The G.W.R. 4-cone ejector

Some comments by R. C. Ormiston-Chant

READERS of the magazine, and students of Cyril Freezer's G.W.R. locomotive drawings particularly, will have noticed that on the larger machines the brake vacuum ejector is positioned on the right of the fire-box wrapper, just ahead of the cab spectacle. From it leads a long pipe to the smoke-box. The whole is supported on brackets bolted to the boiler, the extreme ends of the brackets carrying the handrail.

The brackets are, or were, in fact drop forgings of steel, having a saddle for the pipe and a knob for the rail, which last was 1½in. steel pipe.

Bob Wills's kits for the Star, Hall and King Class locomotives have the ejector and pipe as one casting. He offers no particular advice about fixing it or the handrails outside of it. The popular means is to open up some split-pins (supplied) and clip the pipe onto the boiler and fire-box flank, then to "spot" the wire handrail onto each pin-loop with a touch of solder. This is dicey owing to the softness of the ejector and pipe, and I have never liked it; so, I simply "thunked" another way out.

The best way yet is this. Either Araldite or solder (with low m.p.) the ejector and pipe *in situ*, bang over the split-pin holes. From the inside of the boiler or fire-box, drill through both No. 68, so the normal hole pierces the pipe as well as the shell. Then close up the split pins to the wire and fit as usual.

All this is done before the boiler shells are secured together whilst the inner faces of the shells are easily reached.

The handrail can later be fitted and stands off the pipe in the correct manner. The same means *could* be used on Gem kits of L.N.W.R. locomotives, but George uses brass wire for the pipes and drilling through this after the soft metal is far from safe—the drills wanders off the hard stuff. Instead one may carefully mark the thick wire at each split-pin hole and then with a round needle file cut up from below a notch at each mark, to about half the wire thickness. When the wire is placed but not secured the split-pins can be inserted and the whole lot bonded in place.

Either method gives the correct impression that the pipe is sitting on saddles. Do not try and file notches in the Wills cast pipe; it will be too frail after such treatment and is easy to drill through once fitted.

I will now say something of the Swindon "four-cone" ejector. Some readers may not even know what the thing is for on their models.

Vacuum brake ejectors for steam locos commonly have a conical nozzle for boiler steam within a conical orifice followed by a venturi, an opposing cone with smooth transition from one to the other. The outer cone takes air from the train pipe when steam is sent through the inner cone. The two are sent along the exhaust pipe to the smoke-box and out of the chimney. Even today most ejectors are content with a single cone of about 1in. bore at the nozzle, there being a smaller one angled into the outer cone to keep the vacuum against minor leakages, etc. in the train system.

The G.W.R. developed a most successful version in the 1890's out of the Sanders's automatic vacuum brake. Churchward assisted a young genius called Bolitho in this. Hence when he took up his famous office he had a sound system for the railway. But as time passed the railway felt that to cope with the high vacuum of its brake a more powerful ejector was needed, something that would make a brake fast.

So the "four-cone" or "torpedo" ejector was designed. It jumped straight in at the deep end by sporting no less than three steam cones for the main ejector with a fourth for the small ejector, each nozzle ⅞in. diameter!

As G.W.R. locomotives had crosshead-driven pumps for keeping the vacuum, the small ejector was rarely used. At Swindon, during stripping, we usually found its steam cock seized solid with disuse. The pump, being very robust and not making any serious demand on the boiler, unlike the small ejector, coped on all but a few occasions during the life of a locomotive. (In fact I observed that the larger pump, 5in. bore and 30in. stroke, could make a complete brake on a loco within 1 mile, from nil to 25in. of mercury: this was done during the brief tests alongside the works after shopping).

The four-cone was a formidable vacuum maker! My private record is on a 40-van meat train at Wolverhampton, when the 47XX hauling it made the whole brake from scratch in 12sec. flat! The eruption of steam from the chimney could lead lesser souls of lesser railways to think that a desperate leakage had occurred from the smoke-box tube-plate or some tubes had burst or something. But L.M.S. men at Hereford, who also worked Western engines, assured me that it was just what they liked, and one assumed that Western men just accepted it as one of the many good things about the finest locomotives in the world. It still survives of course, along withthe pump, on such preserved G.W.R. locos as at Bulmer's or Tyseley or Didcot. In spite of its bulk and location it did not seem to obscure the view from the driver's seat overmuch, though the L.M.S.R. displayed much more common sense in siting its ejectors, as a rule.