

Swiss Vapeur Park at Le Bouveret.



*Shed scene at Le Bouveret*

My wife and I are both keen on Switzerland, over the last few years we have been lucky enough to have a number of visits to the Swiss Vapeur Park on the shore of upper Lake Geneva.

We like to go when they have their international steam meet, this is usually over two weekends and the week between them, in June.

The trip there is quite easy, we usually drive it in a day. We start from home at about seven in the morning, put the car on a channel tunnel train about an hour later and are off on the French motorway about an hour after that. Our route takes us through Reims and down towards Dijon. From here we turn off to Besancon leaving the motorway and going over the mountain pass to enter Switzerland near Lausanne. We then drive along the north shore of Lake Geneva passing Montreux, arriving at Le Bouveret at the very far end of the lake in time for a late tea. We share the driving doing about two hours each with a short break on each changeover. We usually take one of the small electric engines and a passenger car along with all the other holiday paraphernalia so the car is pretty full! The drive is all considered part of the trip, we have our favorite places to stop, full advantage being taken of hypermarkets, meringue shops, cheap diesel, etc.

#### THE TRACK AT LE BOUVERET

The Swiss Vapeur Park is situated in an idyllic spot by the lake in the village of Le Bouveret. It occupies a medium size plot with a lower and upper loop giving a run taking about ten minutes to complete. This is to me the most photogenic miniature railway I have visited, not only is there lake and mountain scenery in abundance but the line also has a number of scale buildings, some being used as cafes or gift shops. There are also a great number of tunnels and bridges to negotiate on the way round.

As you leave the three-road station you pass the electric locomotive shed on your right, then under a large girder bridge and into the first tunnel under the top loop. This is quite a long tunnel with a sharp left turn on the exit running alongside the full size Swiss railway. On your left is a large lake crossed by a suspension bridge modeled on San Francisco's Golden Gate Bridge. At the end of the lake there is a set of points leading to a rack line that climbs over the main line coming down on the far side of the hill to rejoin the original track. We go under the rack line bridge, loop round the hill, and after passing through a short tunnel and find ourselves crossing the Golden Gate Bridge. This bridge has one of the best bridge rumble noises I have experienced, full size or miniature.



We then go through a couple more tunnels and skirt round the back of the station heading to the far end of the site passing a number of the small buildings and level crossings with automatic warning buzzers. There is another lake at the other end of the line and here we start the long climb to the top loop, this section is double track as the down line is laid beside the one going up.

*Start of the rack section*

The upper loop is about twelve feet above the lower line and crosses a number of the large bridges and tunnels that we have previously been under.

We pass the station for the third time on the high level, with views out over the lake. On top of the hill is a small castle complete with a proper vineyard, (the park makes its own wine!). We go round the castle, rejoin the up line and roll down to the lower level again. If you get the speed setting right you can get brake squeal out of the loco sound system down the full length of the downhill slope.

*Scale buildings at Swiss Vapeur Park*



From here we pass more buildings and crossings, go round the back of the steam shed and reenter the station. It is quite a trip!

The track is laid to five and seven and a quarter inch gauges and uses steel channel section laid in its side. The rack line is laid to seven and a quarter inch gauge only.

### RACK LOCOMOTIVES

Fred Stauffer is one of the regulars at the Swiss Vapor Park, and a Maxitrak customer of long standing. When the rack line went in at the park it was not long before he came to us to make a

suitable engine. Fred is a retired mechanical engineer and used to work in the US so his English is excellent, he is a past master at taking our



designs and modifying them to do something different.

*A good load on the rack*

When it came to designing an electric rack engine we started with a standard Simplicity 2 chassis. We extended the wheel base and put on outside rod drive, this gave us room to put the rack gear in the center of the chassis. When you are going up the rack the engine needs about three times as much power as it does on the flat. In order to pull a normal load with the same motor the rack gear is run at one third of the speed of the rail wheels. So as to prevent the two drive systems fighting each other on the rack the rail wheels are driven through a clutch that has to be disconnected when the rack is in use. When the drive is declutched the rail wheels are only serving to keep the locomotive on the track and take no part in the drive system.

This makes driving interesting! As you approach the rack the train needs to be slowed right down, when you hear the gear click into engagement with the rack you need to throw the clutch out. From then on you proceed slowly up the rack at one-third speed, at the top you keep going at the same pace on the way down. There is a rule when driving a Ford Model T (or any other car with only rear wheel brakes) to go no faster down a hill than you would normally go up it, I feel this is good practice on the rack as well.

*The first rack engine at work*



At the back of the train is a small guards van equipped with a rack gear and an anti roll back or runaway on the downward trip it only serves to help you on your way. Fred tells me that on the full size the speed going down is less than on the ascent as there is a greater danger of the rack gear climbing up in the rack and derailing the engine during descent. The typical speeds are 25 kph up and 15 down, this is why up trains



usually have to wait for descending trains in the passing loops.

As on full size Swiss railways our engine was equipped with three braking systems, one on the wheels, one on the rack gear and one through the motors. In practice all the braking is done on the motors which hold the speed down with ease, it is only when you pop out at the bottom of the rack that you find your self coasting along with no drive and two of the braking systems not operative. As this is usually heading towards a red light at the junction back to the main line it pays to be speedy engaging the wheel drive clutch to get matters back to rights. From then on the engine is driven like a standard adhesion locomotive at normal speed, the rack gear is in constant mesh and continues to turn but has

#### *The second rack engine*

nothing to engage with so does not affect normal running.

The original motor was half horsepower that Fred had in hand, this found the going too hard and burned out after a short while. A petrol hydraulic system was tried but due to noise was soon converted to a one horse power electric system which has continued in use ever since. This engine did all that was asked of it and looked very smart with a Swiss box cab body modeled after the Schoellenenbahn locomotives and made by Fred. The next electric rack engine was a development of this original design, it had three axles and a more powerful one horse power motor, it's size and weight greatly increasing its haulage capacity. The chain strengths were increased and two drives were taken off the layshaft to the rack gear, one on either side of the gear. This gave me some headaches getting all the different chain drives to mesh each other and the rack brake gear. Once again Fred made the body but this time a narrow gauge diesel outline with Golden Pass Railway blue and yellow livery. As with the first engine this locomotive did it's stuff in a similar manner handling up to two large riding cars full of people.

The third rack locomotive was quite a different animal, it was based on the Simplicity 2 design like the others but had a petrol hydraulic drive. I consider this design to be the most elegant solution to the problems presented by this type of engine. The rail wheels are driven by a more or less standard drive system. This consists of a Honda engine in the cab, tooth belt drive to a hydraulic gearbox under the bonnet and then chain drive to a lay shaft under the chassis and on out to the wheels. Chains are heavy duty and the wheelbase is spread as on the first engine to allow room for the rack gear, outside rod drive is more or less universal on these engines because of everything going on inside the frames.

The rack gear is quite small and is geared direct from the lay shaft so as to do the same track speed as the wheels. Because of this there is no need for a clutch in the drive system making the layout easier. On the rack the extra low ratio is achieved through the hydraulic drive so you only have to drive slowly into the rack, balance the power against the load on the rack and speed up when leaving the rack section.

To achieve this under more control the usual hydraulic control lever was replaced with a screw system, like a steam loco reverser. Working off the linkage we had an indicator

showing the ratio being used, the first section had a yellow band showing it could be used safely on the rack, over this ratio was for flat running only. We also provided a screw down hand brake and double chain drive to the rack gear. Unlike the other two rack locos this one had a standard Simplicity 2 body but additionally squeezed under the bonnet was an extra silencer, spark arresting exhaust tail pipe and a set of air horns.

On test this engine would pull sixteen to eighteen people up the rack but is happy with about ten to twelve. A rack lubrication system is being added as a few drops of oil on the rack gear make a lot of difference to the Haulage power. In addition to running at Le Bouveret all three rack engines have been used in other locations including public running on a commercial basis so they have all had a lot of use.



*Petrol hydraulic rack engine*

## TRIPS FROM LE BOUVERET

In this most picturesque part of Switzerland there are lots of other attractions at hand. Both my wife and I are very keen mountaineers, in fact I would go so far as to say that we will tackle any mountain with a railway up it! As a great many Swiss mountains come with this very useful appendage one is almost spoilt for choice.

As with many mountain regions the weather can be changeable, a mountain trip can be made or marred by the weather and it pays to not plan a particular day but to just go when the weather looks good.

One of our favorite trips starts on the paddle steamer to Montreux, these lake steamers are the height of Edwardian elegance and worth a trip on their own. The first one to leave Le Bouveret in the morning has been moored there over night and is always one of the 1950's diesel conversions, but if you wait for the second or third it might be one of the steam powered ones! Most tourists are looking at the thirteenth century castle Chillon standing on its own island with the mountains behind and admiring the scenery, I am usually hanging over the rail in the engine room watching the machinery go round.

This reminds me of childhood memories doing the same thing on the "Medway Queen" in the '50s. One big difference is that the Swiss boats are absolutely spotless, you could eat your dinner off any part of the engine. One young American visitor remarked to his friends, "I don't know how it is powered, must be hydraulic or something" it took one of those "don't you dare" stern looks from my good lady to stop me putting the young man right on the matter. Pollution is a big factor on the lake and oil fired steam ships are better than the diesel ones in this respect.



*Paddle steamer on lake Geneva*

Montreux is a beautiful city to visit on it's own but mountaineers should direct their steps to the station where they will find the Swiss Railways main line that runs along the shore of the lake, the meter gauge rack and adhesion Golden Pass line that climbs over the mountains to Lake Thun and beyond to Interlaken. The third line is the rack railway to Rochers De Naye. This is the line we get on, when you see the seats facing each other are on different levels you know you are in for a good ride! The line climbs out of the town in a long tunnel but is soon offering excellent views over the lake, which improve as the line climbs higher. One feature of many of the Swiss lines is the use many of the older items of equipment as well as new ones. The Rochers De Naye line is a good example, on days when the loading is light you are likely to be given a ride on a 1950's railcar while there are box cab electric locos in use, dating form the early days of the line. We climb over six thousand feet to the summit of the line where the views are breathtaking, on a clear day Geneva can be seen some thirty miles off down the lake.

The next station down the main line is Aigle, this small town has no less than three meter gauge tramways leaving form the station car park. The first one sets off in the wrong direction up a very narrow one way street, and then pulls in to the depot on the outskirts of the town. The driver gets out, walks to the other end of the train, changes the points for the mountain line and gets back in. We are then off on the rack all the way to Leysin some three thousand feet above sea level. The second line is also interesting but does not



have rack sections, preferring to wind around to gain height. The third line is both rack and adhesion and climbs up to Champery at an altitude of some four and a half thousand feet above sea level.

At the next station down the main line, Bex, yet another narrow gauge rack and adhesion line climbs to Villars and Bretaye.

*Aigle from the train to Leysin*

As you follow the main line away from the lake you get into a large glaciated valley, there is a flat valley floor with steep mountains on either side. The next large town after Aigle is Martigny situated where the valley does a right angle turn. Here another meter gauge rack and adhesion line starts, taking us to Chamonix.

After a short level run from Martigny this line commences a hair raising climb out of the valley and then crosses the border into France before traversing many deep gorges as it winds its way towards Chamonix. There appear to be virtually no border formalities on this line, so if you want to



smuggle French cheese in to Switzerland

*Champery train at Aigle*

(or Swiss cheese in to France) this is the line to use. At Chamonix there is a second rack line taking you to the sea of ice, and on the platform is a plinthed steam locomotive.

The railway goes on from Chamonix deeper in to the French Alps, as yet unexplored. It is the only line we have seen using third rail collection as well as overhead, swapping from one to the other at random. Many of the adhesion sections are pretty steep as well as the rack sections. Chamonix is like a typical small French town except that it has Mont Blanc in the background complete with glacier running down its side.

Back in Switzerland the next interesting line along the valley is at Visp. Here we have the meter gauge rack and adhesion line to Zermatt and the Matterhorn, the Matterhorn – Gottard Bahn. Of all the lines this is the one most like a large model layout. This is especially true of the bright red coaches that look for all the world as if they have just been taken out of a gauge 1 L.G.B. train set box. The line has run parallel to the main line from Brig but at Visp it sets off up a small side valley full of waterfalls and cliffs. When the valley looks impassable we switch to the rack to make an escape. The locomotive



slows for the rack entry and then speeds up again, all coaches are equipped with a rack gear for braking, when our coach at the end of the train hits the rack we are going quite a speed and the poor old gear gets one hell of a clonk as it engages. You expect to go slower on the rack than on the level, but not on this line as the train accelerates up the grade. The rack is also not a constant climb and includes some down hill sections as well as up. Zermatt is a car free town,

*Swiss, French border on the way to Chamonix*

everyone makes their way by train, a shuttle train runs to a large car park at the bottom of the mountain. This is the western end of the Glacier Express, which, the Matterhorn – Gottard Bahn operates right through the center of Switzerland’s Alpine region to Disentis. This is a one hundred kilometer run from the river Rhone to the Rhine, one of the world’s great railway journeys.

When you arrive in Zermatt you find yet another mountain railway going from Zermatt to the Gornergrat, at ten thousand feet high this offers excellent views of the Matterhorn (weather permitting).

There are eight narrow gauge lines connecting to the main line within a fifty mile run from Montreux.



*Overall advertising on Swiss national railways locos*

you can see why this a rail enthusiasts paradise. Even the operations on the main line are unusual, the normal train consists of a locomotive, a set of coaches and a driving trailer used as a push pull set. If the train needs more coaches they are added at the back, on the other side of the engine. This means the engine appears somewhere near the back of the train when the locomotive is pushing. Many of these engines have very bright all over advertisements adding to the odd look of the train.





### FRED'S "EIGER"

Having got two electric rack engines and one petrol powered one under his belt Fred felt the need for a steam locomotive for use on 7 1/4" gauge at the Swiss Vapeur park. There are two basic types of steam rack engine, rack only where drive is on the rack gear not the wheels and rack and adhesion where both must be powered.

*Fred driving "Eiger" on the rack*

The rack only engine is the simplest, usually the boiler is placed at an angle to the frames to keep the water level correct and the cylinders work the rack gear through levers or gearing so as to achieve the extra power needed to go up the incline. A rack and adhesion engine has to do all this and also work like a conventional engine on the level sections of track. There are usually two sets of cylinders, one works the wheels in conventional fashion, while the second set is geared to the rack drive which runs at a much slower speed. The boiler has to cope with the changes in level, including going down hill as well as up and is usually placed horizontally but with the tubes low at the smokebox end for uphill coverage. At the other end the top of the firebox top slopes down to maintain water cover when going down hill as well.



*Typical scene at the Swiss Vapeur Park*

There is a version of this type of engine using only two cylinders, the rack gear being directly driven by the coupling rods at the same speed as the wheels. To save complication this was the type of engine chosen. We had a look at the Maxitrak designs with a view to a rack conversion but considered the engine too small for the power required.

As it happened we had a large Romulus chassis in for second hand sale and this was used as the basis for Fred's rack engine named "Eiger". We did not get involved in the build of this engine but we gave it a once over for Fred before delivery. This included marking the two long water gauges for the three different modes of operation, uphill, level and down hill. Each gauge had a maximum and minimum level marked in red for uphill, white for level and yellow for downhill as I recall. The rack gear also had to be set accurately for height so as to match the rack on the track. These settings are important for correct operation.

As Fred said in his sing song Swiss accent, "I calculate that the engine will pull at least four people plus driver and brake van on the incline" and indeed it did, it was just the manner of it performing this feat that was remarkable.

As you come to the rack section the train is slowed to engage the rack, it is then necessary to give her full throttle to attack the slope. Anyone who has opened up a steam engine full bore will have some idea of what to expect. If Fred's engine needed to be called after a mountain then Vesuvius or Etna would have been more appropriate than Eiger as the smoke, soot and ash emitted from the chimney was more akin to a volcanic eruption while the noise sent people scurrying from the far corners of the park so as to see the cause of the commotion. At full bore Eiger was not slow and sped up the rack in pretty short order. At the top a stop is required to ensure the water level is high enough for the downhill trip, plus a couple of turns is put on the manual lubricator for the rack gear while the injector is on.

This spectacle proved to be a handicap for Eiger who found himself banned from taking the public up the rack, only special guests are invited to enjoy the baptism of smoke and hot ash that is an ascent of the rack behind Eiger. I am told that the few full size engines to this design put on a similar show, hence their unpopularity.

Eiger was not immune from a bit of soot throwing even on the level, my friend Julian was driving him (not up the rack) when a prim lady passenger behind tapped him on the shoulder and said in excellent English "driver your engine is putting carbon on me". I do not know his reply except that he found it highly amusing, however



*Double cylinder rack locomotive*

the lady passenger had the last laugh as unknown to us the rubber block on the rear suspension had spread and stopped the oil reaching the back axle box. After wearing itself about 5mm oval the axle seized while the train was in a most inaccessible part of the

line. This brought the entire proceedings to a halt while Eiger was manhandled ignominiously on to the nearest footpath out of the way.

With hindsight Eiger may have been more acceptable if he had two sets of cylinders or a gear system to lower the ratio of the cylinders for rack use. One of the features of rack engines with two sets of cylinders is the need to get the two synchronized when entering the rack. The rack engine needs to be started as the rack is approached. To give the driver an indication of the rack engine speed a small red disc is mounted on the front of the water tank, this twists to and fro with each revolution of the rack engine and lets the driver know how well he is balancing the speed to match the train speed. This is to be seen on some of the miniature rack engines running at the park and is another feature of rack operation that is unfamiliar to us from more level countries.

All in all this is a trip with a lot to recommend it, especially if you are interested in steam, railways and mountains.  
Andy Probyn.



*More scenes at the  
Swiss Vapeur Park*



