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**Autor:** Hardy-Randall, Malcolm  
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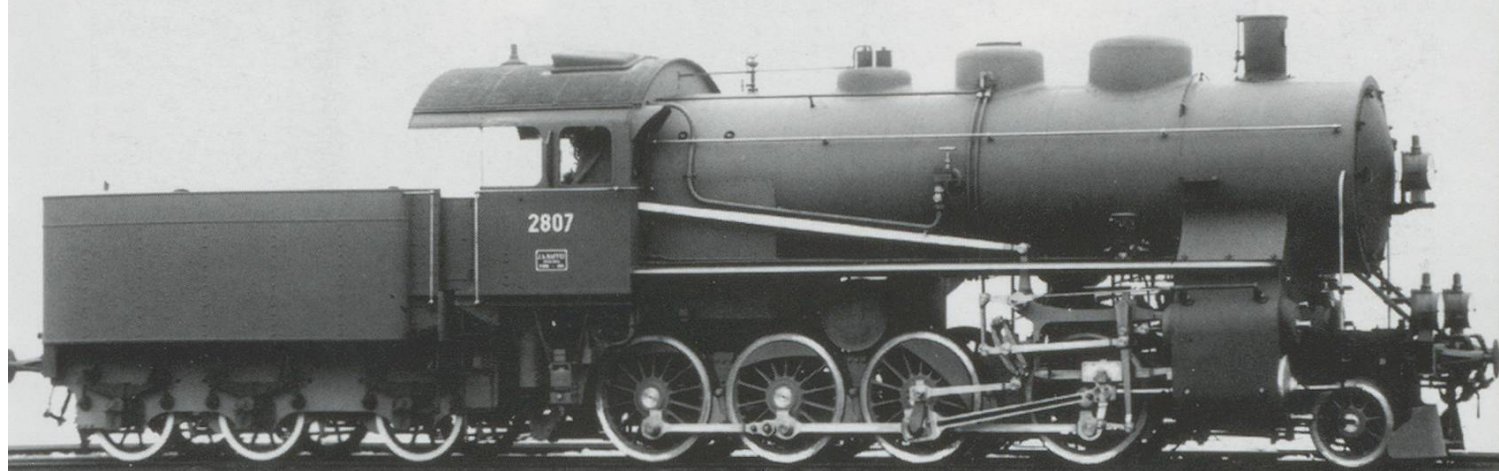
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## **PART 2 - GOTTHARDBAHN HEAVY FREIGHT LOCOMOTIVE TYPE C 4/5**



*C 4/5 No 2807 outside the works in Munich.*

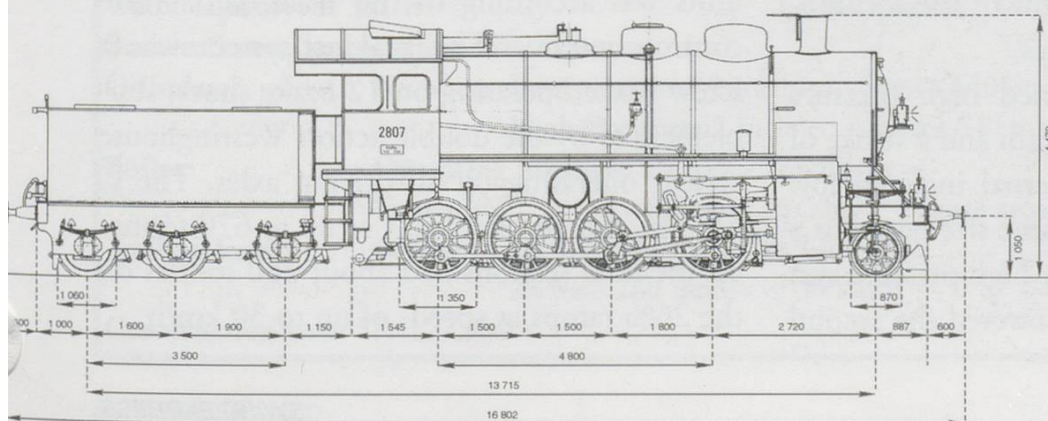
The number of passengers carried on the Gotthardbahn during the year 1906 had risen to over 3.5 million and the freight shipped was up to 1.5 million tonnes net. The Gotthardbahn had a requirement for a locomotive capable of hauling up to 320 tonnes over the ramp sections of the Gotthard line. The norm was for two type A 3/5 locomotives to head and often one as banker on express trains on the mountain sections, in the case of freight traffic three or four type D 4/4 would be employed on heavy trains. This was clearly not an economical use of motive power.

The Gotthardbahn in 1905 ordered the type C 4/5 locomotive from Maffei as best suited to satisfy the requirement. Here was a locomotive that seemed to ooze confidence in achieving what its designers had intended. This locomotive looked right for the task in hand, the design being based upon that for a

locomotive that had been in service on the German Reichsbahn for the past two years and had proven itself to be very successful. This locomotive class was at the time the most powerful in Switzerland and saw its entire life in service on the Gotthard route.

In spite of having a longer driving wheelbase of 4.8 metres (the current heavy freight locos of the type D 4/4 had a wheelbase of 4.2 metres), the C 4/5 locomotive could easily negotiate 180-metre radius curves and so was able with ease to run on track built with the 300-metres radius curves found on the mountain line. Maffei delivered a total of eight - Nos:2801 to 2808 - of these four cylinder compound locomotives rated at 1,100 kW, all of them fitted with the Clench designed steam drier that provided 41 m<sup>2</sup> of heating area. (The Clench steam drier was a large steam chest through which the fire-tubes were passed.)

The C 4/5 was fitted with a boiler that measured 4.45 metres in length and operated at 15 bars pressure, safety being provided by two pop valves. The boiler heating area on this locomotive measured 278





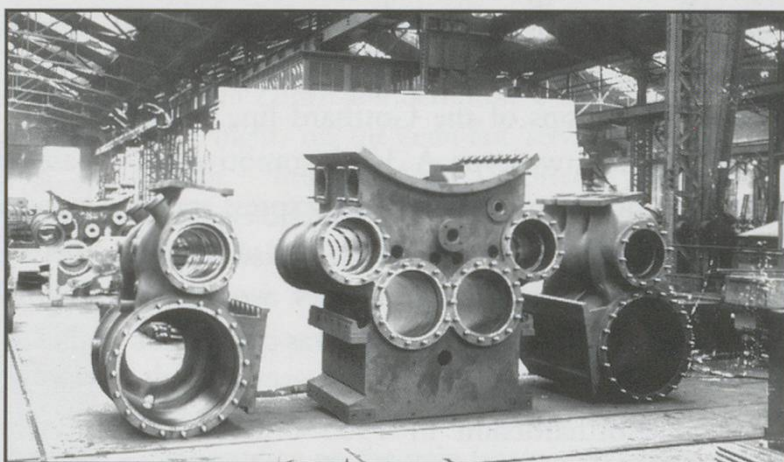
*Göschenen. A C 4/5 pilots an A 3/5 over the bridge on the north side of the station.*



m<sup>2</sup> and the firebox grate 4 m<sup>2</sup> making them the largest of any of the Swiss locomotives.

With excellent steaming capabilities they were ideal for the work required of them. The C 4/5 was able to develop a tractive effort of 124.50 kN, had a service weight of 114.1 tonnes and an adhesion weight of 62.2 tonnes. During a later major refit in 1913/6 the C 4/5 had the Clench reheat system removed and replaced with the more modern Schmidt superheater (this superheater passed the steam via 24 tubes almost back to the firebox wall, which took the steam temperature up to 300° C.) Because of this change the service weight of the locomotive increased to 117.4 tonnes.

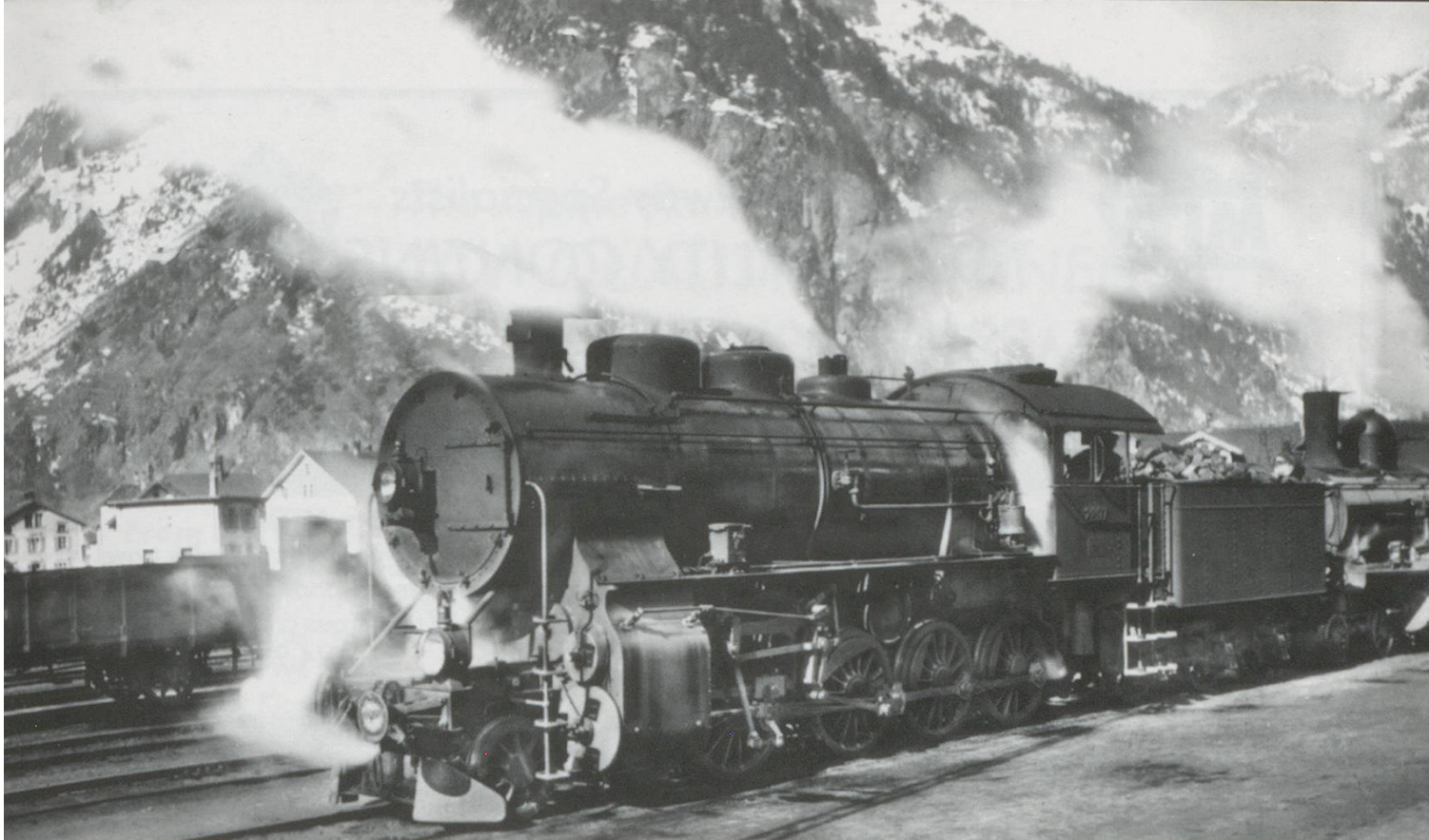
The two internal inclined high pressure cylinders had a bore of 640 mm and a stroke of 395 mm, and the two external inclined low pressure cylinders had the same size bore but a stroke of 635 mm. Both the high pressure and the low pressure cylinders powered the second



*The Maffei works showing the huge cylinder blocks of the C 4/5.*

driving axle of the locomotive, the first driving axle pivoting with the leading bogie wheel as designed by the engineer Von-Borries. Cylinder control on both high and low pressure units was according to the Walschaerts valve control system. The braking system was a screw brake operating on 12 brake shoes, supplemented by the double action Westinghouse system operating on all driving axles. The C 4/5 was able to haul loads of up to 670 tonnes on the level sections and about 260 tonnes on the 26% ramps at speeds of up to 30 km/h.





The main duty of these locomotives was hauling the freight trains but they were also to act as an assisting locomotive on the really heavy freight and passenger trains over the mountain section, and it was not an uncommon sight to see two of these locomotives on the heavier trains. The entire C 4/5 class in this series was transferred to the SBB stock list when the Gotthardbahn was nationalised in

*C 4/5 2807 and A 3/5 218 wait in Erstfeld yard.*

1909, and was withdrawn from service in 1925. Regrettably no record of any of them or their German Reichsbahn predecessors surviving the breaker's yard could be found.

References.

Der Dampfbetrieb der Schweizerischen Eisenbahnen 1847 - 1966 Moser.

Photos. Hardy-Randall collection. EAB

## Locomotive Data

**GB Type:** C4/4 - Nos. 2801 - 2808

**SBB Type:** C4/4 - Nos. 2801 - 2808

**Built by:** Maffei (München, Germany), Works No.2576 - 2573

**Date built:** 1905

**Date in Service:** 1906

**Date out of service:** 1925

**Power:** HP1,500 - kW1,100

**T/E at wheel rim:** kN124.5

**Speed maximum:** km/h 65

**Speed Indicator:** Klöse

**Driving wheels:** Diameter 1,350mm

**Rigid Wheelbase:** 3,300mm

**Total wheelbase:** 13,715mm

**Length overall:** 16,802mm

**Height:** 4,470mm

**Loco weight:** Pielock

**Empty:** 72.20 Tonnes

**Service:** 77.90 Tonnes

**Adhesion:** 62.40 Tonnes

Schmidt

**Empty:** 72.90 Tonnes

**Service:** 80.00 Tonnes

**Adhesion:** 63.50 Tonnes

**Water capacity:** 17.00 m<sup>3</sup>

**Coal capacity:** 5.00 Tonnes

**Brakes:** Screw, double action Westinghouse

**Cylinders:**

**Number:** Low pressure: 2 Inclined - Stroke 640 mm / Bore 635 mm

High Pressure: 2 Inclined - Stroke 640 mm / Bore 395 mm

**Boiler:**

**Operating pressure:** 15 Bars - Pop valves

**Length:** 4450 mm

**Tubes:** 367

**Firebox:** 13.20m<sup>2</sup>

**Grate area:** 4.10 m<sup>2</sup>

**Trailing load:**

**Gradient:** 10 ‰ - 670 tonnes @ 30 km/h

26 ‰ - 260 tonnes @ 30 km/h

**Construction cost:** SFr 127,300