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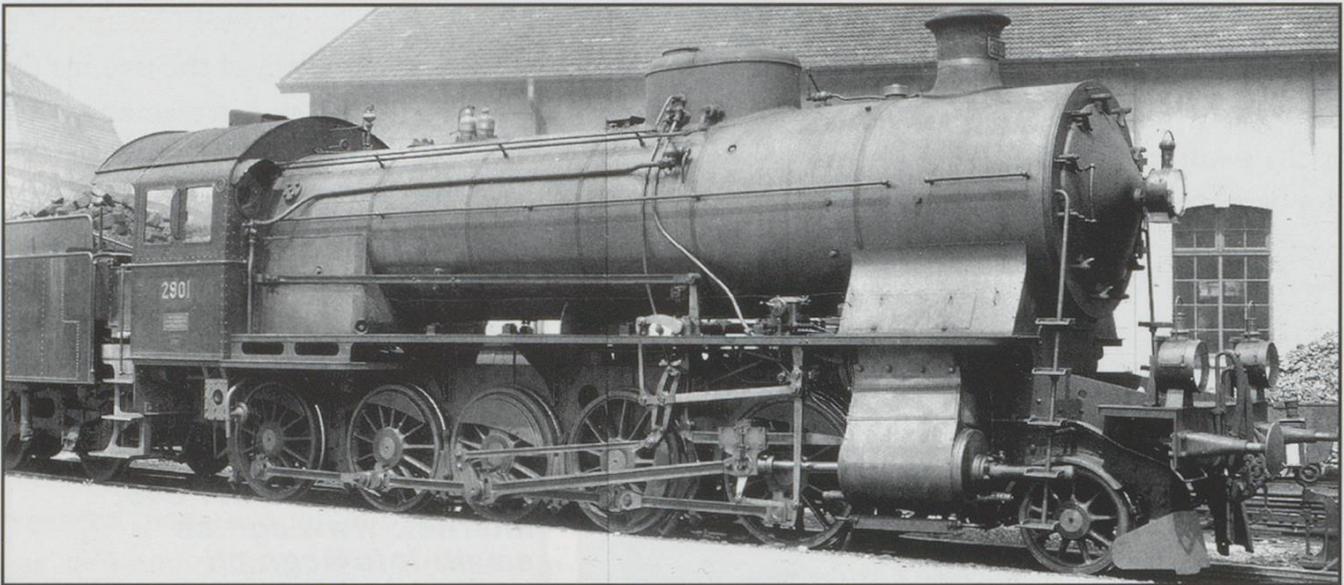
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**PART 6 - SBB  
HEAVY FREIGHT LOCOMOTIVE TYPE C 5/6**



**4 CYLINDER SIMPLE. PROTOTYPES.**

The Gotthard line - which became part of the SBB in 1909 - provided the most direct route for traffic from the north of the country to Italy - the BLS single track main line from Thun to Brig was at this time still under construction - and the Sion Valley single line route meant a huge detour via a line not capable of handling large amounts of traffic.

The trailing load requirement for freight traffic was up to 1,000 tonnes on the parts of the Swiss Federal network with a ruling gradient of up to 10‰, and up to 900 tonnes on the Gotthard valley lines. To enable this to be achieved a locomotive with a configuration of five driving axles would be required, but must remain within the 15 tonne maximum axle loading for the route. The final choice of locomotive was to be built by SLM and is now known as the C 5/6, the final delivery of which was the last steam locomotive built for the SBB. A total of 30 heavy goods locomotives of the Type C 5/6 would be required to work on the Gotthard and its feeder lines.

The prototype locomotives were to be built as a four cylinder simple locomotive

and delivered to the SBB in that form. However, delivery of the remainder of the class was as four cylinder compound locomotives at which time the SBB agreed to have the prototypes converted to the same form. The top speed of this locomotive was 65 km/h and a power rating of 1074kW made it the most powerful steam locomotive on the SBB network. It was ideal for the work on the heavy freight trains of the SBB main lines and the freight and passenger trains on the Gotthard mountain sections.

The two prototype locomotives - Nos. 2901 and 2902 - left the works in 1913 constructed as simple four cylinder locomotives with a boiler pressure of 13 bar and fitted with a 24-tube Schmidt superheater. Steam passed via piston valves to the cylinders, which measured 470 mm in diameter and had a stroke of 640 mm, controlled by Walschaerts valve gear. The 5 250 mm long boiler was protected by two pop-valves located on the boiler top at a point above the fourth driving axle. Sand from the large sand/steam dome was fed in front of the first and second driving axles.

Because of the curve limitations of the lines throughout Switzerland, a rigid wheelbase for such a long locomotive would present a major problem. However, the C 5/6 overcame this as the design included the Hemholz - Winterthur axle, whereby the front bogie and the first driving axle operate in unison. The location of the last driving axle is further back in the locomotive frame with its own double arm spring system, thus reducing the

tonne passenger trains at 35 km/h on the Gotthard mountain lines.

Both prototype locomotives underwent major rebuilding in 1920/2 to increase the boiler pressure to 14 bar and to convert them into compound engines. This modification involved the removal of the two inside low pressure cylinders and replacing them with high pressure units that exhausted into the two outside mounted low pressure cylin-



rigid wheelbase component to a level that is acceptable to the Permanent Way Dept.

Normal braking operations was via the automatic double-action Westinghouse system controlling brake shoes on driving axles 2, 3, 4 and 5 plus all trailing tender axles, and via a hand operated screw brake as the emergency back up. The locomotive while hauling a 1,000 tonne train for 20 kms over the level track section, would consume just under 2 tonnes of coal and 13.5 m<sup>3</sup> of water.

With a tractive effort of 152 kN, the C 5/6 was able to haul 1000 tonne freight trains on the general network, 900 tonne freight trains on the Gotthard valley lines, and 320 tonnes of freight at 25 km/h or 200

tonnes. When the work was complete the two prototype locomotives became standard in this respect in the same way as the locomotives in the rest of the series.

#### **4 CYLINDER COMPOUND LOCOS.**

The works of SLM delivered the balance of the C 5/6 series - Nos. 2951 to 2978 - during the period 1913 to 1917. These locomotives could be identified by the different arrangement for the cylinders. The later locomotives were built as four cylinder compounds fed from a boiler with an operating pressure of 15 bar and fitted with the 24-tube Schmidt superheater.

Although the Gotthard line requirements played a major part in the design of the C 5/6, not all of them worked full time on the line. Many of them could be found working heavy freight trains anywhere from the marshalling yards (Rangierbahnhof Rbf) in Basel Rheinshafen to Chiasso.

During the Second World War (1939 - 1945) the SBB received a request from the German Government for the loan of some steam locomotives for use on the German Railways (Deutsche Reichsbahn). Because of this action the SBB despatched 16 of the C 5/6 type locomotives to the DR in 1942. Locomotives Nos.2951 - 2953, 2955 - 2958, 2960, 2967, 2970 - 2972 and 2975 - 2978 worked the south Western district of the DR until returning to Switzerland at the conclusion of hostilities in 1945.

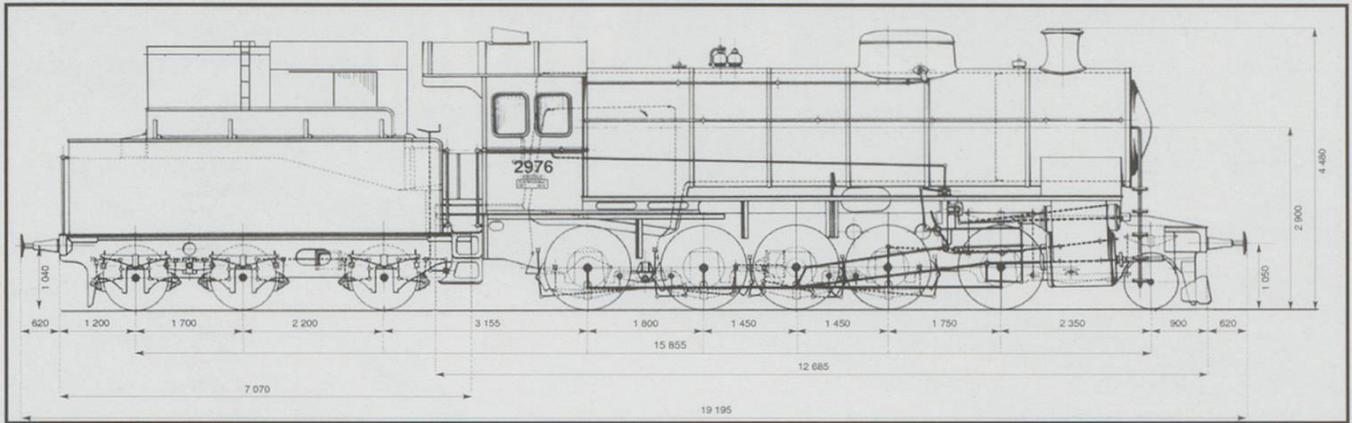
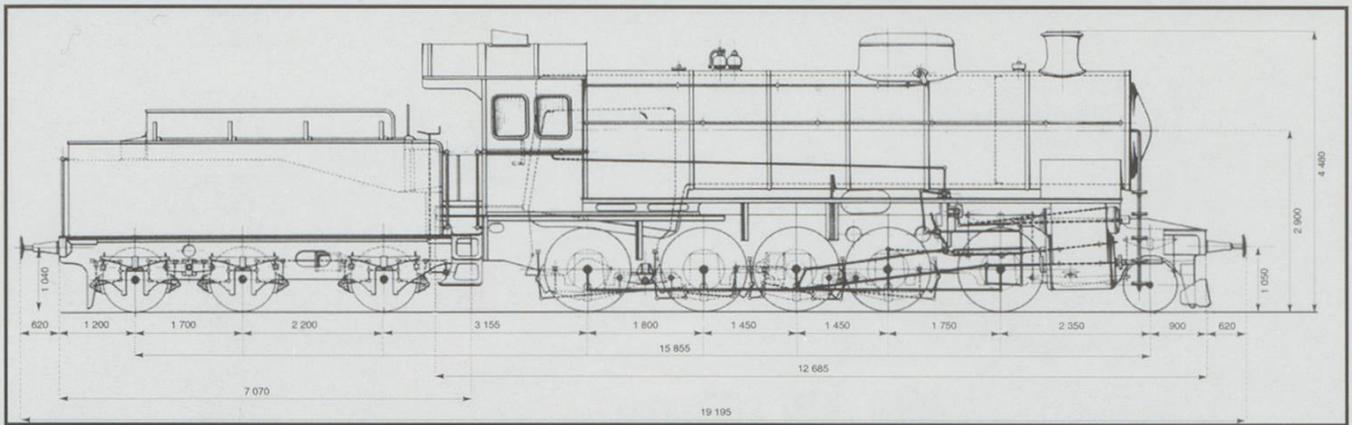
However, the wanderings of the C 5/6 class of locomotive were not yet over. Due to the ravages of war the French Government was so desperately short of motive power for the French National Railway (SNCF), that the Swiss once again received a plea for help. This time Nos.2951 - 2961, 2965 - 2973 and 2975 - 2978 along with 13 of the C 4/5 class locomotives transferred

to the French railway network for the period 1945 to 1946.

It was necessary to increase the adhesion weight of some of the C 5/6 locomotives involved in hauling the 1,200 tonne freight trains from Basel Kleinhüningen Hafen to Basel Bad Rbf and Basel SBB marshalling yard over the 7 kilometre long 14‰ gradient. Nos.2959, 2961, 2962, 2963 and 2964 underwent the fitting of an additional ballast weight in the form of 10 tonnes of lead. This extra load increased the locomotive

<b>Locomotive Data.</b>		<b>Prototype</b>	<b>Compound</b>	
<b>Type</b>		C 5/6		
<b>Nos</b>		2901-2902	2951-53	2954-78
<b>Built by</b>		SLM Winterthur		
<b>Works No</b>		2363 - 4	2360-2	2491-50, 2517-28, 2610-2612
<b>Date built</b>		1913	1913	1914-1917
<b>Power</b>	HP	1 459		
<b>Power</b>	kW	1 070		
<b>T/E at wheel rim.</b>	KN	149.00		
<b>Date in Service</b>		1913	1913	1914-17
<b>Date out of service</b>		1933	1954-66	1957-65
<b>Speed maximum</b>		km/h	65	
<b>Speed Indicator</b>		Klose		
<b>Driving wheels</b>				
Diameter	mm	1 330		
Wheelbase. Rigid	mm	2 900		
Driving Axle	mm	6 450		
Total	mm	15 855		
Length overall	mm	19 195		
Height	mm	4 480		
<b>Loco weight.</b>				
Empty	Tonnes	76.00		
Service	Tonnes	86.00		
Adhesion	Tonnes	74-80	76.10	77.50 <sup>(1)</sup>
<b>Total weight.</b>				
Loco+tender	Tonnes	125.60	127.60	128.40
Water capacity	m <sup>3</sup>	18.00		
Coal capacity	Tonnes	7.00		
<b>Brakes</b>	Type.	Double acting Westinghouse, Screw.		
<b>Cylinders</b>				
Number [Low pressure]		4	2	2
Bore	mm	470	710	690
Stroke	mm	640	640	640
Number [High Pressure]			2	2
Bore	mm		470	470
Stroke	mm		640	640
<b>Boiler</b>				
Op.Pressure	Bars	13/14 [Rebuilt]	15	15
Length	mm	5 250	5 000	5 000
Boiler Tubes/Sup'htr			187/24	187/24
Firebox	m <sup>2</sup>	13.70		176/28
Grate area	m <sup>2</sup>	3.70		
<b>Maximum Trailing load, all types</b>				
<b>Gradient.</b>		<b>Passenger Traffic</b>	<b>Freight Traffic</b>	
Level		550 tonnes	1000 tonnes <sup>(2)</sup>	
10 ‰		500 tonnes	900 tonnes	
27 ‰		200 tonnes	300 tonnes	
<b>Constn. cost</b>	SFr	143 000	168 400	168 400

Notes.  
 (1) Increased by 10 tonnes with fitting of lead ballast [Service. Basel Kleinhunigen Yard to Muttenz].  
 (2) Increased to 1 200 tonnes for locos with lead ballast.



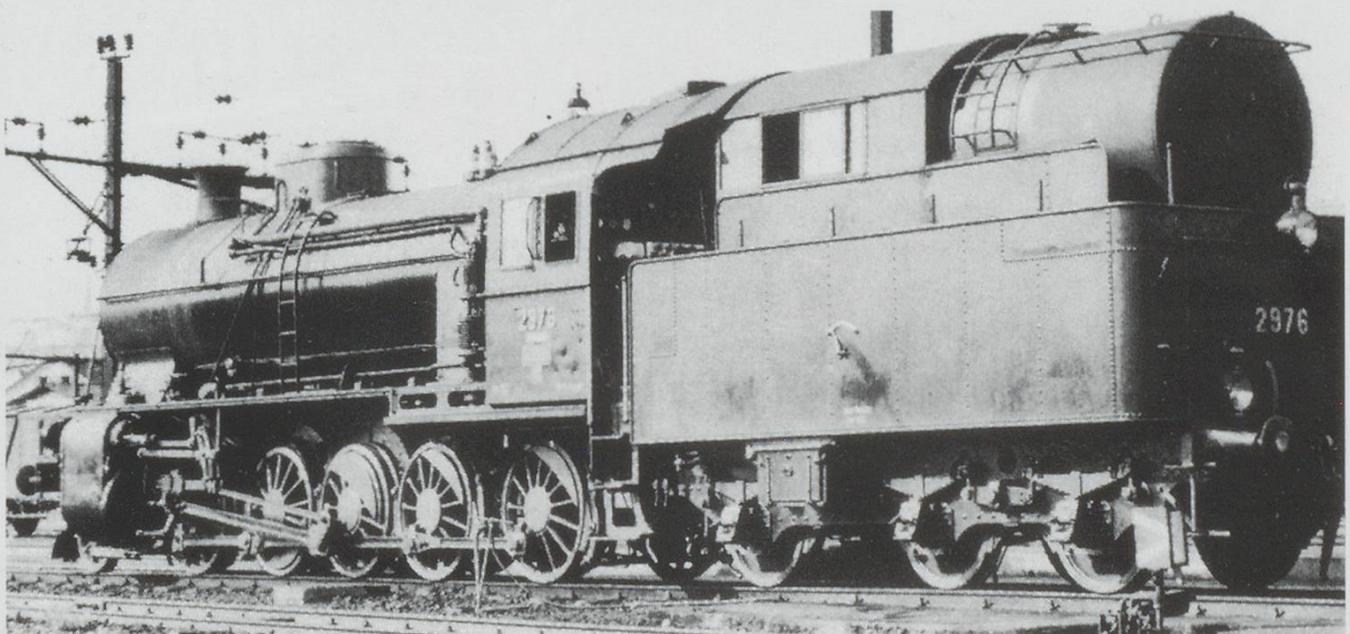
adhesion weight from 76 tonnes to 86 tonnes but research failed to uncover the results and duration of this test.

With the arrival of the electric locomotive on the scene and the demand for locomotives able to haul over 1,200 tonnes on the Gotthard valley section, the C 5/6 started to withdraw from the main lines. They spent the last part of their lives in the Basel Harbour yard as well as the larger SBB

shunting yards. Up to 1960, they also worked with some of the Eb 3/5s that had transferred on to the non-electrified Gotthard feeder line that ran from Luino to Giubiasco.

Locomotive No.2976 was the object of an experiment to overcome the increase in coal prices and to try to improve the effi-

*Steam around Switzerland continues on page 40.*





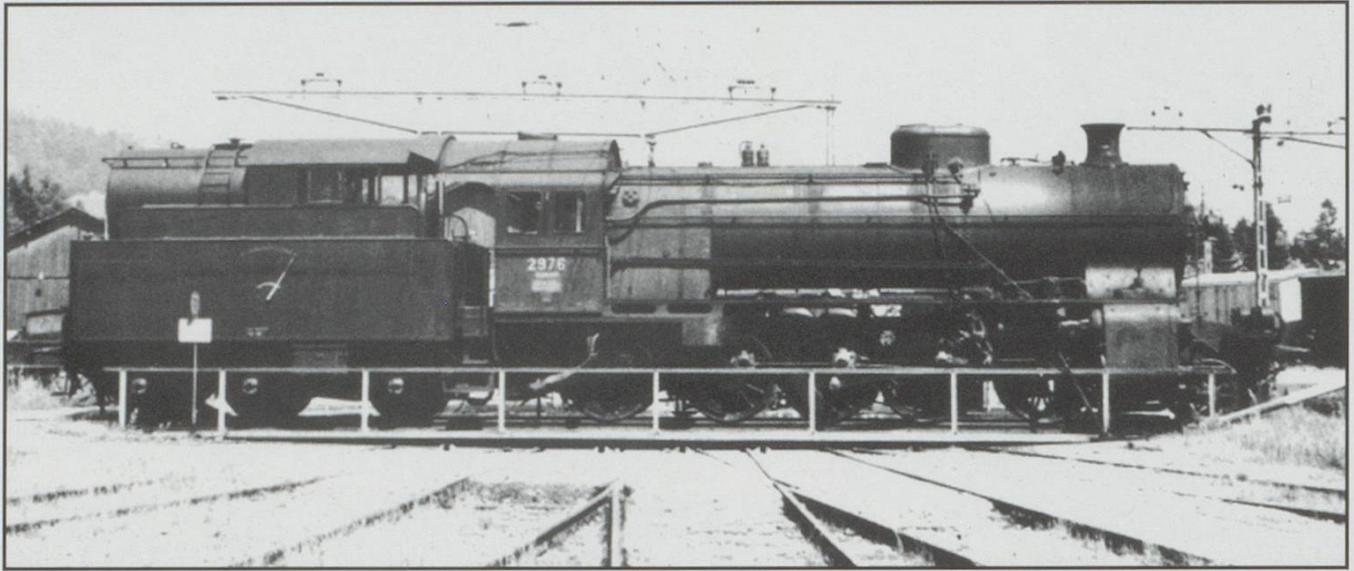
*Above: An MOB ABDE 8/8 arrives at Château D'Oex on service to Montreux. 19/05/01. Below: SBB Re 4/4<sup>II</sup> 11108 in Swiss Express livery is pictured at Neuchâtel awaiting its next turn. 24/05/01. Both photos: DS*





*Above:* The new Riffelalp Tram in front of Switzerland's most famous mountain, the Matterhorn. 7/2001. Photo: George Hoekstra. *Below:* A BLS 465 heads a BLS coach set near Kandersteg. This will become only a memory in the next few years as the BLS hands over main line trains to the SBB in exchange for Bern SBahn services. The photo is published courtesy of the BLS.





*Continued from page 37.*

ciency of the C 5/6 locomotive. An engineer, Sprenger of Arth-Goldau, got the go-ahead in 1953 from the SBB to carry out the conversion of C 5/6 No. 2976 to oil firing. New firing controls allowed for the burning of oil instead of a solid fuel, by fitting heat retaining spheres in the fire grate and spraying them with a mist of fuel oil.

The coal area in the tender contained a 4,000-litre storage tank for the oil, and a cabin for the staff monitoring the tests. At a later date the entire tank and cabin underwent a total rebuild into a fully covered area over the tender. During 1959, a larger tank with a larger capacity of 7,000 litres replaced the smaller unit in an effort to improve the range of the locomotive. Extensive tests on most lines served by the SBB involved the time of several engineers over many months.

Unfortunately the person who planned the conversion, in spite of the rather grandiose office, had failed to win any financial or engineering backing to develop the idea. On top of which a new all-purpose electric locomotive, the Ae 6/6 made its debut on the Gotthard in charge of both passenger and heavy freight trains, thus making the trials on the C 5/6 purely academic.

No. 2976 was not converted back to coal firing, but instead retired from service in

1964. Some models of the second series of this locomotive type are still on view to the public; Nos. 2958 was outside the main railway workshops on the north side of Olten until March 1997, but has now been removed and is undergoing a total overhaul in preparation for service on passenger "specials" in four to five years time. No. 2965 moved from Erstfeld to the Swiss Transport Museum in Luzern and is now stored in the main hall, No. 2969 was, in 1995, on display outside SLM Winterthur and No. 2978 resides in the museum area at Vallorbe.

Locomotive No.2978 had a total overhaul by the SBB workshops in Biel before taking part in the 150 year anniversary parade for the Dutch Railway, after which it returned to Vallorbe. When No. 2972 withdrew from service in 1958 its boiler replaced the unit in locomotive No.2969, likewise in 1960 when No.2956 retired from service its boiler replaced the unit in No.2978.

References used:-

*Der Dampfbetrieb der Schweizerischen Eisenbahn. 1847 - 1922. Moser.*

*SLM Lokomotiven 1871 - 1984. VRS Association.*

*SBB Documents.*

*All photographs from my collection, obtained from SBB Photos and SLM.*