LOCOMOTIVES AND THEIR PERFORMANCE No. 28

"PELORUS JACK" RECALLS

THE PISTON-VALVE "Fa"

On Nelson-Glenhope "Main-Line" Working

The piston-valve "Fa" class 0-6-2 tank locomotive was probably the smallest conventional steam locomotive built by New Zealand Railways. Six were constructed at the Addington workshops during 1902 and 1903, and were distinct from the 14 similar slide-valve locomotives rebuilt at Newmarket, Petone and Addington between 1897 and 1905 from old "F" class 0-6-0 saddle-tank locomotives. It is more than likely that they were intended to replace the extremely lightweight "D" class 2-4-0T and "C" class 0-4-2T locomotives, and may have been designed to negotiate inclines as steep as 1 in 35, such as were found on the Picton and Nelson Sections. They appeared on the scene in the era of the various "U" class 4-6-0s and the variants of the "W" class 2-6-2T. In some respects, perhaps, they were a further development of the "W" series and should have been classed as such, but in other respects they were derived from the converted "F" class locomotives that eventually became "Fa".

Had there been convenient rail access to Nelson, the relatively low power output of the "Fa"s most likely would have seen them replaced much earlier by something having a little more power and a greater range on their water and fuel capacities. As it was, they remained the smallest main-line engines in regular service on the NZR right up to the 1930s. Other locomotives of similar weight and power elsewhere were relegated to yard work or much lighter duties as time went on, but those at Nelson in particular faced very severe restraining grades daily, grades that demanded maximum capacity power on ascending inclines and every care with speed and hand brakes on the descent of abrupt mountain grades.

The "Fa"s were most astounding wee locomotives, having a surprising quality of sinew and muscle, and they possessed exceptional braking power. They were noted for having really good brake adhesion.

My first trip from Nelson to Glenhope, 59 miles, was on a passenger excursion double-headed by "Fa"s in 1912. There were enough cars to provide a full load for two locomotives, so the train was double-headed throughout the entire round trip. The excursion was repeated each year, and was worked by "Fa"s until the first "Wf" 2-6-4T arrived in 1915.

On the stiff ascending grades their record of reliability and competence took locomotive running men by surprise. Their capability and endurance on slog-it-out grades, and their running and riding qualities drifting at high speed on the long descending valley routes, were astonishing for such small engines. They had the climbing qualities of a 12-wheeler and the riding comfort of a Baltic.

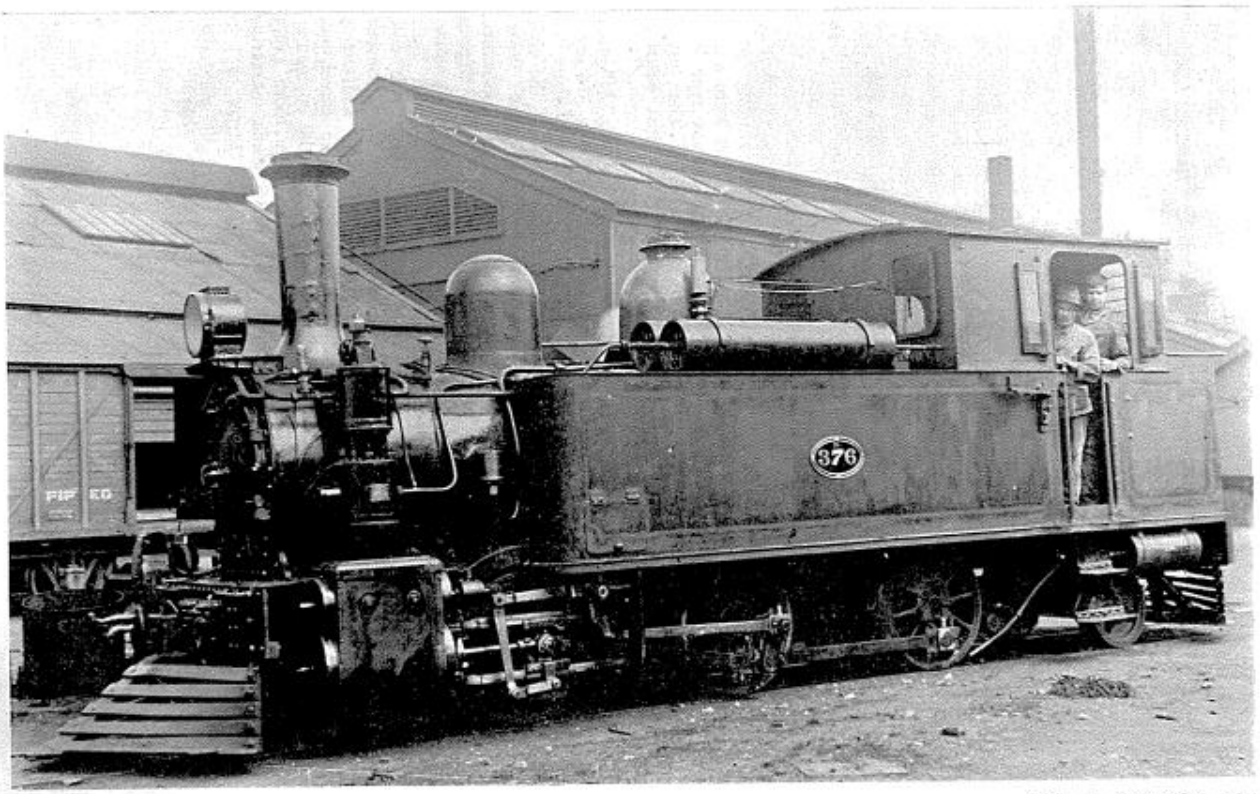
The trip I write about was the annual Boxing Day excursion to the end of track at Glenhope, and after 1912 I never missed one of these popular end-of-year rides behind the "Fa"s or "Wf"s. Typical of the period, the 1912 excursion was very well patronised, so the train was composed of eight of the early "A" class bogie cars, three "C" class 6-wheel cars, and a van.

I can recall something of the rolling stock of that period. There were still one or two four-wheel vans at that time, but this excursion had a bogie vehicle, and the total consist, with about 35 tons of passengers and picnic gear aboard, weighed about 175 tons. Vans on "non-air" sections were correctly described as brake vans; on air-braked trains, vans did no more braking than other vehicles.

At this time there would have been a "D" 2-4-0T, an "F" 0-6-0T, and three "Fa" class 0-6-2T locomotives at Nelson. The ruling grade of 1 in 35 reduced the tonnage rating of the "big" engines, the "Fa"s, to a load of 90 tons behind the drawbar, while the "F" was rated at 75 tons and the "D" at 55 tons. So this train of 175 tons required the combined energy of two of the largest engines on the section, Nos. 315 and 373. In 1912 No. 315 had recently arrived in Nelson and was still wearing its grey paint on side tanks, cab, bunker, and cylinder jackets after a workshops overhaul. It came dismantled, and after reassembly wore a new coat of grey; the rest was black, relieved by the red paint and polished brass of number plates and builder's plates, and of course the polished brass dome and whistle. No. 373 had long since turned from grey to black by the amount of polishing done by the cleaners. Its tanks, superstructure, wheels, rods, spectacle plates, cylinder jackets, headstocks, and cowcatchers all had a nice smooth finish. Both locomotives were well shined up for the occasion, and there was a load of fine Welsh coal in bunkers and footplates to help generate the 9,090 lb of tractive force that each would have to produce to surmount the Bishopdale grade.

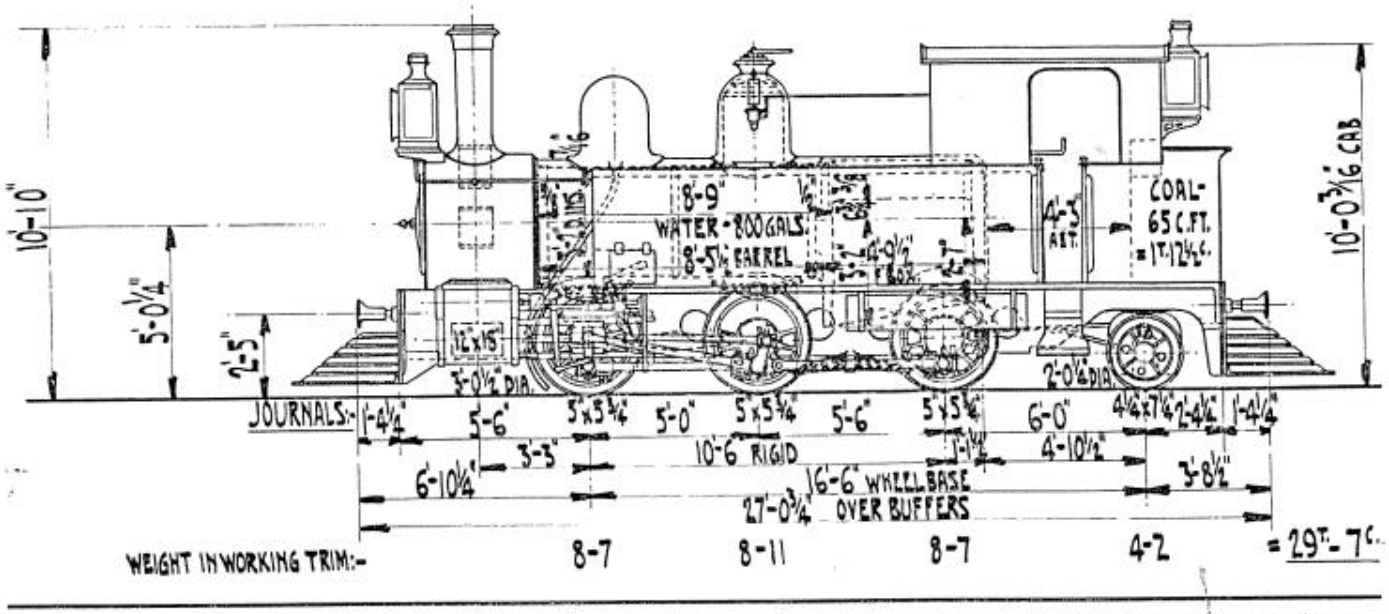
They were rare little engines, only six of their kind, a link between the flat-valve "W" and the new piston-valve, inside-admission type "Wf" and "Wg", and were a big improvement on the "F", having a larger cab, ample coal bunker (by comparison), water tanks of almost double the capacity, Walschaerts valve gear, outside-admission piston valves, a Belpaire firebox, and an inboard trailing truck under the bunker. The boilers were among the last of the Belpaire-firebox type built by New Zealand Railways. The last, I believe, were for the "Ba" class 4-8-0s of 1911.

To return to the trip. No. 315 took the lead, being separated from 373 by a 3-board "L" wagon. The three 6-wheel "C" cars were marshalled in front of the eight "A"s as they were to come off at Wakefield and remain there until our return. Right on time, 7.45 a.m., the two engines whistled off into the morning sunshine, accelerating slowly after the cylinder drain cocks had been closed. They were cold and would produce a better performance after steam passages were thoroughly warmed and dried out. Valve travel was set at about 65 percent and the enginemen opened their throttles a little more every two hundred yards on a grade increasing from 1 in 80 at North Esk Street to 1 in 61 at Totara Street. There the rails left the highway and, climbing sharply, the locomotives fought their way towards the ruling grade, striking 1 in 38 at milepost 2 (measured from Port Nelson), 1 in 37 through the reverse curves, and finally 1 in 35 and 1 in 49 into Bishopdale (milepost 3, elevation 213 feet), an incline much steeper than the Raurimu Spiral or indeed any part of the present North Island main trunk line. The locomotives



From an unidentified print

No. 376 was the last of the five "Fb" class 0-6-2T locomotives built new at Addington Workshops during 1902 and 1903, and reclassified "Fa" in 1905. This particular "mighty midget" was later allocated to Greymouth, and had a Westinghouse brake pump mounted on the side of the smokebox.



From a Cedric Green locomotive diagram

This drawing is reproduced full size from a Cedric Green diagram, the scale being 3/16ths of an inch to the foot, correct for 16.5mm. gauge model railways. Copies of the full drawing are available from the Society. See the price list.

blasted up into the deep cut in a fog of smoke and a roar of escaping steam as two safety valves lifted after the throttles were closed at Bishopdale. Very free steaming, their fireboxes seldom failed to provide steam in volume and at pressure unless the fuel was grossly inadequate, or if there had been a new fireman who had not adapted his mode of firing to suit the small grate area of 10 square feet.

Coasting down the southern slope of Bishopdale Hill, the two "Fa"s held back the forward surge of the cars, and having no air brake the guard and his assistant screwed down the van handbrake and the brakes on three of the cars. Near the foot of the grade, the hand brakes were released and, after rounding the 10-chain curve, the main highway was crossed. Slack was run out and couplers tightened as the train climbed the short grade, partly 1 in 55 and 1 in 68, into Stoke. After loading a few customers, the two "Fat Annies" (as these locomotives were affectionately called) quickly accelerated to 25 m.p.h., then the enginemen turned off the power and drifting speed reached 30 m.p.h. at Freezing Works, almost at sea level. There was no business there, so both drivers opened up carefully, hoisted their long reverse levers from down in the front corner of the cabs over about 12 notches, adjusting the cut-off to approximately 25 percent. So they steamed through to Richmond, where they filled their 800-gallon capacity tanks with water.

Out of Richmond the "Fa"s whistled off again, accelerating rapidly along the mile separating Richmond from Appleby, the mile thence to Hope, and the three miles to Brightwater. Stops were made at each place, brakes coming into action on the locomotives and the van. This was all straight track without a curve until near Brigntwater, after crossing the Wairoa River.

Between Brightwater and Spring Grove I was watching from the car window as the lead engine screamed a familiar signal. I watched the white-painted livestock guards flash by, and the regular level-crossing signs of those days: not the crossed-arm RAILWAY CROSSING sign of today, but a large square board with the word STOP in large letters and a smaller board below with the inscription LOOK OUT FOR THE ENGINE. All traffic then was horse-drawn, and there were probably fewer than a hundred motorcars in the entire country at that time. At level crossings, prudent folk alighted and stood beside the buggy while the driver held the horse's head.

After Brightwater, curves became more prevalent, and the main highway was crossed three more times before Wakefield, 16.3 miles from Nelson, was reached. Approaching Spring Grove, 13.6 miles, it was noticeable that the right of way was leaving the wide valley floor and leading towards an ever-narrowing valley, that of the Wai-iti. As the grade increased, the enginemen let their reverse levers out half a notch at a time to increase the degree of cut-off in the cylinders, and the firemen became busier as the demand for saturated steam at 160 lb per square inch increased.

The station yard at Wakefield was on an incline, so brakes were left on to hold the rear cars while the three "C"s were cut off after passengers and their impedimenta had been unloaded. The locomotives pulled them ahead past the main-line points, and after the guard had lined up the road the couplings were slackened while the porter lifted the hook, and gravity propelled the cars into the yard where they were braked to a halt. The guard reset the points and locked up for the main line while 373 and 315 coasted back to the tanks for water.

Both enginemen looked over their machines for missing oil-cup corks, split pins, lock nuts, and defective suspension gear. The "Fa" with a 36½-inch diameter wheel made 138 revolutions per minute at 15 m.p.h., 277 at 30, and 370 at 40 m.p.h., the highest rate likely to be attained by any train that included a 4-wheel freight wagon. Piston speed also was consequently rather high in main-line service, reaching 13,320 inches per minute at 40 m.p.h. At these high rotating and reciprocating motions, corks, split pins and lock nuts were easily thrown off if not properly secured.

With both locomotives watered, and now with a reduced trailing load of 145 tons, we left Wakefield to face the gradually steepening grade through Wai-iti and Foxhill to Belgrove, stops being made at each station. The track followed the bank of the Wai-iti River, and as the valley

narrowed and became confined we passed through increasingly high cuttings.

Ahead of Belgrove was Spooner's Range, the divide between the Waimea and the Motueka Rivers. It was only four miles to the top of the hill, but the summit was at 1,010 feet and Belgrove was at 438 feet. Between the two points the grade to be surmounted was considerable even for a 12-wheeler or a Pacific, but for a midget like an "Fa" the hill seemed far beyond its capabilities. There were numerous curves to negotiate as the track sidled around the steep face of the battered mountain, rather reminding one of the track and hill slope between Paekakariki and Pukerua Bay. But imagine "Fa"s lifting a 145-ton train up an even steeper grade, an inclination of 1 in 40 without any easement anywhere, steeper than any portion of the famous Raurimu Spiral.

At Belgrove both locomotives refilled bunkers and deck space at a coal stage built right alongside the main line. Four long-handled shovels came into action, and so much coal was taken aboard that the firebox door could not be opened or closed, therefore the cab floor was filled full with the firedoor open and the fire piled so high in the rear corners and under the baffle that very little overfire air could enter to cool the brick arch and flues.

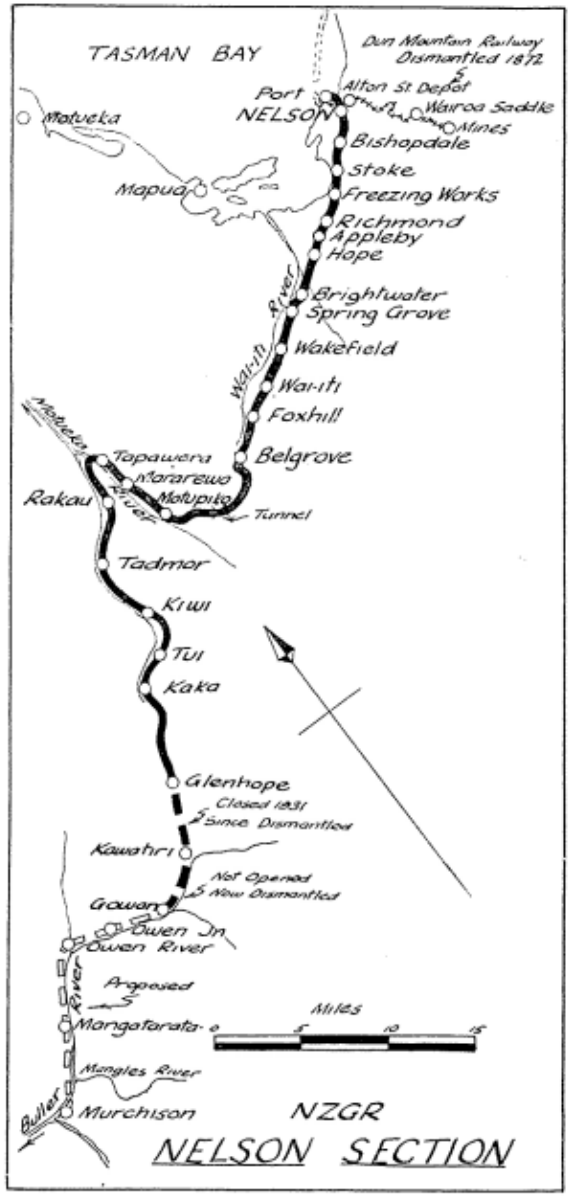
Leaving Belgrove there was no run at the grade; the 1 in 40 started right at the platform, but the locomotives did not have the extreme load with which they had left Nelson, and besides they were now well warmed up to a good running heat. Until this stage I had ridden the rear car as I wanted to see the driving wheels and motion gear shining in the sunlight, and I wanted to take in the double-header leading the cars into the transitions between curves and tangents. Now that the train had left the valley floor the front end was hidden more often than not, so I made for the leading car platform, right behind 373. There were no gangways bridging the spaces between the end platforms of the cars in those days, so my change of position involved swinging from the steps of one car to another seven times.

While I could not say that they sounded like a couple of 2-10-2s, the engines were working steam at 160 lb/sq. in. through 12in. x 18in. cylinders, and they sounded as if they were intent on overcoming gravity and making time in spite of all the stops for passengers, fuel, and water. They assaulted the grade in a very determined manner and hammered the main-line steel through cuts and over fills with exhaust steam and smoke blasted high, the exhaust bark indicating absolute maximum power output. Those little machines were working real hard.

From my position on the car platform I could see the engine crew hard at work. The throttle was open wide and not touched, while the reverse lever was well forward and left there. The fireman shut off steam to the injector each time he opened the firedoor. After making such a heavy fire while coaling at Belgrove, he had to run the clinker hook lightly over the firebed to feel its shape and to break down any ridges or irregular formation. On came the injector again as soon as the door was closed, as with such heavy steam production the consumption of water was considerable. He had a 6.5mm. Sellars injector. The correctly calibrated size for redesigned "Fa"s was 5.5mm., but for those piston-valve "Fa"s with 10.7 sq.ft. of grate area and the Belpaire firebox the 5.5mm. size could not feed the boiler fast enough while working with the throttle latched wide and the cut-off set at 55 percent, and towing a full load at 9-11 m.p.h. It was therefore imperative that a larger injector be provided.

As soon as we entered the three-quarter-mile tunnel, I escaped into the car for shelter from the heat, gases, flying cinders, and soot. The hard-working exhausts barked up the next half-mile through the darkness, when the power was eased off. We had reached the crest in the tunnel, and the change of grade permitted them to drift, still in the bore with couplings slack at first, but soon the cars were shoving very hard with the guard and his assistant busy tying down the hand brakes on the last three cars and the van. The engine brakes were not applied.

We emerged into the sunshine at 20 m.p.h. and speed continued to increase gradually until we were doing about 35 m.p.h. The descent had begun at 1 in 44, gone to 1 in 40, then 1 in 55 and 1 in 57, and by that time the application of brakes on another car had brought the



This map, drawn by R. D. Grant in 1955, shows the route of the Nelson Section from Nelson to Glenhope, together with the closed, partly completed, and proposed extensions as far as Murchison. We regret that space has not permitted reproduction of a gradient profile.

pace under control. The train crossed the creek twice on timber side-truss bridges, clung to the steep hillside on the right for the first mile, crossed the creek to cling to the left slope, crossed the creek again, and followed the right bank of the Motueka River. Here, in the last half-mile, the grade had eased to only 1 in 142, thus assisting the locomotives to slow down our pell-mell, helter-skelter pace and to enter Kohatu under control. Here both locomotives were to take water again. While one was taking a long drink, the other cut off and the firemen emptied the smokeboxes, which had filled considerably. Had this not been done, the deposit of cinders would have risen above the lower rows of flues.

Note that, while we were racing down that hill, the engine brakes had not been used. They were held in reserve and could be used to restrain the cars from exceeding 40 m.p.h., for emergency use, and for making the final stop at Kohatu. The practice was to let the car and van brakes retard the train so that there was always additional braking power in case of need. They never committed all of their braking power on that kind of incline.

Kohatu, later renamed Motupiko, was an officered station in those days, and there was a semaphore home signal outside the main-line points at each end of the yard. Here we unloaded a few passengers and some baggage and hurried on to Tapawera. After leaving this station we turned sharply to the left around a long 12-chain radius curve. It continued through about 115 degrees. Then we crossed the Motueka River on a timber side-truss combined road and rail bridge.

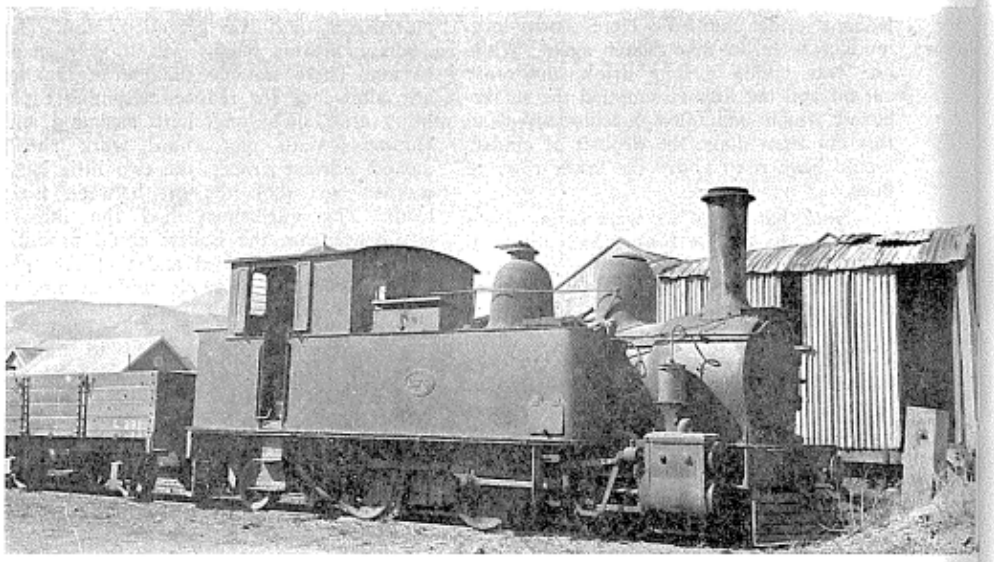
The rails then led the excursion into the valley of the Tadmor, perhaps 300 to 400 yards across at its lower end, but soon becoming more confined as we progressed. Rakau, just a wide place on the road, was passed at speed, the two energetic little battlers attaining and holding 30 m.p.h., smoke going high, firemen busy and efficient, and a white feather at the "pops" for considerable distances.

No provision was made in the schedule for refreshments to be served, nor was time allowed for their consumption, but a private party at Tadmor, 41.3 miles, enterprisingly supplied sandwiches, cakes, tea, and soft drinks, which were appreciated by passengers and crew. Tanks were topped off during the 10-minute halt, and then 315 and 373 really left town, laid their ears back, and took to the increasing fight against gravity and curves where the valley narrowed, the track entered cuts, the hill slopes crowded in, and there was room for only the right of way, the Tadmor River, and the gravelled road. The Tadmor at this height was a very small stream. There was no thought of making any allowance for reduced steaming capability after such long, hard steaming and climbing. With more hard work ahead against adverse grades, the two little locomotives just took the bit between their teeth. The enginemen had the utmost confidence that the boilers could produce more steam if required and that the two firemen could manage it without undue exertion.

Kiwi, where we stopped to unload more passengers, was little more than a station shelter and some sidings. Tui, the next station, at 49.6 miles, was a water stop, the last before Glenhope, and top of the divide was just 6½ miles ahead, at 1,485 feet. The 800-gallon tanks gave the "Fa"s a rather restricted range between trackside tanks, so water stops were numerous; on such inclines, with the enginemen hammering them along at faster than schedule time, the little machines were "thirsty critters". So they filled right up again.

Still behind time because of the refreshment stop at Tadmor, the pair of handsome miniature "passenger-jacks" up ahead threw their weight over the ranges. The crews strained every nerve to make up time before arrival at Glenhope, and those insignificant little machines were capable of the extra effort. Through deep cuts, up the narrow valley beside the now almost non-existent stream, the double-header, now climbing at 1 in 55 and making 18 m.p.h., roared along at maximum capacity, pop valves still with an occasional feather of steam, water transferring from tanks to boiler at the injector's maximum rate of flow. The enginemen were converting those handsome little 0-6-2Ts into hogs — well named while fuel and water were being transformed into energy at such a rate.

We crossed the divide at 1,485 feet, plunged down into the Hope Valley and, after a fast run down (ruling grade 1 in 51), the train ground to a halt at Glenhope at 11.42 a.m., three minutes ahead of the advertised. We were 59.1 miles from Nelson, and at an altitude of 1,272 feet.



Photograph: F. H. E. King

This photograph of "Fa" 374 was taken at Nelson about 1937, apparently not long after it had been officially withdrawn from service.

The routine of these excursions was for the train to arrive at Glenhope at 11.45 a.m., for the van to be switched to the other end of the cars, and for the engines to enter the locomotive yard where one would be spotted over the cinder pit and the other would stop at the coal stage. Fires were cleaned — this was done with a long-handled clinker shovel — fuel was shovelled on deck and into the bunkers, and after an inspection and watering, the crews had a wash in a bucket of warm water and then relaxed in the shade of a small clump of silver birches near the coal shed. The customers picnicked along the banks of the Hope River; some later strolled around the depot and down the Hope a short distance. Soon after the locomotives left the engine terminal and made for the main line at the head of the cars, the passengers would return and embark.

As shown on the gradient profile, the aggregate elevation overcome since leaving Nelson was 2,269 feet. By comparison, a trip from Hamilton at 131 feet to Mamaku at 1,890 feet would have been quite a minor exercise for a Nelson-based "Fa". If one had toured the North Island with a Nelson crew in charge, it probably would have put up some surprise performances in running and climbing ability against the most adverse inclines. By and large the piston-valve "Fa" was a locomotive the average New Zealand railwayman had never heard of. Veteran "rails" were astonished when they appreciated the energy these minature locomotives were capable of sustaining. They were mighty midgets.

When I joined the NZR Locomotive Running Branch in 1925, firemen were still expected to screw on the engine or tender hand brake to run in slack and get the couplers bunched before an air-brake application. We could not see the reason for this as it was really unnecessary, but you can see that it was a carry-over from pre-airbrake days. A light reduction of brake-pipe air pressure of 3 to 5 lb/sq.in. would have the effect of running in slack gently enough (provided there were no air leaks). However, in the first 20 years following the introduction of air brakes, confusion

and misconception prevailed amongst locomotive running men, and the intricacies of the brake were far from being understood. Before the air brake, trains throughout New Zealand were run over considerable distances of rough terrain with the fireman clamping on the hand brake in addition to the guard tying them down in his van. If a freight required additional retarding power to that provided by engine and van, then it would be stopped at the top of the grade, wagon brakes pinned down, and the train started again.

But back to Glenhope and the excursion. At 2.40 p.m. the two little locomotives, with cylinder drain cocks blowing, came out of the engine terminal road. They had not been turned, as there were no facilities, so they ran in reverse, 373 leading. At 2.50 it was customary to blow several long whistles to urge straying customers to hurry back, and it was usually a little after three before the excursion started up the grade.

Both "Fa"s were coaled to the same overflowing degree as they had been when leaving Nelson and the Belgrove trackside coal stage. Fuel was piled so high in the cab that the firedoor was left open of necessity. For a short distance the firemen fired that way, but to counter the cooling action they maintained a very high bank in the rear corners and under the baffle plate. This was a dangerous practice with an "Fa" worked hard, as the draught was liable to drag the fuel, including the high bank, forward under the arch, and eventually it would choke up the clear space against the rear flute sheet. Once that sensitive part was choked off, steam production would fall dramatically, and the fireman would have to concentrate entirely on freeing the space under the low front end of the arch. But with fuel piled so high in the cab it was very difficult to direct the clinker hook accurately into the far reaches of the front end under the brick arch. On the Nelson Section a fireman had to be something of an acrobatic gymnast because the fuel was nine inches high against the boiler backhead, and in the space where he would normally stand in a stooped firing posture he had coal over three feet high. Therefore he was forced to fire with the left foot on the flame-plate (above the firedoor) and with the right knee rammed into the coal pile. The angle of the coal surface did not permit a direct shovel shot into the fire-bed, so the knuckles of his right hand could not avoid contact with the coal surface. In this difficult posture, the fireman's head was a good deal lower than his rear end.

Why would they go to such lengths to get a little extra fuel on deck? The answer was they did not want to break into the bunker because, once there was a hole there down to the shovelling plate, wind whistling through that hole carried an endless stream of coal dust and fine particles swirling through the cab after speed reached 10 to 15 miles an hour. This would get into their eyes and, with both enginemen afflicted with painful eyes and defective vision, the safety of the train and their ability to run to schedule would have been impaired. In addition they would have had to replenish supplies en route the slow way, the "armstrong" way, by long-handled shovel. So the firemen were prepared to stand on their heads for the first mile or so out of Nelson, Belgrove and Glenhope.

The return journey from Glenhope provided an additional interest for one who liked to remain close to a steam locomotive. I liked to stand on the platform of the front car, almost within reach of the acorn on the smokebox door, and quite close to the tall stack and the hard-working exhaust that told of the energy being expended on surmounting the grades. It was a nice set-up for an interested rider, a good observation post provided one was prepared to accept the usual stray cinders and a gradual discolouration of hide and clothing. But I used to think it was worth it all.

In later years I was privileged to ride on the apron between smokebox and tender of one of the Southern Pacific's "AC" class 4000 series cab-in-front articulated steam locomotives through the Siskiyou Mountains of Oregon, up Klamath Falls way. That was in 1930-31. The smokebox end of this 450-ton locomotive provided the sound and the fury, and so also did our 29-ton "Fa"s. With the exception of the cab, it was the most interesting location, as you could both see

and hear the performance and the power.

The two 10-year-old "Fa"s had the train moving just after 3.5 p.m. We were on the incline right from the platform, and ahead was the formidable grade. But instead of a 450-ton "AC", we had only the two innocent-looking 29-tonners to battle against the next three twisting miles. They were being worked in reverse (like the cab-in-fronters) with the cut-off set at about 60 percent. Both firemen were very busy with overburdened fires, fire-doors still unable to be closed, clinker hooks in hand (always a glove on the right hand to avoid skinned knuckles), feeling the formation of the firebed, and probing that front end to ensure it did not choke. Then the fire-iron was put away, and the grates were fired with light fires: two shovels, one in each corner. The fuel bank was maintained high to prevent too much overfire air entering, and also to prevent the furnace heat from reflecting outward and causing burned sleeves and arms.

Perhaps one of the most entertaining parts of the trip was the slow slogging up that hill against the drag of the coaches. The synchronisation of valve mechanism and the drive rods was an entertaining sight. I would shift position to the other side, to see the driver visible through the cab window, watchful and alert, and keeping the engine "on its feet". On the other side the fireman was busy and dextrous with shovel and clinker hook as shown by the solid black column of smoke, denoting really high temperatures, and the loud vibrating rumble each time a new fire was laid. In addition there was a feather from the pop valve to tell that maximum pressure was being carried.

At 12 m.p.h. it took us about 18 minutes to reach the top of the grade. The water, which had been surging around the extreme bottom of the gauge glasses in the cab (it was much higher at the smoke-box end), quickly rose to five-eighths full after the change of grade, then the push-over throttles were closed and reverse levers dropped out to full valve travel. Couplers were compressed, and speed increased rapidly as kinetic energy developed in the accelerating coaches. On that 20-mile down grade to Tapawera, engine brakes were used but little, only to check the pace around the sharper curves, or when stops at stations or trackside gates were to be made. The excursion was brought to a halt at Kaka, Tui, and Tadmor, plus two farm gates.

The "Fa"s had no snifting or relief valves, but their cylinder drain cocks were literally floating as air was sucked in at each stroke. When drifting at 35 to 40 m.p.h. one could wonder how the small cock apertures could possibly relieve the vacuum quickly and effectively enough at each stroke (remember that the wheels made 323 r.p.m. at 35 m.p.h. and 370 at 40). That's the way it was done, and it appeared quite satisfactory. If it were not, the valve liners and cylinder walls would have been found scored by cinders from the flues by way of the exhaust blastpipe. Air entering the cylinders while drifting appeared to be ample, as no scoring took place. During that rapid drifting, considerable attention was paid to valve and cylinder lubrication, as effective lubrication was much more urgently needed in those circumstances. Oil provided while working steam was more effective owing to the presence of moisture in the steam.

At Tadmor there was the unofficial delay for refreshments again. Both engines took water, and the enginemen checked over the running gear. Running in reverse, the valve crossheads collected a lot of dirt and grit from highway crossings, and the lower crosshead guides needed to be wiped off and oiled afresh.

When the "all aboard" was called and the green flag was shown, the two engines quickly accelerated to 35 m.p.h. Power was then turned off, couplers slackened, and the coaches pushed hard. Rakau was passed at 40, and the same hot pace was maintained until the Motueka River combined bridge hove in sight. The bridge was crossed at 5 m.p.h., then a short acceleration round the long 10-chain radius curve brought the train into Tapawera, at the foot of the 10-mile climb through Mararewa and Kohatu and up to the tunnel.

The Motueka was on our right and the way lay along an open river terrace as far as Mararewa, but then the track climbed up the side of another water-formed terrace reminding me of the climb from Kakariki to Greatford between

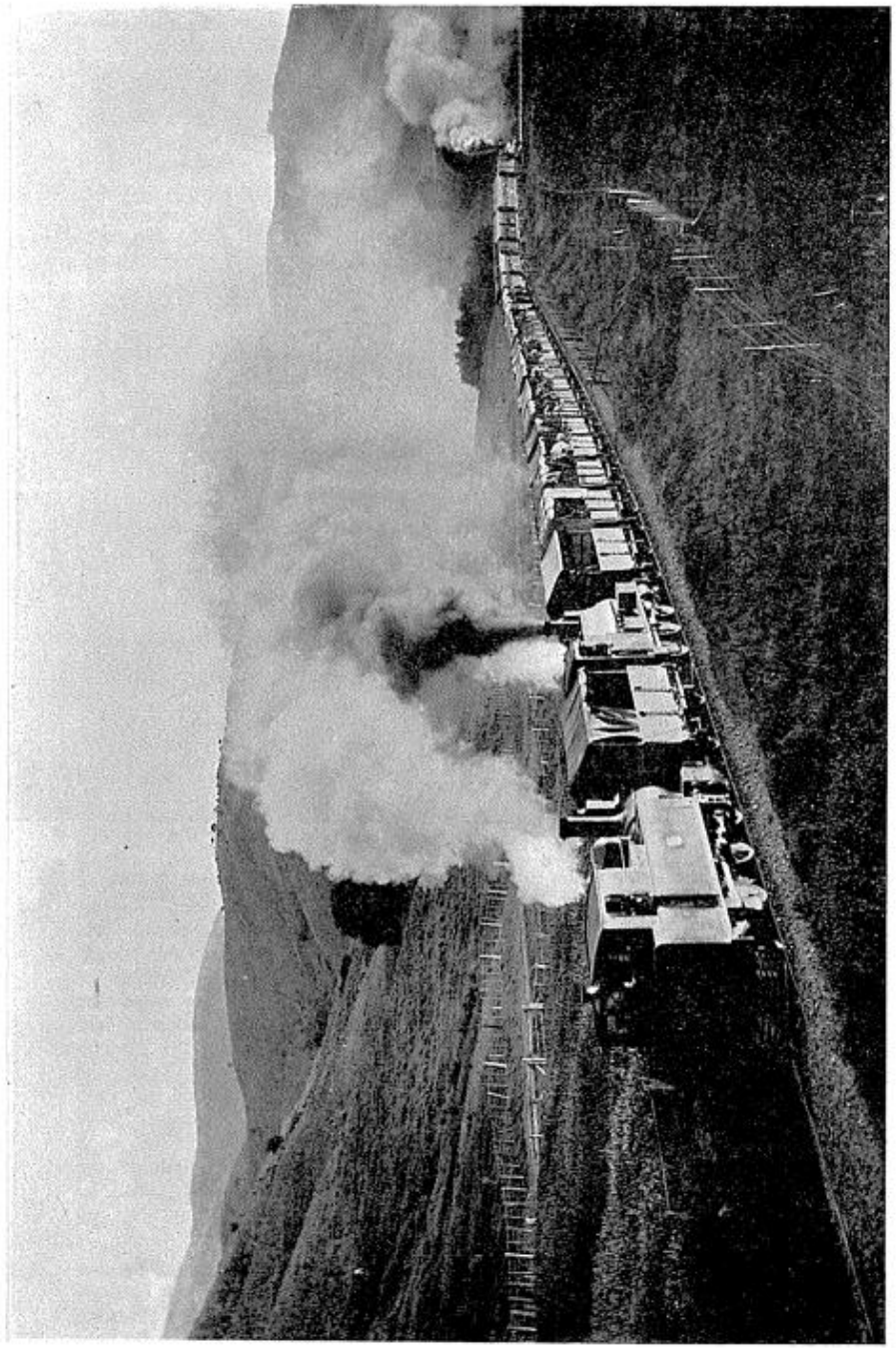
Photograph: N.Z. Railways Publicity

A view forward from the leading platform of the passenger car on a typical Nelson Section mixed train. This one is returning from Glenhope to Nelson in the early 1950s, with a "Wf" at the head.

Feilding and Marton. At the road crossing the climb eased and the train rolled easily into Kohatu. There both engines took a long drink. The coal in their bunkers was also watered in preparation for a fast run down from the tunnel to Belgrove. But before this there was the 5½-mile slog-it-out grade up to the tunnel.

Between Kohatu and the tunnel there were high hills on each side of the line. Near the top, curvature increased the resistance to be overcome and slowed progress still further. Cut-off was lengthened on both locomotives, and they were working very hard to make 9 m.p.h. Then we were rounding the S curves with the tunnel in sight and both firemen laid heavier fires to take them up the remaining 500 yards to the summit inside the bore. Here the power was eased off, then drawbars fell slack. The coaches were shoving with increasing force, but soon the guard and his assistant clamped the brakes on the van and three cars, the enginemen letting the locomotives run free.

Down the 1 in 40 incline they let the excursion race to Belgrove. That kind of grade without the restraint of air brakes on all wheels would throw a fright into



Photograph: Jones Junior (1908)

Described on the print as "a record train returning from the Show in November 1908", this three-engine special is climbing the 1 in 35 gradient of Jenkin's Hill towards Bishopdale from the southwest. The three locomotives, all necessarily running bunker first, were an "Fa" 0-6-2T (either 373 or 374), "F" 146 and "D" 144. The train included 19 "L" class goods wagons temporarily fitted with seats and tarpaulin roofs. It was said to be carrying a thousand passengers.

any inexperienced bystander, let alone a fan who didn't know whether there was reserve brake power or not. However, after a hair-raising dash down that hill, an extra two car brakes came on three quarters of a mile from Belgrove, and at about the same time both engine brakes, which had been idle and were still cool, also came on. The headlong dash was slowed and the stop, seemingly miraculously, was made under control. It had taken about eight minutes to bolt down, where it had taken around 24 minutes to slog up that morning.

The locomotives took another 700 gallons of water each and were coaled. After leaving Belgrove there was a lightly descending race track for 16 miles to Freezing Works. The rails of 53 lb/yard and the sleepers were well maintained, and as no heavy locomotives pounded them, vehicles rode well and crews took advantage of the favourable conditions. The clickety-clack of rail ends sounded really lively under the cars, and the little "sewing machines" spun along, eating up the miles at just 90 seconds each. There were smells of coal dust, of waste gases of combustion, of valve oil and bearing oil, of steel fragments from flange and rail, from worsted packing and journal oil, from track dust and from the dust raised at crossings, and there was sound from the whistling, from the roar of flanges and tyres, and from the wind in my ears. All these made the ride thrilling indeed. That was the thrill of riding the rails in the years just before World War I, when in those days of horse-drawn vehicles anyone making eight to ten miles an hour over the rough gravelled roads was travelling at quite a respectable pace.

We had a run through both Foxhill and Wai-iti, but stopped at Wakefield. The porter rode the leading car platform, then when the train was nearly stopped he was down on 315's footboard, side chains uncoupled, hook lifted, and when the train finally stopped the two locomotives immediately drew away and coasted down beyond the main-line points, the train being held securely by van and car handbrakes. The porter was off, and had unlocked and lined the road, and coupled the locomotives to the three "C" cars in less than 40 seconds. With hand brakes released, the cars were drawn out on the main and attached to the train after a mighty fast shunt. As soon as the Carl Pihl buffers met, and the hook, bridle and side chains were secured, the guard showed the green flag and we were off, with a surprising degree of acceleration. Most of the customers in the three cars had already been on board, seated, or draped out of the lowered windows, or decorating the end platforms.

A momentary halt at Spring Grove, where one passenger disembarked, and off again, subsequent stops being made at Brightwater, Hope, Appleby, and Richmond. Water was taken on here, and both enginemen oiled around and tested the flow of sand, hammering out any wet stuff from the pipes. Next stop was Stoke; 15 seconds after stopping we were off again, and soon were coasting 2,000 yards down the gravel fan to Annesbrook crossing. When they hit the long 10-chain curve both locomotives were opened up again, speed at 35, cut-off at 25 percent, whistle blowing for the crossing, flanges riding the outside rail, and throttles opened wider as the grade started to restrain them, cut-off adjusted to 35, speed slowing rapidly as gravity took hold of the swaying cars, and at length, when the train had slowed to 8 m.p.h., cut-off was set at 65 percent.

Meanwhile the firemen had been busy baling in the fuel, keeping the water hot and the water level low. At 65 percent the Johnson bar was pointing at the top of the cab rear window, the steam pointer on the red line (160 lb/sq.in.), and the water just showing in the extreme bottom of the glasses. With the water level any higher, the boilers would prime every time while negotiating the 1 in 35 incline in reverse, but of course not while in forward gear.

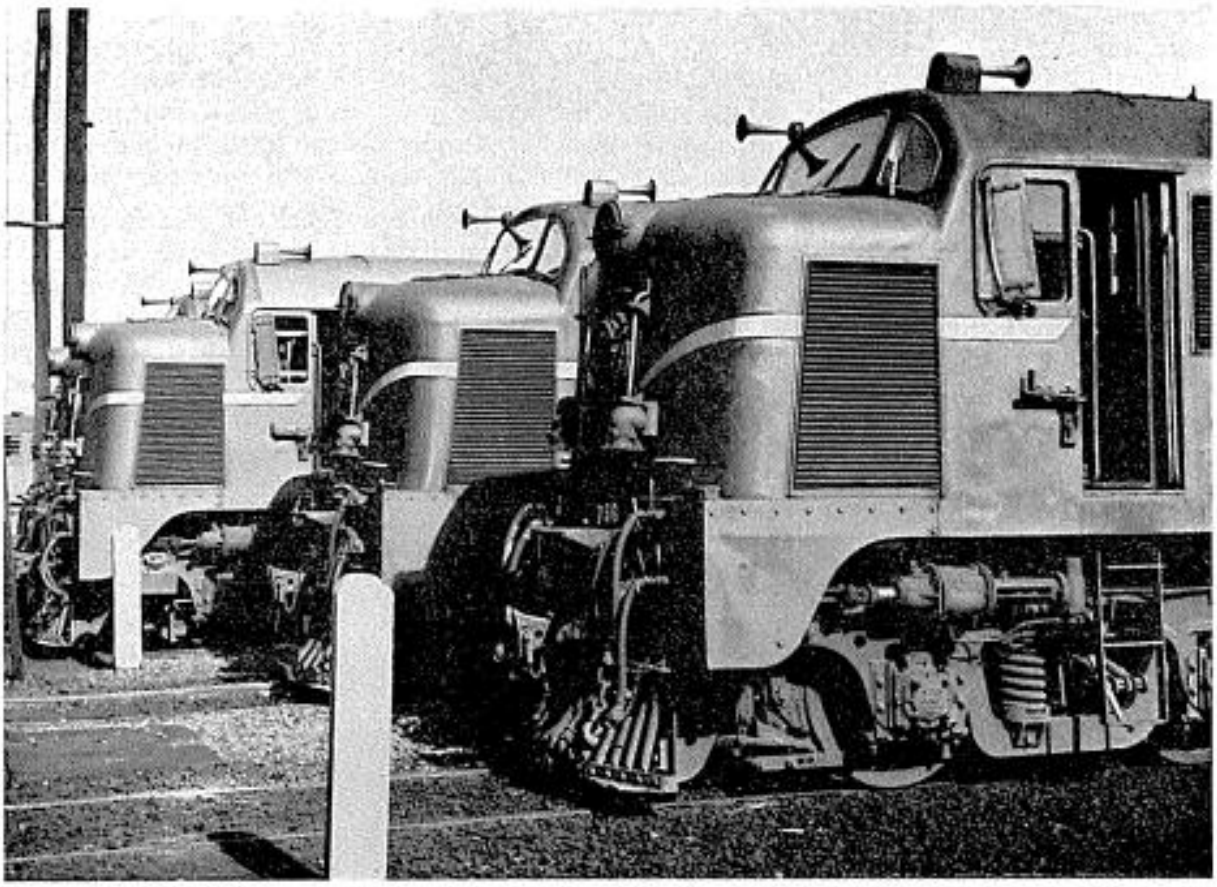
Speed had settled down to 7½ m.p.h. by the time we were on the 12-chain curve 700 yards from the summit of Bishopdale Hill, the curve pictured in the accompanying illustration of a three-engine special returning to Nelson. Note in the illustration how all the hand brakes are on one side, different from the situation on main lines where the brake levers are liable to be found on either side and at either end. Having all the hand brakes on one side simplified the problem of secur-

ing them while smothered in steam and smoke in the tunnel.

After a brief stop at Bishopdale the engines quickly accelerated to 25 m.p.h., their fires were allowed to die, and the injectors were on to refill the depleted water levels while drifting with the van and three car brakes restraining the forward plunge. Approaching milepost 2 at the reverse curves, engine brakes went on lightly, running in slack in the stretched out couplers. Then the leading driver opened up the whistle valve in a long blast for the Totara Street crossing and for the semaphore and crossing gates at Nelson Station.

Three or four one-horse landaus were normally waiting to take patrons away, and a sizeable crowd was usually waiting on the platform. The passengers alighted, turned away, and headed for home, while locomotives and crews were forgotten by all except one enthusiastic rider who had one last look at the men and their very small but wonderful machines.

The two "Fa"s had covered 118½ miles since leaving town that morning, and a lot of hard work by engines and men had been successfully accomplished. In making scheduled arrival times at Glenhope and Nelson, much effective concentration had gone into the operation of throttle, cut-off and braking by the enginemen, and equally as much into the operation of shovel, clinker hook, and injector by the firemen. Now that steam has vanished, this trade is a lost art.



Photograph: G. T. Radcliffe

Four "Dg" class 750 h.p. diesel-electric locomotives lined up at Linwood locomotive depot, Christchurch. Thirty of this class were in the South Island in 1972, and 12 at Auckland.