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The HISTORY of LOCOMOTIVE BUILDING in DUNKIRK. Henry Mille.

The decision of the New York And Erie Railway to make Dunkirk the western terminus of the railroad put the name of Dunkirk village on the map of Chautauqua County and printed in large capital letters.

The men of that day who dreamed about a transportation system that would collect the agricultural wealth of the far western states and transport it to the seaboard at New York City had a vision far ahead of their day. Not one out of a thousand people of the state knew what a railroad was and had never seen a locomotive.

The locomotive at that time was a recent invention with which men had been experimenting for over a century.

Way back in1769 a Frenchman named Nichilas Joseph Cugnot designed and built a locomotive to run on ordinary roads. It looked like a lumbering truck with two rear wheels and a front steering wheel. The boiler was suspended, overhanging the front end and, after running twelve or fifteen minutes,at a speed of three or four miles per hour ,it was necessary to stop and get up steam. It made several trial trips in Paris . When turning a corner one day,at a speed of three miles per hour,it upset with a crash. It was considered dangerous and locked up in the arsenal. Then followed Murdock's engine with one cylinder in 1784,Trevethick experimented with one in 1803.Then came Puffing Billy in 1813 and " Locomotion " in 1825 and Stephenson's "Rocket" in in April 1829. In this same year ,William Murdock, an associate of Matts built the Stourbridge Lion,which was built in Stourbridge, England and was the first locomotive run on the Delaware and Hudson Canal Company Railroad. It arrived in America May 10th. 1829. It weighed seven tons. The boiler and other parts of this engine are now in the National Museum in Washington, D.C.

Soon America became interested in locomotive building and the West Point foundary at NewYork, in 1830 put in operation on the Charleston and Hamburg Railroad in South Carolina, a locomotive named "The Best Friend "with six cylinders and a sixteen inch stroke. All four drivers were made of wood with iron hubs and tires. It weighed four and one-half tons.

The South Carolina Railroad employed a negroe fireman who did not like to hear the hiss of steam when the safety valve opened to relieve the boiler of excess pressure.So one day the fireman sat on the safety lever so he would not hear the hiss of escaping steam.Suddenly there was a terrific boiler explosion which was the last hiss the poor darkey ever heard and the locomotive was a total wreck.The Best Friend went back on the fireman and not enough if him remained to give him a decent funeral.

We have traced the development of the locomotive from its infancy and you will note that it became a power in transportation about 1829 and 1830. Now let us trace the development of the railroad. Men soon realized they could draw heavier wagon loads if they ran their trucks on rails even when moved by horse power.At first the trucks traveled on planks laid flat on the ground. Then iron rails were added and the trucks traveled on wheels with flange tires to keep them on the track.These were used around quarries and mines.

The first locomotive to arrive in Dunkirk ,brought here by boat in 1849 by Mr Brooks,is supposed to have been the old "Orange Engine". The writer remembers when, as a boy he climbed into the cab of this engine after its days of usefulness were over and the engine was sidetracked.His recollection of this locomotive was that the combined weight of the engine and tender would not equal the weightof a light tender today.It had a copper firebox and flues and a complicated valve motion.Wood was used for fuel.Engines were not converted into coal burners until many years later.

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When you see the picture of a large funnel shaped smokestack on an engine you may know that it is a wood burning locomotive. The reason for using this type of stack was to controll the sparks thrown off by the wood fire. The internal construction consisted of wire netting designed to controll the sparks thrown into the air by the exhaust draft. At times these would resemble a display of fireworks.

There was an oil house situated just east of the New York Central freight house and on the east side of Park Avenue. Oil was shipped in wooden barrels in those days and not in tank cars. They tell us that an engineer was not getting the necessary draft to raise sufficient steam. At Brocton he punched several holes in the netting with his coal pick. Yes, the engine steamed better but showered the vacinity with sparks. These sparks set fire to the oil house and also to the buildings just north of the depot between Main and Beaver Streets. All were destroyed in about an hour.

An oil barrel rolled off a train into East Third Street. Some people salvaged the barrel and took it into the house. It was leaking badly so they put it into a tub. One of these fellows, with more curiosity than sense, held a lighted candle too close, igniting the oil and, as a result all the buildings between Deer and Leopard Streets were burned and one man lost his life.

When Dunkirk became the western terminus of the longest railroad in the world of that day it became necessary to build repair shops in Dunkirk to keep these engines in repair. These shops were built on land donated by the Dunkirk Land Co. and consisted of about twenty acres. These shops were used for repairs until about the year 1868 when Mr. Brooks was Master Mechanic of the shops. An occasional new engine was built when lack of repair work permitted.
Then in 1868 the Erie officials decided they would move all the locomotive repair work to Hornell and so advised Mr. Brooks.
He realized that this would be the worst thing that could happen to Dunkirk, which had grown from a struggling village to a prosperous town and that it would impoverish many honest workmen who had established comfortable homes here.
Mr. Brooks had too big a heart to see such a calamity happen without making an effort to keep the shops running.
So he contacted the Erie officials in New York with the thought of building new locomotives.

A company was organized and incorporated Nov. 11, 1868. The number of trustees who were to manage the affairs of the company was to be five and the names of these trustees were Horatio C. Brooks, Marshal L. Hinman, C.W. Chapin, H.M. Simons and John H. Bacon Jr.
The company was incorporated to carry on business in the Town of Dunkirk, Chautauqua County, New York. You will note that Dunkirk was still a town and not a city at that time.
The certificate of incorporation was filed in the office of the Secretary of State at Albany N.Y. on the 12th. day of Nov. 1869.
Mr Brooks was elected President and Superintendant and Mr. Hinman Secretary and Treasurer. Mr Brooks and Mr. Hinman were residents of Dunkirk and the other trustees resided in New York.
Mr Brooks leased the property known as the Dunkirk Shops for a term of ten years and he named the new company The Brooks Locomotive Works.

The first order for locomotives was from the Erie R.R. Co., such order being for twenty five eight wheel type of engines of six foot gauge which was the standard gauge of the Erie at that time and the order was completed at the rate of two engines per month. Only one was completed the first month and one during December. Twentyseven were completed the first year. During the calendar year of 1871 forty five engines were completed and seventy three completed in 1872. This brought the

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We have seen how the locomotive became a power in transportation in Europe about the year 1829 or 1830. The same was true about a year later in America. The proposal to build a railroad across New York State from the ocean to the Great Lakes was agitated by Wm. C. Redfield as early as 1831, twenty years before C.H.Sherman ran the first train into Dunkirk in 1851.

There were several different plans considered. One was to build the road to Jamestown and it was to cost between six and ten million dollars.

The first charter was geanted by the legislature April 24, 1832. and the company was organized August 9, 1833. The first ground was broken Nov. 7, 1835. The western end of the road was to be located somewhere between Cataragus Creek and the Pennsylvania State line. Finally the company decided it should be located in Dunkirk. If they had selected some other western terminal I would not stand before you today and tell you the story of locomotive building in Dunkirk.

The road was completed in sections beginning at the eastern end and trains were making regular runs on these as soon as they were completed.

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monthly average up to six engines per month.
3 It might be of interest right here to know that during the prosperous years of the American Locomotive Co. the monthly output sometimes was as high as seventy five engines per month. 3 engines every working day.

Then in 1873 a financial panic spread all over the country, and manufacturing business was practically at a standstill. Only six locomotives were built in 1874 and twenty five in 1875.
This was the year Mr. Brooks received his first order to build some of the new type called "Consolidation engines".
This was the year I started to work in the plant. This was a type of of engine with three pairs of connected driving wheels with a two wheel or leading front truck and no trailre truck under the cab. This type is now classed as a 2-6-0, a type that has one pair or two wheels for a front truck and three pairs or six driving wheels and no trailer truck. A 4-10-2 type would have a four wheel front truck with five pair or ten drivers and a two wheel trailer truck under the cab.

Do you understand how the steam is applied in the cylinders? When the piston head is at the back of the cylinder, steam is admitted back of the piston which pushes the piston to the front end of the cylinder, then the valves are shifted to allow steam to enter the front port, pushing the piston back. The pistons are connected to the driving wheels by the main rods which turn the driving wheels. You can realize how fast those pistons travel when the locomotive is running sixty miles an hour. These pistons come to a dead stop and reverse their direction twice for every revolution of the driving wheels.
Nor do we stop making improvements when a high powered and speedy engine is designed no more than we stop making improvements in the design of the modern automobile or flying machine.

Injectors now supply the boiler with water in place of pumps. The early locomotive was equipped with two pumps. When the engine had been standing for some time and the water got low in the boiler, the engineer found it necessary to run the engine up and down the track to pump water into the boiler. Then the injector was invented which is operated by steam which forces the water into the boiler at any time whether running or standing.

The dome of a boiler is its highest point and here is where the throttle is located that supplies steam to the cylinders. The reason for having a dome is to get dry steam, as far as possible from the boiling water, still we call this "saturated steam".
You know that water boils at 212 degrees yet the temperature of the boiler is many degrees higher. We now install a super heater that heats the steam to about 600 degrees to what is termed "dry steam". Increasing its pressure to about 300 pounds and increasing its pep and power over saturated steam.

You will recall that when starting a passenger locomotive, the engineer would back the tr in about a foot to take up the slack. He would then give the train a jolt forward in starting that would almost throw you out of your seat. Today he starts the tr in without a jolt so you scarcely realize the train is moving. How does he do it? Recent improvements have applied steam power to the trailer truck wheels in starting as well as to the drivers. This steam power is used in starting only. A truck so equipped is called a "Booster truck".

In early railroading days, the brakeman ran over the tops of the freight cars to set the hand brakes. Now the brakes of the entire train are controlled by the engineer when he applies the air brakes.
The story is told about Mr. Brooks being in New Jersey where some men were experimenting with mechanical controlled brakes but the effort was a failure. Then Mr. Brooks told these experimenters that, in his opinion, this would be successful only if they used compressed air for power. This gave the inventors a new idea and soon they developed the Westinghouse Air Brake, now in use all over the country.
Then the inventors reminded Mr. Brooks that he was the first to

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suggest the use of air and invited him to be a partner in their factory. He told them to stick to their air brake and he would stick to locomotive building.

The material and machinery used in building locomotives has been gradually improved. At first copper sheets were used to make the inside of the fire box, them steel boiler plate was developed that that would not split or crack while being flanged into proper shape. At first the boiler shop flanged all the plates by hand, using mallets made of wood. Now the boiler shop will shape a complicated boiler sheet in about five minutes by shaping it with dies in a flange press which is operated by hydraulic power of one thousand pounds pressure per square inch. Can you comprehend the enormous pressure used? It means that a load or pressure of one thousand pounds is loaded on every inch square of surface to which it is applied.

Today we pick up a locomotive with an electric crane and suspend it in the air above a long row of engines set side by side and then carry that locomotive over the tops of the others and set it down on any desired track.

Perhaps it might interest you to know that the Erie was the first road to run trains by telegraph despatch orders. Telegeaph orders used in running trains was unknown in those early days. Convenient sidings were constructed along the line of single track and east bound trains had the right of way, but lost it if they were more than ten minutes late in arriving at a turnout or waiting station. They must then take the siding and wait for the westbound train. One day Superintendant Minot was on the train. At Turner's station his train was to wait for the east bound express to pass. Mr. Minot was an old telegraph operator and when the west bound train arrived at Turner's, Minot telegraphed to Goshen asking whether the east bound train had left the station. The answer was that it had not arrived, showing that it was much behind time. Superintendamt Minot then wrote and handed to conductor Stewart the first telegraphic train order ever written, an order to run the train to Goshen regardless of the train coming east. The conductor handed the order to the engineer and told him to go ahead. The engineer read the order and passing it back to the conductor, exclaimed, "Do you take me for a fool? I won't run by such a thing". Conductor Stewart reported back to Superintendant Minot who went forward and used his authority on Engineer Lewis, but without avail. Superintendent Minot climbed into the cab and took charge of the locomotive himself. Lewis got off and took the rear seat of the last car. Minot then ran the train to Goshen and finding the other train had not arrived, he wired to Middletown. It was not there. He ran to Middletown and so on to Port Jervis where the other train had just entered the yard. Due to telegraph orders an hour had been saved by Minot's train and the telegraph system of running trains was adopted.

Perhaps you might ask, "How long does it take to build a locomothve?" When it is necessary to get out new drawings, patterns and castings and order the necessary material it requires over two momths before the first one of an order is completed, yet the Brooks Works have received orders and completed the first engine in twenty one days. These were duplicates of former orders.

Mr. Brooks insisted that all parts of a certain class be interchangable so a piece could be taken from one engine and applied to another. This was the first effort to make all like parts of the same size and interchangable. The practoce of this has done much to make automobile building the success it now is.

In recent years the locomotive builders have perfected the electric locomotive. In this type we eliminate the reciprocating motions of the pistons. Please remember that the pistons stop twice and reverse their direction for every revolution of the

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driving wheels. In this type we eliminate the reciprocating motion of the pistons. ~~Please remember that the pistons stop twice and reverse their direction for every revolution of the driving wheels.~~ In the electric locomotive there is a rotary motion, the machonery moving in one direction only. This is an advantage.

When a locomotive is designed for high speed it is equipped with driving wheels of large diameter. Driving wheels of small diameter are used in constructing freight engines. While these engines travel much slower, they can haul heavier trains.

Today we are developing the Diesel locomotive which uses oil for fuel. This engine generates electricity for power. This drives motors attached to the driving axles.

From this small beginning in 1829 has grown a mighty factor in transportation all over the world. It is estimated there are over 200000 locomotives in the world, with over 44000 in North America, over 9000 in South America, over 122000 in Europe and 17000 in Asia; over 3000 in Australia and over 6000 in Africa.
Please remember that the locomotive is only about 115 years old. We are familliar with the present day locomotive, what will the designer of tomorrow give us?

The steel first used in forging crank pins and rods would crystelize and break in running and this might wreck the engine. Then vanadium steel was invented, resulting in fewer breaks. Then heat treating steel forgings was introduced, so today we rarely have a broken rod or crank pin, or driving axle. I have seen a pair of driving wheels hoisted by a traveling crane and the axle break close to the wheel and one of the wheels drop to the ground.

There are several different kinds of steel, roughly divided into two classes. High carbon or tool steel that can be hardened or tempered, and a low carbon steel. This is used in forging crank pins, rods and axles. This steel is much improved after heat treating. The Dunkirk locomotive people were pioneers in the heat treating of steel.

Since the development of steel castings this material has been used extensively in locomotive construction and that is one reason why the present day engine can remain in service so long. Even cylinders are sometimes made of cast steel with a gun metal sleeve or bushing lining the cylinder. When this bushing is badly worn it can be removed and a new bushing shrunk into the cylinder but the cylinder is not scrapped; even an entire tender frame is of steel, cast in one piece, and engine frames are made the same way. Formerly engine frames were wrought iron forgings, the parts forged in the hammer shop and then welded together by blacksmiths. In the hammer shop they would take boards about eighteen inches long and twelve inches wide and pile wrought iron scrap on them about a foot high. These piles were put into a furnace of white heat and by the time the boards were burned away this metal would be at a welding heat and then taken out of the furnace and forged under heavy steam hammers. This scrap made the finest grade of wrought iron. Some parts like links and guides that were subject to much wear were case hardened so the outside surface was so hard a file would not scratch them.

You will remember that I said that the track gauge of the Erie was six feet. When new roads were built they adopted a track gauge of four feet eight and onehalf inches. This is the standard track gauge of today. When it was necessary to transfer freight from western roads to the Erie or Erie freight to western roads, it was necessary to transfer it in Dunkirk from cars of one gauge to cars of the other, causing delay and adding to the freight charges. Then the Erie changed its track gauge between New York and Dunkirk all in one day to the gauge adopted by the other roads. Now you can load cranges

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in California and deliver them in New York without changing cars or, ship a locomotive, built in Schenectady and deliver it on the Pacific coast and run it all the way on its own wheels.

You might ask what boiler pressure is used in the modern locomotive? Many years ago the pressure was 110 then was gradually increased to 150 and 160 pounds. I would not be surprised if some exceeded that pressure today.

One of the engines that made a speed record that became known all over the world is the "999" of the New York Central Railroad on May 10, 1893 when it attained a speed of 112.5 miles per hour. That was some improvement in speed over the speed of the Cugnot engine which ran in the streets of Paris in 1769 at a speed of three miles per hour. The "999" had 19 by 24 inch cylinders, 86 inch driving wheels and carried a boiler pressure of 180 pounds and weighed 124000 pounds.

Few Dunkirk citizens realize the enormous amount of money the Brooks Works distributed in the city. In the year 1885 they paid in wages the sum of $1156923.22 This was the lowest pay roll in seventeen years. In 1891 the pay roll amounted to $1586656.16.

The American Locomotive Company was organized in June, 1901. They bought the entire Brooks plant and added many improvements and new buildings and greatly increased the output.

The last locomotive built in the plant was in 1928. At the present time the plant manufactures oil refinery equipment, heat exchangers and fills government contracts such as gun carriages and other war equipment.

During the first world war the Company had a contract for 1250000 high explosive shells for the British Government. This work was completed three months in advance of the contract date.

At one time the productive force touched a payroll of 4500 men.

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Realizing that the majority of those who listen to my story of locomotive building have had no mechanical training, I decided to use what I will call conversational language and refrain from using mechanical terms as much as possible.

If there are any questions you would like to ask, I shall be glad to answer them if I can.

Henry Hille

August 5, 1944.

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