

EXMOOR LOCOS ON THREE GAUGES ■ VERY EARLY NG IN SCOTLAND

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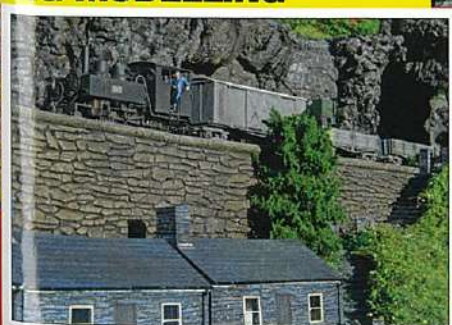
SHAY RESTORED TO SERVICE IN TAIWAN

# PLATINUM PLANS

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# A Shay for the 21st Century



Michael Reilly describes the successful authentic restoration of a Shay locomotive, now operating regular services in Taiwan.

Regular readers of *NGW* will need no introduction to the Shay articulated locomotives of Taiwan's 2ft 6in gauge Alishan Forest Railway (AFR). Some 20 were supplied to the line between 1910 and 1920 in two separate classes of 18 tons two-cylinder and 28 tons three-cylinder versions. They formed the motive power mainstay on the Alishan for the next five decades, becoming as synonymous with the line as the B-class 0-4-0STs have with India's Darjeeling Himalayan Railway.

By the time steam working officially ended in November 1984 just two Shays remained in working order. Two others had been wrecked in accidents, a third badly damaged in a fire while a fourth, no 14, was

**Heading: Restored Shay no 21 on its special service between Chiayi and Beimen, paired with the attractive cypress wood carriages.**  
Photo: Tsai, Wen Chi/AFR

**Below: First moves – a team from Slovakia's Čierny Hron Forestry Railway inspecting 18-ton Shay no 17 in Chiayi with a view to possible restoration, 30th June 2019.**

donated to Australia's Puffing Billy Railway in the 1970s. The rest remained in Taiwan, some in store but most on static display at various locations around the country, exposed to the elements and usually in poor condition.

One of the two still in use at the end of steam, 28-ton no 26, was steamed from time to time for special trains. The success of these persuaded the Forestry Bureau, which owns the line, to restore a further two, nos 25 and 31, also 28 tonners, to working order in subsequent years.

### Oil and diesel

While no 26 remained in its original coal-fired condition, the other two were modified to take account of contemporary operating practicalities. Converted to oil-firing, they were equipped with diesel-powered compressors in the bunkers which enabled steam to be raised quickly, and electronic controls which

permitted driver-only operation.

Undoubtedly practical from an operating view, they were hardly authentic, at low speeds the noise of the compressor overpowering the more traditional sounds of a steam loco. But sentimentality rarely

outweighs practicalities and in recent years all steam operations have been handled by one of these two, with no 25 based at Chiayi and no 32 at Alishan. The author was fortunate to witness a rare steaming of no 26 (and privileged to experience a ride on its footplate) in 2006. But Chiayi City council introduced a ban on coal fires not long afterwards, since when it has remained in store.

These matters largely rested in 2009, when any thoughts there might have been about restoration of more Shays were overtaken by other events. In a controversial move, operation of the AFR had been contracted out to a private company the previous year. However, after a super-typhoon saw



large sections of the railway washed away in landslides, and a dispute over who was responsible for paying for reconstruction, the Forestry Bureau took back control.

The immediate priority was to restore services over the whole line, a major task in view of the damage that had been done and one that is not yet finished – completion of a new tunnel through the most badly damaged section was planned for 2023 and full re-opening likely to follow this year.

The Forestry Bureau then sub-contracted operational responsibility for the line to the state-owned Taiwan Railways Administration. This lasted until 2018, when the Bureau decided to take back operational control.

### New approach

In recognition of the line's cultural and historical significance there was now to be a distinct change of approach to its operation, with a much greater emphasis on heritage aspects than hitherto. To this end, the railway was formally reconstituted as the Alishan Forest Railway Cultural and Heritage Office (AFRCHO).

Meanwhile, outside awareness of the remaining Shays was growing, and with it interest in trying to restore some to working order for operation outside Taiwan. At least one British organisation contacted the AFRCHO in a bid to acquire one and bring it to the UK for restoration.

The most determined approach, however, came from Slovakia's Čierny Hron Forestry Railway, which sent a team of engineers to Taiwan to make a full inspection of 18-ton Shay no 17. An offer was then made to restore it to full working order, with the proviso that this would be done in Slovakia and that the loco would spend some time thereafter operating on the Čierny Hron railway. Together with the Welshpool & Llanfair in the UK, the Čierny Hron line has a 'sister railway' relationship with the AFR. ➤



**Below left: Up she goes – no 21 is lifted onto a road trailer at the AFR depot on 15th October 2020 for transport to workshops in Taichung for restoration. Before moving to the depot in 2019 the loco had previously been displayed in a park for more than 40 years. Photo: AFR**

**Above: Newly restored 28-ton Shay no 21 in the AFR's Beimen works.**

**Right: Inside the cab, showing the eco-fuel briquettes under test and some of the ash they generate. Note the floor level handbrake and the short-handled firing shovel.**

**Below: No 21 undergoing running tests, coupled to one of the AFR's large diesels – one of these is this month set to enter service on the Welshpool & Llanfair Light Railway.**

**Below right: Adjustments underway to the seating of the rear driveshaft.**

*Uncredited photos by Michael Reilly. All taken at Chiayi on 23rd-24th November 2022 except where otherwise stated.*





authenticity, as does retention of the pump by which water is fed into the boiler. This has the great advantage over injectors of requiring a much lower steam pressure to operate successfully – just 5kg/cm<sup>2</sup>, or 71lbs psi – of crucial importance when working trains up long gradients of five per cent (1 in 20) or more.

Perhaps the most striking aspect of the restoration has been in the choice of fuel. Coal remains prohibited under Chiayi City ordinances but after approval from the city council, the decision was taken to use biofuel. At the time of writing, tests on this were still underway but the fuel of choice is likely to be Indonesian briquettes made from compressed wood chips and coal dust. More authentic than oil, this generates heat more quickly than coal but also burns faster and generates considerable amounts of ash. The task for a modern fireman looks set to be a demanding one, especially with that short-handled shovel!

**Special trains**

Restoration of no 21 was completed in May 2022, followed by extensive tests and steaming trials at Chiayi. Since February this year the loco has been operating a special service on the first Saturday of the month between Chiayi and the first intermediate station of Beimen, hauling the cypress wood carriages introduced last year.

Participants on the special trains, tickets for which cost 400 Taiwanese dollars (equivalent to around £10) are given a guided tour of the loco shed and a commemorative ticket. The railway is also conducting weekly training for loco crew and engineering staff on the operation and maintenance of Shay locos.

The investment in the loco, in finance, manpower and political terms, has been significant and the now renamed Forestry and Nature Conservation Agency is to be commended for its support for the project.

Most encouraging of all, building on the experience gained, the go ahead has since been given to begin work on a further loco restoration – backed by central government funding, the project to tackle no 17, one of the smaller 18-ton engines, will begin in the summer. Thanks to such support, we should be able to enjoy the sight and sound of a working narrow gauge Shay for many years to come. **NGW**

■ The AFR produced a Youtube film on the restoration of Shay no 21, to the line's usual high standards. It can be watched at [bit.ly/3TMNSU2](http://bit.ly/3TMNSU2)

The offer may have been tempting, but the AFRCHO and its parent Forestry Bureau had to take account of domestic sensitivities and the cultural significance of the Shays – imagine the reaction in the UK if one of the Ffestiniog Railway's double Fairlies was sent overseas for restoration. After due consideration the offer was therefore declined, although the possibility that a Shay may yet go overseas on loan has not been ruled out.

The growing foreign interest in the Shays had, however, helped convince the Bureau that it should pay for the restoration of another one. After a full evaluation of the condition of those still in store on the railway, the decision was taken to restore no 21, another of the 28-ton three-cylinder class.

**Heritage wins**

The least-challenging option would have been to restore this loco in similar fashion to nos 25 and 31, with oil firing and electronic controls. But a powerful counter argument was made that restoring a Shay as near as possible to its original condition was important for more than purely historical reasons. It would also contribute to preserving traditional skills in steam loco construction and maintenance and passing these on to future generations. This view prevailed and the decision was taken that no 21 would be restored to what can best be described as fully operational museum condition.

Very few operating steam

locomotives around the world today can claim to be in anything like this condition. Boilers must meet modern safety regulations and while other modifications may not be as obvious as oil firing and electronic controls, alterations such as improved blastpipe arrangements, the more efficient lubricators and more ergonomic cab arrangements are today the norm.

Constructing a new steel boiler to modern standards was unavoidable for no 21 if it was to run again but every other part on the locomotive is either original, including the gears and cylinders, or has been carefully copied from the original.

Painstaking attention to detail was often required, such as in the precise angle of the bevel gears on the drive shafts. Most of these too are original, re-machined to ensure uniformity after more than 50 years of service. To add to the challenge, none of the original blueprints or drawings survived, so patterns had to be made from the existing components before new ones could be made.

There have been no concessions to modern levels of comfort. The handbrake is almost at floor level and the original short-handled coal shovel survived and remains in use. Both are uncomfortable arrangements for today's fireman and suggest that in the early years, his or her predecessor spent most of their shift either on their knees or squatting on their haunches – not much fun over a journey lasting several hours!

A colonial-era oil can that was found during restoration adds to the

*“Investment in the loco has been significant – the Forestry Bureau is to be commended for its support for the project...”*

**Above: Plenty of admiring viewers as no 21 pulls away on another service. Photo: Albert Wu/AFR**

**Below: Shay no 17, the next to be restored, is a smaller 18-ton loco very similar to no 13, which is displayed in a park close to the Alishan's Chiayi station and was photographed by NGW editor Andrew Charman on his visit to Taiwan in December 2018 (NGW 137).**

