



**THE ENGINEERING INSTITUTE OF CANADA**

*and its member societies*

**L'Institut canadien des ingénieurs**

*et ses sociétés membres*

---

## **EIC's Historical Notes and Papers Collection**

(Compilation of Articles, Notes and Papers originally published as  
EIC Articles, Cedargrove Series, and EIC Working Papers)

## **ENGINEERING HISTORY PAPER #54**

### **“Engineering on a Small Island”**

**by Andrew H. Wilson**

(previously produced as Cedargrove Series #27/2014 – January 2014)

\*\*\*\*\*

EIC HISTORY AND ARCHIVES

\*\*\*\*\*

© EIC 2017

## **Abstract**

The island in question is the Isle of Man, which is located around the middle of the Irish Sea and approximately equidistant from the coasts of Scotland, England, Ireland and Wales.

The paper discusses briefly the history and development of the Island and its various connections with industries and engineering. It includes comments on the life of William Kennish, a Manxman of the 19<sup>th</sup> century and an inventor/engineer of some note, as well as on contemporary engineering and engineering training on the Island. It mentions very briefly the Island's fictional connection with the Island of Sodor.

The paper also includes a much shorter, but similar, account of the history and engineering development of Canada's Prince Edward Island.

## **About the Series**

Principally, the Cedargrove Series is intended to preserve some of the research, writings and oral presentations that the author has completed over the past half-century or so but has not yet published. It is, therefore, a modern-day variant of the privately-published books and pamphlets written by his forebears, such as his paternal grandfather and grandmother, and his grandfather's brother John.

## **About the Author**

He is a graduate in mechanical engineering and the liberal arts and has held technical, administrative, research and management positions in industry in the United Kingdom and the public service of Canada, from which he retired over 25 years ago.

He became actively interested in the history of engineering on his appointment to chair the first history committee of the Canadian Society for Mechanical Engineering in 1975 and served both CSME and the Engineering Institute of Canada in this capacity for varying periods of time until 2003. He has researched, written and edited historical material for both organizations, as well as the Canadian Society for Senior Engineers. He is also a past president of CSME and EIC.



The Island in the Irish Sea

The Main Places on the Island



## Introduction

The small island is the Isle of Man. It sits in the middle of the Irish Sea. If, on a sunny day, you climb to the top of its highest hill - Snaefell, 2000 feet above sea level - and look to the north you will see Scotland's Mull of Galloway. If you turn to the east you will see England's Lancashire coast. If you then turn to the south, and the day is clear enough, you may see the north of Anglesey in Wales. And if you turn west you will see Ireland's Mountains of Mourne.

As is my custom, this paper has its basis in the history of engineering and brings the Island's story up to contemporary times. However, there will be more photographs and maps than usual! It is a somewhat lengthened version of a talk I gave to the Ottawa Chapter of the Canadian Society for Senior Engineers in October 2013.

As a project, it began at Christmas 2012 when my daughter and Isle of Man resident, Ellen Paul, gave me a copy of Robert W. Stimpson's book *William Kennish: Manninagh Dooie - True Manxman*, the biography of the Manx inventor and poet who served with distinction as a chief carpenter in the Royal Navy and later as a self-employed engineer with headquarters in New York. Of English origin, Bob Stimpson is a long-time Man resident, a professional engineer and an amateur historian.

I had read the non-poetic parts of this book before the New Year, with enthusiasm. Having visited the Island several times already, having seen the Laxey wheel and other examples of Manx engineering that have been preserved, and having realized that many engineering companies had set up shop on the Island in the postwar years, I decided to put together a project on the history of engineering on the Island, interwoven with some of the Island's geography and political history. Both my daughter and Bob Stimpson helped me with it, providing material that I would otherwise have been unable to include. As noted, I gave a talk on it late last year, which generated an encouraging response.

The thought had already struck me that the Isle of Man project would benefit from comparison with engineering experience on a comparable Canadian island. The most suitable one appeared to be Prince Edward Island which, although considerably larger than Man, has gone through somewhat similar development. For this, I was helped by the Association of Professional Engineers of PEI and by earlier personal contact with the Island.

## The Island and its History....

The Isle of Man appeared out of the ocean as the ice sheet retreated northwards at the end of the last Ice Age. Much earlier, it had been attached to the rest of Europe. Over the most recent centuries, it has been known by such other names as Ellan Vannin (in Manx Gaelic), Mann, with two n's, Mannin and Mona's Isle. Speaking of language, Manx was the Island's *lingua franca* until relatively recently. It is one of a group of three Goidelic languages, the other two being



## Scottish and Irish Gaelic.

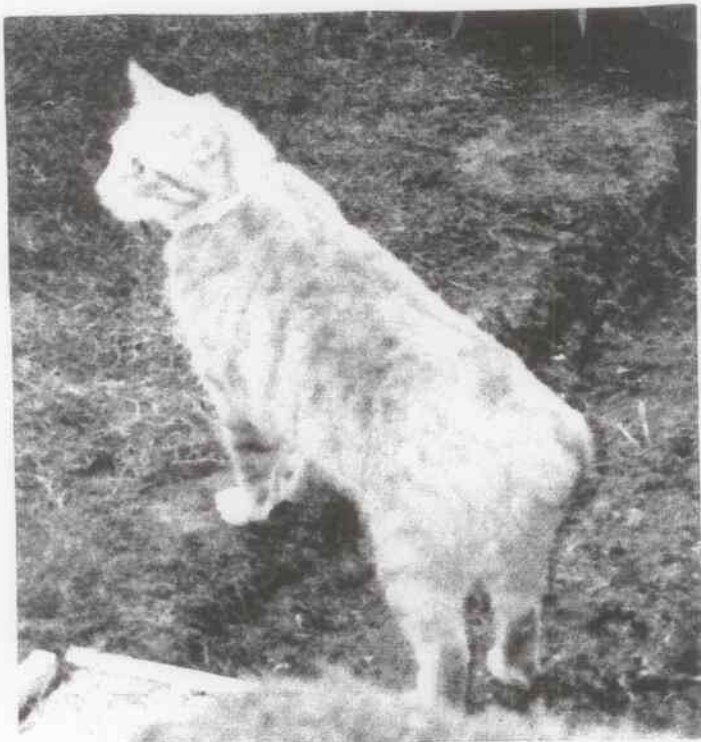
The island is approximately rectangular, but pointed at each end, and lies at a NE-SW angle to the meridian. It is some 32.5 miles long and 13.5 miles wide, with an area of 221 square miles. Off its southern end is a very much smaller island, called the Calf of Man. A ridge of hilly country runs centrally from north to south, roughly parallel to both coasts. Much of the remaining space is quite flat and has been concerned principally with farming. Anyone familiar with the countrysides of the Scottish Lowlands and Borders and the Southeast of England will find much that is similar on the Island, from 'dry-stane-dykes' to raised hedgerows and relatively small rectangular green fields. Much of the coastline is rugged and cliffed.

The average annual rainfall is 40 inches, and the average temperature 47 degrees Fahrenheit. Fogs are common. Indeed, legend has it that they hid the Island from invaders in years long past and acquired the nickname, the 'cloaks of Manannan' - after the mythical sea god. Snowfalls are not common, except sometimes, on the highest hills. However, during late March 2013, the worst snowfall since 1963 hit the centre and west of the Island. Farmers lost over 14,000 cattle and sheep in the 9-to-12-foot drifts.

The very first inhabitants of the Isle of Man were nomadic hunter-gatherers. Many thousands of years later the Celts came. The Romans, by the way, took nothing to do with the Island. Scandinavian invaders arrived around 800 A.D., having also invaded the islands off the west coast of Scotland. They were Norsemen, rather than Vikings, and their helmets had no horns. One thing the Norsemen did for the Isle of Man was to establish - in 979 A.D. - a Parliament, known as the Tynwald, which is now the oldest, continuous parliamentary entity in the world. The Norse remained in possession of Mann until the Treaty of Perth in 1266, and after the Battle of Largs, on Scotland's Clyde Coast, when King Alexander III's warriors chased the Norsemen back home. The Scots ruled Mann for about 70 years. Then the English took over and installed a series of noblemen as rulers, notably the Stanleys, later Earls of Derby - the same family whose connection with Canada is now enshrined in a hockey cup. In 1736 the Scots took over again, but sold the Island back to the English in 1765, after which the Kings and Queens of England were the Lords of Mann, ruling again through a series of noble or knighted Governors.

Although never completely independent of British rule after the Norsemen left, the Isle of Man has never been part of the United Kingdom. It is now formally a British Crown Dependency, or British Island (similar to Jersey and Guernsey). It was once notorious for its participation in smuggling. It has also been branded, historically, as one of the world's so-called 'tax havens' but lost that undesirable label recently after establishing a leading role in reciprocal taxation agreements with the U.K., E.U. and U.S.A.. This process has now been followed by other similar jurisdictions.

The current population of the island is around 85,000, of whom 26,000 live in Douglas, the current capital and seat of the Government, the Legislative Council and the House of Keys, with another 9,000 in the Village of Onchan, on the coast immediately to its north. Many of the others live in the towns of Ramsey in the north, Peel in the west, and Castletown, the former capital, in



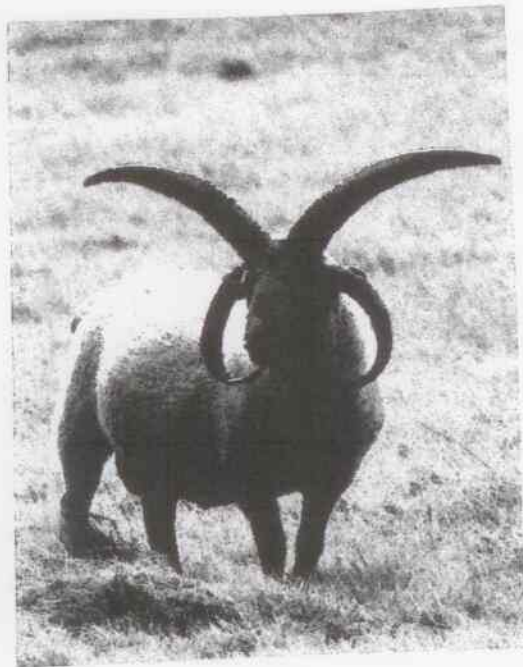
Manx cat



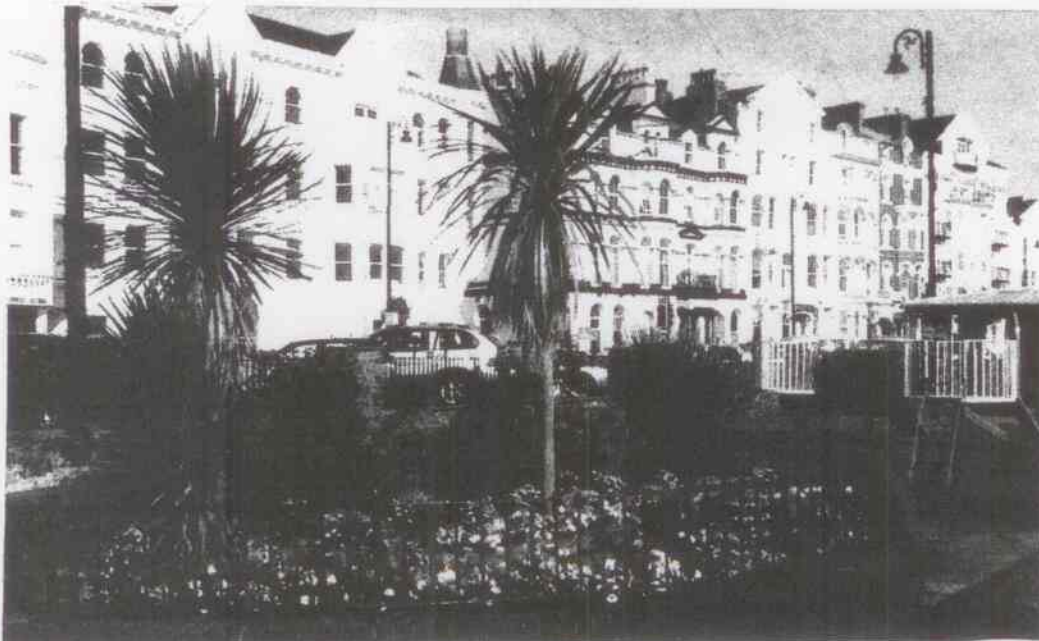
Triskelion



TT Races



Loaghtan sheep



Promenade, Douglas



the south. Nowadays, the Isle of Man is famous for at least three things: the motorcycle races that are held annually; its three-legged emblem (triskelion), the origin of which is uncertain; and its tail-less cats, which apparently are not really Manx. The Loaghtan sheep native to the Island have four horns, and are considered a breed 'at risk' today, with fewer than 1500 remaining.

The Isle of Man's early industries were concerned with the land and the sea and using their products for survival. Aided by the Gulf Stream, the fertile soil of Mann has been extensively cultivated through farming - both crops and animals - since the days of the Celts. Their early tools were primitive, both home-made and acquired.

The Island has always been self-sufficient in food. Fish, especially herring, have been historically important for local consumption and for trade. Islanders preserved large quantities each year by salting them. However, for a very long time, the head of a Manx family could not always support it by farming alone and had to have a second job, at sea, in a town trade, or abroad. Water power has enabled the Island to develop industrially and as a habitation. Along the way, Manxmen developed their own method of holding down the thatch of their cottage roofs during windy storms.

Since Celt and Norseman days, the many sandy strips around Mann's perimeter have allowed for the easy beaching of boats, both fishing as well as warlike. Even the large Norse ones, which they brought with them, could be moved away from the tides using rollers. As an island, of course, Mann could not survive without the building of ships, both at home and abroad.

### **Early Engineering**

During the Middle Ages, in keeping with experience in the British Isles and in other countries in Europe, the largest buildings constructed on the Isle of Man were either castles or churches.

The construction of buildings throughout most of the Island has been largely dependent on local limestone, the exception being in the southwest, around the town of Peel, where the local, softer red sandstone has been used.

St. Patrick's Isle, just offshore from the town of Peel, is the site of Peel Castle. It was originally built of wood by the Norsemen in the 11<sup>th</sup> century, although stone parts were added later. Rebuilt in the 14<sup>th</sup> century, it was abandoned in the 18<sup>th</sup> and never rebuilt again or restored. St. Patrick's Isle was also the first centre of Christianity on Mann. A Catholic monastery had been established there in Celtic times. The original St. German's Cathedral, the seat of the Bishop of Sodor and Man - of which more later - was built within the walls of Peel Castle in the 13<sup>th</sup> century. It fell into ruin a half-millennium later and was never rebuilt. Nowadays, St. Patrick's Isle is connected to the main Island by a causeway and the ruins of the castle and the church are open in summer as tourist attractions.

The town of Peel itself has also been the long-time capital of the Manx herring fishery and its off-shoot 'kipper' industry.

Bishopscourt was originally built at Kirk Michael, some miles north of Peel, in the 12<sup>th</sup> century as the official residence of the Bishops of Sodor and Man. It is the only large house on the Island to have been occupied continuously for eight centuries. The original timbered building was rebuilt in 1698 using stone. It was repaired and restored in the 18<sup>th</sup> century, and maintained as the Bishop's residence until the 20<sup>th</sup>, when it was sold to private interests.

The construction of the compact but substantial Castle Rushen, on the other side of the Island and in the old Manx capital, Castletown, began around 1250 while the Norsemen were still on the Island. It was extensively repaired and rebuilt a century later by England's Edward III, after Scotland's Robert the Bruce had destroyed it in 1313. Local limestone was used. Unlike the castle at Peel, the one at Castletown has been maintained over the centuries and is now a working museum.

The building of Rushen Abbey at nearby Ballasalla was begun before Castle Rushen, in the 12<sup>th</sup> century, when it came under the Cistercian Order, and while the Norse still ruled the Island. Originally built of wood, it was later rebuilt with stone. The early Cistercians were farmers but were skilled at draining land and harnessing running water. They also produced wool, and built bridges of stone. The Abbey was restored in 2000.

Harbours, jetties, piers, slips, breakwaters and boathouses were built, beginning in those early years, notably at Castletown, Ronaldsway, Derbyhaven, Douglas, Laxey, Ramsey, Peel, Port St. Mary's and Port Erin, most making use of local materials. Lights and lighthouses were also built. In 1650, for example, a light was erected on the fort at Derbyhaven. It was later replaced by a lighthouse at nearby Langness to better serve the safety of ships entering the neighbouring port of Castletown. In 1816 a seamark tower was built on Douglas Head. It was lit in 1833 and rebuilt in 1892.

It was Scotland's Northern Lighthouse Board, rather than England's Trinity House, that received permission from the British and Manx Governments in 1815 to build lighthouses at Point of Ayre on the Island's northern tip and on the Calf of Man in the south to protect shipping going to, and coming from, the Firth of Clyde. Robert Stevenson designed them in 1818. However, the two on the Calf were later deemed ineffective and were replaced by a new lighthouse built on nearby Chicken Rock in 1875, designed by Stevenson's sons, David and Thomas, the father of author Robert Louis Stevenson. The NLB has retained responsibility for the Manx lights. Mann still has the most densely populated coastline for lighthouses in the world.

In 1832, William Hillary - a recent immigrant to Mann - brought about the building of the Tower of Refuge in Douglas Bay. Designed by John Welch, and built on a reef submerged at spring high tide, the Refuge was intended to warn ships in the Bay of the reef's existence and to provide temporary shelter for any sailors washed overboard or otherwise marooned during a storm. It had a bell to summon help and, for a short time, was kept supplied with fresh food and water. Since it





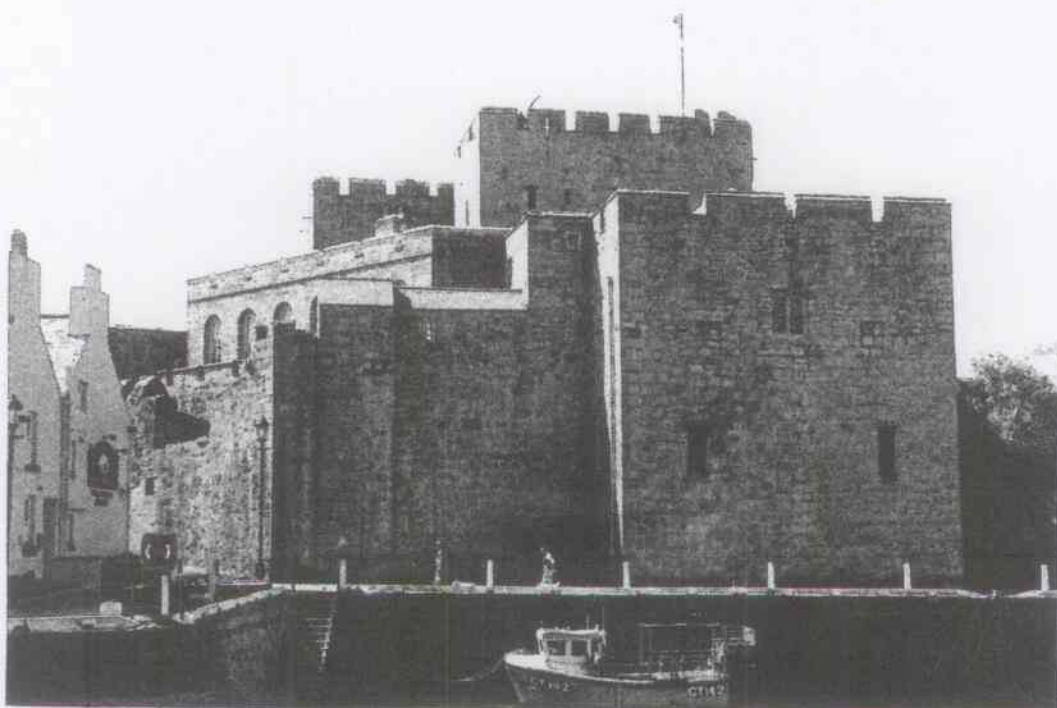
Tying down a thatched roof



Peel Castle and the original St. German's Cathedral



Model of Rushen Abbey



Castle Rushen, Castletown





Point of Ayre and Chicken Rock Lighthouses



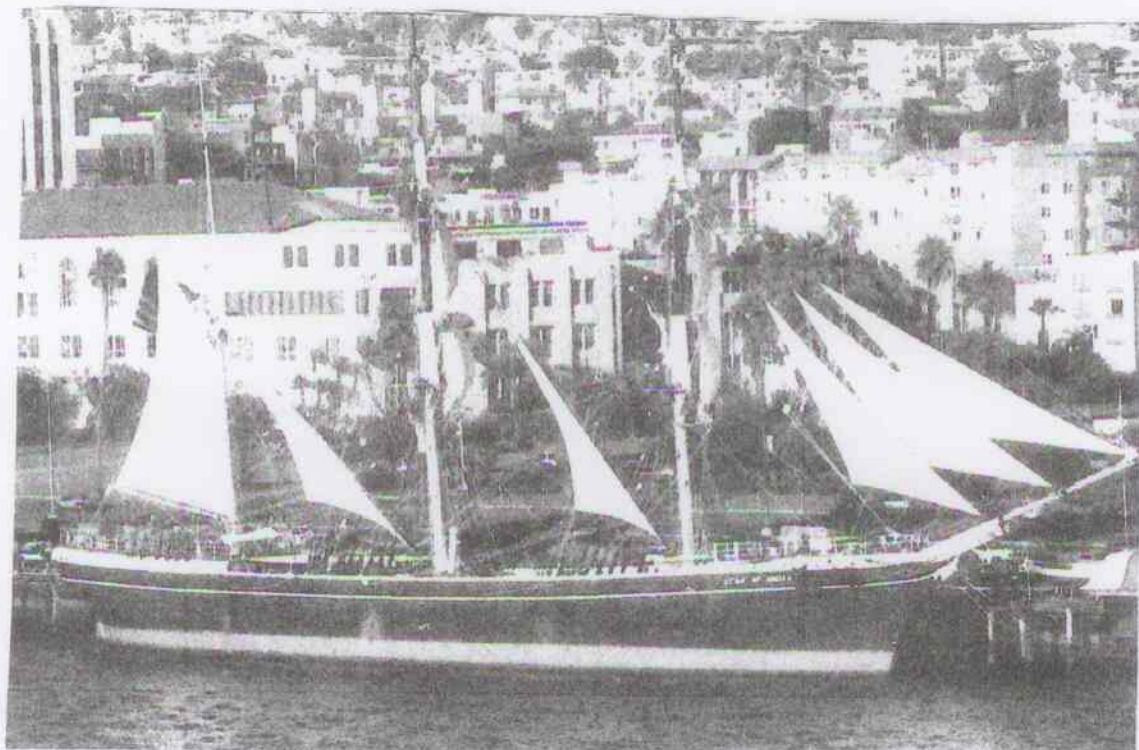
Tower of Refuge, Douglas Bay

was built, no ship has been wrecked on the reef. Hillary was also instrumental in founding what became the Royal National Lifeboat Institution, which has rescue vessels located all around the British Isles and, subsequently, successfully emulated worldwide.

### **Ships, Shipping and Shipbuilding**

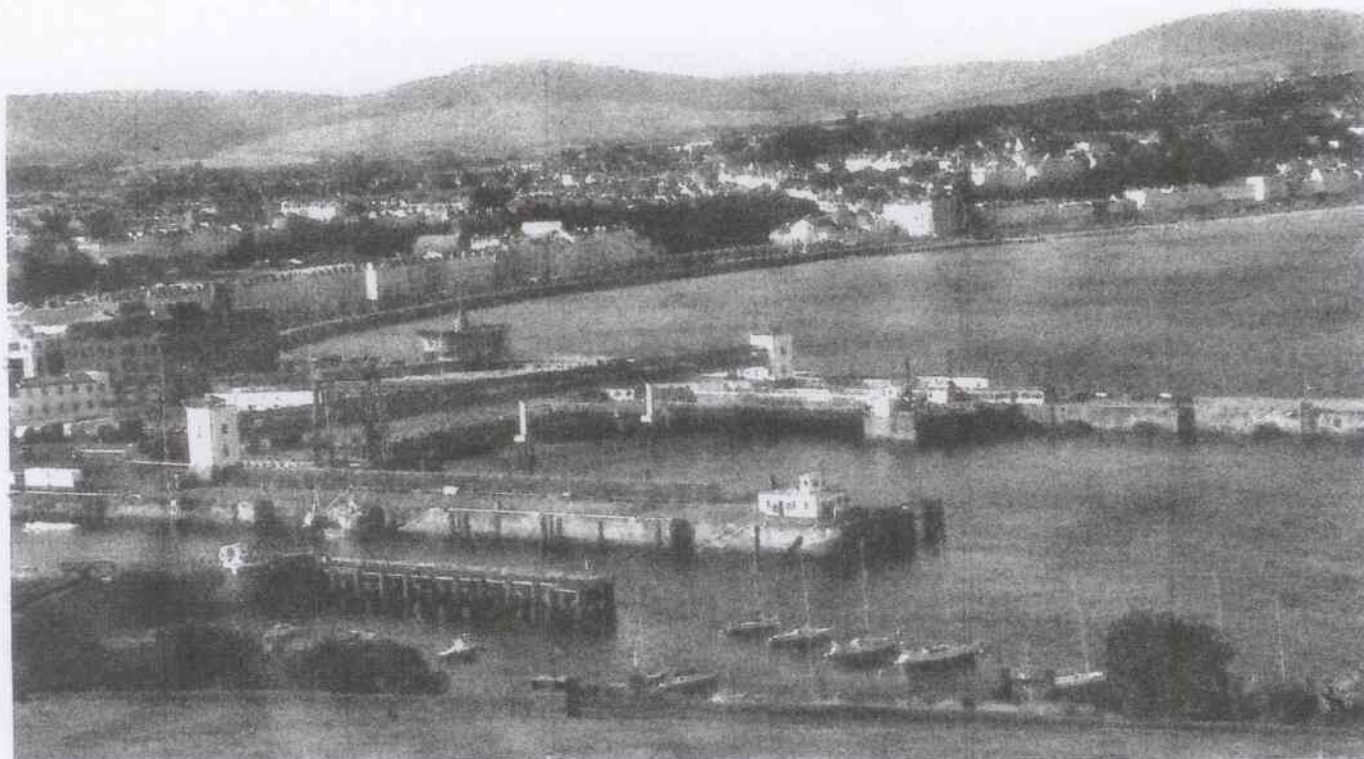
Shipbuilding flourished on the Island while hulls were made of wood. The principal yards were at Douglas, Ramsey and Castletown. A well-known Douglas shipbuilder of the 19<sup>th</sup> century was William Qualtrough. The ships he and others built on the Island were principally for Manx use in fishing and for trade in the Irish Sea, including smuggling, although Island-built schooners and barques plied seas in other parts of the world under non-Manx ownership. Sometimes the hulls were built inland, near the source of the timber and the skilled labour, and transported overland to a river or the sea. Sideways launching was also used. The advent of steam, with wooden hulls, presented the Manx shipbuilders with less competition than did the advent of iron hulls and steam. The Ramsey shipyard built some iron-hulled ships, including the world's first oil tanker (the *Jane* in 1862), and the sailing ship *Star of India* (launched in 1863 as the *Euterpe*), currently the centrepiece of San Diego Maritime Museum. It is still in operation today, sailing and fully maintained and repaired.

The Isle of Man Steam Packet Company operates the oldest continuous ferry service in the world, beginning in 1830 when the steamer *Mona's Isle* made the first 80-mile crossing from Douglas to Liverpool. Its ships, however, have been built by English or Scottish shipbuilders. These beginnings coincided with those of the tourist trade to the Island, which swelled significantly throughout the 19<sup>th</sup> century. In the 20<sup>th</sup>, the two World Wars reduced this trade to zero and took many of the Company's ships into war service. It recovered after the First War but,



*SS Star of  
India*

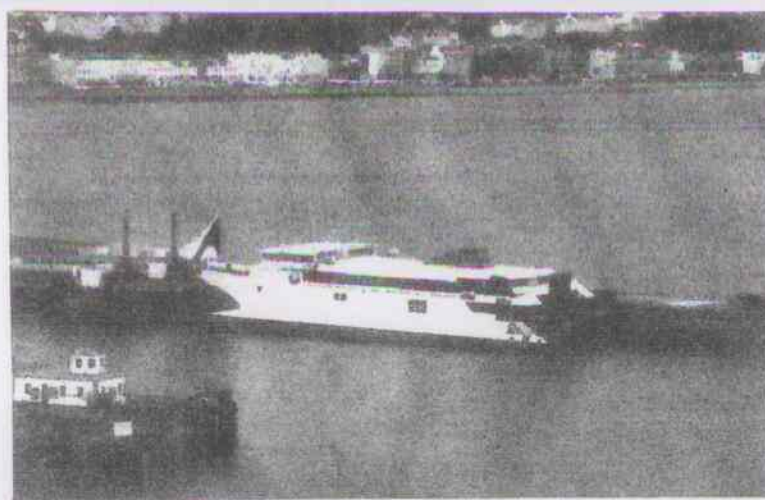




Outer Harbour and  
Ferry Terminal, Douglas



IoM Ferries:  
*MV Ben-my-Chree*



and the Catamaran  
*Manannan*

except for the weeks of the motorcycle races, it has not recovered to any extent since the Second War, after which the option of a European holiday became possible for many British families. However, freight and passenger traffic to and from the Island and the Lancashire ports and Ireland have kept the Company in business. Car ferrying capacity was introduced in 1962. Steam has also given way to diesel. Currently, a small freight carrier also operates from Ramsey

### **Mining on Mann**

The Isle of Man has no coal and it has always been expensive to import. However, the dominant Manx slate is highly mineralized, and has been mined and quarried. Evidence suggests that mining goes back to the days of the hunter/gatherers, when deer antlers were used to dig into the earth and stone hammers were used to break up the rock. The earliest small scale ore discoveries - of lead, copper and iron, for example - were made at Bradda Head, Glen Chass and Rushen in the south of the Island. It has been suggested that the versatile monks of Rushen Abbey were mining in the 13<sup>th</sup> century.

The most active mining period on Mann was from the mid-18<sup>th</sup> and during the 19<sup>th</sup> centuries, in two main areas: Foxdale and Snaefell/Laxey. The principal minerals extracted were zinc, lead, silver and copper. Access to significant supplies of water was necessary for these operations.

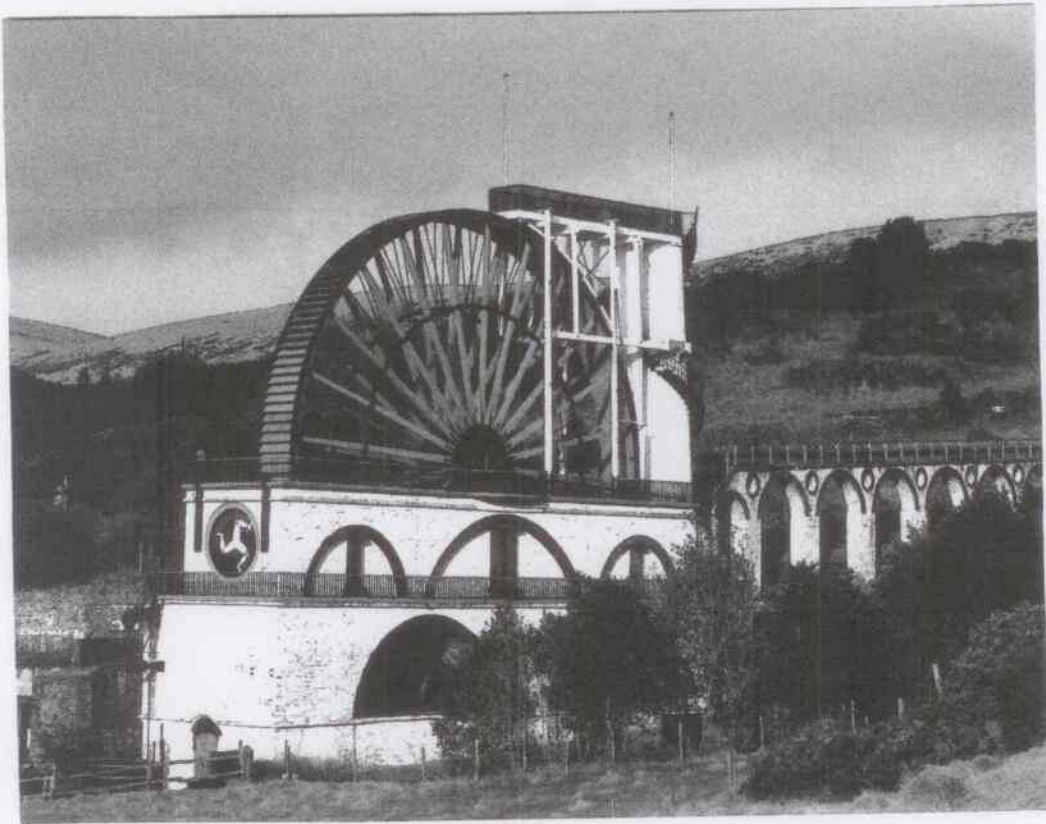
The main Foxdale group of lead and silver mines (some seven miles west of Douglas) consisted of five principal mines in a cluster, the largest of which employed at its peak several hundred men underground and a hundred more on the surface. It produced an average 3500 tons of ore annually for many years. These mines had closed by 1911. Evidence of their existence has almost disappeared. There were also a number of other, smaller mines in and around Foxdale.

The Snaefell mine - lead, copper and zinc - was located on the side of the hill of the same name and about two miles to the northwest of the main Laxey mine. Again, its closure in the early 20<sup>th</sup> century left behind few traces of its existence. However, a 50 foot diameter water wheel from this mine has since been re-erected at the surviving washing floor at Laxey. The harbour at the town of Laxey, south of Ramsey, was built specifically for the shipping of ore from the mines.

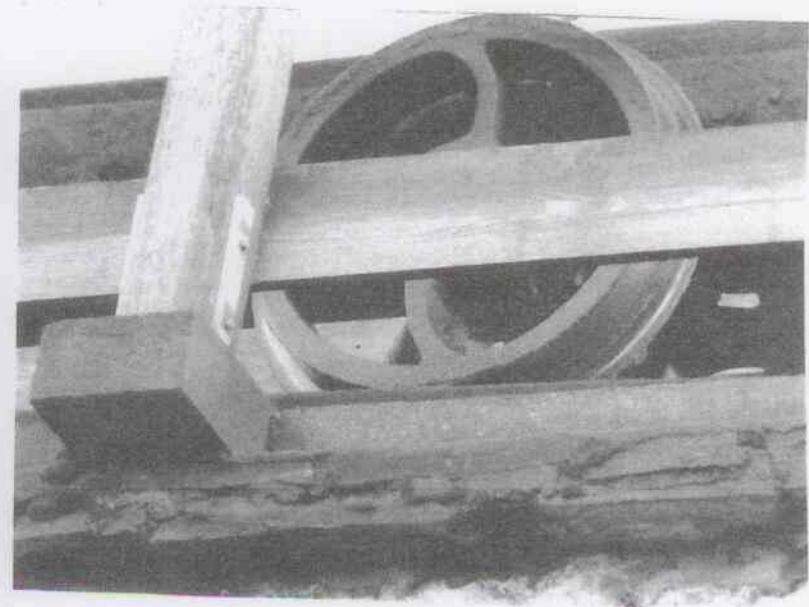
The main Laxey mine is perhaps the best known of the Manx ones because of the enormous water wheel that has been restored and has become a present-day tourist attraction. The main mine - there were several subsidiary workings not far away - produced zinc, silver, lead and copper. The depth of the shafts gave rise to the need to drain the accumulating water, and this was satisfied by the wheel, christened the *Lady Isabella* after the wife of the then governor of the Island in 1854.

Water wheels and mills have been around Mann for hundreds of years but none was as big as the one built at Laxey. It is 72 feet in diameter and the buckets are 6 feet wide. The wheel is backshot, the water coming from a reservoir some distance uphill and being fed by gravity to the top of the tower beside the wheel. Normal operation was at two-and-a-half revolutions per



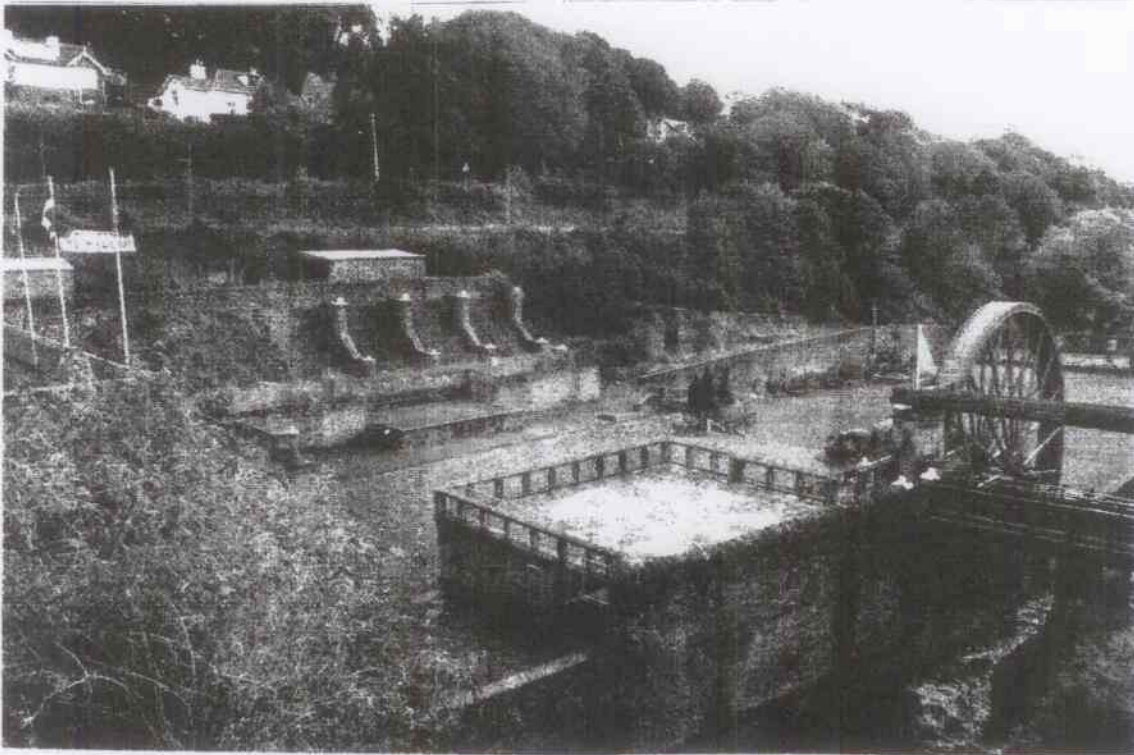


The Laxey Wheel



Viaduct Roller

Laxey Wheel from the  
T-Rocker end



Remains of Laxey Washing Floor - with Snafell Wheel in Place

minute, generating around 185 hp. Attached to the wheel was a crank with an eight-foot stroke, which was attached to a mechanism that slid on rollers along a 600-foot viaduct up to the mine to drive an inverted T-rocker connection which, in turn, transferred the horizontal motion of the mechanism into vertical motion to enable a series of plunger pumps to bring water up from the depths of the mine. Some 250 gallons of water per minute could be drained from the mine, 1500 feet below the surface, and transferred to the Laxey River, unfortunately polluting it. As a present-day tourist attraction, the wheel still turns at two RPM, but the sliding mechanism is sometimes disconnected from the wheel.

Questions have been raised about where the Laxey wheel's components were made. There seems no doubt that the crank and the other larger, solid metal components were forged in foundries in England, but doubt remains about how many of the rest were made there or on the Island.

At first, miners had to descend into the mine by ladder and ascend it when their work was done. However, a 'man engine' was later designed and built. A kind of oscillating ladder, it took a man upwards or downwards, about ten feet at a time, between a series of stationary platforms. Driven by accumulated water pressure, progress on it was dangerous and still very slow, but it was better than climbing the ladder!

The ore raised from the Laxey mine was moved first by horse and cart and later by a narrow gauge railway with its tiny locomotives to the washing floors downstream. Here the ore was broken up, the usable material transferred to the harbour for shipping, and the waste material



discarded.

The mine was finally closed in 1920. The wheel and its environs did not come into the possession of the Manx Museum and National Trust until 1989, after which the site was adapted for tourism. Also, some of the downstream washing floor area has been restored and, as mentioned, a wheel from the Snaefell mine has been re-erected there. But the other mine-related buildings have been demolished. The narrow gauge railway has been partly restored and a tiny locomotive rebuilt.

### **Mills and Other Processing Businesses....briefly**

Among the earliest watermills on the Isle of Man were those for milling grain. Again some of the earliest milling was done by the monks at Rushen Abbey. As in other parts of the world, milling technology on the Isle of Man has progressed through the centuries and some evidence of this progress can still be seen. There have been several other kinds of mills all over the Island - for cotton, flax, hemp for ropes, paper, wool and the making of cloth. A few are still in operation. In the late 18<sup>th</sup> century, there were as many as 18 breweries on the Island. Today, there are only two. Bricks have also been made since around 1700, and production continues. And of course, fish processing has always been a staple industry. But in spite of producing metal ores in some quantity, *metalworking* has not been a common activity on the Island.

### **Railways**

The first rail lines on the Island were of the narrow three-foot track gauge and connected Douglas with Peel in 1873 and Douglas with Port Erin in 1874, both owned by the Isle of Man Railway Company. A third line, owned and operated by the Manx Northern Railway, was built in 1878-79 across the Island from St. John's, on the Douglas-Peel line, to Ramsey. A short line from St. John's to Foxdale was added in 1885 to serve the mines. However, the demise of these mines and the completion of the Douglas to Ramsey line by the Manx Electric Railway put the Northern Railway in difficulties and it was taken over by the Isle of Man Railway in 1904.

During the 1920s, the Isle of Man Railway formed a subsidiary that operated most of the Island's bus services and propped up its railway interests, until the 1960s. However, the IMR system closed down in 1965, was briefly revived in 1967, but the passenger side of the Peel to Ramsey lines closed down permanently the following year and the freight side in 1969. The Douglas to Peel line closed for regular traffic in 1971. The permanent way on the Peel-Ramsay and Foxdale lines were lifted in 1975. That year, the line from Port Erin terminated at Castletown, in 1976 was extended to Ballasalla, and in 1977 to Douglas. The Government took over the IMR in 1978 and, since then, it has been run by one of its departments, principally as a tourist attraction.

The Manx Electric Railway runs from Derby Castle at the north end of the Douglas Promenade, up the east coast of the Island to Ramsey, by way of Laxey, using both urban streets and segregated country for its right-of-way. The gauge, again, is three feet. It opened in 1893 to

Groudle Glen, in 1894 to Laxey, and 1899 to Ramsey. It uses passenger rolling stock that might be called 'tram-trains' - the tram being a passenger-carrying 'motor-car' with the driving machinery, linked to a passenger-carrying trailer. The first trams were connected to the overhead 550 volt, dc power lines using Hopkinson bow collectors until the beginning of the 20<sup>th</sup> century when trolley poles were substituted. Originally, the power for the line was generated by the MER. More recently, it has been supplied by the Manx Electricity Authority's grid. The line until recently operated year-round, with less frequent service in winter. By the late 1950s the line was in financial trouble and was acquired by the Manx Government and, like the IMR 20 years later, has been run by one of its departments which, incidentally, is now also responsible for running the Island's bus service.

The Manx Electric Railway's Groudle Station connects the line with the small, separate Groudle Glen railway - a short two-foot gauge railway that runs through the woods of the glen. At Laxey, passengers may connect with the refurbished Laxey Mines Railway, mentioned above.

To reach the MER's Derby Castle terminus, passengers may use the Douglas Horse Trams which run from the Sea Terminal, along the Douglas Promenade, to Derby Castle. The Horse Trams began operation in 1876, and still use the original rolling stock...but not the original horses! There is actually a stable in Douglas where 'retired' tram horses spend their sunset days.

Finally, the MER connects at Laxey with the Snaefell Mountain Railway. The SMR ends at the summit of the Island's highest hill, 30 minutes and five miles away. Its gauge is three feet, six inches, which makes it and its stock incompatible with the MER unless the bogies are swapped. Its power is the same as the MER - 550 volts dc, drawn from overhead wires, still using Hopkinson bow collectors since they are deemed more dependable in the strong winds experienced ascending and descending the hillside. The railcars are single units, wooden-bodied, and built around 1895, when the railway's operations began. The SMR uses a Fell Incline Railway Centre Rail system for braking on the downward journey through the steep parts of the track. Actually, the son of the inventor of the Fell system was the surveyor for the SMR route. There is one stop on this route - at The Bungalow, a famous location on the TT circuit, close by where Murray's TT Museum used to be, and within sight of the summit of Snaefell.

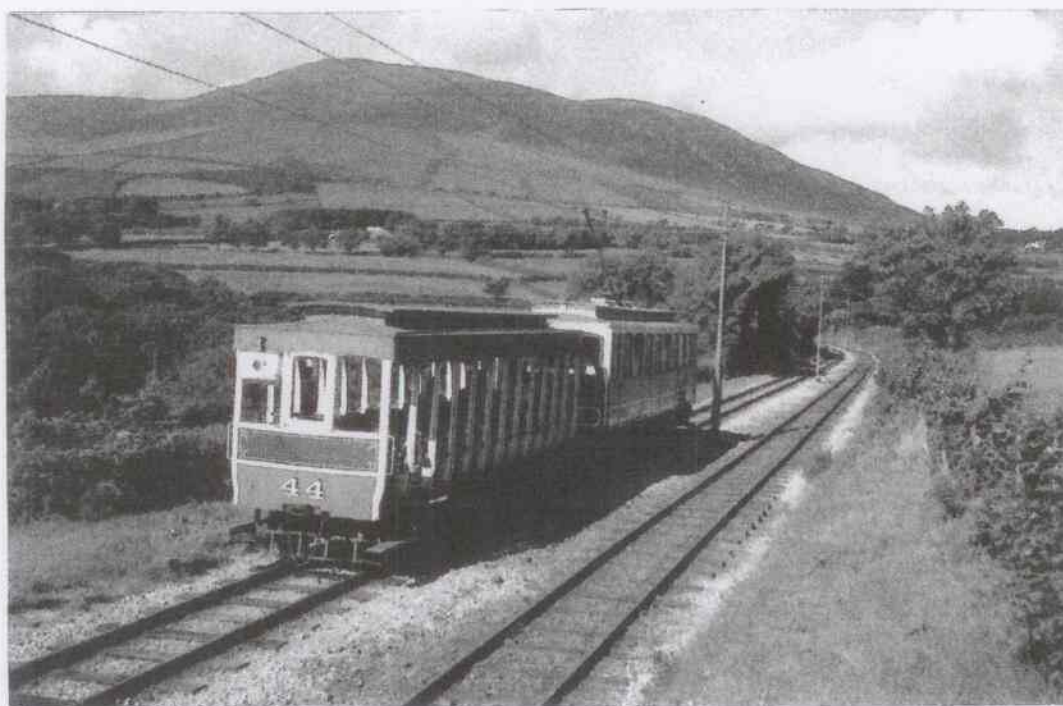
Originally of somewhat dubious ownership, the SMR was acquired by the MER in 1902. Following financial difficulties in the 1950s, it was taken over by the Manx Government in 1957 and is now operated by one of its departments.

Currently, therefore, three 'main' railway lines operate on the Island: the Steam Railway, from Douglas to Port Erin, with six regular stops in between; the Manx Electric Railway from Derby Castle in Douglas to Ramsey by way of Laxey, including six regular stops; and the Snaefell Mountain Railway, which departs from, and returns to, Laxey. Original rolling stock is still used on all three.

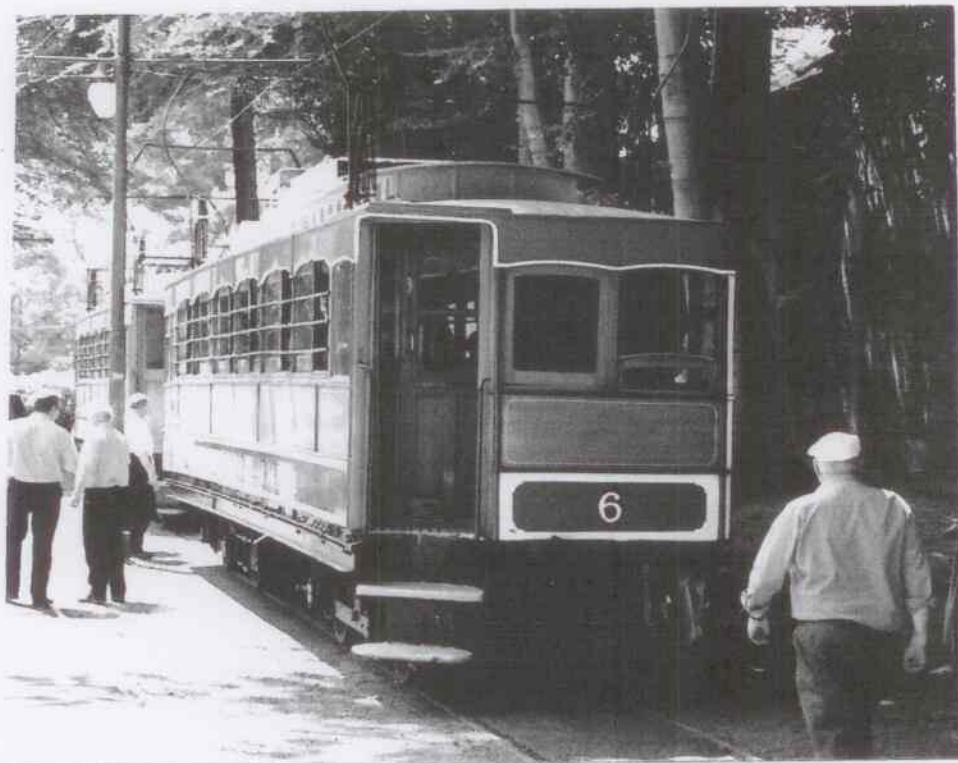




Coach and Locomotive - Port Erin to Douglas Railway



Tram-Train - Derby Castle (Douglas) to Ramsey Railway



Rail Cars - Snaefell Mountain Railway



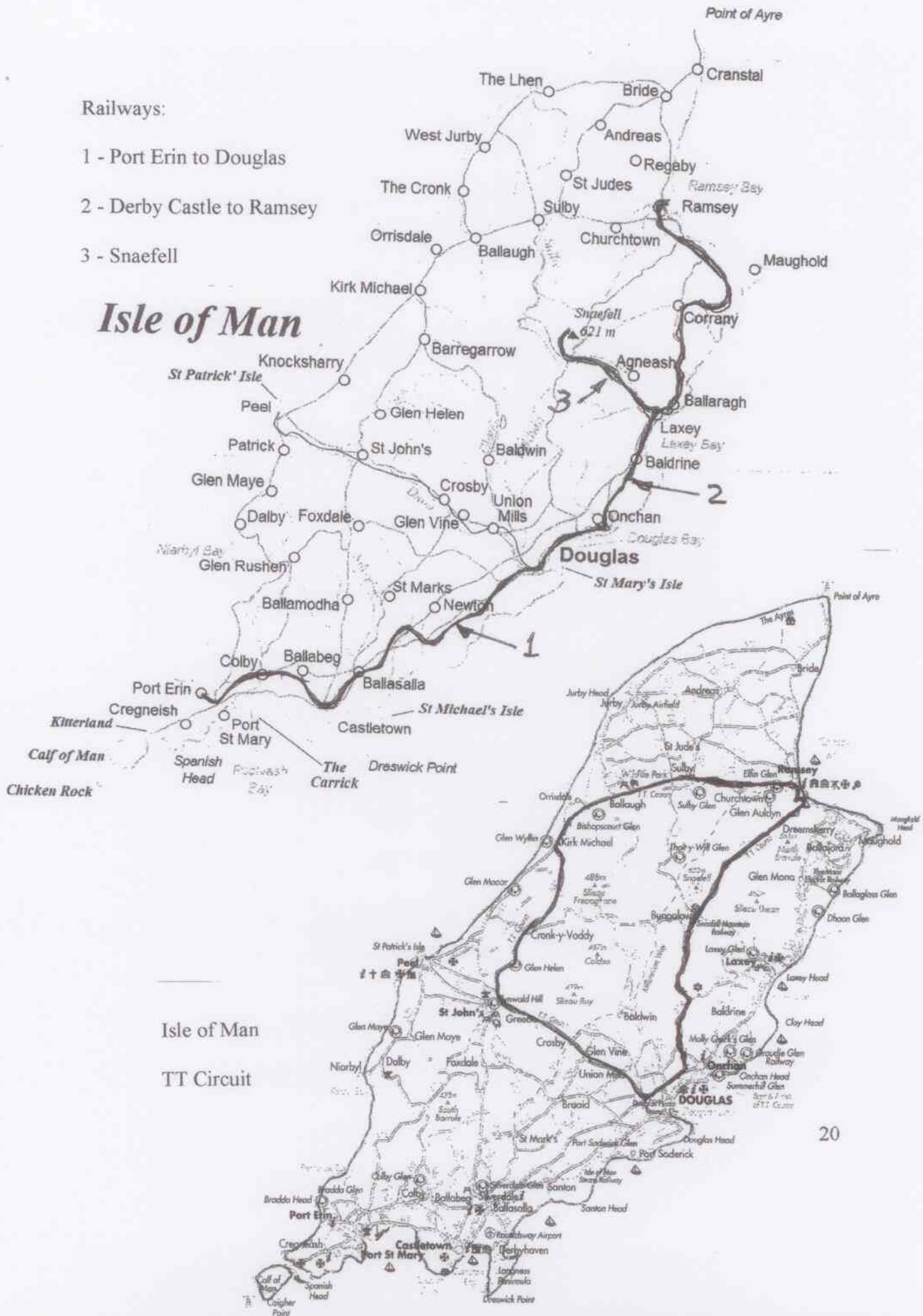
Horse Tram - Douglas Promenade



Railways:

- 1 - Port Erin to Douglas
- 2 - Derby Castle to Ramsey
- 3 - Snaefell

## Isle of Man



## Motor Cycles

Certain public roads on the Isle of Man have contributed significantly to the development and design of, first, cars and then motorcycles for over 100 years. In contrast with the ones in the U.K., the Manx Government was persuaded to close public roads for periods of time to enable trials to take place. On the other hand, the actual design and other work to the machines has been done in the manufacturers' plants worldwide and not on the Island.

The early racecourses were of different lengths from the current Tourist Trophy one, which is almost 38 miles long, beginning at Glencrutchery Road in Douglas, then south and west across the Island to near St. John's and adjacent to Tynwald Hill, from there northwards, parallel to the west coast, to Ballaugh, from there to the east coast and Ramsey, then south again over the 'mountain' section, by way of The Bungalow and Snaefell, and back to Douglas and the finish at Glencrutchery Road. Over the years, these races have contributed to the Island's income from tourism and since World War II have been the mainstay of it.

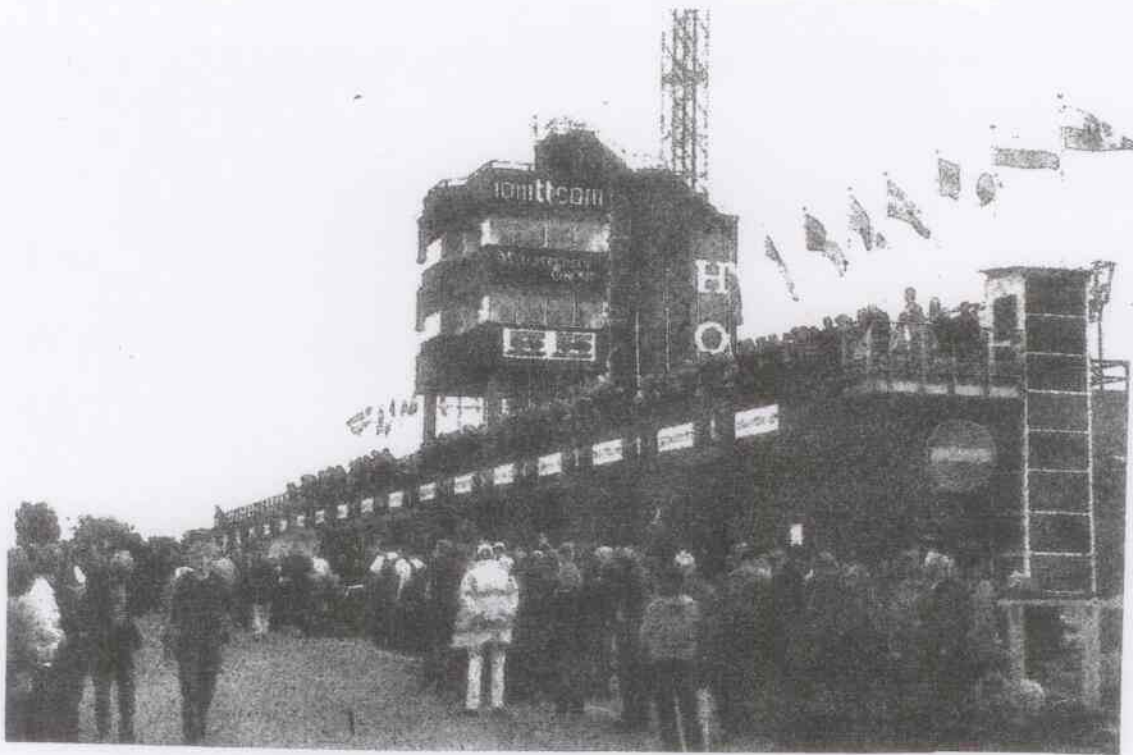
The races for cars began in 1904 with the Gordon Bennett trials, but these lasted for only a few years. The TT races for motorcycles began in 1907 and the Manx Grand Prix races in 1923. Nowadays, both meetings include practice days and race days, the TT in June and the MGP in August. During, and for a short time after the races, various temporary grandstands and safety barriers are in evidence round the course. A permanent grandstand and race facilities have been built at Glencrutchery Road, where vintage car rallies have also been held from time to time.

The TT and MGP competitions include a number of race classes, including some for motorcycles with sidecars, and based on the various cycle engine sizes. Whereas prior to World War II the competing motorcycles were predominantly British and European, after the War they were joined by a Japanese contingent.

In its very early days, the Manx tracks were for carts rather than for cars. But as the roads and their surfaces improved, so did the vehicle speeds. By 1911, the fastest motorcycle lap was done at 50 miles per hour. By 1926, it was 70 mph. By 1939, speeds were reaching 90 mph, by 1957 100mph, and 110 mph by the 1970s. Even the cycle-and-sidecars were reaching these speeds. On the downside, and on a regular basis, motorcycle riders have lost their lives pitting their skills against the circuit and their machines. As mentioned, the part of the circuit called 'The Bungalow' was for many years the home of Murray's Motorcycle Museum. It exhibited something over 100 makes of racing machines, plus numerous photographs and examples of riding gear.

The Isle of Man considers itself to be the road racing capital of the world.





Glencrutchery Road Stadium, Douglas (during a car rally)

### **The World Wars...and Engineering After Them**

The Island's connections with World War I were memorable, among other things, as the location of internment camps for enemy aliens and, during World War II, for 'hosting' three British military airfields - at Ronaldsway, near Castletown, for the Fleet Air Arm, and at Jurby and Andreas, for the Royal Air Force. Post-war, Ronaldsway was developed as the Island's commercial air terminal, with flights to other cities in the British Isles. It also became the focus for the establishment of a series of small companies that provide innovative equipment for the aviation and other industries.

When tourism declined as the major industry on the Island after WW II, the Manx Government opened it to the financial advantages of a 'tax haven' - although the use of this term in regard to the Island has recently been questioned by the British prime minister. From the late 1990s, the Government of the Isle of Man has foreseen a progression towards tighter global financial controls, improved regulation of trade, and the exchange of taxation information. It developed what is now seen as the best-in-class taxation data exchange process, which is in place in many countries, including Canada and the United States, and resulting in its being placed on many 'white lists' of approved jurisdictions. However, in 2009, at the same time as the world financial crisis was taking place, the then British Government discontinued a customs tax-sharing agreement with the Manx Government, costing it £140 million in revenue and forcing it to retrench in order to rebalance its budget in five years' time. This process has apparently gone well but has reduced the support that could be applied to on-going Government policy of encouraging the establishment of high-technology industries on the Island.

Having discussed shipbuilding, mining, railways and the TT in the context of engineering on the Isle of Man, principally pre-World War II, it is important to remember that a great deal of this kind of activity in its conventional forms has taken place on the Island since World War II in the building and development of Douglas and the other towns and harbours on Mann, the construction of roads in addition to those to carry the motor cycle races, the provision of electricity, transportation, clean water, and the disposal of wastes.

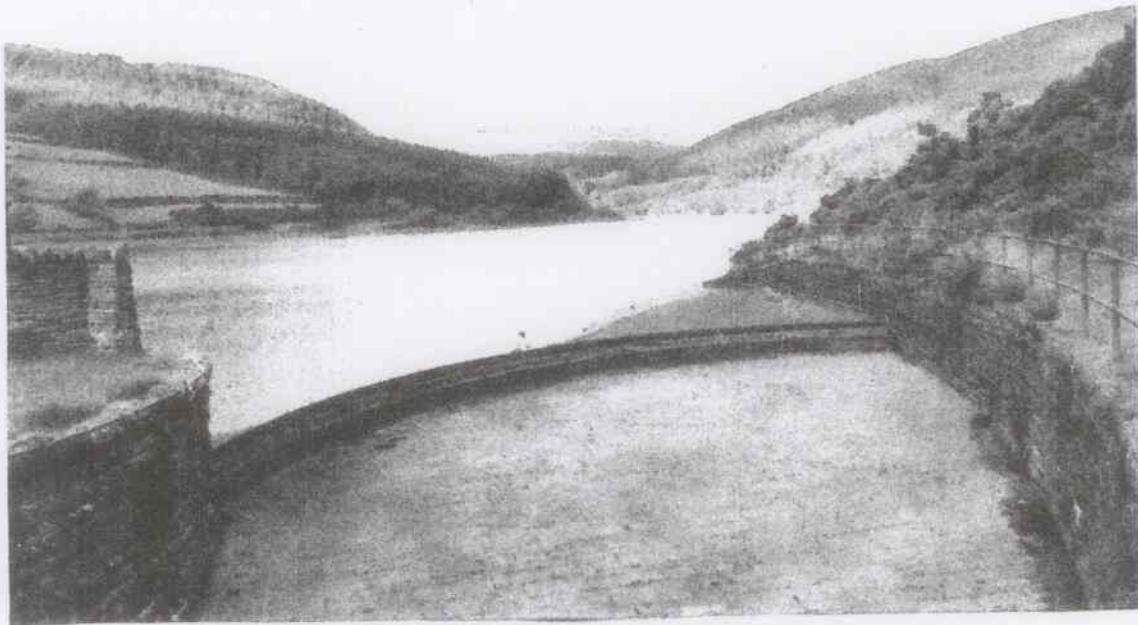
There are no lakes on Mann, so reservoirs were needed to provide the towns and villages with piped water when river supplies and wells became inadequate. Currently, ten are in service under the jurisdiction of the Water & Sewerage Authority. The two largest were built at West Baldwin, north of Douglas in 1905, and at Sulby, southwest of Ramsey in the 1980s. There are also two recently-built water treatment plants, one at Sulby (2005) and the other at Douglas (2008). The Island also operates a sewerage infrastructure involving treatment and disposal systems, and based at Meary Veg, between Douglas and Castletown. The Authority was formed in 1972 from a number of smaller, independent units, many with cast-iron mains dating back to the late-19<sup>th</sup> century. In addition to the surface reservoirs there are now 33 underground service reservoirs, some holding as much as 5 million gallons of water, around 40 miles of large water mains and over 900 miles of treated water mains. While much of the water supply flows under gravity, in the higher areas of the Island water is pumped up into the supply.

As mentioned earlier, the Island has no coal, so that when water power became inadequate, power-generating plants had to be brought into service using imported fossil fuels, and a Manx grid developed. However, in 1999 the construction of a 65-mile undersea ac interconnector cable was approved to bring 40 MW of power from the English grid to Mann, to link up with its existing grid. A connection into a Scottish-Irish natural gas distribution pipeline across the Irish Sea in 2004 resulted in the Manx Electricity Authority's main Douglas power plant, at Pulrose, adding gas turbine to steam and diesel power generation and the majority of the Island's gas consumers being converted to natural gas from the far inferior butane and air mixture previously used. The Island now earns a substantial minor part of its income exporting energy into the UK/EU grid system through the interconnector cable.

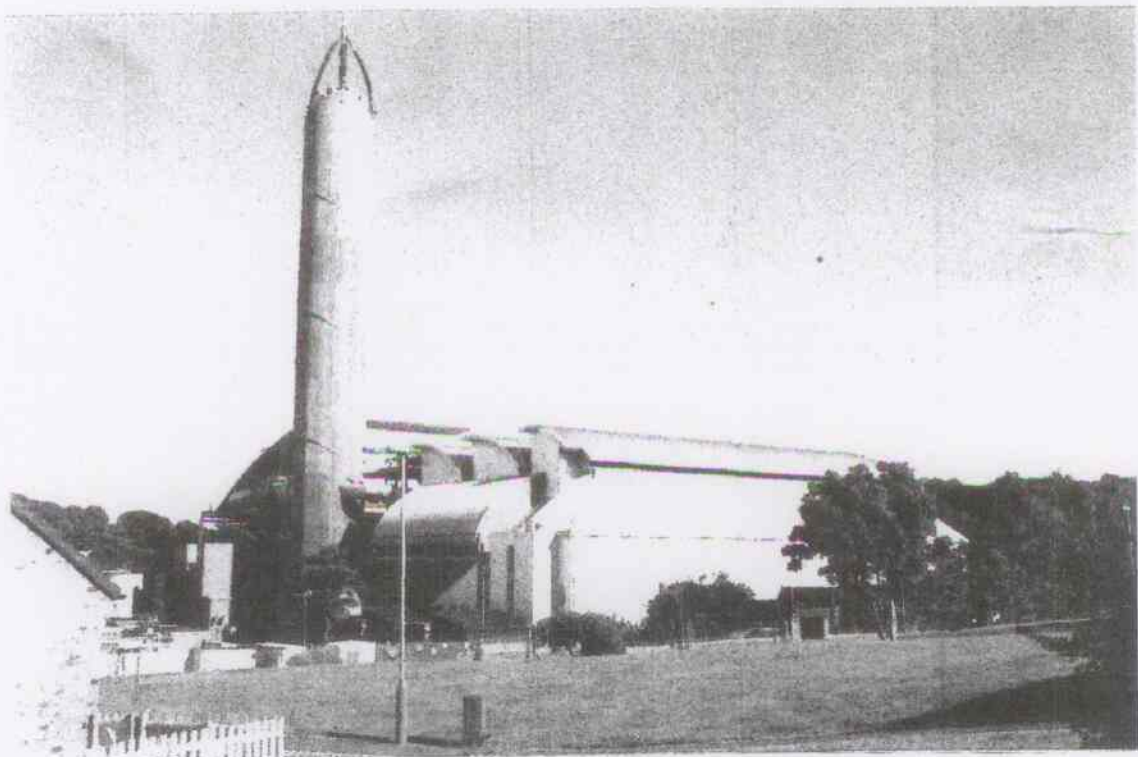
Waste management and the minimizing of land fill use have also been concerns of the Manx Government in recent years. The large energy-from-waste plant at Richmond Hill, Douglas, was recently built to EU emission standards, to dispense with the need to truck waste to the north of the Island for disposal, and to dispose safely of animal and clinical waste. This plant is privately owned and operated by SITA UK.

The present sea terminal and harbour at the south end of the Douglas Promenade was built in the 1960s and has been modernized extensively since then. And, since both inner harbours are tidal, barriers were installed at Douglas and at Peel to retain harbour waters and floating vessels as the tides recede. A modern bascule bridge was also installed at the entrance to the inner harbour at Douglas.





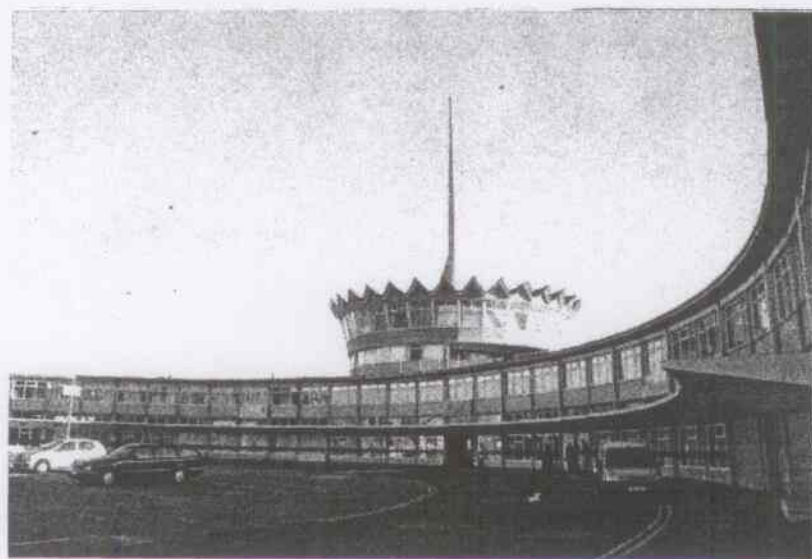
West Baldwin (Injebreck) Reservoir and Spillway



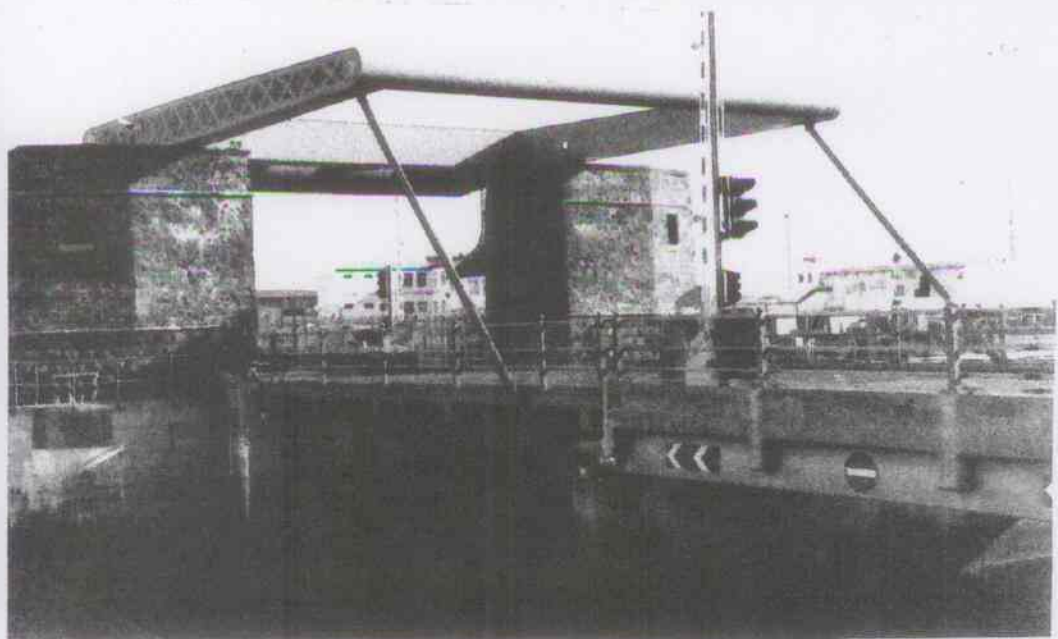
Pulrose Power Plant, Douglas



Energy-from-Waste Plant,  
Douglas



Sea Terminal Building,  
Douglas



Bascule Bridge and  
Entrance to Inner Harbour,  
Douglas



During the last two decades or so, the Isle of Man Government's Department of Economic Development has taken a direct interest in encouraging IT and high-technology manufacturing companies to establish value-adding design and production facilities on the Island and, in this, it has been successful. Many of those that came to the Island settled at Douglas and nearby Onchan, and also at Ronaldsway, which has already been mentioned. For example, CVI Technical Optics Ltd. - part of a world-wide group - has produced components for the Mars *Phoenix Lander* and the Mars *Explorer* projects. Parts have been made for the Airbus, Boeing and Rolls-Royce companies and for the petrochemical industry. Swagelock, a British company, makes components for high-quality fluid systems. DLP Limited, the largest manufacturer of shower bases and special bathing equipment for disabled and infirm people in the UK, has design and production facilities on the Island. The Strix Company, another world-wide one in the production of small steam generating equipment and controls also has facilities. The Aerospace Cluster companies, working on the design and manufacturing of aerospace components employs, with its supporting contractors, over 1000 people. Since the world financial crisis of several years ago, this policy - and its results - have allowed manufacturing industries on the Island to emerge from the shadow of the financial sector. The problem now is the continuation of this trend.

Short reports of the discussions the author had with senior people in the Strix and Swagelock Companies on the Island have been included below in an appendix.

### **Museums, Engineering...and Education**

The Manx are proud of their history and heritage. As a result, there are many museums on the Island that preserve them. I would offer some very brief comments on three of them - one each in Douglas, Peel and Castletown.

The first, in Douglas, is the National Museum. First opened in 1922, its galleries present, visually, slices of Manx life, activity and natural history, as well films showing major events, a national art gallery, and artifacts from recent times, including the TT races. The main building is a former hospital. An addition to it was opened in 1989.

The second, in Peel, is the House of Manannan, named after the mythological sea god. It concentrates on the Island's Celtic, Norse and maritime past and emphasises fishing and trade, including reproductions of living situations on the Island. Its most spectacular exhibit is the specially-built Norse longship replica, *Odin's Raven*, which was actually sailed from Norway to Mann as part of the Millennium of the Tynwald in 1979, and is positioned within the building, but with bronze statues of its crew outside, pulling it by a rope that appears to pass through the huge single pane of the main window.

In Castletown, in addition to Castle Rushen, is the smaller Nautical Museum. Opened in 1951, it houses many maritime artifacts, models and pieces of equipment, and includes a sailmaker's loft. Its centrepiece, however, is Captain George Quale's armed yacht *Peggy*. Quale was active in the smuggling business in the 1790s. However, after his mother died in the early 1800s, he hid the yacht in its boathouse-cum-vault in the building. It was not discovered until 1935, after the last member of the Quale family had died.



Nautical Museum, Castletown -  
the *Peggy* sits behind the wall  
(at right) with sign

For professional engineers, there was until very recently an Isle of Man Engineering Society which was established as a 'learned' society to "facilitate the interchange of information, ideas and practice on all matters appertaining to the various branches of engineering..." Engineering interests and the promotion of the profession are now being maintained and promoted by the local memberships of two British professional Institutions, the IET and the IMechE. The professional registration of engineers remains in the hands of these and the other British Institutions. I have no firm figures for the past or current numbers of practicing engineers on the Island, although there appear to be over 200 of them currently in practice. Consulting engineering firms, based principally in Douglas, have grown significantly in number since World War II.

The Isle of Man College of Further and Higher Education provides training in engineering on the Island, although most of it is relevant for the technologist and technician levels, with concentrations on manufacturing, electrical technology and electronics, and motor vehicles. Those seeking degrees must do so in Britain. In order to meet future demands for its graduates, the College recently embarked on an expansion program.



### **William Kennish**

Perhaps the best known name, historically, among Isle of Man engineers is that of Richard Casement, the self-taught designer of the Laxey Wheel. Less well known, until recently, and not always associated with the Island is William Kennish. In the modern sense, he was never really an engineer - except that he was self-taught and only claimed to be one after many years of related experience, and while living in the United States. Robert W. Stimpson published a biography of Kennish in 2011.

Kennish was born in a cottage at Cornaa Bridge, near Ramsey, in 1799. His father was a farmer and owner of a flax mill. William, however, learned the trade of ship's carpenter, having served a seven-year indentured apprenticeship with a shipwright in Douglas between 1811 and 1818. It is thought that he worked for the following years at the Ramsey shipyard, after which he joined the Royal Navy, at Plymouth in 1824, as a carpenter's mate. He rose through the ranks to be a superintendent carpenter and retired from the Navy in 1843 as a very senior non-commissioned officer. He returned briefly to the Island, taking up a variety of activities, including a teaching position at Ballasalla, the village near Castletown, and continued to develop his technical ideas. Unsatisfied with his employment and invention prospects on the Island and in England, he emigrated with his family to the United States in 1848, settling in Brooklyn, New York.



**Portrait of William Kennish c1845**

Kennish was basically an inventor who held numerous patents that he was unable to exploit commercially. While in the Navy, he invented - among other things - a system based on a theodolite for concentrating the gunfire of a battleship that would do maximum damage to the enemy. It was very effective in practice, but for it he received only marginal credit. He also published a book on his inventions, which included improvements to engines and hydraulic motors. While U.S.-based, he continued inventing but also took part in civil engineering activities, the most significant of which was the survey work he did over several years that led to the discovery of a lock-less, sea-level route between the Atlantic and Pacific oceans across the Isthmus of Panama. Kennish died in New York in March 1862 at the age of 63.

Speaking of Manx inventions and innovations, Robert Stimpson has also drawn my attention to the patenting by a Manxman of a version of the ball bearing cage in the 1830s, the launching of the world's first oil tanker in 1862, and that the longest-working iron-hulled sailing ship in 1863. There was also, apparently, a German interned on the Island during World War II who had filed a British patent application in 1940 for a gas turbine that was abreast or ahead of the one filed by Frank Whittle. He eventually emigrated to Canada. Another of the Island's German internees was part of the design team for Britain's post-war Handley-Page V-Bomber.

### Prince Edward Island

Having got around to mentioning Kennish in New York and the *Star of India* in San Diego, I realized I should also talk for a moment about engineering on a (relatively) small island in Canada. There may be several that are qualified, but I have chosen Prince Edward Island since its association with engineering mirrors to some degree that of the Isle of Man.

PEI is Canada's smallest province. It is very roughly rectangular with pointed ends, and is somewhat larger than Mann - 140 miles long, and varying between 2 ½ and 37 miles across. Its long axis lies east-to-west, rather than north-to-south. The prominently indented coastline has rugged cliffs and long sandy beaches, for which it is famous. It is equally famous for its red soil, which helps to grow the Island's main crop, potatoes. PEI lies in the southern part of the Gulf of St. Lawrence, just a few miles from the coast of New Brunswick, with Nova Scotia just off to the east.

Relatively flat, with rolling hills, and originally tree-covered, the Island was inhabited a few thousand years ago by the Aboriginal Mi'kmaq people, who were hunter-gatherers. It was seen by Jacques Cartier during his exploration of the Gulf of St. Lawrence in the 16<sup>th</sup> century A.D.. It was later part of the French colony of Acadia, and was called Ile Saint-Jean. Serious settlement began around 1720. Its government, however, sat at Louisbourg on the eastern coast of what is now Cape Breton Island.

PEI suffered during the mid-18<sup>th</sup> century wars between the French and the British although, by





Prince Edward Island

then, the Island's (French and Aboriginal) population had grown to around 5,000. By 1769 the British had prevailed militarily and at the diplomatic bargaining table and PEI became a British colony. This connection was reinforced by the arrival, during and after the American Revolution, of settlers loyal to Britain, as well as settlers from Britain itself. In 1798, the Crown renamed it Prince Edward Island, after the Duke of Kent, Queen Victoria's father. Charlottetown, in Queen's County and on the Hillsborough River, became the capital. It was named after King George II's consort. Charlottetown was the location of the 1864 conference that set the Canadian Confederation in motion three years later. However, PEI did not join this Confederation until 1873. One of its conditions for doing so was that Canada would take over the debt owed by the Colony for the construction of its railway. Another was to establish a ferry service.

In Canadian terms, the Island's climate is relatively mild, moderated by the waters of the Gulf that surround it, although it experiences winter sea ice - and snow. It is relatively free from fog. The annual precipitation has been sufficient to provide it with a good groundwater supply. The growing season, however, is relatively short.

As was/is the case for the Isle of Man, PEI's principal production industries were, and still are, agriculture and fishing, including shellfish. Forestry declined as land was cleared for farming. During the 19<sup>th</sup> century, and until the advent of steel-hulled and steam-propelled ships, there was - not surprisingly - a great deal of shipbuilding. But PEI succumbed, as Mann did, to these innovations since it had no coal or iron deposits, or appropriately skilled tradesmen. Nor had it the needed supplies of energy, since the forests had been replaced by farmland and, again like

Mann, it has no oil. While its few rivers could supply waterpower to run mills, they could not supply the large quantities of electricity needed for industrial and other purposes. The cost of energy, generally, on PEI has always been high. Nowadays, the Island is increasing its use of renewable energy sources as well as being linked by undersea cable to the New Brunswick grid, as Mann is to the English one.

The population of the Island is currently around 140,000, with 35,000 living in the capital, Charlottetown.

Mining has been limited to open-pit sand-and-gravel operations. Building construction has been modest. The construction of port and lighthouse facilities have always been engineering activities on the Island, supplemented by a railway system linked to the five main ports and two airports, but which was closed down in 1989. Currently, there are around 2500 miles of paved, and 1000 miles of unpaved or clay, roads on the Island. There is a section of the Trans-Canada Highway on it.

Manufacturing on PEI has been associated principally with agricultural and fish products, although in recent years government diversification programs involving aerospace, bioscience, information technology and renewable energy have attempted, with limited success, to expand this activity.

Up until the opening of the eight-mile-long fixed-link toll bridge between PEI and the New Brunswick mainland in 1997, it was served by ferries, year-round, between the Island and New Brunswick in the west and between it and Nova Scotia in the east. The Confederation Bridge was built by a consortium. The prefabrication of its sections was done on the Island.

Post-secondary education on PEI was, for many years, provided by St. Dunstan's College and Prince of Wales College in Charlottetown. Principally liberal arts institutions, intending engineers would usually begin their education at these institutions and finish it at a full-course university in Nova Scotia or elsewhere. St. Dunstan's and PWC were amalgamated in 1969 as the University of Prince Edward Island, and it has continued to provide engineering diplomas. Technical-level education has, since then, been provided by Holland College, also in Charlottetown.

The number of professional engineers practising on the Island was, for a hundred years or more, very small indeed. It was not until 1952 that an engineering group was formed, under the umbrella of the Engineering Institute of Canada - a learned society. Some three years later, the Provincial Legislature passed an Act founding the Association of Professional Engineers of PEI - a licensing society. In 1956 the APEPEI had only 30 members. By 1980 the number had risen to 130. It currently stands at around 240 registered engineers, with a further 30 in training and



another 160 members of other jurisdictions temporarily licensed to practise on the Island. In addition to construction, public works, education, environmental and industrial work, these engineers provide a range of consulting engineering services.



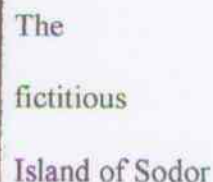
The Island's most spectacular engineering achievement has been the building of the Confederation Bridge. On May 31, 1997, the day before it was officially opened, thousands of runners inaugurated it.

### **Thomas the Tank Engine...and Anne of Green Gables**

One final note on the Isle of Man.....this time with a fictional as well as an engineering twist to it. The story begins in the 12<sup>th</sup> century A.D. when the Pope established the bishopric of Sodor and Man. Sodor referred to the Hebrides and other (southern) islands off the west coast of Scotland. (The northern ones were Shetland and Orkney Islands.) Originally, it was suffragan to the archdiocese of Trondheim in Norway. Sometime after the battle of Largs in 1263, the 'Sodor'

As a youth, born in 1911, Wilbert Awdry became enthusiastic about railways. As an adult, he became an Anglican priest, an author, and the father of young Christopher, for whom he devised stories about railways and their engines, and was later persuaded to publish them. By 1972, his *Railway Series* included 26 books. They were also inspired by Awdry's participation as a volunteer in the restoration (by, among others, the engineer-historian, Tom Rolt) of the Talylyn railway in Wales. His most famous creation was *Thomas the Tank Engine* whose 'home' was on the *Island of Sodor*, both of which were made even more famous - although with some alterations - by Britt Allcroft's television programs.

Reverend Awdry died in 1997 at the age of 85, but *Thomas* continues to pull passengers and freight on *Sodor* ...and to stimulate the imaginations of younger children!





Prince Edward Island is also associated with fiction (but not with engineering) geared for children - older rather than younger ones. The original book in the series, *Anne of Green Gables*, appeared in 1908, written this time by a minister's wife - Lucy Maud Montgomery. It has since sold millions of copies and it and its sequels have been adapted for film and TV. Meanwhile, the *Green Gables* house, which inspired the fictional setting, is visited by thousands of tourists every year.



## Appendix

Robert W. Stimpson kindly arranged for me to meet with senior manufacturing company engineers during my visit to the Isle of Man in September 2013. I was impressed by these visits, on two principal grounds. One, the enthusiasm expressed by the engineers regarding the progress made by their companies in the competitive markets they served. And two, the support the companies had received from the Economic Development Department of the Government of the Isle of Man.

The accounts that follow lean heavily on our discussions at that time and on the additional information provided by Andrew Hewins of the Strix Group at Ronaldsway and Davis Parkes of Swagelock Ltd. of Douglas.

The Strix story began in 1946 when Manxman Eric Taylor - who, during World War II, had invented a bimetal thermostat to control the temperature of heated flying suits used by the RAF - set up Otter Controls Ltd. in Buxton, England. In 1951, Taylor established a subsidiary company, Castletown Thermostats, on the Isle of Man to make thermostats for companies such as Rover Cars, Joseph Lucas and Fisher & Ludlow. In 1957, Castletown got its first major order - half-a-million controls for Morphy Richards electric blankets, and set about developing the tools for large scale production.

In 1959, Eric Taylor's son John - also a Manxman - joined the Otter/Castletown companies on graduation from Cambridge and quickly showed himself to be an inventor like his father. When Eric died in 1971, John became chairman of Otter and in 1977 a director of Castletown, taking over as chairman in 1979 and separating Castletown from Otter.

Meanwhile, Castletown had been expanding its production and employment in Castletown and acquiring new facilities at Port Erin. Its Taylor-inspired development team had also produced the 'Vapourstat,' the world's first integrated kettle control, and launched the C2 unit in 1981, which featured a totally integrated switch control and element assembly, and which back-stopped the company's production for many years. Castletown acquired an international reputation as an innovative company.

In 1982 Castletown Thermostats became Strix, again with Government help and expanded its facilities at Port Erin. In 1984, Eddie Davies joined the company as managing director and expanded into Ramsey. In 1985 the company's headquarters were consolidated at Port Erin. The total workforce was 170 and 30,000 controls were being produced each week. It dominated the world's largest kettle market, the U.K.. In 1986, the P-series of controls was put on the market, after development work at Castletown. The Strix patent portfolio by then numbered 250 worldwide. Company headquarters moved back to Castletown, and the company began to expand its operations overseas. In 1989 it expanded its Ramsey operations, with Government help, and increased its capacity to produce quality mouldings, pressings and bimetals.

The 1990s brought further expansion abroad and in England, as well as U.K. awards for manufacturing excellence. In 1995, it produced its 100 millionth control. By 1996, it was in the under-floor heating market. However, 1998 saw the appearance of the first Chinese counterfeits of Strix products.

John Taylor retired in 1999 and Eddie Davies became executive chairman. In 2000, the HSBC took a 40% stake in Strix, and the company prepared to enter the coffee-maker market, with HSBC's help. 2001 was the company's 50<sup>th</sup> anniversary. It has since continued to grow and to expand overseas.

The company's headquarters are now at Ronaldsway, as is its research department, which keeps the flow of new and enterprising products going. Otter Controls remains one of its principal competitors.



Swagelok Ltd. has only been on the Island since 2003, but its two predecessor companies go back much further.

Marown Engineering was established at Marown, near Douglas, in 1960 and manufactured a range of instrumentation for the oil and gas and petrochemical industries. Terry Mackay bought the company in 1968 and added the manufacture of components for Rolls Royce aero engines. In 1987 he sold the company, named Kenmac Limited since 1972, but remained managing director until 1997, when he became chairman. The company relocated to Douglas in 1994. In 2003, Kenmac, its high-quality products and its 130 employees were acquired by Swagelok.

Then, and still, a privately-held company, Swagelok was founded in Ohio, U.S.A. in 1947. It operates world-wide. It has design, development and manufacturing facilities covering a broad spectrum of fluid system products. By the time it reached the Island, it was serving the market for systems and components for the oil and gas, power and petrochemical industries, for example. Its acquisition of Kenmac immediately opened up its global network of sales outlets to its existing and new products, as well as adding them to the Swagelok list. By 2013, it had doubled the number of its employees and was producing aero engine components, pressure regulators, instrumentation valves and manifolds, piping flange adaptors and valve and regulator components.

The Swagelok plant on the Island impressed me. It also impressed another recent visitor, journalist John Webster, whose article appeared in the September 2013 issue of the Manx business magazine *Money*. Webster writes, and I would agree with him:

The facility, equipment, products, team and client list are all immediately impressive and the enthusiasm and passion of those working at Swagelok is tangible, no doubt stemming from the fact that the products are world leading and their factory is 'lean', well organized and highly productive. Despite continuing success, there is an underlying concern in the Company and amongst the wider manufacturing sector, that the limited skilled labour pool is restricting their growth and future development, as well as the potential for the Island to continue to attract new manufacturing businesses.

As I have noted in the text above, the Isle of Man has no university-level institution to train new, high-level people for its engineering industry and potential graduates (my own grandson, for example) must seek professional training somewhere in the U.K.. The Island does have a college level institution which, I understand, is taking both notice and action in regard to technical training. For example, a new £4.5m engineering training facility - to be called the William Kennish Centre - will open late in 2014.

It would seem to me that the future of engineering companies on the Isle of Man, although

usually small and not likely to grow very large, will require continuing support, not only from the education sector, but also from the Government, which has already provided many of them with resources that have generated success in the marketplace.

### Acknowledgements

I am particularly indebted to my daughter, Ellen Paul, a resident of the Isle of Man for introducing me to Robert Stimpson and William Kennish, for her considerable help in information gathering, and for hosting me during a recent visit to the Island to complete the research and photo-taking. Also to Bob for sustaining a correspondence prior to my visit to Mann in September 2013, for his comments on versions of this paper, and for the meetings he set up with Andrew Hewins and David Parkes of Strix and Swagelok, whom I also thank for seeing me and for the material they gave me. Finally, there are the members of the Ottawa Section of the Canadian Society for Senior Engineers who gave me an opportunity to present the material and who took a genuine interest in it.

Nevertheless, the responsibility for any factual errors in this paper is mine.

### Sources

Robert W. Stimpson *William Kennish: Manninagh Doodie - True Manxman* Robert W. Stimpson, Douglas, Isle of Man, 2011

Sara Goodwins *A Brief History of the Isle of Man* Loaghtan Books, Sutton, Surrey, April 2011

T.A. Bawden, I.S. Garrad, J.K. Qualtrough and J.W. Scatchard *Industrial Archeology of the Isle of Man* David and Charles, 1972

Andrew Scarfe *The Great Laxey Mine* Manx Heritage Foundation, 2004

*50 Years of Engineering Excellence, 1955-2005* Association of Professional Engineers of Prince Edward Island, 2005

*The Strix Group: The first fifty years* (2001)

*Swagelok: Value beyond the expected* (Power-point presentation, 2013)

John Webster, "The Isle of Manufacture," *Money* September 2013

*Financial Times* London, 13 May, 2014



Plus Wikipedia sources for Strix and Swagelok; the Isle of Man Government; Shipbuilding on the Isle of Man; the Isle of Man Steam Packet Company; the *Star of India*; the Diocese of Sodor and Man; the Manx Electricity Authority; the Manx Water and Sewerage Authority; Lighthouses of the Isle of Man; Pulrose Power Station; Energy-from-Waste Plant; the Isle of Man TT races; the Isle of Man College; Manx Museums, including Murray's Motor Cycle Museum; the Cities/Towns of Douglas, Ramsey, Peel, Castletown; Peel Castle and Cathedral, Castle Rushen; Rushen Abbey; Manx Mines History; Laxey Mines, Foxdale Mines; Bishopscourt; Isle of Man Railway; Manx Electric Railway; Snaefell Mountain Railway; Isle of Man Sea Terminal; Reservoirs on the Isle of Man; William Kennish; Ronaldsway Airport; Isle of Man Social and Economic History; Isle of Man to England Interconnector; Thomas the Tank Engine; Wilbert Awdry; the History of Prince Edward Island; Higher Education on Prince Edward Island; Charlottetown, PEI.

### Photo Credits

Unless mentioned below, the photographs were supplied by the author and taken during his various trips to the Isle of Man and to Prince Edward Island. The others:

U.K. map, page 2, adapted from an Isle of Man Transport brochure;

Isle of Man map, page 2, from Sara Goodwins' *A Brief History of the Isle of Man*, page 4;

Manx cat, page 5, Ellen Paul, Isle of Man

Triskelion, page 5, *Industrial Archeology of the Isle of Man* Manx National Heritage, 2006;

Loaghtan Sheep, page 5, from Sara Goodwins' *A brief History.....* page 10;

TTRace, page 5, Isle of Man tourist brochure;

Chicken Rock, page 10, Wikipedia;

SS *Star of India*, page 11, supplied at author's request by R.W. Stimpson;

Tram-train, page 18, Isle of Man Transport brochure;

TT Course map, page 20, adapted from Isle of Man Transport brochure;

Railway map, page 20, adapted from Isle of Man Transport brochure;

The map of Prince Edward Island and the photograph of the Confederation Bridge on pages 30 and 32 are from Wikipedia and the *Globe and Mail* for May 31, 1997, respectively.

The map of the fictional Island of Sodor on page 33 is from Wikipedia.