

The Class 490 Steam Engines of MÁV, and the Restoration of Locomotive No. 490,039

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Abstract

The Hungarian designed narrow gauge steam engine-type built in the largest number and the largest class of 760 mm gauge MÁV locomotives. The paper shortly describes the more than 100 years history of locomotives type 70 of MÁV Gépgyár (MÁV Machine Factory). During the 46 years of its production, 142 units were built in 21 batches in Budapest between 1905 and 1950. MÁV put into service 61 locomotives on its local narrow gauge lines between 1906 and 1950 designated as class XX1c at the beginning, and as class 490 after 1911. The 100-th anniversary offered a good reason for the rehabilitation of the oldest unit of the type that could be found in Hungary, the oldest survival of the MÁV 490 class. As the result of the restoration, putting into service the locomotive increased the number of the passengers travelling on the Budapest Children's Railway significantly.

Keywords

steam locomotive · railway history · rolling stock modernization

1 Preface

On the 4th of September 1905 the regular service started on the 760 mm gauge network of the Görgényvölgyi Erdei Vasutak (Görgény Valley Forest Railway- GEV), carrying the timber cut in the Royal Hungarian Forest estate of Szászrégen. The Royal Hungarian Ministry of Finance the sponsor of the railway construction works ordered three locomotives from the MÁV Gépgyár (Machine Factory of Royal Hungarian State Railways – MÁV). The MÁV Machine Factory with its decades of experience in building narrow gauge steam engines designed a new eight-wheeled type tank locomotive for 760 mm gauge and 5,5 t axle load, equipped with Klien-Lindner axles. The type 70 locomotives, combining the features of industrial and local railway narrow gauge locomotives, could run on the 15,6 km long Szászrégen—Libánfalva main line of the network, where public services were introduced, and also on the industrial sidings connected to the main line, built with sharp curves and 60 ‰, gradients.

In 1905 the Hungarian railway industry had more than 30 years experience in building and designing locomotives. The first narrow gauge steam engine to be built in the countries of the Hungarian Holy Crown was constructed in 1872 in the Iron Factory of Állami Vaspályatársaság (ÁVT), Staat Eisenbahn Gesellschaft in German, in Resicza, preceding the first standard gauge locomotive built in Budapest by a few months. A steam engine designed by John Haswell and built in the Locomotive Factory of Vienna—Győr Railway, was put into service on the Iron Factory's 950 mm gauge Resicza—Szekul line in 1871. The construction of the local industrial network continued and three other identical four wheeled tank locomotives were also built in Resicza. The last of the three, with the running number 4 and called "Hungária", was introduced next year in the Vienna world exhibition, and in 1896 in the Budapest Millennium world exhibition, as the first steam engine ever built in Hungary by using only Hungarian produced raw materials [1,2].

Several different narrow gauge steam engines were built by the MÁV Machine Factory before the turn of the 19-20 centuries. The first two were delivered to the Salgótarjáni Kőszénbánya Rt., Salgótarján Coal Mine Company, in 1876. These

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790 mm gauge locomotives were the first steam engines designed in Hungary. While the number of same type standard gauge locomotives produced in the MÁV Machine Factory reached even several hundred units by the end of the century, the orders for the narrow gauge locomotives were characterised by a few numbers or small batches only. A quarter of the 60 different steam locomotive types built in Budapest between 1873 and 1900 were narrow gauge, but the number of the narrow gauge locomotives was a little more than 25 among the 1500 produced [3].

The Hungarian Parliament forced and helped the construction of the secondary, local railway network with the aims of increasing the traffic on the main lines, expanding the good influence of the railways to the underdeveloped country sides connecting them to the economic life and making markets for the new products of the Hungarian railway industry. More than 7000 km of local line network was built in Hungary between 1880 and 1900 on the base of Considere's theory who said: "*The railway lines do not make any economic influence on the markets which are farther than 12 km from the axes of the tracks*" [4]. According to the Local Railway Acts 1880. XXXI. and 1888. IV., the builders of the secondary lines were private companies bound themselves by a Standard Contract to use the products of the Hungarian industry and apply the regulations of MÁV. MÁV, or one of the big railway companies whose network was the local line connected to, operated the railways and the Hungarian State guaranteed and paid the interests for Local Railway Private Companies even if the operation of the lines was not profitable. The fast growing secondary network generated an economical crisis by the end of the century and the State abandoned making of new contracts.

The success of 760 mm gauge lines of Bosnia-Herzegovinai Országos Vasutak (Bosnia-Herzegovinian National Railways – BHOV) attracted the attention to the importance of narrow gauge railways.

Because of the lack of finance more and more local railway lines planned earlier as a part of the standard gauge network, were constructed in narrow gauge from the second half of the 1890s in Hungary, but these private companies bought the narrow gauge locomotives from Austrian and German factories. The Royal Hungarian State Railways (MÁV) also forced the construction of new narrow gauge forest railways by excluding the water shipment of timber bought for producing wooden sleepers.

The Hungarian Parliament supported the local companies and enterprises with preferences, which produced the same quality products cheaper or at the same costs as the foreign companies [5]. Weitzer János Gépgyár és Vasöntöde (Weitzer János Machine Factory and Foundry) in Arad started the production of steam locomotives as well in 1896. 132 steam engines were built there in the next nine years, 65 among them for narrow gauge. The most popular and well known locomotives of the Arad Factory were the MÁV class XII (later series 377, MÁV

Machine factory type 29) and the Austrian designed, IIIa3 class, 760 mm gauge, Klose system locomotives of BHOV. After the forge-shop burned down in 1904, steam engine production was stopped in Arad, and the MÁV Machine Factory took over the duties of the factory and built the last four, heavier version of the Hungarian class IIIa3 steam locomotives in Budapest for the 760 mm gauge Bosnian network [6].

Besides the big producers the railway workshops also started to build locomotives. The first new steam engine in the railway workshop of Rimamurány-Salgótarjáni Vasmű Rt. (Rimamurány-Salgótarján Ironwork Co. - RMST) Ózd factory was built for its own 1000 mm gauge industrial network in 1898.

The steam engines built for the narrow gauge industrial railways were characterised by high tractive effort, and relatively low speed, ability to the small curve radii negotiate, climb steep gradients and often by the small loading gauge of the section of the narrow and low tunnels in the mining and gates in the workshop areas [7]. The loading gauge of the narrow gauge track local railways was larger due to the demands of public service. As the narrow gauge local railways played a more and more important role in the national rail traffic network, their lines became longer and their networks larger. By the end of the century the operation of 60-80 km long narrow gauge local lines demanded faster train service than on the short line sections built before, in the 1890s. Because of long distances it was necessary to increase the speed of the trains up to 30-35 km/h. Also the narrow gauge industrial railways like Percesi Bányavasút (Perces Mine Railway) and Erdélyi Bányavasút, (Transylvanian Mine Railway - EBV) opened their line sections for public service at the end of the century.

In 1899, three different 760 mm gauge tank locomotives were built in the MÁV Machine Factory. The eight-wheeled, type 47 called *Hégen*, built for the Segesvár—Szentágotai HÉV (Segesvár—Szentágotai Local Railway), was constructed on the basis of long experience in building of industrial locomotives. It had a short wheel base and high tractive effort (Fig. 1). The Austrian designed type 48 built for the Szatmár—Erdődi Local Railway was a typical local railway locomotive. It had a 0-6-2 wheel arrangement and could run at 30 km/h top speed in passenger service, meeting the traffic demands of the narrow gauge local networks in the Austro-Hungarian Empire at the end of the century (Fig. 2).

The eight-wheeled type 51 built for the order of the EBV combined the features of the industrial and local railway locomotives, and could run in public service and also on the steep gradient and sharp curve industrial sidings. Its construction was based on the design of type 29 standard gauge local railway locomotives, on the idea, if a narrow gauge local railway wanted to provide the same level of service as a standard gauge line, then it was necessary to use so powerful locomotives as the standard gauge ones (Fig. 3) [8]. Comparing the features of the two types, the boiler capacity of the type 29 locomotives was higher because of its larger grate area and heating surface, but the type

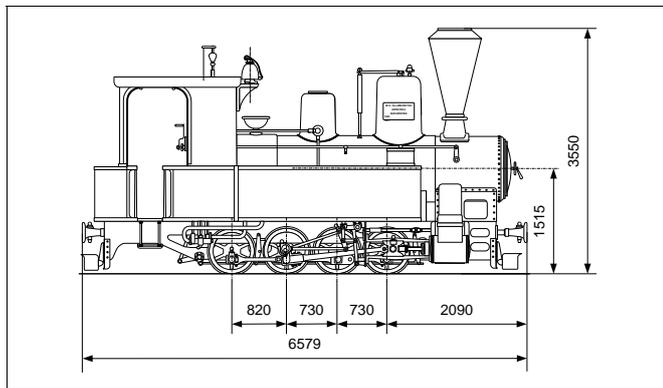


Fig. 1. Locomotive type 47 "Hégen" of Segesvár—Szentágotai Local Railway

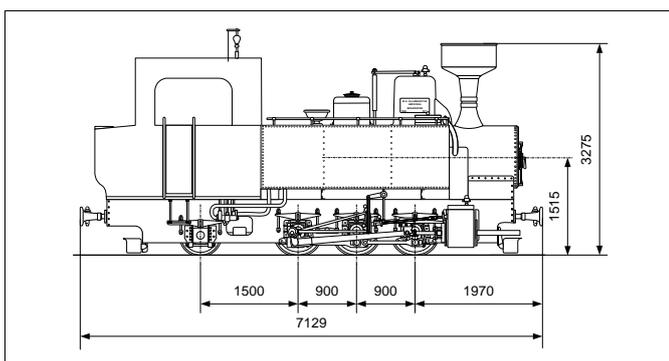


Fig. 2. The Austrian designed local railway locomotive of Szatmár—Erdődi Local Railway built in Budapest as type 48

51 had a higher tractive effort. It had Klien-Lindner hollow axles to negotiate the small curve radii. Despite the good features its 24 t service weight was too heavy for the 760 mm gauge local network built with the highest axle load of 5,5 t. Not more than seven pieces of type 51 locomotives were built in Budapest for the EBV and the Rózsahegy—Koritnicai Local Railways. One wood fired version of type 51 locomotives was built as type 69 for the Erdélyi Erdőipari Rt., (Transylvanian Forest Industry Co.) in 1904. Because of her long boiler and long wheel base it could not fulfil the demands of the forest railways.

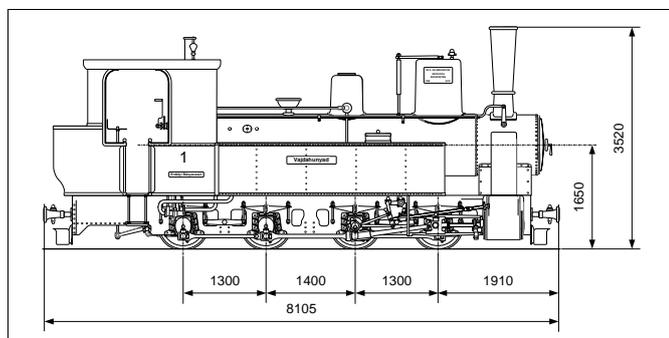


Fig. 3. Type 51 narrow gauge local railway locomotive equipped with Klien-Lindner axles

In 1902, MÁV Machine Factory made a tender for the delivery of the locomotives of 760 mm gauge Szombathely—Pörnyői

Vasút (Szombathely—Pörnyői Railway). The design of the locomotives was based on types 51 and 69, but the length of the draft locomotives was decreased by 1000 mm, and the axle load down to 5,5 tonnes. By increasing the grate area to 1,04 m², the boiler pressure to 14 bar, and decreasing the cylinder diameter from 340 mm down to 325 mm the good traction features of the types 51 and 69 could be kept. In 1904, also the wood fired version of the locomotives was designed.

The economic operation of the narrow gauge railways needed standard types of locomotives, which could run without restrictions both on the local and industrial lines including the light railways built to transport agricultural products. The construction of standard types for the different railway companies shortened the time of manufacturing of locomotives and decreased the production and maintenance costs. The MÁV Machine Factory, like the other continental locomotive producers, excluding locomotives of special requirements, started to build standard narrow gauge locomotives. In the period from 1905 until the end of the First World War, the first units of well known narrow gauge steam engines of the MÁV Machine Factory were constructed and built, like types 75, 78, 85, 86, 94, 106 and 107, and among them the most successful type 70 locomotives. The MÁV Machine Factory also continued the delivery of locomotives for the special requirements of industrial railways. The special products of the Factory were the Austrian designed type 81, 96 and 100 locomotives built for the BHOV.

2 The first type 70 steam locomotives

The main technical features of the type 70 locomotives, built first in 1905, were the same as the wood fired version of the draft eight-wheeled tank locomotives designed for the Szombathely—Pörnyői Railway. But in some small details the locomotives were improved. The Hall-type cranks were replaced, the distance between the mainframe plates was increased, and the steam piping was simplified, decreasing the resistance of the steam flow into the cylinders and into the chimney.

The main frames of the locomotive were made from 17 mm thick steel plate. The cylinders, having Stephenson valve gear, were outside of the framing. The diameter of the wheels was 750 mm. The first and fourth wheel-sets were equipped with Klien-Lindner hollow axles. With the rigid wheel base of 1150 mm the locomotives could run on 30 m radius track curves. The rivetted boiler made from 12 mm thick steel plates had 14 bar steam pressure. The fire box made from copper plates had a 1,04 m² grate area. Inside the 916 mm diameter boiler the number of 40 mm diameter smoke tubes was 128 and their length was 2700 mm. The heating surface of the boiler was 48,14 m². The locomotives, because of wood firing, were delivered with Klein type chimneys equipped with turbine spark-catcher. There was a large 3 m³ area in the drivers cab for the storage of wood. The power of the locomotives reached 120 HP (88,3 kW) in case of wood firing. The first three of type 70¹ locomotives with the production number of 1810-12 were

put into service in Szászrégen on 31st of August 1905 (Fig. 4).

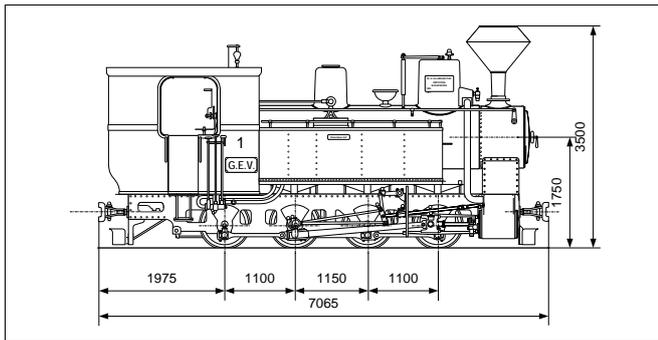


Fig. 4. The type 70 narrow gauge locomotive of Görgény Valley Forest Railway

3 The 490 class locomotives of MÁV

The construction works began on the 51 km long Szatmár—Bikszádi HÉV (Szatmár—Bikszádi Local Railway) 760 gauge local railway line in March of 1905. The new line had a connection at Szatmárnémeti Kossuth kert station to the Szatmár—Erdődi and Nagykároly—Somkúti HÉV (Szatmár—Erdődi and Nagykároly—Somkúti Local Railways) operated by MÁV, making a big 760 mm network in that region. The new line's first 35 km long section leading to Avasújváros from Szatmárnémeti ran on the plains. The rest led from Avasújváros to the famous salt bath of Bikszád climbed up on a gradient of 18 ‰, with 80 m curve radius through the Valley of Avas Mountains. The contractor was required to buy the material and the rolling stock from Hungarian factories. The MÁV Machine Factory built two coal fired type 70 locomotives for this order.

The drivers' cab of the coal fired type 70³ locomotives delivered for the order of Szatmár—Bikszádi Local Railway was modified to carry 800 kg coal. The balance-weights integrated with the outside cranks were put on the wheels. Better balancing of the driving-gear made possible the increasing of the speed to 30 km/h. The locomotives were equipped with a train steam heating device according to the demands of the local railways. The power of the locomotives reached 150 HP (110 kW) in case of firing with MÁV Standard coal. The first two type 70³ locomotives, classified XXIC. 6967-6968 steam engines were put into service on the railway in the spring of 1906. In 1908 further four type 70⁴ locomotives were delivered to Szatmár—Bikszádi Local Railway.

Soon, the delivery of the first locomotives was followed by a large number of orders. The type 70 locomotives became a basic steam engine type, in a short time, on the 760 mm gauge 5.5 t axle load lines built in the Carpathian basin before 1920. Their good features, the ability to negotiate sharp curves, the large boiler capacity and the ability for overloading made them economically viable on both the local and industrial networks of forest and mining railways, comparing to the Austrian and German locomotives built for similar duties and running on the Hungarian narrow gauge lines.

Until the end of the First World War 31 units were put into service on the narrow gauge Szatmár—Bikszádi, Torda—Topánfalva—Abrudbányai and Maros-Tordai Local Railways operated by MÁV. A further eight units were delivered and put into service on the occupied territories, at the request of the War Department. Nine units were delivered to the forest and industrial railway lines.

The serial production of the locomotives made possible the further development of the type. The first two units of type 70⁸, delivered for the Szatmár—Bikszádi Local Railway, were equipped with speedometer. The type 70⁹ locomotives, built for the War Department, and put into service with the numbers of 490,952-958 (IVa 4052-4058), had Petz-Rejtő type water cleaners, which were widely used on MÁV standard gauge steam engines at that time. The indirect load weight safety valves were replaced by direct operation safety valves of MÁV type (Fig. 5).

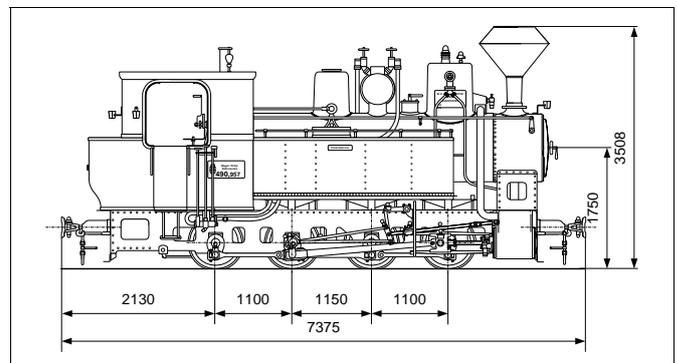


Fig. 5. The type 70⁹ class 490 locomotive of MÁV

After confirmation of the dictated Trianon agreement on 4th of July 1920, by which Hungary lost two-thirds of its territory, all of the narrow gauge lines operated by MÁV, except the short section of Gyulavidéki HÉV (Gyulavidéki Local Railway), were in the occupied territories. Of the 112 MÁV narrow gauge locomotives only five, of the 42 units of 490 class locomotives only two remained under Hungarian control. 15 units with former Hungarian lines in Transylvania were taken over by the Rumanian State. 20 were sent to the new established Serb-Croats-Slovenian state, and two to the new born Czech-Slovak state. Some of the locomotives fell into the hands of Polish and Italian governments. The locomotives were classified as 81-001-008 in the stock of JDZ in Yugoslavia, and U45 class in Czechoslovakia [9].

The building of new steam locomotives was continued in Budapest after the First World War. Some new designs were also developed in the MÁV Machine Factory, which has got the new name in 1922, Magyar Királyi Állami Vas- Acél- és Gépgyárak (Royal Hungarian State Iron, Steel and Machine Factories – MÁVAG). During this time a six wheeled 750 mm gauge locomotive with superheater, the type 127 without superheater and the type 128 narrow gauge locomotives were designed. One unit of type 127 was delivered to Kecskeméti Gazdasági Vasút (Kecskemét Light Railway - KGV). The locomotive had the

same boiler, cylinders and valve gears as the type 70 steam engines. 35 units of powerful type 128 were built for the Yugoslavian 760 mm gauge network in 1930-31. The type 128 with its indicated power of 952 HP (700,7 kW) was the most powerful 760 mm gauge steam locomotive ever designed and built in Hungary. The Hungarian industry could produce great products also in small dimensions at that time. The design and construction of type 128 locomotives in Budapest had the same importance in the history of Hungarian industry in this period as the type "Árpád" inter city railcars competing with the Budapest—Vienna flights, the electric locomotives of Kálmán Kandó and the type 122, MÁV 424 class steam engines.

123 units, more than 21 percent of the steam engines built in Budapest between 1921 and 1938 were narrow gauge locomotives. Many of them, like the types 96 and 128, were delivered as war compensation to Yugoslavia. The other part of the new narrow gauge locomotives, built in this period except the one unit of type 127 and four new type 70 steam engines, were standard types with low output of power, designed for light agricultural service or to haul mine-wagons. Two new built type 70 locomotives were delivered to a logging company in Transylvania and two to the Gánt Aluminium Mining and Industry Company, where six small locomotives, two 70 and four of 85 types, carried 425 000 t Bauxite in 1937 to Bodajk railway station 12 km apart from the mine-fields.

By the first Vienna Decision signed on 2nd of November 1938, in the golden hall of the Belvedere palace, the South part of the Hungarian Highland returned to Hungary. By this decision the Hungarian railway network was increased by 1164,5 km, including 121,8 km narrow gauge lines. A further 328 km standard and 99 km narrow gauge line returned after the occupation of the East part of Hungary on 15th of March 1939. A large network of forest and industrial railways was in operation on the returned territories together with the narrow gauge local lines. As the result of the second Vienna Decision the length of the Hungarian narrow gauge network was increased by more than 400 km with the return of the North part of Transylvania.

The Hungarian State made strong efforts to improve the traffic circumstances on the returned country lines. Three times the invested between 1920 and 1939 was spent on these territories until the end of the Second World War comparing to the previous 19 years. MÁV Headquarters decided to increase the speed up to 60 km/h on MÁV 760 mm gauge lines, the general introduction of air brake both in passenger and freight service, and increasing the axle load up to 8-12 t. For the modernisation of the rolling stock MÁV Headquarters ordered new steam engines, diesel railcars, passenger coaches and freight wagons of 15 t loading from the Hungarian rolling stock factories. Putting into service the powerful type 96 and 128 type locomotives on the Hungarian 760 mm gauge network was also taken into consideration. At the same time, MÁV borrowed 21 narrow gauge steam engines from the Hungarian private railways, among them three type 70

locomotives marked with the temporary 490,101-103 numbers. No. 490,101 was a type 70¹ locomotive built in 1905 with the serial number of 1812 [10]. Some of the locomotives were used on the construction works of 760 mm gauge Szászlekenye—Kolozsnyida line which connected Marosvásárhely to Budapest before the new Déda—Szeretfalva standard gauge line was finished.

The MÁVAG Factory in Budapest received an order for the delivery of 30 new type 70 locomotives in 1940. The 35 year old locomotive type was modernised according to the new requirements of the 1940s. The locomotives got new cylinders equipped with Heusinger-Walshaert valve gear. The copper plates of the riveted fire box were changed to steel plates. A MÁV system water cleaner was installed on the boiler. The regulator valve was moved into the dome and the main steam pipe was led through the tube plate via the smoke box to the cylinders. The exhaust pipes were outside. The cylinders and the exhaust pipes were insulated. The heating surface of the boiler remained the same, supplying saturated steam. The first two modernised type 70¹⁴ locomotives were put into service on the forest railway of Tarac Valley in 1940. The locomotives had electric front lights and electric water gauge lighting in the cab.

In 1942, MÁV put into service 20 unit type 70¹⁵ locomotives with the numbers 490,034-053. The locomotives were equipped with air brake and air compressor. Instead of the Klein type chimney a mesh screen in the smoke box and simple tube chimney was installed on the locomotives. Because of the redesign of the boiler and the new valve gear, the speed of the locomotives could be increased to 35 km/h (Fig. 6). The locomotives were put into service on the Marosvásárhely network, but they also ran on the Szatmár—Bikszádi and Szatmár—Erdődi Local Railways and also on the industrial railway of Gánt bauxite mines. By the end of the year the 70 became the Hungarian designed narrow gauge steam engine type built in the largest number leaving behind the successful, but lighter 75 and 85 types.

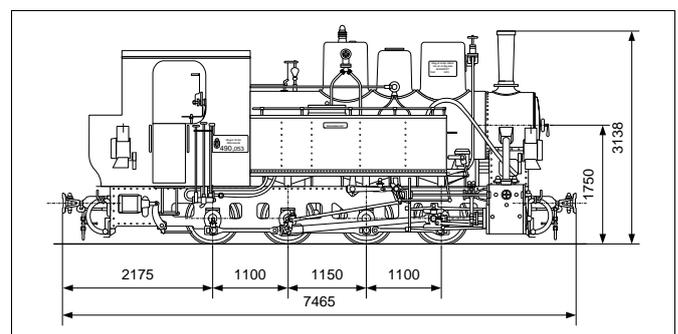


Fig. 6. The modernised type 70¹⁵ locomotive of MÁV

A further ten locomotives were ordered by MÁV in 1942. The planned type 70¹⁹, 490,054-063 locomotives were same as the previous MÁV type 70¹⁵, but they had electric lighting. The Soviet troops occupying Budapest confiscated the locomotives found in the MÁVAG workshops, and on the bases of the agreement signed by the Soviet and the provisional Hungarian Gov-

ernment, they were converted to 750 mm gauge and put into service in the Soviet Union in 1945 and 1946.

The transport demand of the reconstruction works in the post war period and the increasing of industrial production capacity requested new railway vehicles, among other things new powerful narrow gauge steam engines. Having escaped some of the MÁV 490 class locomotives from Northern Transylvania and East Hungary, the class 490s were put into service on the network of the Alföldi Első Gazdasági Vasút (First Agricultural Light Railway of the Plain - AEGV) and on the important mine and industrial railways. One of them, the 490,034 was converted to 950 mm gauge for a short period and was lent to the Debrecen Városi Gazdasági Vasút (Debrecen City Agricultural Light Railway - DVGV). After one year of operation the locomotive was converted back to 760 mm [11]. In 1949-50, the 490,039; 044 and 049 locomotives were equipped with oil burning equipment and they were located on the Budapest Pioneer Railway. The oil firing was unsuccessful on the locomotives, so after one year of operation it was removed.

The production of the type 70 locomotives was continued. In 1947 and 1948 twenty units of 70²⁰ type steam engines were built for the Yugoslavian war compensation. The 70²¹ batches of the last 30 locomotives were built in 1949-50. Many modifications were introduced according to the demands of quantity production. The rivets were replaced by welds on the cab and on the water tank. The capacity of coal bunkers on the coal firing locomotives was increased to 1,3 m³. Three of them were delivered to Bulgaria, nine to Rumania, eight to Yugoslavia and ten remained in Hungary. MÁV put into operation eight locomotives with the numbers 490,054-061 on its nationalised Sáropatak and Békéscsaba narrow gauge local networks. The last two of 70 type locomotives were put into service on the Balinka coal mine and Komlói GV (Komló Agricultural Light Railway) lines in Hungary.

As the last one of type 70 locomotives leaved the MÁVAG Works, the steam engine production was still continued in Budapest. After the Second World War some other narrow gauge types were also built. The last four of ten type 96⁶ locomotives were not delivered to the customer Yugoslavian state. Together with other two type 96⁵ locomotives they were converted to 1000 mm gauge and put unto service in Hungary. They were the most powerful narrow gauge locomotives put into service in Hungary.

The MÁVAG offered type 96 and 128 narrow gauge steam engines for the soviet war compensation, but instead of delivery of its own design the production of a new type, the soviet K^V4 was introduced. 240 units of this type were built in Budapest between 1950 and 1953. 234 were delivered to the Soviet Union and the rest remained in Hungary.

The last series of narrow gauge locomotives built in Budapest was a 1057 mm gauge 2-6-2 locomotive type of the Indian railways in 1957. After the Second World War the narrow gauge locomotive was one of the most important export products of

the Hungarian heavy industry. Only 32, less than 10 % of the 380 narrow gauge locomotives built in Budapest, were ordered by Hungarian railway companies or originally built for export but put into service in Hungary.

In 1958 the production of steam engines was finished in Hungary. 7576 steam locomotives, 966 among them with narrow gauge, were built in Budapest between 1873 and 1958. Taking into consideration the number of steam engines built by other factories and railway workshops in Hungary the total number is 7750 among them more than 1050 narrow gauge locomotives [12].

In 1956, more than fifty 760 mm gauge steam engines were in MÁV locomotive stock, among them fifteen type 70, class 490 engines built in 1942 and 1950. They ran on the lines of Sáropatak and Békéscsaba networks, where the axle load was at least 5,5 t. They hauled heavy passenger, mixed and freight trains. The locomotives were often lent to the mine railways helping them in fulfilling their transportation duties. MÁV took the operation of the locomotives into account for a long time. The class was taken into consideration when preparing the new MÁV Standards in the 1950s. MÁV also modernised their 490 class locomotives. The Antidur water treatment was introduced on them. All of them were later equipped with electric lighting.

In 1963, after putting into operation the Mk49 class diesel locomotives, the dieselisation and the modernisation of the MÁV 760 mm gauge line network was finished. 68 new diesel locomotives, more than 140 new passenger coaches and 650 freight wagons were produced and put into service on the 760 mm gauge network in the previous 15 years. Only five class 490 steam locomotives remained in MÁV service located to Szob GV (Szob Agricultural Light Railway) and two continued their operation on Tapolca—Diszel stone-quarry line. Other two type 70 locomotives were in service on Balinka coal mine railway.

The steam operated mine railways were closed in the middle of the 1970s. The 490,041 from Tapolca was exhibited in the yard of MÁV Szombathely Directorate, the type 70²¹ “Győző” in Balika and the type 70¹⁸ “Imre” in the museum of the Gánt bauxite mines. The 490,039 was also withdrawn from the operation and exhibited in Budapest Hűvösvölgy station. Four, as the last survivors remained in service on the Szob GV performing an enormous transportation task moving 500 000 t stone year by year on a short 4 km long line section.

In 1981, after the last line section of Sáropatak network was closed, the 490 class steam engines were replaced by Mk48,2000 class diesel locomotives. The 490,057 was exhibited in Nagycenk and 490,058 in Ópusztaszer. The other two remained in Szob, generating the steam for the heating of the station and workshop buildings. From 1st of July 1983 the 490,053 was located to Kecskemét for hauling nostalgia trains. The locomotive No. 490,056 was taken to Balatonfenyves in 1986, where it was operated in summer and in the autumn hunter season for ten years.

4 Restoration of locomotive of MÁV No. 490,039

The idea of putting into service the 490,039 locomotive on the Hűvösvölgy line for the 40th anniversary of the Budapest Pioneer Railway was not supported by MÁV Nostalgia Committee in 1988. The result of that decision was the buying, renewal and putting into service of the last remaining diesel railcar of Lillafüredi Állami Erdei Vasutak (Lillafüred State Forest Railways – LÁEV), because the rail car No. ABamot 2 was one of the first three traction units put into service on the first section of Budapest Pioneer Railway in 1948. The railway enthusiasts had to wait almost 20 years for restoration of the oldest MÁV 490 class locomotive.

The successful operation of locomotive No. 490,056, taken from Balatonfenyves to the Budapest hill side line, the 100th anniversary of the type and the MÁV 490 class locomotives offered a good possibility for the renewal of the 490,039 steam engine, as being the oldest type 70 locomotive in Hungary and the oldest 490 class MÁV steam engine, which ran also on the Budapest Pioneer Railway in 1949-50.

The official trial run of locomotive No. 490,039, built in Budapest in 1942 with the production number 5260, took place on Marosvásárhely—Parajd line between Nagyteremi and Ákosfalva stations on 17th of April 1942. It was at first located to Marosvásárhely. From next year it was operated on the Szatmár—Bikszádi Local Railway, and from 1945 on the AEGV network. In 1949, its boiler was converted to oil firing in Budapest Istvántelek Workshop and equipped with the special direct train air brake system, and it was operated on Budapest Pioneer Railway for a year. After removing the unsuccessful oil firing equipment it was taken to the Békéscsaba network and in 1962 to the Szob GV. The locomotive was exhibited on Budapest Hűvösvölgy station in 1973, celebrating the 25th anniversary of the opening of the Pioneer Railway [13].

The locomotive, now owned by the Traffic Museum of Budapest, was transported to Istvántelek Workshop in December 2004. During her renewal the most important point of view, besides operational requirements, was the restoration of the locomotive to the original state as far as possible to offer and provide real historical values to a railway educating the young generation and last but not least to increase the number of passengers by the new heritage service [14]. The hardest part of the work was the replacement of the 60 years old boiler, which was out of service for the last 30 years. The production of the new boiler was undertaken at the Istvántelek Workshop in Budapest. The state of the art new boiler was produced by the help of MÁV Székesfehérvár Workshop. Some parts of the old boiler were used again, like the fire box foundation ring and the smoke box tube plate, but the riveting was replaced by welding, where it was possible (Fig. 7).

The fire box was given a bigger fire door hole, and a brick arch. The old water cleaner equipment was removed but its dome was put back without any function, keeping the original

form of the locomotive. The boiler was given heat insulation under the boiler casing. The locomotive was given her original chimney with mesh screen placed in the smoke box.

The air compressor and the air brake were installed again, including the special direct train brake pipe used on the Budapest hill side line, which is necessary because of the steep gradients (Fig. 8). The main reservoir is in the cab under the coal bunker. State of the art drivers brake valves were used both for the automatic and direct systems. Also the cab and the water tanks were renewed. The running gear, the rodding and the cylinders were refurbished.

The test with the restored locomotive before putting into service on the Children's Railway in Budapest started in May 2007. The official trial run took place also in May. The first introduction for the public was on 9th of June. The MÁV Co. Historical Committee Rolling Stock Section proved the locomotive before its special memorial meeting held on 21st of June 2007, remembering the restoration of the more than 100 years old MÁV locomotive class and the history of Hungarian narrow gauge steam engine production.

5 Validation

The year 2006 was a deep point in the passenger traffic statistics of Children's Railway. The number of passengers sank below 280 000. Having put into service the locomotive No. 490,039 the number and the load of trains running in nostalgia service could be increased. As the results of the successful locomotive restoration the number of passengers travelling on the railway has been increasing since 2007 and in 2009 exceeded the number 350 000.

6 Summary

In 1950 when the 142nd unit leaved the MÁVAG works production of type 70 locomotives was finished. The locomotives were running in seven countries most of them in the Carpathian Basin at that time: in Hungary, in Bulgaria, in Czechoslovakia, in the Soviet Union, in Rumania in Yugoslavia and one unit in Germany, representing the success of the Hungarian designed narrow gauge steam engine-type built in the largest number. 142 units of type 70 locomotives were built in 21 batches in Budapest between 1905 and 1950, during the 46 years of production. MÁV put into service 61 locomotives on its narrow gauge local networks between 1906 and 1950. Four of MÁV class 490s as the last survivors of MÁV narrow gauge steam locomotives remained in scheduled service until 1981 and two of them hauled nostalgia trains up to present days. More than ten type 70 locomotives exist even today, eight in Hungary. The oldest, built in 1922, can be found in Rumania. Three is in working order in Hungary including the No. 490,053 waiting for reparation and one other unit was renewed and put into service again in Bosnia-Herzegovina in 2009, to haul tourist trains.

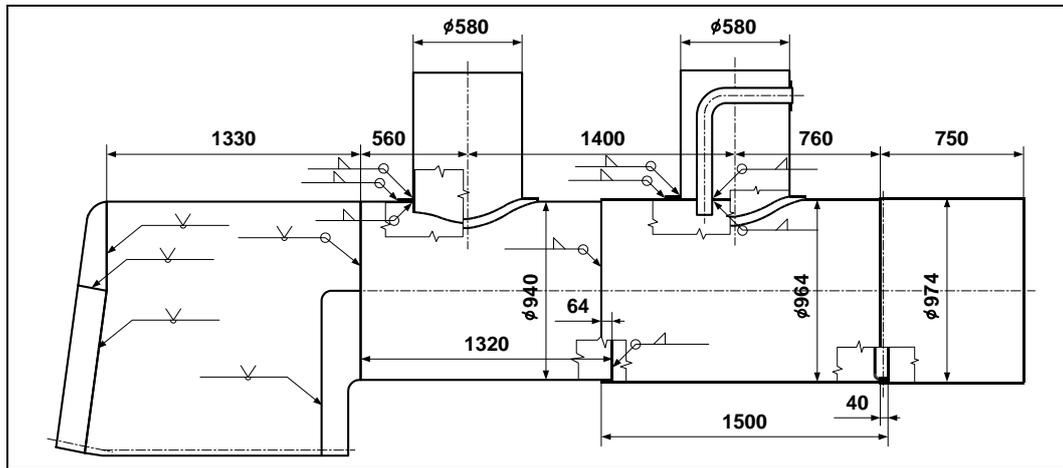


Fig. 7. The new welded boiler of MÁV 490,039 locomotive

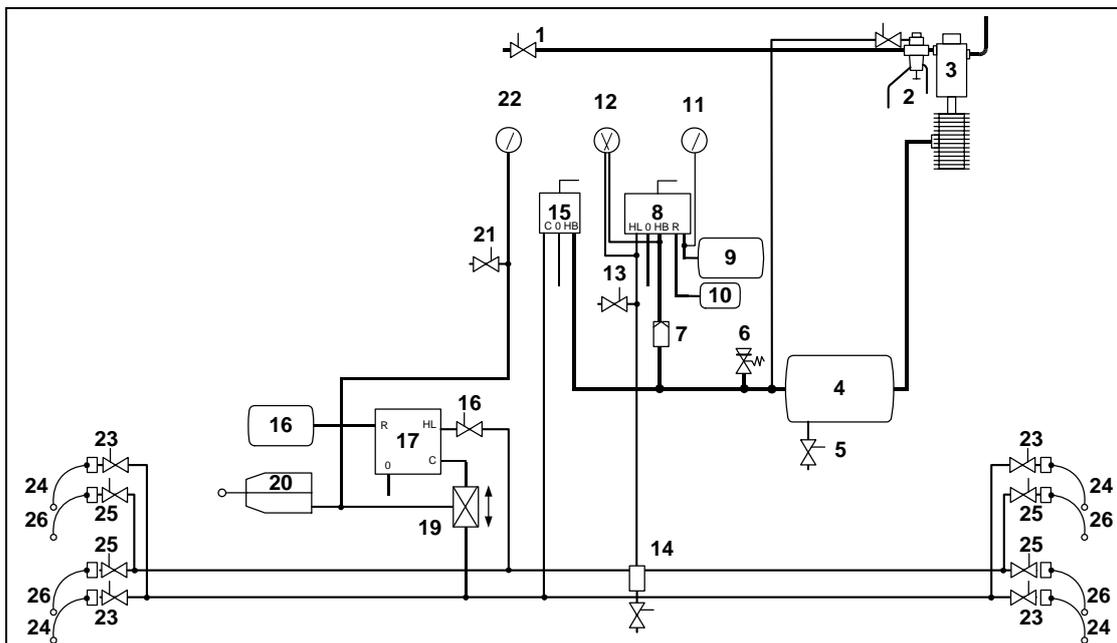


Fig. 8. Brake system of MÁV locomotive No. 490,039

1 steam stop valve, 2 air compressor governor, 3 air compressor, 4 main reservoir, 5 drain valve, 6 safety valve, 7 air filter, 8 D2-type driver's brake valve, 9 timing reservoir, 10 governor reservoir, 11 timing reservoir gauge, 12 dual gauge, 13 emergency brake valve, 14 water separator, 15 Zbr-type driver's di-

rect brake valve, 16 isolating cock, 17 triple valve, 18 auxiliary reservoir, 19 dual check valve, 20 brake cylinder, 21 release valve, 22 brake cylinder gauge, 23 isolating cock, 24 coupling tube of direct brake pipe, 25 automatic air pipe isolating cock, 26 brake pipe coupling cock.

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