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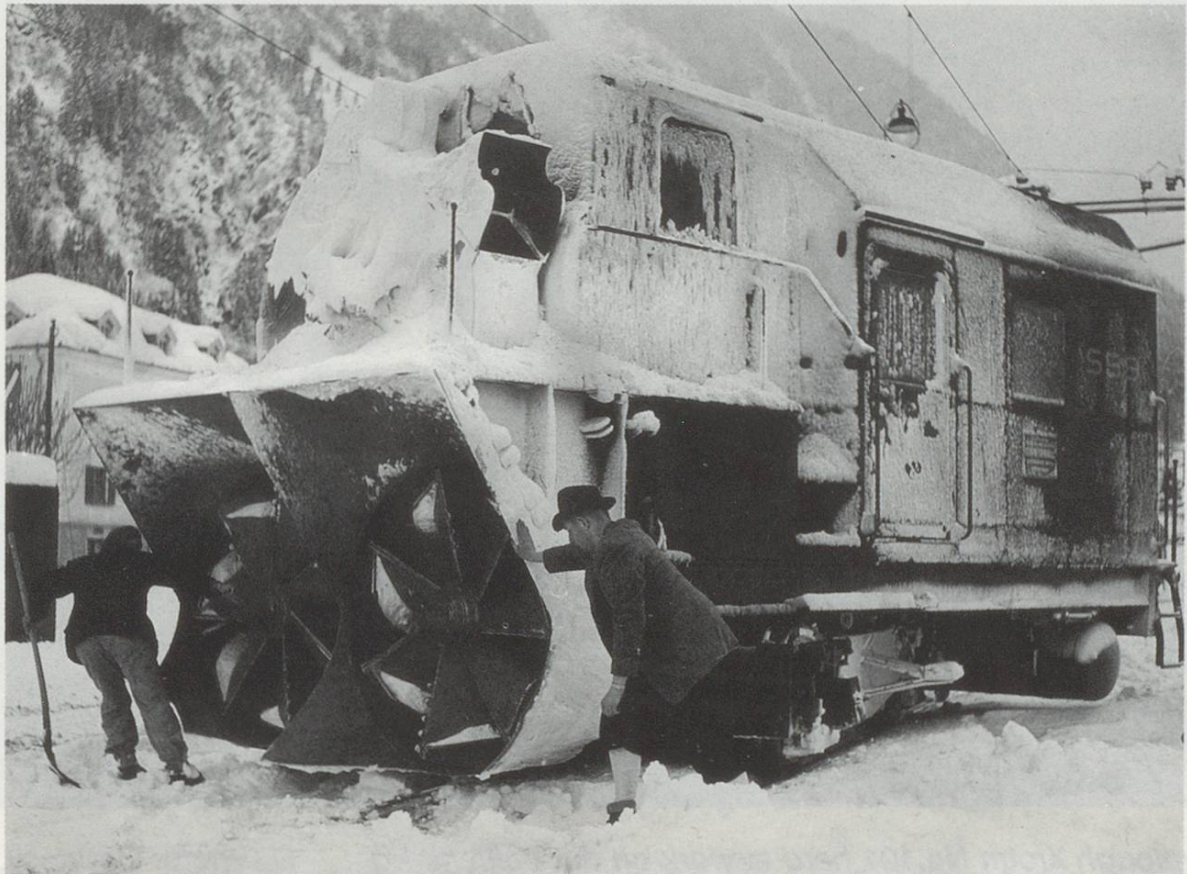
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# Snow Fighting on Switzerland's Railways.

By A.E. Hauser-Gubser.

The passengers of one of the famous alpine railways like the Gotthard or the Lötschberg, seldom appreciate what an immense amount of work has been done to make their journey over the line in a warm, comfortable passenger car in winter a real pleasure. Snow in various forms and heights may be a serious obstacle to a continuous flow of trains over lines, and is fought every winter by various means. the aim of this contribution is to show a little of this never ending fight.



*SBB Snowplough X99 at Airolo, preparing for next run.*

*Photo: Courtesy of SNTO.*

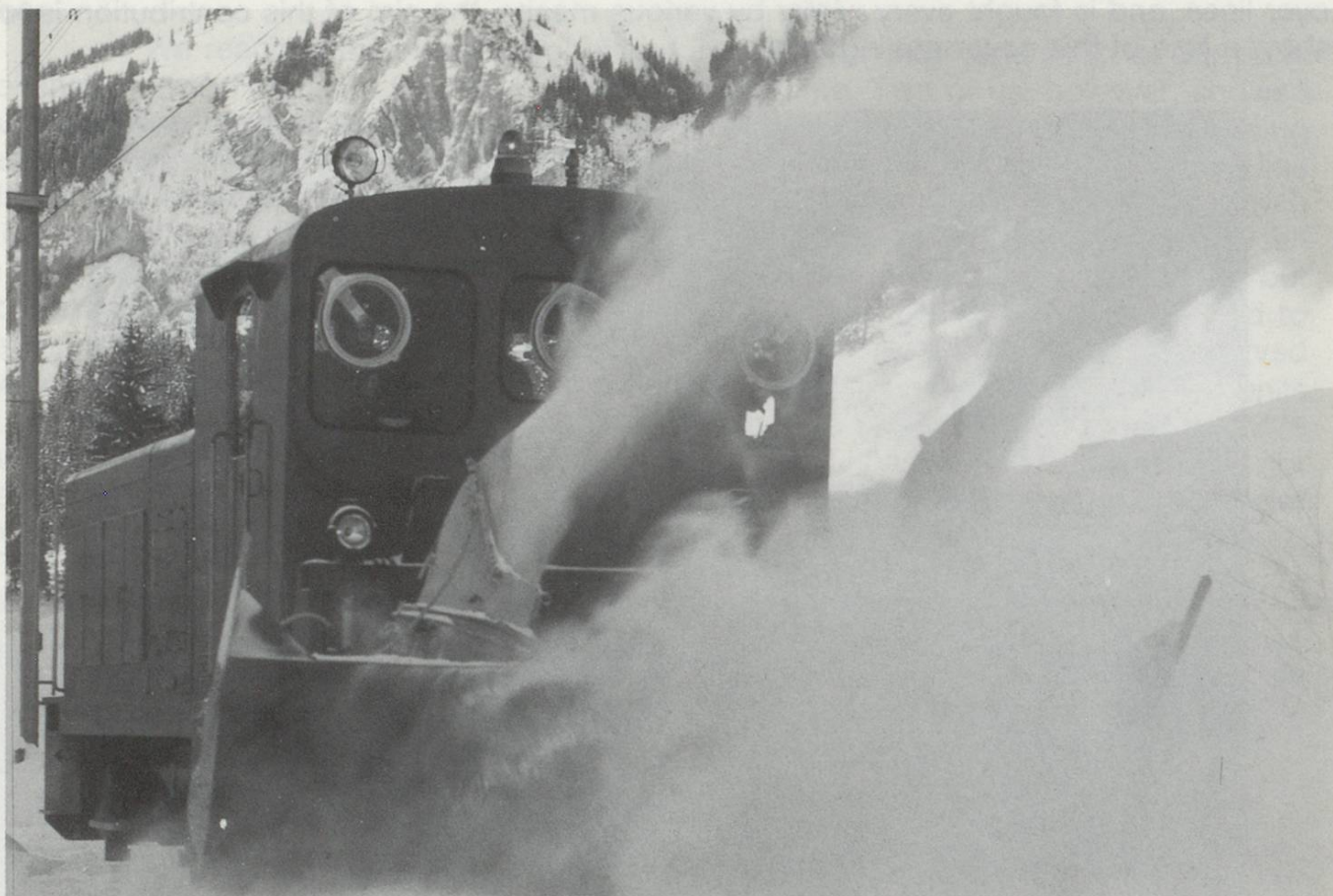
## **Some facts on Switzerland's prevailing Winter Meteorology.**

For a better understanding of Switzerland's winters, it is necessary to know that:-

1. In most winters the snow building up to cover the Alps - in various thicknesses - falls regularly.
2. In the sense of snow fighting, a critical altitude of 1000 metres is considered to be the point where the use of sophisticated snow fighting equipment is necessary. Below that altitude the use of snow ploughs is seldom necessary, but the frequency of use rises dramatically over that altitude. On the Bernina line, winters with 80 sorties of the rotary snow ploughs are common, winters with 100 sorties not unusual and in very hard winters the number may rise to 130 sorties.
3. The quantity of snow which may fall varies considerably according to the altitude, the prevailing winds and the geographical location. Contrary to what most



foreigners believe, it is not the north side which has the highest rate of snowfall per day. For instance, Göschenen, altitude 1105.8 metres, has measured a highest rate of snowfall of 0.90 metres in one day. Whereas, Airolo, altitude 1141.5 metres, at the south portal of the Gotthard tunnel measured a fall of 1.60 metres in one day. On the Bernina line which crosses the Bernina Pass at an altitude of 2253 metres, the snowfalls have attained 2.20 metres in one day. But here the problem is aggravated by the high winds building up snow drifts of considerable depths. It is not unusual to measure snow depths of more than 10 metres, depths of 7 metres building up through the winter are common.



*Snowplough Xrotm No.101 hard at work on the Lötschberg.*

*Photo: Courtesy, BLS.*

4. If a low pressure and a high pressure system meet on the Alps, the resulting meteorological turbulences almost always mean heavy snow falls in a few days onto already compact snow layers. If these snow falls reach a critical height in relation to the incline of the mountain slope and if the fresh snow is unable to stabilise, for instance during a longer cold snow free period, then the danger of an avalanche becomes more imminent. Although millions of francs have been spent on the protection of the railway lines of Switzerland, it is virtually impossible to foresee each avalanche. Proof of this is the avalanche which damaged the Rohrbach bridge on the Gotthard line in January 1981, resulting in its need to be replaced.

5. All over Switzerland is a network of weather stations which are keeping informed the Central Meteorological Station in Zürich and, as far as the snowfalls and avalanche protection are concerned, the National Institute of Snow and Avalanche Research on Weissflujoch near Davos in the Grisons. The latter issues daily an avalanche bulletin during the winter in addition to the weather forecast and, of course, the Railway Administrations may gather the necessary information for the coming days. Since the methods of



forecasting have become more accurate during the last 20 years, the Railway Administrations are now prepared in advance to locate their equipment in strategically important points to be ready as soon as they are called upon to remove the fallen snow. Of course, surprises are still possible. Usually however, the relocation of the equipment is possible early enough so that the passenger can safely assume that he can use the train he intends to board, although it is still sometimes necessary to close a line for one day.

6. To prevent avalanche damage on the railway line, the railways have instructed railwaymen to bring the avalanche down prematurely by the use of mortar shells. The original instruction was given by the Army, but the methods of avalanche firing having become very refined are now quite an art in themselves. Today it is possible to direct the firing of the mortar shells so that an avalanche goes the way it is wanted and then stops in the protection area built high up in the mountains.

7. Since the meteorological situation cannot be changed, the railways try to beat the avalanche and snow danger by the best and oldest means, the forestation of the slopes above the tracks. Whenever it is possible, entire forests are built up, damaged trees removed and replaced by young ones. On the Gotthard line alone, the Swiss Federal railways own a forest area of 7.5 million square metres. The forests have the following favourable influences :-

- (a) The protection against avalanches is perfect when the forest is dense right up to the timber line. Therefore, conifers, larches, firs and low growing bushes are mixed to exploit the ground up to the line.
- (b) The forests hold together the very thin humus layer, therefore rain and rivers cannot wash it away to provide an easy route for the avalanche in the coming winter.
- (c) Forests on a large scale tend to influence the climate in that area in such a way that they restrict the flow of wind. Therefore, the temperature is slightly higher than on open surfaces and the snow tends to melt that much sooner resulting in fewer, if any, snow drifts.

On behalf of all the Officers of the SRS  
I would like to take this opportunity to wish all members a

**VERY MERRY XMAS and a PROSPEROUS NEW YEAR.**

May I also thank all the members who have helped to make the Swiss Express what it is today, and a special thank you to all the Press Officers and Railway Officers whom I have pestered for information. Your help is greatly appreciated.

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