cornish Riviera Express" leaving Paddington, hauled by "Builth Castle"

[F. E. Mackay

the high working pressure that they carry, namely, 225 lb. per sq. in. The force of this pressure, acting on the pistons of the four cylinders, contributes largely to the high tractive power of the engines. The long travel of the piston-valves, which enables the drivers constantly to work the "Castle" in short cut-offs, is probably the chief agent in their efficiency. But this is rather too technical a subject to go into here, and it is now time for us to take our places in the train, as it is just on the starting time of 10.30 a.m.

On the stroke of the half-hour the guard's whistle blows, or the whistle of one of the guards as four of them are travelling with the train. The driver opens the regulator and we are off!

We have a finer start than exists out of any other London terminus. Other lines have to rise out of the valley of the Thames, but Brunel carried his line westward up the Thames valley and, by his old route – via Reading, Didcot, Swindon, Bath and Bristol – barely a grade worth mention exists for the whole of the way to Taunton. So by about Southall we attain the mile-a-minute rate, and by Slough we are ticking off the level quarter-miles every thirteen seconds or so, meaning a speed of just under

70 miles an hour. If we are running dead on time we should pass through Reading, 36 miles out of Paddington, in 37 minutes.

Cutting Off the Corners

Here we must reduce our speed to 40 miles an hour for the curve at the west end of the station, for we are now to leave Brunel's old main line in order to take the more recent short cut by Westbury. After the opening of the 20 miles shorter London and South Western route to Exeter and Plymouth, the old main line by Bristol, beautifully graded though it was, was found too circuitous, and it became imperative to curtail the distance. This was done by bringing the old "Berks and Hants" line up to the main line standards, cutting a great corner out of it by linking Patney and Westbury with a new direct route, 15 ½ miles in length, and then joining Castle Cary, where the Weymouth line bends southward, with the West of England line at Cogload, near Taunton, by another new stretch of line 24 ½ miles in length.

By this means, costly but effective, the Great Western cut exactly 20 miles from their journey to Taunton and all points west of that town. In the earliest year that the "*Limited*" ran it travelled via Bristol, and so made the even longer non-stop journey of 245 ¾ miles daily.

The Westbury route is not difficult in its grades, but it has some long stretches of "collar-work" for the engine. Up the valley of the Kennet it gradually rises, past Newbury and Hungerford, steepening then to the summit at Savernake, 70 miles from Paddington. At Aldermaston, 45 miles out of Paddington, occur the first track-troughs, notable by the provision of one of the first water softening plants erected in England for treating locomotive water. To Savernake we probably shall have taken just about 1 ¼ hours. Possibly we may be a minute or two behind time, especially if the weather is at all windy, but we may pick up a minute or so on the glorious racing stretch down to Westbury, on which we shall probably touch 80 m.p.h., while descending the 1 in 222 from Patney to Lavington.

A severe brake application heralds the approach to Westbury, owing to the sharp curve into the station, and if we follow the reprehensible practice of leaning out of the carriage window we shall see the two coaches of the outermost "slip" neatly dropped off the back of the train. An interesting sight at Westbury, by the way, is the most southerly blast-furnace plant in England, on the north side of the line just beyond the station.

Steepening Gradients

Immediately after Westbury, passed in 97 minutes from Paddington if we have kept time over this initial stretch of 95 ½ miles comes another installation of track troughs where our thirsty steed takes a second long drink. We have barely recovered from the 30 m.p.h. slack through Westbury when there comes another restriction to the same limit over the Frome curve. From here follow the rising grades to the summit known as Brewham or, in the working time-tables, "mile-post 122 ¾," the actual distance mentioned being the old one by Swindon and Chippenham. The last couple of miles up to this point are as steep in parts as 1 in 107.

Once over Brewham we have in front of us a further high-speed stretch down to Castle Cary, 120 miles from Paddington. The grade here is mostly 1 in 98, but exceptionally high speeds are rarely run owing to the winding character of the line. Then we pass over the "cut-off" to Cogload and Taunton.

From Castle Cary to Taunton is, perhaps the one easily timed stretch of the whole journey, and the timing is greatly prized by drivers as giving them a little chance

Of recovering a few minutes that may have been dropped on the arduous earlier stages. Water is taken from troughs just after the old main line has been joined at Cogload.

Taunton, 142 $\frac{3}{4}$ miles from Paddington, should be passed in 148 minutes. Here our steed is thankful to be rid of the burden of two more coaches, as the stiff ascent to Whitehall, where the train crosses the watershed separating the Severn basin from the rivers running southward to the English Channel, is now immediately in prospect. First the ascent steepens during four miles from 1 in 220 to 1 in 163, and then for three miles it increases from the formidable figure of 1 in 90 to 1 in 81. The final three-quarter mile through the summit tunnel is at 1 in 126. With the 530 tons that our "Castle" drew out of Paddington it would not be possible to climb this bank unaided. The load is now four coaches less, however, and with 385 tons our engine finds no difficulty in making the ascent.

Once over Whitehall we have a down-hill run of 20 miles to Exeter, which is passed slowly in one minute under three hours from Paddington, our average speed to this point having been no less than 58.2 m.p.h. This, however, is the end of the high speed achievement.

Among the "Mountains" of South Devon

The line now has to wind round the coast past Starcross – where we pass over the fourth set of track-troughs – Dawlish and Tynmouth to Newton Abbot whence, as it skirts the southern slopes of Dartmoor and has to cross one by one the deep river valleys finding their way to the sea, it stretches



Photo] Down "Cornish Riviera," passing Kensal Green, hauled by "Prince George" [F. E. Mackay

out before our engine the steepest main line gradients in the whole of Great Britain. Fortunately two more coaches were dropped off at Taunton, leaving only eight, of a total weight of 310 tons, which is the maximum that even the powerful locomotives of the "Castle" class are allowed to take unaided over Dainton and Rattery Summits.

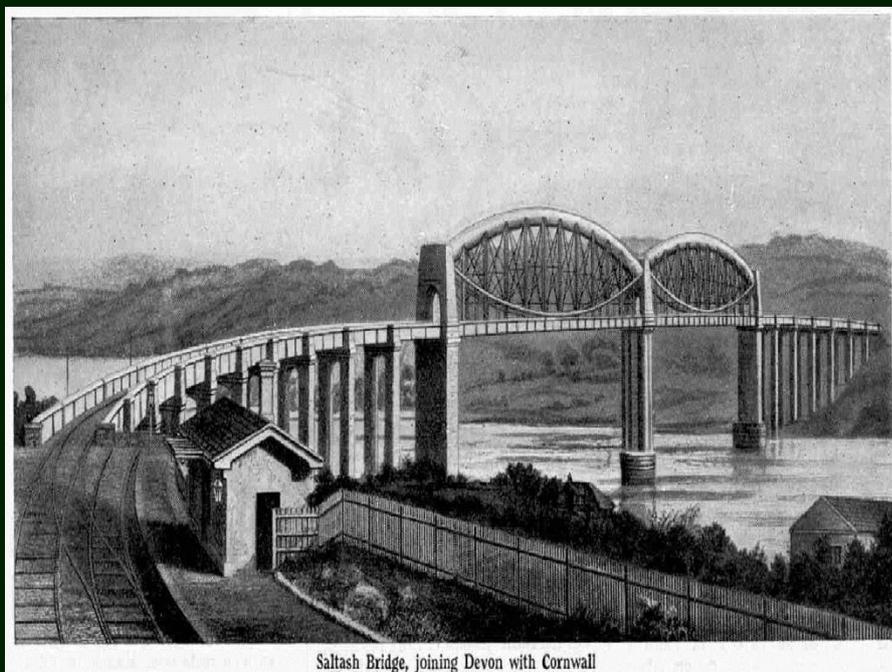
The ascent from beyond Newton Abbot to Dainton Tunnel is only two miles long, but its steepest pitch is no less severe than 1 in 36, and if we top the summit at anything much over 20 m.p.h. we shall do well. Then follows an almost equally precipitate and very sharply winding descent to the valley of the Dart at Totnes, whence we are faced with Rattery Bank, five miles long, 2 $\frac{1}{2}$ of which are at 1 in 51 or but slightly less steep, and another 1 $\frac{1}{2}$ at 1 in 90. From Rattery we go away over a "tableland" past Brent and

Ivybridge, Hemerdon Box down to Plymouth. This is the terror of drivers in the reverse direction, coming so soon after the Plymouth start, with no chance of taking a "rush" at it.

So, probably on the stroke of 2.37 p.m., our "Castle" brings the "Limited" – or what is left of it! – to rest at North Road Station at Plymouth. Even after so strenuous a task as this, however, her day is not done, for, in charge of another crew, she has yet to retrace her tracks over that last formidable stretch of line, by making a trip from Plymouth to Exeter and back before nightfall.

On the seven coaches of the "Limited" – the Newquay coach is to follow – another engine has now been hitched. Until recently the handy "Moguls" were responsible for most of the Cornish work, but 4-6-0 engines, even up to and including "Castles," now work freely right through to Penzance, and quite likely we shall have a four-cylinder 4-6-0 "Star" for the rest of the journey. The ups-and-downs of the Cornish main line are so terribly steep and the curves so sharp that we must not expect much in the way of speed. To Truro, our next stop, 80 minutes are allowed for the 53 ¾ miles.

Chief interest in this part of the run centres in the crossing of Brunnel's magnificent Saltash Bridge,



Saltash Bridge, joining Devon with Cornwall

which takes us over the Tamar from Devon into Cornwall, four miles after leaving North Road. The river here is 1,100 ft. wide, and the difficulty of spanning the waterway was the greater in that its depth in the centre was some 80 ft. This difficulty Brunnel overcame by the use of caisson construction, and he managed to "fly" over the river by two vast spans resting on the

one centre pier. The chief strength of the bridge lies in the great curved tubes of wrought iron, elliptical in section and hollow, from which the floor of the bridge is suspended by vertical tie-rods. It is a tribute both to the genius and to the foresight of Brunnel that this unique structure, opened in 1859, is still in use, carries the vastly heavier locomotives and trains of to-day.

So the "Limited" forges westward past Liskard, Par and St. Austell to Truro, over stone viaducts that until recently were wooden trestle bridges, through cuttings and tunnels and over reverse curves which, from the footplate, seem almost bewildering in their frequency. Then on through Redruth and Cambourne, famous for their connection with Watt and Trevithick, to Gwinear Road, where connection is made to Helston and the Lizard; St. Erith, where the St. Ives coach is jettisoned; and last of all round the margin of Mount's Bay across the causeway from Marazion into Penzance, where we draw up at 5.00 p.m. exactly as far from London as is the Scottish border north of Carlisle.

So another day's journey of the "Cornish Riviera Limited" express has been successfully completed.



Supplied freely with the January edition of the Darstaed/Vintage Trains e-newsletter, all of which can be viewed on the NEWS page of www.darstaed.com or future editions obtained from upton@darstaed.com

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