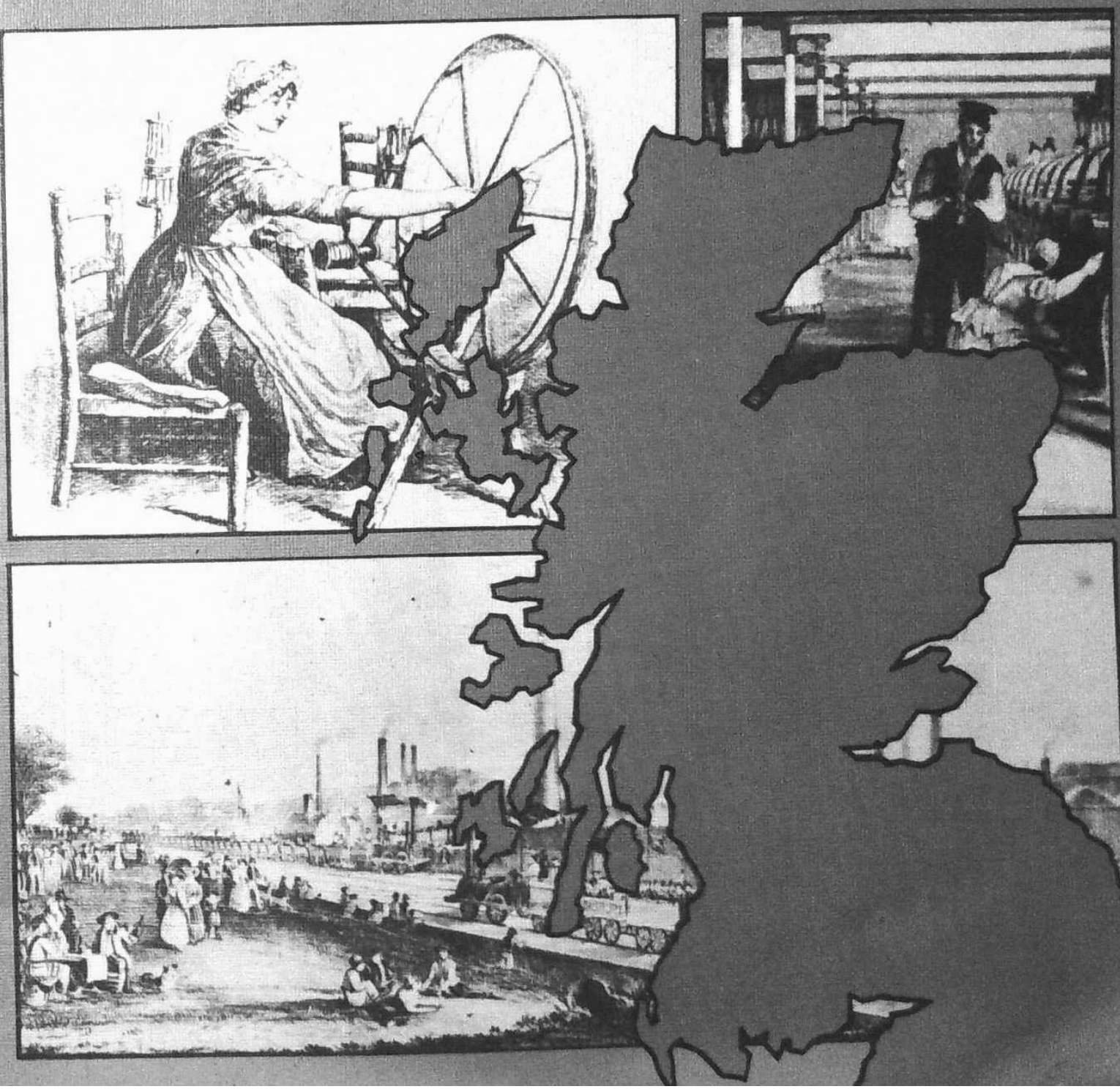
The Rise of SCOTTISH INDUSTRY

John Patrick



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Preface

The aim of this book is twofold. It seeks to show some of the practical details involved in the process of industrialisation during the eighteenth and nineteenth centuries, and also to indicate how industrialisation affected the lives of the people involved. Sometimes this has been done through a fairly detailed study of a particular estate or project, while the maps and graphs help to present an overall view. It is hoped that this book will give some idea of the tremendous amount of time, money and energy that went into establishing Scotland as an industrial nation, as well as the risks that were run by the people caught up in the process, from the entrepreneurs who risked losing their capital, to the workers who risked their health and well-being.

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A Note on Money

No attempt has been made to convert eighteenth-century prices into decimal currency. Wages and prices have changed so much that it would be misleading to say that 1s was the equivalent of 5p. All £ s d unless marked (Scots) is in sterling.

12 pence = 1 shilling
20 shillings = 1 pound sterling

Scots money was phased out after the Union of 1707.

£1 (Scots) was the equivalent of 1s 8d sterling.

Scots Dry Measure

2 pints = 1 porpet
2 porpets = 1 peck
4 pecks = 1 pirlot
4 pirlots = 1 boll

A boll of oatmeal weighs about 65kg. Weights and measures in common use in the eighteenth century were not standardised. This meant, for instance, that the amount of meal in a boll might vary a good deal from place to place.

1 Scottish Industry and Trade about 1700

Population

In 1755 the Reverend Alexander Webster wrote to Church of Scotland ministers all over Scotland to ask them how many people lived in their parishes. When all the returns were in, he added the numbers together and found that the total population of the country was just over 1,250,000. This was the first time anybody had tried to do an accurate count of Scotland's population. It seems that at the time Webster did his survey the population was rising. It is therefore likely that in 1700 about 1,000,000 people lived in Scotland. More than half of them were in the Highlands. Very few of them lived in towns. Edinburgh, the largest town, had a population of about 30,000. Glasgow housed 14,000, and Aberdeen and Dundee each housed around 10,000. These four were the largest towns in Scotland.

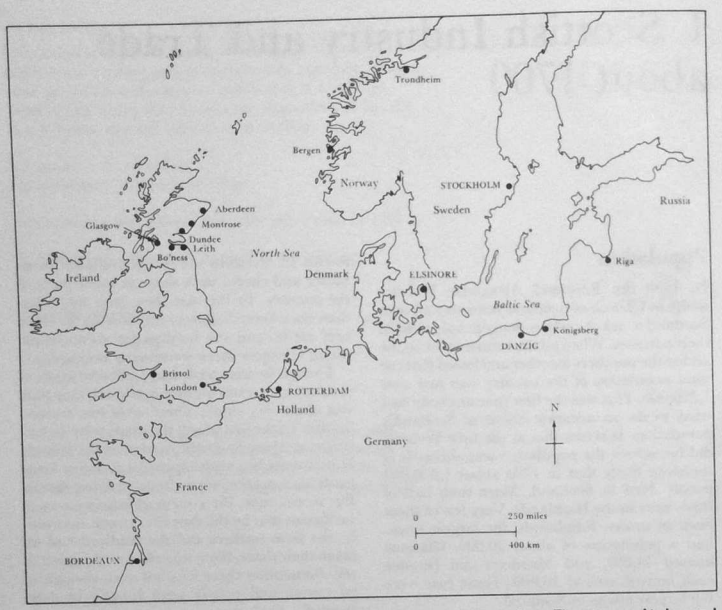
Agriculture

Most people in Scotland made their living by farming. In the Highlands they grew a little grain and looked after flocks of sheep and cattle. They made the wool into cloth and sold a few of their cattle. Every year at harvest time those who lived near the Lowlands moved down to help gather in the harvest. In the same way, Lowland townspeople went out into the countryside every autumn to help bring in the crops. All the year round some country produce was brought into the towns to be sold at fairs and markets. Grain, meal, linen, wool, meat, hides, hens and eggs were all produced on the farms, and bought and sold in the Lowland towns. In Ayrshire the farms produced more butter and cheese than those in other parts of the country. In the east they grew more flax than elsewhere. Galloway was famous for black beef cattle, and the borders for sheep, while round Glasgow there were many orchards.

Though farmers took many different kinds of produce to market, the amount which they took was often very small. There were two reasons for this. In the first place, the roads were so bad that everything had to be carried on horseback. It was therefore very expensive to carry large loads to a market town from outlying farms. But in any case, the system of farming was so inefficient that by the time the farmer, his family, the farm workers and the landlord had all taken their share, there was often nothing left to sell. Sometimes there was not even enough to go round, and people went hungry or even starved.

Industry

There was very little industry in Scotland. Coal was mined along both banks of the Forth, round Glasgow and on the west coast at Saltcoats and Irvine. The mines were small, and most of the coal was either exported or burned locally. Some was used to boil sea water to make salt and a little went to boil soap and sugar. South of Glasgow lead was mined. A small quantity of iron was made in small furnaces. But industry was not important, and Scotland had to import most of the manufactured goods she needed as well as a good deal of raw material.



All the towns printed in capital letters had full-time Scottish factors living in them. They arranged to buy and sell cargoes in return for a percentage of the price. All ships passing through the sound between Denmark and Sweden had to pay a toll

Trade

Many of Scotland's imports came from England. She imported quantities of English-made woollen cloth and other textiles like silk and cotton which had been brought to England from overseas. Scotland also bought tobacco from England. Most of this tobacco had been shipped across from the colonies in America. The English government would not allow any foreigners to trade with English colonies. Since Scotland was at the time a separate country with its own Parliament, Scottish merchants were included in this ban. All American tobacco was carried from the colonies in English ships and most of it was landed in Bristol or London. Scottish merchants who wanted to buy this tobacco had, therefore, to get it from England. This was much more expensive than it would have been to ship it straight across from the plantations to Scotland. Other products also came from England, including everyday items such as nails, pins and glass, and more expensive things such as harness for horses, sedan chairs and even coaches. Scotland also traded with other countries. She imported butter, leather and horses from Ireland. From Norway came timber, and Sweden provided most of Scotland's iron. Holland sold cloth and metal goods, while France supplied wine and other luxuries.

To pay for all these imports, Scotland had to export. Mostly she sold raw materials of one sort or another. Cattle and skins were sent down to England. Grain was shipped across to Norway. Herrings from Scottish waters were sold to Sweden, France and Germany. Coal was shipped to Holland and salt to Northern Germany. English wool, smuggled across the border, was sold to France. The only manufactured item sold abroad was linen. This was exported to England.

Apart from the traffic across the border with England, most of Scotland's trade was with the countries of northern Europe. These countries lay to the east of Scotland. As a result the ports on the east coast, especially those on the banks of the Forth, were more important than those on the west, and the richest merchants lived in Edinburgh and Fife, though Glasgow's share of trade was increasing. A merchant who wanted to trade abroad had to solve a lot of problems. First, he needed a few hundred pounds with which to buy a cargo and hire a boat. If he did not have enough money he might share the costs with another merchant. Once he had raised the money, he had to decide where he wanted to trade. Usually he chose a country like Denmark, where there was a Scottish agent who, in return for a percentage of the price, helped merchants to sell their goods. The merchant would write to the agent to ask him what goods were in demand. The agent might answer that a cargo of salt would sell well. The merchant then went and bought enough salt to fill a cargo boat (usually about 50 tons), and hired a boat and crew to collect the salt, take it across to the agent, and get his advice as to where to sell it.

Once the captain of the ship had sold the cargo, he had a fair amount of money. As a rule the merchant had ordered him to spend this money on buying foreign products, like iron or timber, which would be easy to sell in Scotland. When he had loaded his ship with such goods, the captain sailed it back to Scotland. Once it reached port the cargo was unloaded, and the merchant paid the captain for the hire of his boat. He then looked round for someone to buy the goods he had imported. If he was lucky he sold them for a good deal more than he had paid out in expenses. Thirty per cent was reckoned to be a reasonable profit on such a voyage.

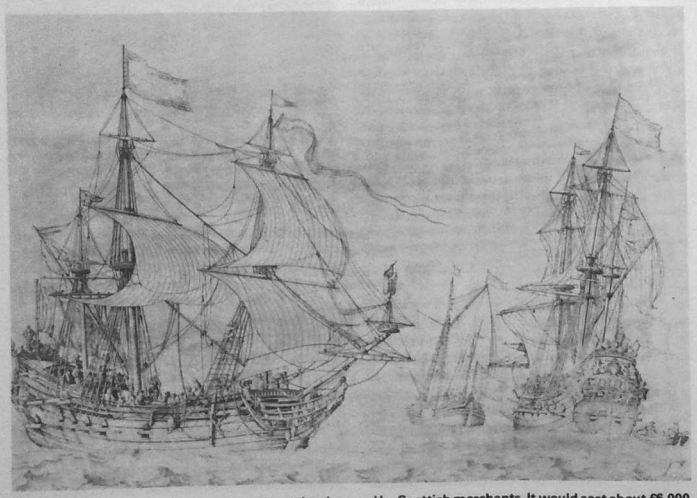
Craigievar Castle was built by a successful merchant, William Forbes. He made his money trading with Danzig and was rich enough to employ the best builders and craftsmen in Scotland to work on his castle, which was completed in 1626

Scottish shipping

Most of the ports with which Scotland traded were not very far away. In good weather Norway could be reached in four days, London and Rotterdam in five or six. Even so, voyages often took several weeks to complete. Sometimes bad weather caused delays but, more important, a

week or so might be spent moored off shore, waiting for a customs officer to come on board to check the cargo. Once it had been unloaded, a boat might have to wait a fortnight or more before its return cargo was ready to be loaded. In the winter ship owners were unwilling to make long sea crossings and many of them kept their vessels tied up in port from November to April. Most boats made only two or three voyages a year.

One reason why owners did not like winter voyages was that their ships were very small. Few of them could carry more than about 50 tons of cargo, which was very little even by seventeenth-century standards. Some Dutch boats, for example, carried ten times as much. There were two reasons why Scottish boats were so small. First, they were cheap, and sailors and merchants could not afford to spend a lot of money on a ship that was only going to make two or three trips a year. Secondly, Scottish harbours were cramped and inconvenient, so that large boats often found it difficult to get alongside the quay to load and unload, while little ships could slip in and out quite easily. The ships were not only small, they were also very few in number. It has been reckoned that in 1700 Scotland's merchant fleet consisted of about two hundred ships, whose total tonnage was less than that registered at the small English port of Scarborough. What is more, hardly any of the ships trading from Scottish ports were built in Scotland. Scottish shipyards were small and inefficient, so it was cheaper to buy a boat built in Holland than one made in Scotland.



The smallest of these three boats was about the size used by Scottish merchants. It would cost about £6,000 (Scots) and, with luck, would last between twenty and thirty years

Government policy

(a) Industry

There can be no doubt that in 1700 Scotland was a poor country. Her farms usually grew enough to feed and clothe her people, but there was little or nothing to spare. Her industries were few, so that she had little to sell abroad except raw materials. Government ministers were worried by their country's poverty and made various plans to try to make Scotland richer. For instance, they believed that if more factories were established, Scotland would be able to make goods for herself instead of importing so much. Perhaps she might even be able to earn money by selling them abroad. Accordingly, in 1681 the Scottish Parliament tried to help the woollen industry. It became illegal to import wool from England, and manufacturers were allowed to set up wool mills tax free. Several mills were set up in the Lowlands, but never did well as they produced expensive, poor quality wool. As a result English wool, which was cheaper and better, was smuggled in over the border, and little Scottish wool was sold.

(b) Fishing

The government also tried to encourage the fishing industry. The waters around Scotland teemed with fish, but most of the boats out catching them came from Holland. The Dutch boats were large and well equipped. They caught a lot of fish, mostly herring, which they then took back to Holland. Scottish boats were small and had poor equipment. They each caught only small quantities of fish, which they either used to feed the families of the crew, or else sold in the nearest port. Nobody organised the Scottish boats. Everyone put to sea and landed whenever he liked. The Dutch boats, on the other hand, worked to a plan. In 1670 the government decided that Scottish fishermen needed better organisation. It therefore set up the *Royal Company for the Fishery of Scotland.* Members of the company were granted the sole right to fish off the Scottish coast and were allowed to import all the materials needed for

Scottish boats often fished from sloping beaches. To avoid getting wet, these fishermen are being carried to and from their boats by their wives. The baskets were used to bring the catch ashore

building large fishing boats duty-free. The government hoped that a Scottish fishing fleet, equipped with the new large boats, would now be set up, would catch huge quantities of fish, would sell these fish overseas and would make a lot of money. However, this was not to be. Organising a fishing company was a difficult, complicated and expensive job. For eleven years officials tried to get the company started. In 1681 they finally gave up, and in 1690 the Scottish Parliament passed an Act abolishing the company.

(c) Trade

By 1690, then, the government had tried to help both the wool and the fishing industry in Scotland, without success. It was decided, therefore, to try to encourage overseas trade. In other countries in the seventeenth century most trade was carried on by large trading companies which were protected and encouraged by the government. For instance, in England

the East India Company had been granted a charter which gave it the sole right to trade with India. Knowing that nobody else would be allowed to compete with them, the merchants of the company invested a lot of money in their trade. They bought large ships, and built ports and depots in England and India. Their trade increased, and they grew very rich. In the same way, the Dutch East India Company was given a monopoly of trade with the East Indies.

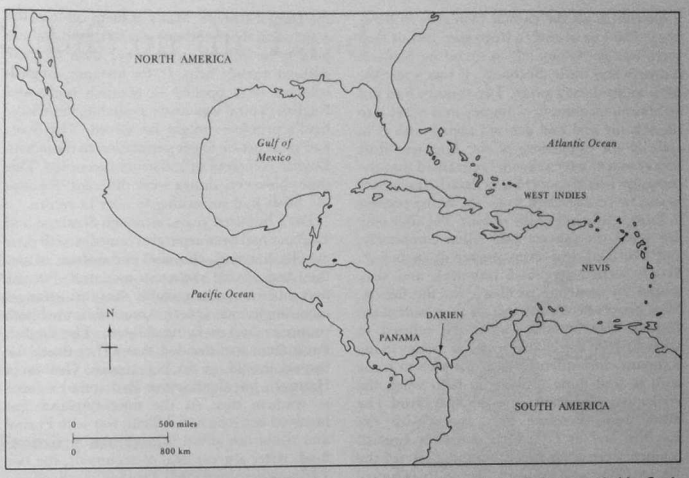
The government in Scotland saw how successful these two companies had been, and decided to set up a Scottish company to trade with Africa and the Indies. The Act establishing the company was passed by the Scottish Parliament in 1695, and the new company began to raise money. At first many English merchants were willing to invest in the new venture. This upset the East India Company, who persuaded the English Parliament that the company would suffer if the Scots were allowed to trade in competition with them. The English Parliament therefore forbade any English merchant to put any money into the new company. This was a serious blow, because the directors had been hoping that at least half their capital would come from south of the border. Now it all had to be raised in Scotland. Fortunately the idea of a Scottish trading company was very popular in Scotland and they managed to collect the enormous sum of £400,000 sterling to enable the company to begin trading.

The Darien scheme

The most important man in the new company was William Paterson, a merchant who had made a fortune trading in the West Indies. Paterson was full of new ideas – he had helped to found the Bank of England in 1694. He now put forward a new trading scheme which was, he said, bound to make money. He planned to set up a colony on the Isthmus of Darien, a thin neck of land which connects North and South America. Goods could be shipped across the Atlantic from Europe, landed on Darien, carted across to the Pacific coast, loaded onto other ships and taken on across the Pacific. At the same time, goods from the Pacific would be flowing in the opposite direction. This would avoid the long, stormy and dangerous sea passages round Cape Horn or the Cape of Good Hope. It all seemed a splendid idea and the directors of the company, who had never been anywhere near Darien, agreed that they should send out an expedition to establish a new colony as Paterson advised.

In fact the scheme was not as good as it sounded. In the first place, there was no easy route from one ocean to the other. Goods would have to be carried over fifty miles of rough and hilly country. Next, the climate at the coast was unhealthy, with a long rainy season. Finally, the whole area had already been claimed by Spain, and the Spanish were bound to try to drive out any foreigners who settled there without permission. Nobody connected with the company knew exactly what Darien was like: even Paterson had never actually landed there. They knew that Spain claimed the area, but thought that the Spanish government was too weak to do anything about what went on in Darien. Accordingly, they went ahead, and in July 1698 five ships set sail from Scotland to establish the new colony. After a long and stormy voyage, they finally landed on Darien in November.

The colonists had a terrible time. The climate was much wetter than they had expected and very unhealthy. Added to this their provisions were bad. One colonist wrote that in every pound of flour you found 'a quarter of a pound of mouldy maggots, worms and other such beasts'. Beef was 'as black as the sole of my foot', while if the dried peas were boiled, 'big maggots and worms must be skimmed off'. It was no wonder the colonists fell ill, and by June 1699 more than four hundred of the original twelve hundred had died of various fevers. Many of the colonists drank too much, and the leaders quarrelled among themselves. To make matters worse, the Spanish were preparing to attack the settlement, and the English government, wanting to keep on good terms with Spain, forbade all English colonies to offer any help or support to the Scots. There seemed no hope of doing any trading. Indeed, it was difficult to see how the colony could carry on at all.



The narrowest part of the isthmus joining North and South America had already been settled by Spain before the Scots arrived. At Darien, which lay further south, the climate was worse and the country rougher than in the part occupied by the Spaniards

Finally, in despair, the colonists decided to leave. They loaded up their boats and set sail on 18 June 1699. After a voyage involving storm, sickness and shipwreck one ship, with a mere three hundred people on board, reached the Clyde in November.

The company directors in Scotland knew little or nothing of what was really going on in Darien. They had received dispatches asking for more men and supplies, and had prepared a second expedition consisting of four ships to send out to the colony. This expedition sailed from the Clyde in August 1699, two months after the original settlers had left Darien, but before anyone in Scotland had heard the news. As they got near to Darien, the relief expedition heard reports that the colony had been abandoned, but did not believe them. At the end of November they arrived. They found, as one of them wrote, 'nothing but a vast howling wilderness, the colony deserted and gone, their huts all burnt, their fort most part ruined, the ground which they had cleared all overgrown with weeds'. The relief expedition set to work to rebuild the huts and the fort, but many fell ill, the leaders quarrelled and the men lost heart. Worst of all, the Spaniards were closing in. At first the colonists attacked them and drove them off. But they soon returned and the weakened Scots were in no state to resist for long. 'Our fort,' said one, was 'like a hospital of sick and dying men.' On 31 March 1700 the Scots surrendered to the Spanish on condition that they were allowed to leave unharmed. By 12 April, their ships were loaded and they set sail. It was the end of the Scottish colony on Darien.

The collapse of the Darien company had important effects on Scotland. In the first place, £153,000 sterling had been lost. This was about

a quarter of all the capital available in Scotland. The loss of such a huge sum meant that there was no money left to spend on Scottish industry and trade. Secondly, it was a terrible blow to Scotland's pride. The country had put an enormous amount of money and effort into the scheme and had pressed ahead with it in spite of the opposition of the English. Most Scots seem to have taken it for granted that the company would succeed and that their country would be transformed from one of the poorest in Europe into one of the richest. Yet after only five years the scheme had failed completely, and Scotland was even poorer than before. People were angry and resentful, and they looked for someone to blame for the failure. Most people decided that it was the fault of the English government, which had refused to allow English merchants to invest money in the company, forbidden English colonies to trade with it, and done nothing to help when the settlement was attacked by the Spaniards. The Scots were therefore very angry with the English, and in 1705 three innocent English seamen were accused of attacking one of the Darien Company's ships, found guilty of piracy and hanged on Leith sands.

The Union of 1707

As time went on, the first blaze of anger began to die down and Scottish merchants and politicians thought more calmly about the failure of the Darien scheme. Many of them came to the conclusion that Scotland was too small and too poor to be able to increase her share of trade without outside help. If, for instance, English colonies were opened to Scottish trade and English capital was made available, then Scotland's problems might be solved. The Scots had tried before to get permission to trade with English colonies but had never succeeded. This time, however, things were different, for now the Scots had something to offer in return.

For a hundred years, although Scotland and England had been separate countries with their own Parliaments, churches and systems of law, they had shared the same monarch. For the first time it seemed possible that this arrangement might end. Queen Anne, who ruled both countries, had no living children. The English Parliament had decided that at her death the throne should go to her cousin, George of Hanover, but the Scottish Parliament refused to confirm this. At the time England was involved in a long and difficult war with France and could not afford to have trouble in Scotland. After a great deal of argument, the two Parliaments agreed that England and Scotland should become one united country. In this way England gained complete control over Scottish affairs. In return the Scots gained the right to trade with England's overseas colonies on the same terms as the English. Scotland now had a much better chance to develop her industry and trade.

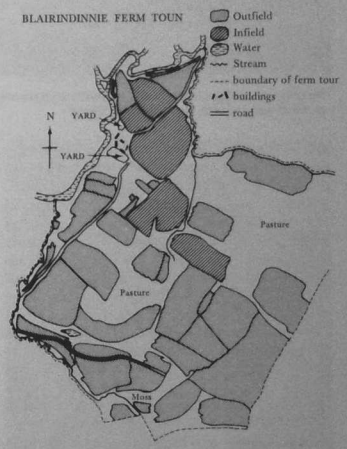
2 Life on the Land

In 1713, Sir Frances Grant bought the estate of Monymusk in Aberdeenshire. It consisted of about 10,700 acres, of which nearly 4,800 acres were moor and moss, 1,900 acres were woodland, and only about 4,000 acres were suitable for farming. The estate was divided into twenty-four townships. Each township was let to tenants who made their living by farming the land they rented.

Farming methods

Scottish farming at the beginning of the eighteenth century was quite different from farming today. On each township there were three different kinds of land. The richest land was called *infield*, and was used every year to grow a grain crop – either barley or oats. Less fertile than the infield was the *outfield*, part of which was used to grow oats for three or four years in succession, until the fertility of the soil was exhausted. It was then used as pasture and oats were sown on another part of the outfield. The rest of the land, which was too poor, too stony or too wet ever to be used for growing crops, was left for the animals to graze as pasture.

On each township the cultivated land was divided into long strips or ridges, which were distributed among the various tenants. Each strip was ploughed up one side and down the other with a clumsy plough, pulled by oxen, which made a curved and wandering furrow. This ploughing heaped the soil up into the middle of the ridge, so that the strips were separated from each other by shallow ditches, which were usually overgrown with weeds. These weeds easily spread into the crop and stopped it growing properly. Farmland thus looked very different from the neat and tidy fields we are used to today. In 1713 Sir Francis Grant described the cultivated land on his estate as 'raised and uneven, and full of stones, many of them very large, of a hard iron quality,



A township, Blairindinnie, on an Aberdeenshire estate. The farm buildings are in the top left-hand corner. Notice how bits of infield, outfield and pasture lie scattered all over the farm. There were no hedges or fences to separate them

The grass growing on this field has preserved traces of the eighteenth-century rigs. The lying snow shows up the S-shaped rigs described by Grant

and all the ridges in the shape of an S, and very high, and full of noxious weeds and poor, being worn out by culture without proper manure'.

Grant was right to point out that the soil did not get enough manure to replace the goodness which the crops took out of it. The only manure that the outfield received was dropped by animals, who were penned in at night by a turf wall, on the stretches which were next due to be ploughed up. The infield was manured every three years at least – usually just before it was sown with barley. The most common manure was a mixture of muck from the *byre* and turf from the outfield. This mixture was called muck-fail, and the farmer might add ashes, worn out thatch and even soil to it, to try to get enough to increase the fertility of his precious infield land. Usually the manure was of poor quality and there was not enough. What was worse, the outfield was being robbed to feed the infield. An Englishman working on the Monymusk estate noticed that the tenants stripped the turf from the outfield, 'some for muck-fail, some to burn and others to repair the houses with, taking away the earth and leaving the stones to produce corn and grass, which hath spoiled near half the land in Scotland'.

This poor and barren outfield could not produce much grass for the animals even in the summer. There was never any grass to spare to be made into hay, so this had to be cut from the rough pasture instead. This meant that in the winter the horses, sheep and cattle had mostly to forage for themselves on the pasture or else eat the straw from the barley crop. As the winter went on they grew thinner and thinner, and cropped the country closer and closer, until by the spring it 'lay a mere waste; nothing to be seen but stones and dry blades of couch grass, the pasture and meadow lands gnawed to the quick, and strewed with the dead carcases of sheep'. To make sure that there was enough fodder to go round in the winter, it was usual to kill a number of the farm animals in the autumn and salt them down. The remaining animals had enough food to keep them alive through the winter, while those which had been killed were eaten by the farmer and his family.

	Infield	Outfield
Year 1	Oats	Fold
Year 2	Bere	Oats
Year 3	Oats	Oats
Year 4	Oats	Oats
Year 5	Bere	Pasture
Year 6	Oats	Pasture
Year 7	Oats	Pasture
Year 8	Bere	Fold
Year 9	Oats	Oats
Year 10	Oats	Oats
Year 11	Bere	Oats
Year 12	Oats	Pasture

This table shows the crop rotation followed on many Scottish farms before they were improved. At night, animals were penned up into folds on those parts of the outfield due to be ploughed up next for oats. The dung they dropped acted as a fertiliser

A farmer's life

Life for a farmer on an estate like Monymusk was very hard. He relied mainly on oats for his food. He sold the barley and used the money to pay the rent and buy in the few necessities which he could not produce on his farm. Apart from barley and oats, most farms grew a little kale to eat and some flax, which could be made into linen yarn. Sheep provided wool and meat, and cattle gave leather, meat and milk. Even so, a farmer working full time in an average year could only just produce enough to keep himself and those who depended on him. However, as well as providing food and shelter for his family and his farm servants he had to pay rent to the landowner.

Today we take it for granted that rent is paid in cash. But at the beginning of the eighteenth century there was very little money circulating in Scotland, and the farmer paid his rent partly in cash, partly in produce and partly in work. For instance, Robert Adam, who was granted the lease of a farm for five years by Sir Francis Grant in 1714, had to pay a cash rent of £13 13 4d (Scots). He also had to hand over 17 bolls of 'good and sufficient' oatmeal, 4 bolls of barley 'such as will please the merchant', 1 firlot of oats with the straw, 1 hog, 1 load of peats, 3 geese, 6 capons and 12 hens. He had to cart the barley and oatmeal to Aberdeen – a distance of about twenty miles – and be prepared to work on Sir Francis Grant's home farm when needed. In addition, he had to provide a certain amount of meal for the minister and the schoolmaster and help to repair their houses. All his meal had to be ground at one of the mills on the estate and, in addition to paying the miller, he had to help keep the mill in good repair. On top of all this, the law required that he should turn out six days every year to help repair the roads.

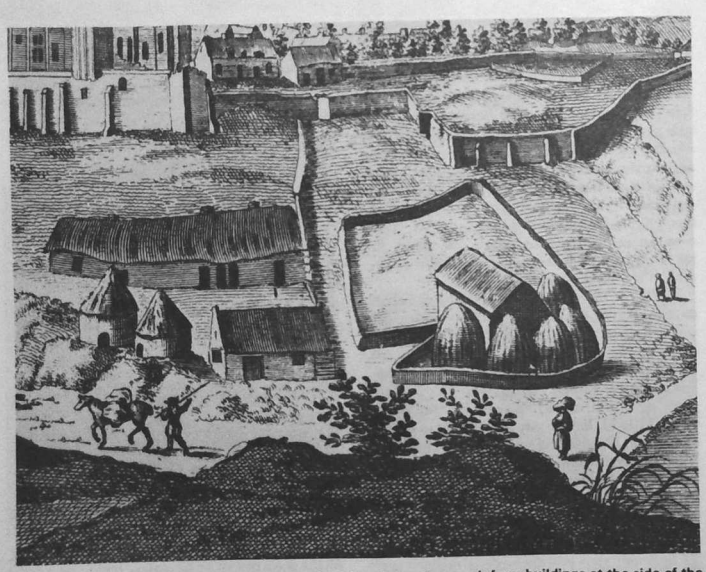
Farmers hated having to do all this work for others, particularly since most of it had to be done in the summer and autumn, their busiest time of the year. A tenant farmer in 1750 wrote:

> I am toiling, *casting* and *leading* peats out of a worn out moss. My servants and I are compelled to labour six days picking straws and stones out of the highway. We are as many days making hay for the laird, shearing and leading his corn. I must plough too and harrow, both for him and the

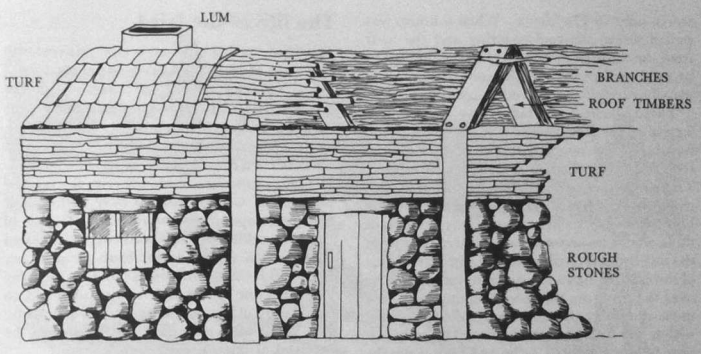
Almost every estate in Scotland had its water mill. All the grain grown on the estate had to be ground in the mill, and the farmer had to pay the laird and the miller for the work. Old mill buildings often survive

minister. My men and horses are every now and then trotting to Aberdeen as carriers as often as I am warned by his officer. And when I am at liberty, I must cast muck-fail and lead it from a great distance or be repairing my houses, which I am bound to leave in good condition. I am often forced to lead lime and slates from a great way off, not only for the laird, but for his neighbours at his desire and when the kirk or the *manse* want reparations. I never want work either at one or other of these works all summer over.

It was easy to grumble about the various jobs which had to be done, but it was very difficult to avoid doing them. The landowner had his own court, called the baron court, where either he or his officers could fine or even evict any tenant who refused to do the work laid down in his lease. In July 1715, for instance, when several tenants refused to help to make a new dam for Monymusk Mill, Sir Francis Grant's bailiff ordered them to begin work at once, or else each pay a fine of £3 (Scots). The tenant farmers must have hated being forced to do such work, and no doubt did it as quickly as they could. Since they were not skilled craftsmen, much of their work must have been very shoddy. To get good work out of his tenants, the landowner had to make sure that they were watched and checked all the time.



This picture of a lowland farmstead near Dunfermline shows the rough farm buildings at the side of the country road in about 1690. The pack horse was the usual means of carrying goods, though the woman on the right seems to have a bundle balanced on her head



The drawing above shows how country houses were built in the early eighteenth century

Clearly, no tenant farmer could cultivate his own land and do all the work he had to do for the laird by himself. Usually several farmers banded together to lease out one of the townships and shared the work between them. If one farmer took the lease on his own, then he had to employ farm servants. These men worked on his land for a little cash, some oatmeal, a bit of land and somewhere to live. The maximum amount they could be paid was laid down by the Justices of the Peace for the county. Since all the justices were landowners who employed farm servants themselves, they made sure that the rates were very low indeed. The most a skilled farm labourer could earn in a year in Aberdeenshire as late as 1750 was just over £11 (Scots) a year. Boys were paid £3 and women £5. The landowners argued that they made so little money from farming that they could not afford to pay any more, and it is true that visitors from other countries always remarked how poor and wretched the people, the crops, the animals and the buildings all seemed to be.

Farm buildings

From descriptions written at the time, it is easy to build up a picture of the kind of houses people lived in.

To make them they first built the walls up to a height of just over a metre using rough, unsquared stones. The gaps between the stones were plugged with turf or clay to keep the wind out. On top of the stone wall they placed layers of turf, until the wall was about two metres high. Every two metres or so along the side walls a wooden post was built into the wall. When the walls were finished the roof timbers were fastened onto these posts with wooden pegs. The roof itself was made of rough branches laid across the roof timbers, and covered with a thatch of turf or heather. A wooden box, open at both ends, was let into the roof to act as a *lum*. The windows were small, and usually only the top half had glass in. The bottom half was covered by a wooden shutter. Most houses had two rooms, usually known as the *but* and the *ben*, with box beds built into the partition between them. The floors were earth, with a rough hearth of stones for the fire. Adjoining the house there were other rough buildings which were used as byres and barnes.

Labourers' houses might be even worse. Often they had no outhouses, and had to share their home with their animals. Some houses were very small – about five metres by three. One on the Monymusk estate had 'no door, no window and no lum', and in 1738 was said to be

worth only £6 17s (Scots). When a house was pulled down, the roof covering and the turfs from the walls were thrown onto the midden to be used as manure, but the roof timbers were usually carefully preserved to use again.

These houses were dark, dirty and uncomfortable, and they usually contained very little furniture. The box bed might contain a mattress filled with chaff, or even straw or heather. There would be a rough table with a couple of chairs or benches, a spinning wheel and some bins for storing meal or flour. Over the hearth there would be an iron hook, either slung from the roof timbers or mounted on a bracket. Most of the cooking had to be done in iron pots hung over the fire from this hook. Baking was done on a thick flat piece of iron called a girdle, which was heated over the fire. The only fuel was peat, which had to be cut from a nearby moss and stacked by the house to dry.

The people's diet was monotonous and unhealthy. Usually they ate oatmeal porridge, cooked in one of the pots over the fire. Sometimes they had 'hasty pudding'. This is the recipe, written down in 1797.

Hasty pudding

To a quart of water, whilst it is boiling in an open pot, a small quantity of salt is added, and 13 ounces of oatmeal are dropped into it, by little and little, whilst boiling, and stirred about with a stick or spoon. It is boiled in this manner for two or three minutes, when it becomes pretty thick; and is then taken out of the pot or pan, for use. Hasty pudding is eaten with a little milk or beer poured upon it; or with a little cold butter put into the middle; or with a little treacle.

Otherwise people relied on sowens – a mixture of cold water and oatmeal. For solid food they ate oat or barley cakes cooked on the girdle, and sometimes they would have some stewed beef or mutton with a little kale. On a special occasion they might boil a hen. People rarely ate enough fresh vegetables and were liable to attacks of scurvy. In a bad year when the crops were poor they often went hungry. Between 1690 and 1700, when there was a succession of bad harvests, many of the poor died of starvation.

The life of the laird

The laird lived much better than his tenants. The walls of his house were made of good solid lumps of stone cemented together. It was roofed with slates or tiles, had proper wooden floors and windows filled with glass. Because his tenants handed over part of their crops as rent the laird never needed to go short of food. In 1733, in addition to money rent, the laird of Monymusk was entitled to over a thousand hens and capons, and more than 800 bolls of meal. In addition most lairds kept a flock of doves which could provide fresh meat at any season. But though there was plenty of food, the laird did not have much money and had to spend most of his time on his estate, supervising the work and consuming the produce he received as rent.

Sir Francis Grant, who was a lawyer, did not much like country life. His estate seemed poor and barren and Monymusk House was badly planned and in poor repair. It had 'six different roofs of various heights and directions, and all rotten'. For three years Sir Francis kept the estate, but in 1717 he handed it over as a wedding present to his twenty-year-old son, Archibald, who ran it from then on until his death in 1778. Archibald, unlike his father, was interested in improving the estate.

Dovecotes were very strongly built and often still stand long after the laird's house has gone. Though the doves ate crops, the tenant farmers did not dare to harm them. Only the laird was allowed to kill and eat them

At the beginning of the eighteenth century grain crops were cut with a sickle. To use it the reaper had to bend down, grasp the stems and cut them through with the sickle

Changes in farming

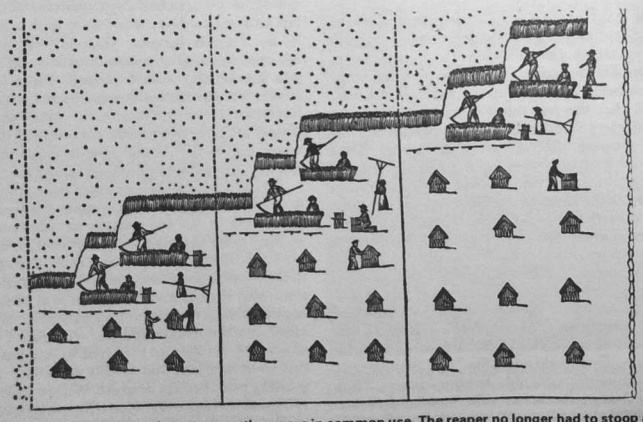
For many years a few landowners in England and Scotland had been experimenting with different farming methods to try to produce better crops and livestock. They discovered that crops grew better if the ground was kept free of weeds, and that the soil could often be made more fertile by proper draining, by applying lime and by growing different crops each year. They found that turnips were a particularly useful crop, since they could be fed to the animals to keep them alive through the winter. In addition, more hay could be got from the pasture if special grass seed was sown on it. This meant that more animals could be kept, to provide a greater supply of meat for the people and more muck for the soil to make it more fertile. There was also muck to spare for the outfield, so that it too could grow crops regularly. The fertile soil produced more crops, and the farmers grew richer. They could now afford to pay more rent to the laird, who also became richer. Thus everybody was better off. Archibald Grant decided that he would try the new farming methods on his estate in Aberdeenshire.

It was a very difficult job. In the first place, nobody in the area had any experience of modern farming methods, and Grant had to bring in an English farmer, Thomas Winter, to Monymusk to give practical advice. Winter was shocked by what he found. 'Here is no harness for the horses that is fit for a horse to labour in,' he wrote. 'Here is no plough that is proper to till the earth with, nor one man in the whole parish that knows how to make use of them . . . Should we in England labour our land . . . after such a careless manner and with such instruments we should get nothing but weeds.' But worst of all the tenants at Monymusk seemed quite satisfied with their old farming methods. They were, he wrote, 'fully persuaded in themselves that there is no better instrument than what they have nor no better way of making use of them than what they practise'. In the same way the tenants did not wish to try out new crops. As long as they had to pay part of their rent in grain, they would not waste land growing peas, turnips or grass. Winter wrote in 1726 that he hoped by 'repeated conversation' to persuade the tenants to change their ways, but it was a slow process. Forty years later Sir

Archibald told his tenants, 'Your misfortunes is not the want of good soil but your mismanagement of it', and went on to accuse them of 'idleness or sauntering about on trifles. And when you are at work,' he went on, 'you don't work with life and spirit, but as if half dead or asleep, and many half hours which you don't value might be made good. As to your poor living I am sorry for it, but it is your own fault.'

It is easy to understand why the tenants were unwilling to alter their farming methods. In the first place, the old methods had been used as far back as anyone could remember and the tenants took it for granted that a system which had been used for so many years must be the best. They were suspicious of new ideas, and preferred to continue working in the way which they knew and understood. Secondly, the new system involved a vast amount of work. The fields had to be cleared of weeds and spread with muck and ditches had to be dug to drain the land where it was too wet. Turnips had to be hoed and weeded regularly if they were to do well. To make the outfield fit for regular crops it had to be ploughed several times, dunged and cleared of stones between each ploughing. The stones were carried off the fields in baskets and used to make dykes. Gradually the old sprawling rigs disappeared and were replaced by square fields enclosed by these stone dykes, which stopped the animals wandering over the crops and divided one crop from another. But it was all back-breaking work, and Grant's tenants hated it, especially when Grant compelled them to clear stones off his own home farm as part of their rent.

Improvements were also expensive. The old ploughs had to be replaced by new ones which would do the work more efficiently, and horses with proper harness took the place of the slow oxen. All these had to be paid for, and so did the seeds for the new crops. Some landowners, like Grant, were willing to lend their tenants money, but many farmers were unwilling to risk getting into debt. They suspected that the improvements were not really for their benefit



By the end of the eighteenth century scythes were in common use. The reaper no longer had to stoop and could cut the crop much more quickly than with a sickle

This huge dyke near Aberdeen is made entirely from the stones cleared from surrounding fields. The tenant farmers must have had a long and hard job shifting all this stone from the land

but were to enable the landowner to charge them more rent for their land, so that in the end they would be no better off for all their work and worry.

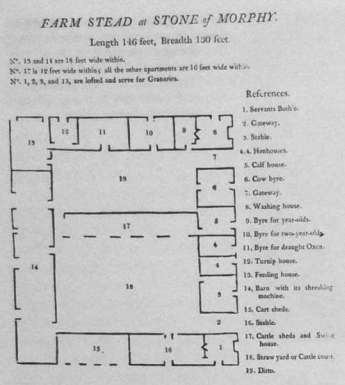
Grant was determined not to allow his tenants to hold up the work of improving his estate. Apart from preaching and persuading, he made new tenants sign agreements to grow the new crops on their land, and then turned them out if they refused. He set a good example by using the new methods on the home farm attached to Monymusk House. The yield from the home farm increased greatly, but most of the tenants were still unwilling to abandon the old ways. 'You won't,' complained Grant, 'follow a good example when you see it has good effects.'

Results of improvement

But in spite of the opposition of his tenants, Grant made steady progress and by the end of his life most of the towns on his estate had been improved and enclosed. As a result, life on the estate had changed completely. In the first place Sir Archibald's income from rent had tripled since he took over. Though his tenants still handed over a certain amount of grain and meal, most of the rent was now in cash. Livestock, such as hens and sheep, was no longer accepted. The tenants, too, were better off. Their diet had improved and they now had fresh meat and vegetables, including potatoes. Housing was also better because Grant used part of the higher rents he charged to pay for good houses.

	Modified Norfolk rotation
Year 1	Barley
Year 2	Turnips
Year 3	Oats
Year 4	Clover
Year 5	Pasture
Year 6	Pasture
Year 7	Barley
Year 8	Turnips
Year 9	Oats
Year 10	Clover
Year 11	Pasture
Year 12	Pasture

The table above shows a typical crop rotation followed by Scottish farmers after improvement. It was similar to the Norfolk rotation used in England, but included barley or oats instead of wheat, and put the land down to pasture for a couple of years



These carefully planned farm buildings, each with its own use, contrast with the seventeenth-century steading shown on page 12. Many nineteenth-century steadings were so strongly built that they are still in use

A visitor to Scotland at the end of the eighteenth century remarked that the cottages were now 'substantially built of stone, with slate or thatched roofs'. They usually had two rooms, and the main living room had a proper fireplace with a chimney. He noticed that few of the windows were made to open, and that the only ventilation in the house came from the door being opened and shut as people passed in and out. He found, too, that the families usually lived all in the one room, which they used as kitchen, sitting room and bedroom. The other room would be furnished with a table, chairs and a chest of drawers, but was only used on special occasions.

The work on the farm had also changed. The old twelve-oxen plough had needed up to four men to control it, but the new ploughs, pulled by two Clydesdale horses, could easily be managed by one man. Threshing machines cut down the number of men needed to thresh the crop. With the new enclosed fields the animals no longer needed watching to stop them wandering onto the crops. On the other hand, there was plenty of work in the turnip fields, and much of the old outfield and waste remained to be cleared and properly cultivated.

Most farms were now let to one tenant, instead of the two or three who used to share one of the old farm towns. The new tenants had long leases, so that they would feel it was worth their while spending time and money on their farms. They employed farm servants, usually for a year at a time. This meant that there were now fewer farmers than there had been. There were, however, just as many people living on the estate, because Sir Archibald had built a new village at the old Kirktown of Monymusk, and had encouraged craftsmen, such as masons and weavers, to settle there. Now the tenants and their servants no longer had to do all the jobs on the estate, but could employ a specialist instead. The work was better done, and the tenant could concentrate on farming.

The whole appearance of the estate was changing too. The new dykes and *steadings* made everthing look neater and, in addition, the waste land was now clothed with trees. Sir Archibald planted millions of them, partly for their appearance, partly for the timber and partly to act as windbreaks. Up and down the country other lairds were following Sir Archibald's example. At first there were only a few of them, but as the years passed the news of the good results of improvement spread, and more and more landowners tried out the new methods. Many of them were less efficient than Grant, and some of them spent too much money too quickly and went bankrupt. But gradually the countryside changed, and all over the Lowlands neat, square fields with stone-built farmsteads replaced the old rigs with their ramshackle buildings. Villages were set up to house craftsmen and act as market centres. The quantity and quality of the crops improved dramatically, and most estates began to produce a large surplus of food to sell off to the growing towns. By 1830 Scottish farming was among the most efficient in Europe, and Scottish breeds of horses and cattle had become famous.

3 The Cloth Industry

The old system

In the early eighteenth century some kind of cloth was made on almost every estate in Scotland. John Younger, who had been brought up in the country in the eighteenth century, wrote later that spinning linen yarn 'on the small wheel and woollen yarn on the large wheel engaged every country woman early and late. Throughout my mother's married life,' he went on, 'she was accustomed to rise very early, by five or six o'clock, even in cold winter mornings, for the purpose of spinning yarn to provide clothes for the family use. The boom of her large, and the birr of her small wheel were music to my young ear on awakening in the mornings.'

Most of these women did not work the whole time at spinning. They were the wives and children of farmers or farm labourers, and they looked after the house and worked on the farm, as well as spinning the wool and linen yarn which came from the sheep and flax produced on their own land. When the thread was spun it was taken to a weaver who worked at a hand-loom in his cottage, making the thread into cloth. The weaver had to be paid for his work. Sometimes he was given cash, and sometimes

The large spinning-wheel was used for spinning wool. The wheel used for linen was much smaller

In the Highlands and islands wool rather than linen was produced. Here in Skye in about 1770 ten women are at work pounding a piece of wet woollen cloth to loosen the dirt in it

he was paid in meal, or even in thread. As the weaver could not earn enough money from his weaving to keep himself and his family, he had a piece of land which they cultivated. Once the cloth had been made, the women took it back and cut it into clothes. These clothes were warm and thick, but not elegant or fashionable.

The linen industry

In the eighteenth century the government wanted to develop an industry in Scotland to produce goods to sell abroad to the colonies and help make the country richer. The linen industry was chosen because an enormous amount of linen was already made in Scotland, and there was no linen industry in England to compete with it.

Good linen is difficult to make. It comes from the flax plant, which needs fertile soil to grow well and takes a lot of the goodness from the land. In Scotland flax was grown on the infield. When the plant was ready it was pulled up, and the stem was soaked in water to rot away the fleshy parts. When they were well rotted the stems were battered with wooden hammers to separate the fibres from the rest of the plant. This was called *scutching*. Once they were dry the fibres were carefully combed out with steel combs called *heckles*. They were then ready to be spun into thread. All these processes were carried out by the family who had grown the flax, and they all had to be done with skill and care if the linen thread was to be fine and even. In most cases the country people were too busy to bother much about the quality of the linen which they made. As a result the thread was usually thick and uneven, and the cloth woven from it was rough and coarse.

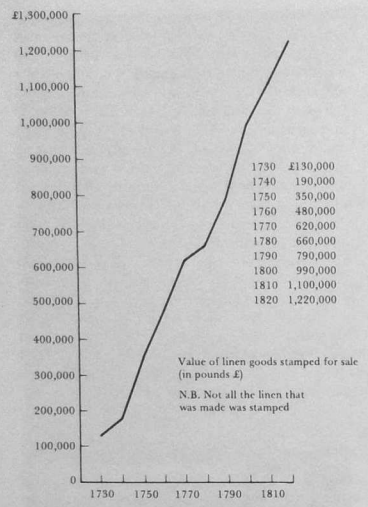
Once the cloth was woven, it had to be bleached. This was a complicated process. The cloth had to be taken, usually on horseback, to bleachfields, where there was a good supply of water and a large area of grass on which the linen could be spread to dry. The linen – a greenish grey in colour – was first marked so that its owner would be able to recognise it again, and then washed to remove the dirt. Next it was trampled in a warm solution of potash, and brought to the boil. It was then rinsed in clean water and pegged out to dry. When it was dry it was soaked in an acid solution, rinsed and dried for a second time. The whole process was then started all over again and repeated as many as six or eight times, until the linen was white. This could easily take about three months. Mistakes were often made in bleaching. If the solutions were too weak they had little effect, and if they were too strong they could damage the cloth. Scottish bleachers were not very skilled, and at the beginning of the eighteenth century much Scottish linen was left unbleached or was sent abroad to be processed.

Improvements in linen-making

The government realised that if Scottish linen was to be sold overseas its quality would have to be improved. It therefore appointed a Board of Trustees and gave them a certain amount of money to spend on the industry. To begin with the Board could only spare about £25,000 a year for the linen trade and they spent much of that on bringing in experts from abroad to give advice. They also offered prizes for new inventions. In the 1720s a water-driven scutching machine was invented and in 1729 one of them was installed in a mill near Edinburgh. It was a success and was copied. To house these new machines small buildings called lint mills were built by the side of streams which provided the flow to turn the water-wheels.

Once the lint mills were established, the mill owners employed a few men to work in them full-time and bought supplies of flax from the nearby farmers. Soon much of the flax crop was being scutched in the mills. These mills were noisy and dirty places, with the sharp-edged scutchers made of hard wood crashing down on the flax and sending the rotting soft parts of the stem spattering all over the floor and the workers. But the machines processed the flax quickly and produced large quantities of lint which now had to be combed. To deal with it all, heckleries were set up, where men worked full-time combing out the fibres. There was still no machine to do this work, and the hecklers could talk as they worked, undisturbed by any clatter. Often they argued about politics, and sometimes they got one of their number to read to them as they worked. The men in the heckling shop came to know one another very well and got into the habit of acting as a group. Sometimes this was just for their amusement. 'They had lots of fads,' wrote Peter Carmichael, who worked in the linen trade himself. 'At one time it would be a band and they would march about toot-tootin' perpetually; at another they would be teetotal, but that did not last long and the most general of their moods was a common bout of drinking.'

This ruined stone building was once a lint mill. It stands in a wood in the middle of the country. It was powered by a water wheel which has completely rotted away. The water which drove it was channelled from a nearby stream

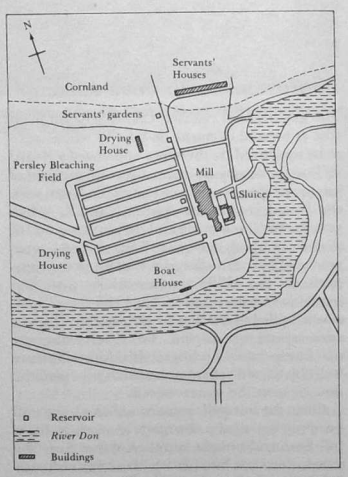


The graph above shows how the amount of linen tested and given the official stamp of approval increased. The scheme was abandoned in 1822

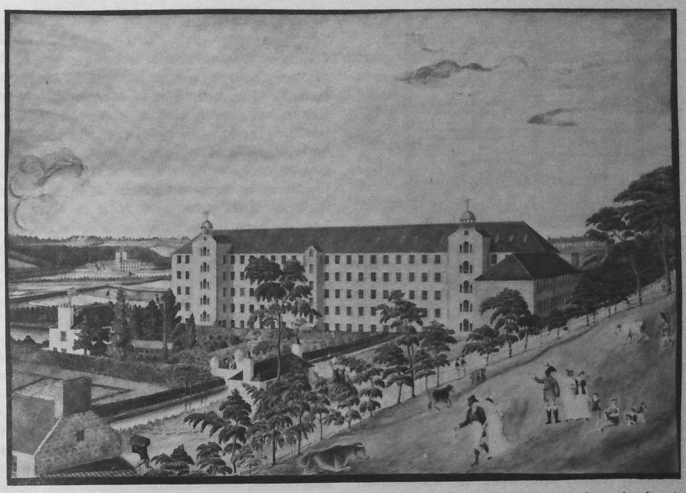
Working full-time at their job, the hecklers became very skilled and the quality of their work improved, so that the spinners were able to produce a fine, even yarn. Once the hecklers realised how important they were they began to act together to demand better pay and conditions, and their skill was so vital that they usually got their way.

When the flax had been dressed by the hecklers it was sent on to the spinners. Linen was slightly sticky, and though machines were invented to spin cotton they could not at first cope with linen, which jammed them up. So linen still had to be spun on the wheel, and to make sure that the work was of the highest quality, full-time spinners were employed. Also, skilled weavers were needed to weave the fine threads into the complicated and delicate patterns which fetched good money abroad.

High-quality linen needed careful bleaching and many new bleachfields were set up, with skilled bleachers who made few mistakes. Some of these were huge places, covering as much as sixty or seventy acres and employing up to a hundred workers. There was plenty of work for the bleachers because Scotland was now able to sell much more linen abroad than before. Most of it was exported through the ports on the river Clyde, and the manufacturers found it best to have the cloth made near to the ports. Before long, therefore, the Glasgow area became famous for the skill of its spinners and weavers. They produced very fine linen, while much of the rest of the country was still producing a much coarser cloth.



A plan of a bleachfield near Aberdeen, showing the main mill, the drying houses and the ditches which carried the washing water to all parts of the bleachfield

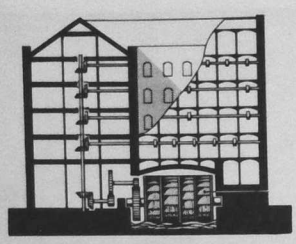


Woodside cotton mill was built beside the Don near Aberdeen. The mill lade brought water from the river to power the works. The actual water wheel was hidden from view under the building

The cotton mills

While Scotland had been concentrating on linen, manufacturers in England had been experimenting with cotton. The cotton plant will only grow in a warm climate, but in the eighteenth century cotton wool could be imported into Britain for as little as five shillings a pound. Not only was it very cheap, it was also easy to process, and by 1780 spinning machines had been invented which turned the raw cotton into thread worth more than £9 a pound. To make money the manufacturer needed a large building to house the machines, people to operate them and a good stream of water to turn the wheels which drove them. It was the stream that really mattered, and if a manufacturer found a good run of water in a deserted valley, he would not hesitate to build a factory there, move the machines into it and bring workers from miles away, building a whole new village on land where nobody had lived before. He could afford to spend a lot of money because he knew that once his factory was working he could make big profits. Within a year or two, many of the best sites in England had been developed, and businessmen began to turn their attention to Scotland.

One example was David Dale, a linen merchant, who found a place on the Clyde where the river could easily be made to power a mill. In every other respect the site was very bad. It lay in a sloping hollow, and was damp and badly drained. The area around was barren, very few people lived there and the roads were poor. All the same, Dale went ahead. He easily persuaded the landowners to lease the site to him and set about building his works. Huge



A textile mill around 1800. The power from the water wheel was taken to every floor of the mill by means of gears and shafts and then fed to the machines by straps and pulleys

quantities of rock and soil had to be carted in to level the site, and a tunnel over ninety metres long was made to bring the water to it. Then the mill was built and the machinery could be installed.

Visitors were often very impressed by mill machinery. A gentleman who went round Rothesay Cotton Mill, where the water wheel was over seven metres in diameter and nearly two metres wide, described it as 'a grand object', and spoke of its 'dark colour', its 'magnitude' and its 'prodigious power', with its shaft like 'the mast of a first-rate man of war, and 100 feet [about 30 metres] in length. Round this,' he went on, 'are fixed a great number of vertical wheels, which turn as many horizontal ones; and these again are connected with others, ranged above them through four or five storeys, alternately vertical and horizontal. The effect procured by this combination of wheels is the ceaseless whirling of many thousand spindles, and the regular movement of all that machinery by which cotton is spun and twisted.' Such machinery was very heavy and the factory which housed it had to be well built to withstand the vibration it caused. All this meant that it cost the owner a lot of money to set up his mill. To get this money back, and make a profit, he had to keep his mill working for about twelve hours a day, year in, year out, and to keep his mill working he needed hands.

Work in cotton mills

Dale soon discovered that it was impossible to get enough adults to man his factory. He tried to attract them by building a village called New Lanark to accommodate them and their families. He found, however, that most Scots hated the idea of 'working early and late, day after day, within cotton mills'. As a result only a few families came forward, 'and the great majority of them were idle, intemperate, dishonest', because only those without 'friends, employment and character were found willing to try the experiment'. But Dale knew that in most large towns there were many orphan children who were being looked after by the authorities. He applied to Edinburgh, and the authorities were willing to supply him with enough children to man his factory, provided that he gave them somewhere to live, clothes to wear, all their food, and saw to it that they were educated. Some of the children were very young – only six or seven years old. Dale did not like employing children under ten years of age, but the authorities would not let him pick and choose. 'If he would not take them at those ages, he could not obtain them at all.' Dale took the children, built a special lodging house for them, and saw to it that they were properly clothed.

The children were also well fed. They had 'oatmeal porridge, with milk in summer or sowens, with milk in winter twice a day, as much as they can take, barley broth for dinner made with good fresh beef every day; and as much beef boiled as will allow 7 oz a-piece each day to one half of the children. The other half get cheese and bread, so that they dine alternately upon cheese and butcher meat, with barley bread and potatoes. Now and then in the proper season they had a dinner of herrings and potatoes.' By November 1793 there were nearly eight hundred children at New Lanark out of a total labour force of 1,300. Like the rest, they had to work from six in the morning until seven at night, with an hour off for dinner. Every night at seven they went to the factory school, where they had lessons for two hours. They were not free until nine at night.

The children worked in the mill as *piecers*. They had to watch the spinning machines at work and, if a thread broke, they had to go and mend it by twisting or tying the two ends together. Every child had a certain number of spindles to watch and if all went well there might be very little to do. But if the cotton was poor, or the machines ran badly, then the children would be constantly on the move, ducking under the machines to get at the threads, mending them, and scrambling clear only to find that a couple more threads had broken somewhere else. They had to be alert all the time, because if they were drowsy, they might not see a thread break, or be too slow and get their fingers nipped by the machine. Many of the children found it difficult to concentrate towards the end of the day, partly because the hours were so long and partly because the spinning flats usually had few windows that would open and were therefore hot and stuffy. There were stories, especially in England, that the children were regularly beaten to keep them awake. But when government inspectors were sent round to inquire about conditions in factories in 1832, they found that in Scotland factory overseers beat the children under their care much less often than did country schoolmasters.

Many people at the time could see nothing wrong in making children work a twelve-hour day. The visitor to Rothesay mill, where there were many children at work, thought it was 'highly pleasing to observe such a number of little hands made useful'. Archibald Buchanan, who managed three of the biggest cotton mills in Scotland, said that children who came to the mills as young as six grew up to be 'as healthy stout people as any in the country', and were in great demand in other trades because of 'the habits of industry' they learned working in the cotton mills. Parents were, he said, 'very desirous' to send their children to work in the mills. Many of the children also seemed happy enough. Margaret Dickson, an eleven-year-old working in a Dumbartonshire mill said she 'liked it very well', and was 'no very tired at night'. She never fell asleep at her work because 'the piecers are aye making fun'. Her master in the mill sometimes scolded her, but never hit her. Indeed she had never seen any spinner give a piecer anything more than 'a wee bit lick. It is no very dangerous in the mill,' she went on, 'gin you take care of yourself your are no very hurted.'

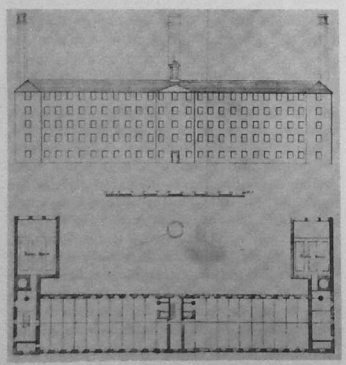
Though the hours seem long, work in the big cotton mills was often better than other jobs. The new, large mills were usually well planned and properly maintained. Deanston Mill in Perthshire was described by an inspector as 'clean' and 'well ventilated' with 'the machinery well fenced'. At James Finlay's mill dust fans were installed to keep 'the atmosphere light, fresh and agreeable', while at Bannerman's mill in Aberdeen drinking water was piped to all the spinning rooms. In the smaller cotton mills and in flax mills conditions were much worse. Gilchrist's flax mill at Inverbervie was 'dirty, low roofed, ill ventilated, ill drained; no conveniences for washing or dressing, no contrivance for carrying off dust; machinery not boxed in, passages so narrow they can scarcely be defined; some of the flats so low that it is scarcely possible to stand upright in the centre of the rooms'. The work in flax mills was harder too.

Work in linen mills

Early in the nineteenth century it had been found that linen yarn could be spun by machine if the lint was first soaked in water. This made it slippery, so that it no longer jammed in the machines. To keep it smooth the yarn was wetted with warm water as it was spun. This drenched the floor and soaked the girls at the machines. In addition, linen yarn was much more likely to break than cotton, so that the piecers had much more work to do. With the damp and the hard work, they had a wretched time. Sir David Barry, who inspected mills on behalf of a House of Commons committee, watched two thirteen-year-old piecers at work. 'One,' he wrote, 'attended to sixty wet spindles, the other to fifty spindles. It is quite impossible to give an adequate notion of the quickness with which these girls joined their broken ends of thread. There is no standing still; every muscle is in action, and that in quick succession.'

Such girls were rarely happy in their work. Isabella Simson, aged thirteen, worked at wet spinning in Kirkcaldy, and told an inspector how she stood 'in the wet', and 'my feet will tell you, they are so swelled and red, what a sad place I am in. My hands are all hacked with the warm water, and I am wet through and through my clothes, with the water that splashes on me.' Janet Neilson, also thirteen, who worked in the same mill, found the work very tiring. 'She whiles gangs to bed without her supper,' the inspector wrote, 'she is sae tired.' A fifteen-year-old, Helen Aitken, who worked at Dunfermline, also found that she did not 'much care about her supper. If I had a little girl,' she said, 'I would never send her to a mill.'

Some flax mills employed a different system of spinning, where the lint did not have to be soaked. Here the problem was that the machines filled the air with a fine dust. Nineteen-year-old Thomas Muir had worked in an Edinburgh flax mill for ten years. 'The dust,' he said, 'is very disagreeable, and occasions coughing and choking of throat and breast.' He was, the inspector noticed, 'affected with a great spitting'. In 1833, after only two days work inspecting dry flax mills, the officials noticed that they became hoarse, and two of them 'had their lungs affected and their breathing hindered by the flax dust'. Some workers were very badly affected. Ann Ward was only twenty-five when she was interviewed by Sir David Barry. He found her spitting blood, with her 'breathing much oppressed with wheezing. Is really very ill. Obliged to sit up in bed at night from difficulty in breathing.'

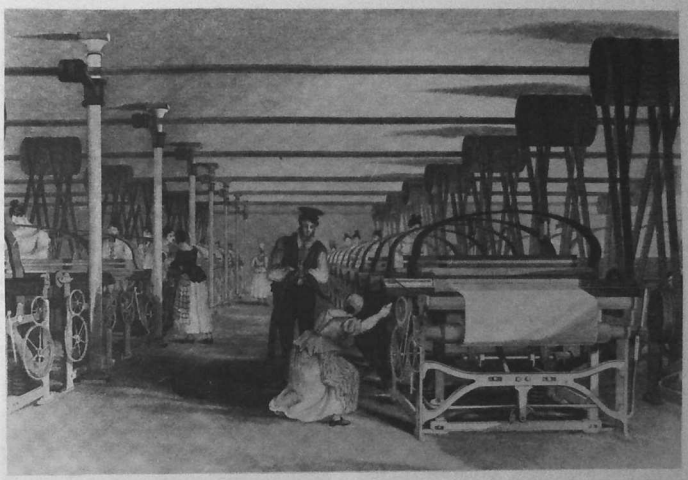


A steam-powered flax mill. There were five floors with spinning machines powered by two 50-horse-power engines, one at each end

In fact, Dale's son-in-law, Robert Owen, reckoned that even in the best mills factory work damaged the health of young children. 'It is true,' he said, 'that those children, in consequence of being so well fed and clothed and lodged, looked fresh and healthy yet their limbs were generally deformed and their growth was stunted.' A young pottery worker in Port Dundas agreed with Owen. He had spent sixteen years in a cotton mill, the last eight as a spinner. At the age of twenty-seven he had left the mill 'as weak as a child', worn out by 'the stress of the work. People that have been a long time in a cotton mill,' he said, 'cannot work like other men afterwards.' In 1833, Parliament acted to reduce the hours of work in spinning mills. Children under nine were forbidden to work at all, those between nine and thirteen were limited to eight hours, and those between thirteen and eighteen to twelve hours a day. Later Acts reduced the hours still further.

Weaving and finishing

Once the thread had been spun, it needed to be woven into cloth. At first this had to be done on hand looms, and there were not enough hand-loom weavers to make up all the thread produced by the spinning mills. They were therefore able to charge a lot of money for their work, and at a time when first-class spinners were earning less than a pound a week for six days work in the mill, hand-loom weavers were able to get two pounds for a four-day week. It was, said one weaver later, 'the daisy portion of



Power looms are noisy machines because of the clatter of the shuttle as it flies from side to side. The noise in a power-loom shop could be deafening with so many looms working at once

weaving', and hand-loom weavers were envied by other workers who saw them drinking their fill at the weekend, and heard stories of them swaggering about in fine clothes all day Monday and only getting down to work on Tuesday or Wednesday. But the weavers' luck ran out. First, a large number of weavers came from the Highlands and over from Ireland to take advantage of the good pay. Then a power loom was invented which could weave plain cloth faster and cheaper than a man on a hand loom. There were now more than enough hand-loom weavers for the work. Their pay dropped, and soon they were competing for jobs in the power-weaving factories where they could now earn more than at the hand loom. By 1830 the weavers were the poorest instead of the richest cloth workers.

Most of the woven cloth was bleached and dyed. New bleachfields were laid out, and special factories were built to do the dyeing. Sir David Barry, watching the work going on at Monteith's factory in Glasgow, was especially impressed by the stove girls who hung wet pieces of cloth up in the stove and took them away again when they were dry. The stove was a building two or three storeys high. The floors were made up of parallel bars over which the cloth was hung, and the whole building was kept very hot to make sure that the cloth dried quickly. When Sir David Barry went into the stove the temperature was 60°C, with the girls walking in and out carrying loads of cloth. The place was full of steam, yet the overseer assured Sir David that the girls were 'as healthy as any'. But not everybody could stand working in the stoves. John Frew, a thirteen-year-old boy employed at Buchanan's bleach works in Glasgow, tried it for two mornings but 'could not get breath for heat'. He now did odd jobs about the

works, mostly holding cloth while it was folded. This was better than the stoves, though another boy complained that 'whiles holding the cloth makes his hands bleed'. He would, he said, 'sooner have short hours and less wages'.

The new towns

By the end of the eighteenth century, steam-engines had been designed to drive spinning machines. Now there was no longer any need to build mills by the sides of rivers, and they could be built near towns, where there were plenty of workers to man the machines. The mill-owner did not have to go to the trouble and expense of building special houses and lodgings for his workers. Instead, they lived in houses put up by landlords who got their living by letting out rooms and flats to the factory workers.

Some workers' houses were well kept and respectable, because when a spinner was in work, he earned enough to live well. In 1833 Andrew Bruce, a spinner, lived with his wife and three children in a flat in Calton. He had a 'good room' and a kitchen on the third floor, with a wash-house below. All this cost £4 a year in rent. His wife, who was twenty-six, had worked in a mill for thirteen years, but now looked after the house and children, who were all too young to work. She had 'always been able to cook, wash, make and mend for the family'. They had 'mahogany bedstead, chest of drawers, table, chair and two beds', and were able to afford meat three or four times a week and 'sometimes tea and coffee'. In the same building Widow Keith had to rely on the money brought in by her son, who was a spinner, and her daughter, who was a power-loom weaver. Her house was well furnished, but her son had recently lost his job, so that she had pawned her clock to raise some cash. On another floor Mrs Fairy was living with her husband and three small children in 'one room, most miserably small and ill furnished'. She earned about 2 shillings a week winding thread on to reels for a weaver, while her husband got 9 shillings a week labouring in a pottery.

In a nearby building John Harrup, a hand-loom weaver, worked 'in a back damp earthern-floored shop, and sleeps in a miserably dirty garret in the same building. No bedstead, scarcely any furniture. Earns on an average 6 shillings per week, out of which he pays all his loom expenses, more than 1 shilling per week. He is twenty-five years of age; his wife twenty-one; one child; likely soon to have another. He is thin, pale, hollow-cheeked, and looks half-starved.' In other towns too the hand-loom weavers lived in poor accommodation. The following description was given by a doctor working in Ayr.

> Their houses are thatched with straw, and the roofs old and in bad repair. The windows in general are fixed, and most of the glass is so much broken that its place is supplied with boards, rags and old hats. The ceilings are low, and these as well as the walls, without plaster. There is usually a bedstead at each side of the door, often much shattered, beneath which all sorts of rubbish and lumber are huddled together, and also the store of potatoes for the family. Nay we sometimes detect a heap of horse-dung under the bed, which is collected by the children from the streets, and sold when a sufficient quantity has been accumulated. The beds are infested with bugs. The bedding consists of straw or chaff, with a scanty supply of dirty blankets and mats, but no sheets. One or two broken chairs and stools and a fir table, constitute the remaining furniture.

There were people even worse off than the hand-loom weavers. Some people had no jobs at all, often because they had fallen ill. For a while they would continue to live in their houses, selling or pawning their possessions to make enough money to live. Then they would have to move to cheaper lodgings, and continue selling their goods until there was nothing left. A Greenock doctor reported that he had visited a poor family and

> found the mother lying in a miserable straw bed with a piece of carpet for a covering, delirious from fever. The husband had died in the hospital of the same disease. There was no fire in the grate. Some of the children were out begging, and the two youngest were crawling on the wet floor. It was actually a puddle in the centre, as the sewer before the house was obstructed and the moisture made its way to the middle of the floor by passing under the door. Every saleable piece of furniture had been pawned during the father's illness for the support of the family. The children were actually starving, and the mother was dying without any attendance whatever.

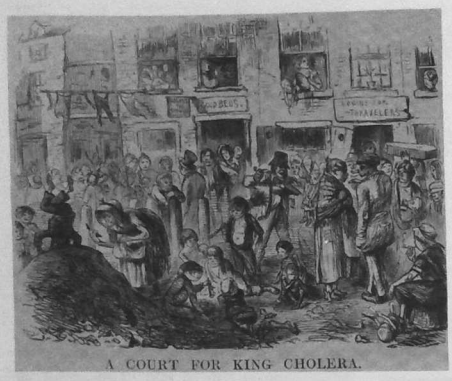
The most any such family could hope for was some help from their neighbours and a few shillings a week from the parish poor fund. Even this could not be relied on. In most parishes the only money available for the poor came from church collections and in bad times there was rarely enough to go round.

Industrial towns were very unhealthy places. They were overcrowded. Whole families usually lived in either one or two rooms and, to keep their apartments warm, they rarely, if ever, opened a window. To save land, the houses themselves were crowded together in a series of courts or closes with narrow alleyways which shut out the sun and the light. There were no rubbish collections and the houses had no drains. As a result the people living there heaped all kinds of filth into the courts and alleyways. These were often unpaved, and puddles of filth stood in the hollows and sank slowly into the ground. The water supply was usually pumped from wells, and often the water in them was infected by the sewage soaking into the surrounding soil. Glasgow, where the population grew from about 30,000 in 1750 to more than 200,000 in 1830, had the worst problems. A professor at Glasgow University wrote: 'In all the districts of the burgh and in the suburbs, there is a want of sewerage and drainage. The streets, or rather the lanes and alleys, in which the poor live, are filthy beyond measure. The houses are ruinous, ill constructed and to an incredible extent destitute of furniture.' A police surgeon noticed that in six closes off High Street there were eight dunghills 'of the largest dimensions'. Often these dunghills were sold off in cartloads, for farmers to spread on their land as fertiliser. In the meantime they spread death and disease.

An 1868 photograph of a Glasgow close with an open drain on the right. Washing is hung on poles to dry. The inhabitants are grouped together in the lightest part of the close

It is easy today to blame townspeople in the nineteenth century for allowing such conditions to develop, but it is important to remember that all over the country people lived in small rooms, threw all their household refuse on to a dunghill and drew their water from a pump. In country towns and villages there was so much fresh air, water and space that this did not matter. When large numbers of dwellings were crowded together in a large town, however, both the air and the water were poisoned.

For many years nothing was done to improve conditions. Nobody prevented landlords from putting up tenements, nobody made proper drains or laid on supplies of water to the new towns. So the towns grew and the problems got worse, until in 1832 the country was hit by a new and terrifying disease, called cholera. The whole country was shocked and frightened by cholera because it struck without warning and killed the rich as well as the poor. It caused terrible suffering, with high fever, sickness and constant diarrhoea. Victims of cholera eventually lost so much liquid that they

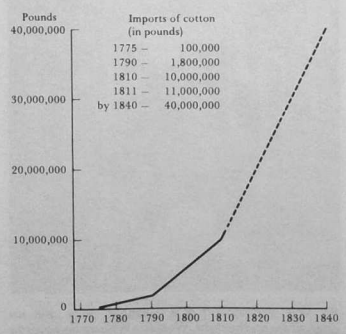


This cartoon was published in 1852. John Leech, who drew it, believed that bad housing, overcrowding, malnutrition and drunkenness all helped the spread of cholera

shrivelled up and died. The disease is caused by germs from sewage getting into the drinking water but at the time people did not know this for certain. It was suspected, however, that the disease was caused by unhealthy living conditions. As a result, Parliament appointed committees to inquire into the conditions in towns. Parliament then passed Acts which set up elected councils in the new towns, with the power to put things right. Gradually conditions improved.

Conclusion

By the middle of the nineteenth century there had been many changes in the cloth industry. During the eighteenth century the linen industry had expanded, with specialist craftsmen and machines. So much linen was made that a large quantity of flax had to be imported to supply the trade. The best cloth was made in the west, but after 1785 the amount of fine linen produced began to fall as the new cotton mills began to go into production. It was easier to make fine cloth from cotton, and it sold well. By the middle of the nineteenth century Scotland was importing more than 2,000 bales of cotton a week. There were more than 150 cotton mills in the country, employing about 35,000 people. Most of the mills were powered by steam-engines and the majority of the workers lived in one of the growing industrial towns. Scotland's cloth industry had succeeded, but its growth had brought new problems of overcrowding and disease to the towns.



The graph above shows how Scottish cotton production increased

4 The Coal Industry

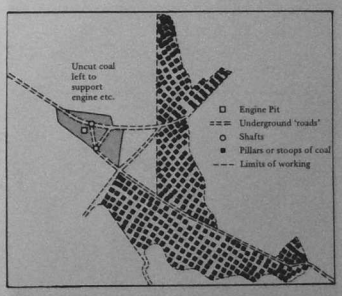
Before the industrial revolution

Coal has been mined in Scotland for many centuries, but until well after 1750 mining was not a large-scale industry. Coal-pits were usually owned by the local landowner, and the first part of this chapter shows how one of the best-known coal-owning families, the Clerks of Penicuik, ran their colliery at Loanhead in Midlothian. Coal-mining was not their only interest. Like most country gentry they organised their estates and played a large part in local government. In addition the first Sir John Clerk, who died in 1722, was a member of the Scottish Parliament for several years, while his son, the second Sir John, who died in 1755, was a baron of the Scottish exchequer, an important government post. He also took an interest in poetry, painting and science. All these other activities prevented the Clerks from attending to the day-to-day running of their pit themselves, so they had to employ others to do this work for them.

(a) The managers of the pit

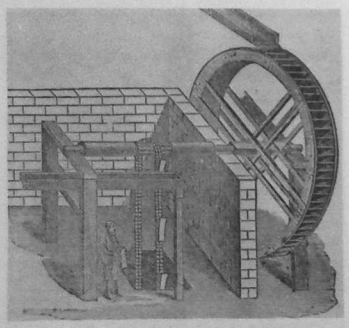
The most important of the full-time mine officials was the *grieve*. He had several jobs to do. First, he was in charge of the finances of the mine. He paid the miners, and organised the sale of the coal. Secondly, he collected the rent for the miners' houses. Thirdly, he was responsible for seeing that the miners and their families lived good and orderly lives. If they did not, he could order 'all thieves, cursers, swearers and profane persons' to appear before him in a special court, where he could fine them for their misbehaviour. Finally, he was expected to 'visit the mines and coal works frequently' to make sure that the other officials were doing their jobs properly. Clearly, the grieve had a difficult and responsible job, and his pay consisted of a basic salary of six shillings a week, with a couple of acres of land, a house and a bonus which depended on the amount of coal produced by the pit.

In the pit itself, the *oversman* was in charge. He told the miners where to work, and tried to make sure that the shafts and tunnels were properly made and maintained. He needed to be a capable and experienced man because the safety of the mine depended on his decisions.

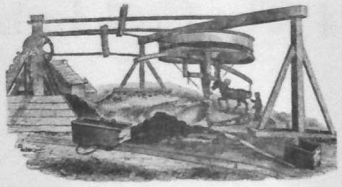


A plan of one of several pits on the Kinnaird estate in Stirlingshire in 1774. The pit shaft with a pumping engine is on the left. The extent of the workings is shown by the black and white check pattern. Each black square represents a column of coal left standing

The other important official down the pit was the *checksman*, who had to check the amount and quality of coal brought to the pit-head. Since the miners were paid according to the amount of coal they sent back to the checksman, he had a thankless job. The miners always complained that he underestimated the amount of coal they had cut, while on the other hand the mine owner would maintain that he had allowed them too much. Thus both the checksman and the oversman had to be steady and capable. They were paid about the same as the grieve, or perhaps a little less – about five shillings a week, with house and bonus. In spite of searching all over Scotland and Northern England it was difficult for the Clerks to get suitable men for these responsible jobs. Sometimes, if they found someone they trusted the Clerks would give them more than one of the jobs to do. For instance, the first Sir John once appointed a man to be grieve, oversman and checksman. It was too much work for one man and as a result Sir John's business started going wrong. Within a few months a coal seam caught fire, many of the miners left, and profits went down by about a half.



In this system of draining, the water wheel drove a chain of buckets which scooped water up from the pit bottom and tipped it out at the top. Other pits used water wheels to power pumps

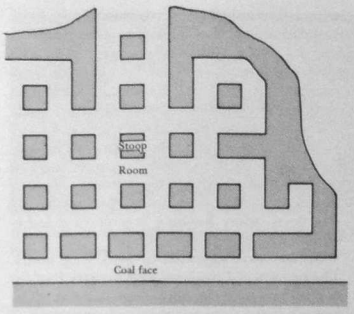


The gin was sometimes further from the pit head than this one. If the loads were heavy, a second horse could be harnessed to the other end of the beam to help raise them to the surface

(b) The pit

By modern standards Loanhead pit was tiny. The pit shaft was only 50 metres deep. This was because of the danger of flooding. The best pumps of the day were driven by a water-wheel, and they were not powerful enough to raise water from any greater depth. In the early years of the eighteenth century the shaft contained a rough staircase up which all the coal had to be carried on the backs of the women and children who acted as bearers. From 1740, however, the coal was raised by a *horse gin*, installed by the second Sir John. This was partly financed by reducing the miners' wages, and for a time they refused to use it. In the end, however, they decided that the saving in work was worth more than t pay cut, and the gin was set to work.

At the bottom of the shaft was the gallery where the coal was mined. To prevent the roof of this gallery from falling in, pillars of coal were left standing every few metres. This meant that between a quarter and a third of the available coal was left in the mine to support the roof. It also meant that a stranger going underground quickly lost his bearings, since he was surrounded on all sides by thick columns of coal, which cut off the light of the candles carried by the miners and their bearers as they moved about the pit. It was a gloomy, cramped place, dark, damp, dripping and stuffy. Though there was little explosive gas in any Scottish pit, there were occasional pockets of



ROOM AND STOOP WORKING

This diagram shows how columns of coal were left to support the roof in room and stoop working

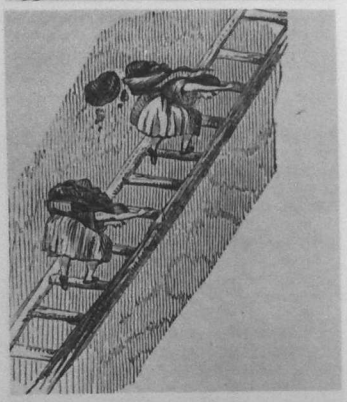
choke-damp, in which a candle flame would shrink to nothing in a matter of seconds, and a man might choke to death almost as quickly. The pit was thus a hard and dangerous place in which to work.

(c) The miners at work

The miners, or *colliers* as they were called at the time, worked in small teams. The leader of each team was the *hewer* who, depending on the thickness of the seam, lay, crouched or stood at the coal-face and cut out the coal. Sometimes he used a pickaxe, and sometimes he hammered wedges into cracks to loosen and split the coal. In either case he did his best not to break the coal up into small pieces since 'large coal' commanded a better price and the more big pieces he sent back to the checksman, the better his pay. The hewer had the most dangerous job in the pit for if he was careless he could bring a couple of tons of coal crashing down about his ears. At any moment he might break through into an underground spring, and all the time he worked in a cloud of coal dust which found its way into his eyes, mouth, nose and lungs. Hewing was a skilled job, and a clumsy or foolish hewer soon met with an accident of one sort or another. About thirty hewers worked at Loanhead.

Once the hewer had got the coal, the two other members of the team moved into action. These were the *bearers*, who were usually members of the hewer's family. Until his children were old enough to fill the post, it was common for the hewer's wife to bear for him. A bearer had in some ways the most tiring job in the pit. She had to carry the coal, usually in baskets called *creels*, from the coal-face to the pit-head. There are stories of weeping women carrying cruelly heavy loads of coal up the slippery steps of a pit shaft; of hewers hardly able to lift the coal they placed on their children's backs to be carried to the pit-head. At Loanhead, once the horse gin had been installed, the worst of the bearers' work was done for them, for now they only had to carry the coal to the bottom of the shaft. Even so it was a hard and wretched life which bent the women's backs and broke their health, making them old before their time. The

A woman bearer dressed in her working clothes



In some pits women carried coal up steep slopes. In others they used stairs. Usually a bearer had the creel, in which she carried the coal, secured by a strap passing round her forehead. Sometimes the strap broke and the load spilled—occasionally onto other bearers

system encouraged miners to marry early, for if they had no wife they had to pay somebody to bear for them. Miners also tended to choose wives for their strength rather than for their beauty. 'A strong young woman,' wrote one observer, 'was sure of finding a husband readily.' So long as she was a good bearer it did not matter if in other respects she proved to be a bad wife. Miners' wives were expected to go on working while they were pregnant. Often they took only a few days off work when their child was born before handing it over to a baby-minder and returning to the pit.

Miners were expected to work long hours. The bearers at Loanhead had to carry coal for twelve hours a day, six days a week. The hewer's hours were not so strictly regulated as long as he cut enough coal to keep the bearers busy for the whole of their shift. This might take much less than twelve hours if he was skilful and the coal was easy to get. But, whatever the owners expected, it is clear that both hewers and bearers often failed to work the full six days. It was quite usual for them to work a five or even a four-day week. The Clerks were angry at this short-time working, and often ordered the grieve and oversman to make sure that the miners worked their full seventy-two hours. But the men ignored all threats and continued to take their holidays. Sometimes they offered no excuse. At other times they claimed to be ill, and the first Sir John was annoyed by the sight of men who were meant to be off sick going 'up and down seeking people to drink and tipple'.

(d) The miners' life

One of the reasons why the miners could afford to take time off was that they were quite well paid. At Loanhead the hewer got 3½d for every corf of large coal and 2½d for every corf of small coal his bearers took to the checksman. A corf was a large wooden box holding about four hundredweight. At that rate a hewer could earn about fifteen shillings a week. Out of this he was expected to pay his bearers about two shillings a week each, but even after paying this he was still left with more money than workers in other industries. In addition to his pay the miner had

It was cruelly hard work to pull a loaded truck along the rough roadways underground. This woman bearer is being helped by two young children

his house provided at a very low rent and was given free coal to heat it. But in spite of high pay, low rents and free coal the Clerks, like other mine owners, found it difficult to attract enough labour.

Men were unwilling to work down the mines. For one thing the job was hard and dangerous, but the main disadvantage was that a miner was forbidden by law to change his job without his employer's permission. Under an Act of the Scottish Parliament miners were bound, like serfs in the Middle Ages, to work for their master until they died. If the mine was sold they were included in the sale. If they tried to escape they could be brought back and punished. Only if they managed to stay away for more than a year were they free. Since labour was hard to get, mine owners enforced this law very strictly. In 1722 the second Sir John warned his miners, 'If you remove to other coal-works without my leave, you will be brought back and disgracefully punished', and there were stories of captured colliers being forced to wear iron collars. Most owners bribed miners to 'thirl' their children to the pit at an early age (that is to make a binding promise on their behalf), thus ensuring a steady supply of labour in future years. Other workers therefore looked on mining as a kind of slavery to be avoided at all costs, and miners were regarded by the rest of the community as despised outcasts. Pit villages were in any case isolated places, grouped round the pit shafts. They were often away from the main trade routes, and few outsiders visited them.

The villages were unattractive places, with long rows of thatched houses. Outside each house stood a heap of dung and rubbish, which was added to until it was large enough to sell as fertiliser to a nearby farmer, for up to three shillings a cart-load. Each house usually had a garden plot, which was rarely cultivated. The houses themselves had earth floors and rough unplastered walls, with small windows and crude, ill-fitting doors. Often there was only one room, and there were never more than two. Such houses were difficult to keep clean, and most of them were filthy. A doctor writing about miners' houses near Tranent in East Lothian said, 'The thatch and rafters are covered with the accumulated dust and cobwebs of many years', while in one case 'the rafters were infested with bugs, which occasionally dropped down'. Some of the houses had little or no furniture, but even in those quite well furnished 'there is a fearful amount of filth, dust, etc., accumulated on the walls, floors and furniture, which, with dirty persons, unwashed rags of clothes, the hot putrid atmosphere usually present, go far to add to the wretchedness of the scene, and to complete the measure of squalid and disgusting misery'.

Most miners, then, lived in squalor and filth. In some cases this was partly due to the fact that there was nobody at home to clean the house, since the miner took his wife and children down the pit to bear for him. 'When I came home in the evening,' said one miner's wife, 'everything was to do after the day's labour, and I was so tired I had no heart for it;

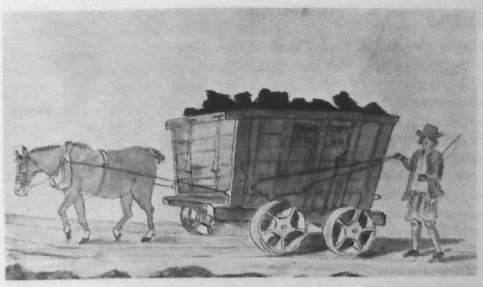
These houses at Low Quarter in Lanarkshire had turf roofs. They date from the end of the seventeenth century, and were photographed about 1890

no fire lit, nothing cooked, no water fetched, the house dirty, and nothing comfortable for my husband.' But this is not the whole story. Most miners did not seem to care how they lived. They were, said a Midlothian doctor, 'a dissipated, drunken, improvident, and dirty set of people, with little or no notion of anything but drunkenness and rioting'. Few of them could read or write, and most of their pay was spent on whisky, which they shared freely with their wives and children. When they took a day off work they spent it drinking, and at New Year many of them were drunk for a fortnight. Some of them drank so much that they got into debt. To a certain extent, the miners' attitude is understandable. However hard they worked, and no matter how much they saved, they had little hope of escaping from the pit. It is really no wonder that they made 'no provision for the future', were often violent and brutal, and seemed to care only for 'riotous dances, raffles, shooting-matches, cock-fights, and scuffles amongst themselves'. Theirs was a hard and hopeless life.

(e) The output and uses of coal

Around the middle of the eighteenth century Scotland's total output of coal was about 500,000 tons. Best large coals fetched between four and five shillings a ton at the Loanhead pit-head. Small coal was worth about half that price. At these prices coal was a cheap fuel. Unfortunately it was very expensive to transport it overland. The roads were so bad that only small carts, carrying less than a ton, or pack-horses, bearing only a couple of hundredweight, could be used, and it was reckoned that the cost of carrying coal was about a shilling per ton per mile. Thus, by the time it had been carried five miles from the colliery, coal had doubled in price and was too expensive to compete with other fuels. Most of it was therefore either consumed near the pit where it was mined, or else shipped from a nearby port. Often wagonways were laid to link the pit to a nearby port.

Some of the coal was used to heat homes and for cooking. Much of the production from Loanhead was sold for these uses in Edinburgh,

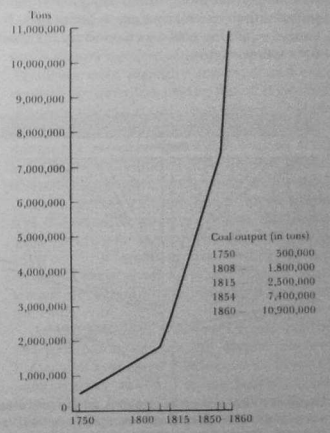


A coal wagon being pulled along a wooden wagonway. The man at the back was needed to whip the horse up hills, and put the brake on when going downhill

just four miles away. Local farmers also used coal to burn limestone in order to make lime to sweeten their ground and increase their crops. The remainder of the ouput was carted to the coast, where the small coal was used to produce salt by heating sea-water in huge cast iron pans, like those at Prestonpans, which created a plume of smoke and steam that was visible for miles around. The large coal, on the other hand, was carefully stacked on board ships to be taken either to Holland or to some British city which had no local supply of fuel. In this way Loanhead, and other similar pits, managed to sell the coal they produced.

The growth in demand

From about 1760 the demand for coal in Scotland began to increase. More lime was burned, partly because more farmers were improving their land than before, and partly because many towns and villages were rebuilt, using large quantities of lime mortar. The population was increasing, and demanding more coal for their houses as local supplies of peat began to fail. Most important, however, were the needs of industry. Ironworks, for instance, had used no coal at all before 1750, but by 1810 their furnaces were consuming at least 250,000 tons a year, and by 1850 their consumption had reached 2,500,000 tons. By the end of the eighteenth century, steam-engines were being set up in cotton mills, and in the 1830s railways were being founded. Other industries also turned to coal for fuel, and the graph below shows how the ouput from the pits increased to take account of these new demands.

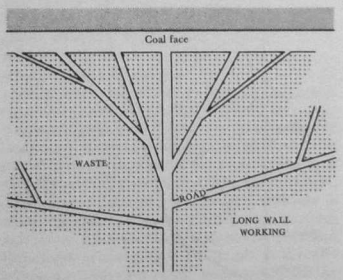


This graph reflects the growth in demand for coal between 1750 and 1860

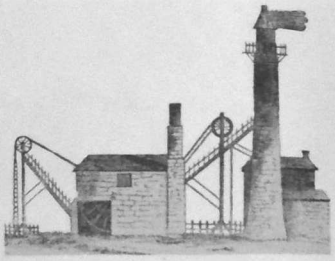
How the industry changed

(a) New mining methods

Such a vast increase in production meant great changes in the industry. To begin with, ways were found to increase production from existing pits. Pillars of coal were no longer left standing to support the roof, but instead wooden props were used to take the strain as the coal was extracted. Next, steam-powered pumps were introduced to drain the pits. These were much more efficient than the old water-powered engines, and enabled much deeper shafts to be sunk to reach new coal seams far beneath those worked before 1760. The galleries where the men worked were also extended, which meant that ventilation shafts had to be sunk and doors installed in the galleries to ensure a flow of fresh air all round the workings. To carry the coal from the face to the pit shafts, wooden or even iron wagonways were laid down, along which small trucks were pulled either by children or, in some pits, by ponies, while the coal was wound up the shaft by a steam-engine.



Under the new system of working, all the coal was extracted and wooden props were put in to hold up the roof. Waste was packed in behind, the props were removed, and the roof was allowed to collapse, leaving only the passages open



Steam-engines were installed at many pits. They were used to wind coal and miners up and down the shaft, and to pump the pit dry

(b) Changes in management

As a result of all these changes coal-pits were much more expensive to work than before. A steam-engine cost about £1,300 to install and £500 a year to run. Deep shafts cost a great deal to sink, and more miners were needed to work the larger pits so that the wages bill rose along with all the other costs. As a result coal-mining became big business and it was no longer possible for landowners like the Clerks to run a mine along with the rest of their estates. Instead, landowners tended to lease their mining rights to industrialists, who had plenty of money to invest in the pits, and were prepared to spend most of their time and energy in organising them.

It is clear, too, that as they grew in size, mines became more complicated, and the old grieves and oversmen could no longer cope with their jobs. Their places were taken by professional managers, who had worked hard for years to understand their trade, and were not only good practical men, but also knew enough about the theory of mining to be able to plan the whole working of the pit with its drainage pumps, ventilation shafts, pit-props and so on. The first of these managers came to Scotland from Northumberland and Durham, where mines had for a long time been deeper and more complicated. Soon, however, Scotland was producing its own managers, the most famous of whom, Robert Bald of Alloa, was a leading authority on mining and in 1808 wrote a famous book called *A General View of the Coal Trade*. Not all mines were modernised. Some small pits went on in much the same way as they had always done, but as the years passed they formed a smaller and smaller proportion of the industry.

(c) New mines

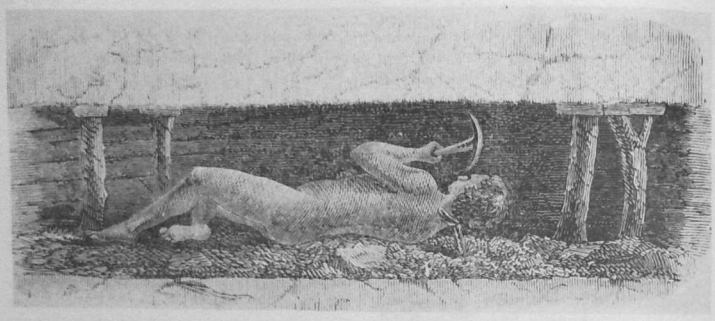
Changes like those described above increased production from existing pits, but the demand for coal was rising so quickly that still more was needed. New mines had to be sunk and new coalfields opened up to meet this demand. There was plenty of coal available, particularly in the area to the south and east of Glasgow. The problem was that it had to be transported long distances to where it was needed. This problem was solved in various ways. First, roads were improved by the new Turnpike Trusts (see Chapter 7), so that bigger and better carts could be used to move the coal. Next, four canals, the Forth and Clyde, the Monkland, the Glasgow Paisley and Johnstone, and the Edinburgh and Glasgow Union were made. It was easy and cheap to carry coal in barges on canals, and new mines were soon opened along their banks, adding greatly to the quantity of coal produced. Later, railways provided an even quicker and easier means of shifting coal from the pit to the consumer, and coal formed the largest part of the early rail traffic. Finally, once the mines were established, industrialists tended to build factories close to them in order to be near to a cheap and reliable source of fuel. Thus the new coalfields became a centre of industry, and attracted a large and growing population to new industrial towns.

(d) Working conditions

Even before the demand for coal increased, the mines were short of labour. As the industry grew, so this shortage got worse, and the mine owners realised that something had to be done to attract new workers to the pits. Their first step was to try to improve the image of mining by abolishing serfdom. This was done in two stages. An Act passed in 1775 ruled that although existing miners were to remain bound to their work, all new recruits were to be free. This Act had little effect because, in spite of the high wages, few workers wanted to go to the pits to work alongside these despised serfs. In 1799 an Act of Parliament finally and completely abolished serfdom, but even this did not work and mine work was still unpopular. Pay rates were increased, until in 1808 a miner could earn about 4s 6d a day – more than a lieutenant in the army. Even at these rates there were not enough workers to man the pits, and the problem was not solved until after 1820, when large numbers of Irishmen, who could find no employment in their own country, came to Scotland and, eager for any work, took the jobs in Scotland's mines.

Down the pits, life was still dangerous and hard. In the old pits, such as Loanhead, there was not much machinery, and there were only a few miners underground at a time. The new larger pits, on the other hand, depended on complicated pumping and ventilation systems, which might easily go wrong. They also had a much greater number of underground workers. Accidents were therefore common, and often resulted in many lives being lost. Yet Scottish pits were still much safer than those in England and Wales because they were almost free of fire damp, the explosive gas which took so many lives south of the border. The number of accidents declined after 1843, when it was made illegal to permit children under fifteen to control the winding engines. Before this it was quite common for boys of nine, who had no idea what to do if anything went wrong, to take charge of these powerful steam-engines which wound the coal and the miners up and down the shaft.

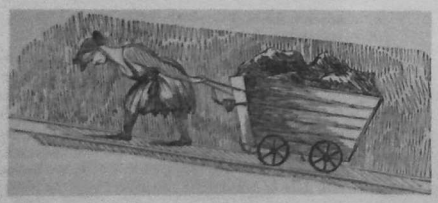
At the coal-face the hewer's job had not changed much, though the deeper pits were hotter and it was now quite usual for hewers to work entirely naked. For the bearers, conditions varied. In some pits girls still had to carry coal up ladders. At Loanhead, for instance, some of the new workings were 20 metres below the gallery served by the horse gin. In 1842,



The picture above, taken from the 1842 committee report, shows a naked hewer at work

Ellison Jack, an eleven-year-old girl, described how she spent twelve hours a day carrying just over a hundredweight of coal at a time up four separate ladders from the face to the pit bottom. 'I am,' she said, 'very glad when my task is wrought, as it sore fatigues.' However working weights and measures varied from place to place. It is very unlikely that the load which Ellison carried weighed as much as a modern hundredweight. In other pits the bearers only had to carry the coal along the level to the pit bottom, but even this could be very hard work. Eleven-year-old Janet Cumming carried more than a hundredweight in a creel on her back. 'The roof is very low,' she said, 'I have to bend my back and legs, and the water comes frequently up to the calves of my legs.' She had, she said, 'no likening for the work'. In more modern pits, on the other hand, bearers went on their hands and knees pulling trucks along behind them. In the best pits the work was done by ponies.

A new job for children in the more complicated pits was that of the *trapper*. In order to make sure that air circulated to all parts of the mine, it was necessary to keep some passages closed for most of the time. Such passages therefore had doors in them called traps, and the trapper had to sit by the door with a string in his hand. When a bearer came along the passage, the trapper pulled the string to open the door. When the bearer had passed, he let the string go and the door closed. It was a dark, lonely, damp, cheerless job, and was frequently done by children as young as six or seven, who worked a full twelve hour shift down the pit.



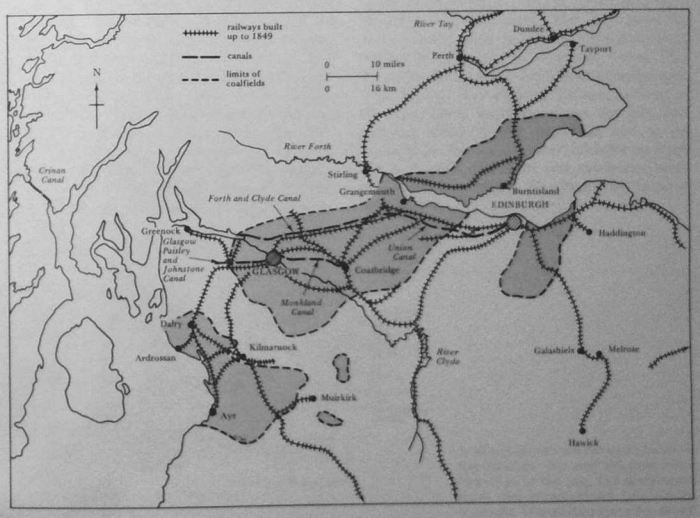
Once rails were laid along the underground roadways it was much easier to pull loaded wagons along them. This bearer is able to manage a full wagon on her own

(e) The Mines Act

Once the Factory Act had been passed in 1833, reformers turned their attention to conditions in the mines, and in 1840 a committee was appointed to investigate the industry. In 1842 the committee reported, and the examples given earlier are from the evidence which they quoted. They decided that mines were no places for women and young children. The work was too hard, the hours too long, and girls and women ought not, they thought, to work alongside naked men. The result was the Mines Act of 1842, which forbade the employment underground of females of all ages and boys under ten. The Act was enforced by inspectors, and made a great difference to the industry. Trapping now had to be done by older boys. Without any women to bear for them hewers either had to carry their own coal back, which they thought a great waste of time, or else had to employ youths to do the work. This was not really satisfactory either, as young men thought that bearing coal was not fit work for a man. They all wished to be hewers instead. In the end, therefore, more pits had to introduce ponies to pull trucks from the coal-face.

(f) Living conditions

Slowly, mining villages too were changing. Most miners still took days off when they pleased, lived in squalor, and spent much of their wages – around £2 a week in the 1840s – on drink. But there were exceptions. Once serfdom was abolished, some miners realised that if they worked hard in the pits and did not spend too much money on drink they



This map shows how the canals and early railways opened up the main Scottish coalfields

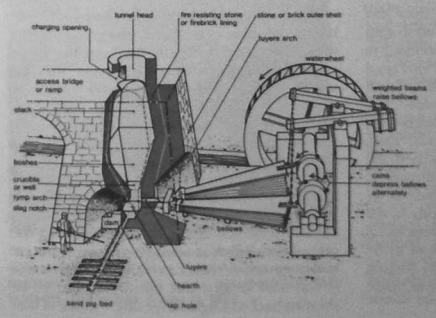
could soon save enough to set themselves up in business. Some bought shops, Others purchased houses, which they rented out to other workers, and in 1840 there was even one retired miner in East Lothian who owned so much property that he was entitled to vote in parliamentary elections. While they were in the pit village, such men usually looked after their houses and cultivated their gardens, so that as time went on there were at least a few neat, tidy, clean houses in every village. Once the women were banned from pit work the number of such houses increased, since the miners' wives now had time and energy to devote to housework, and miners began to prefer good housewives to good bearers when they looked for a wife. There was also plenty of domestic help available, since miners' widows and orphan daughters, who had once worked down the pit, now found themselves unemployed with no one to support them. Some found jobs above ground, sorting and loading coal. Others left the village and looked for jobs elsewhere. Often they had little success at first, 'after having been for so long a period nothing better than beasts of burden'. Gradually, however, these unemployed women found work, and the miner got used to the idea that his wife and children did not go underground. 'It is all far better now,' said one miner's wife, 'and I wouldna gang down again.' By the middle of the nineteenth century the Scottish coal industry, which provided most of the country's fuel, had become much more efficient, more productive, and in some ways more humane than it had been a hundred years earlier.

5 Iron and Engineering

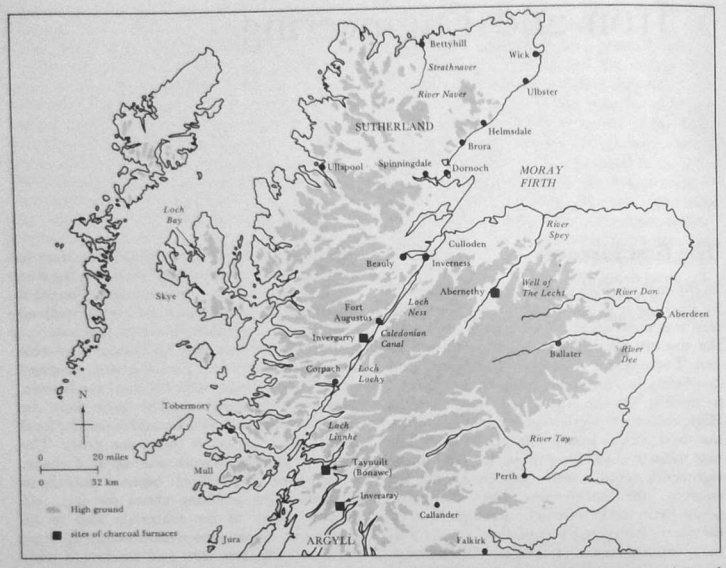
The first furnaces

In the early eighteenth century iron was made by smelting iron-ore with charcoal. Very little iron was made in Scotland, and most of what the country needed was imported from Sweden. There was a good deal of iron-ore in the Lowlands, but no timber to make the charcoal to smelt it. On the other hand, in parts of the Highlands there were large stretches of forest, but there was no iron-ore anywhere near. The first ironworks to be set up in Scotland in the eighteenth century were built by an English concern, the Backbarrow Iron Company, whose main works were in Lancashire. By 1725 they were beginning to run short of wood to make into charcoal and, hearing of the amount of timber in the Highlands, they decided to open a furnace in Scotland. They planned to take the iron-ore by boat from Lancashire to the Highlands, smelt it, and then ship the iron back to Lancashire. The company thought it would be cheaper to take the ore to Scotland than to ship the timber down to England.

By 1727 the company had found a suitable site at Invergarry near Fort Augustus, and had made an agreement with the local landowner, Macdonell of Glengarry. This gave them the right to build an ironworks, and to use the local timber for a period of thirty-one years. The company then got to work to set up the furnace. This proved very difficult because nobody in the area knew anything about the job, and because many of the materials had to be brought in. So masons were brought up from the Lowlands, and iron and sandstone were sent from Lancashire. Gradually the furnace took shape.



A charcoal furnace cut open to show the interior. Ore and charcoal were tipped in at the top. The blast came from the wheel-driven bellows on the right. The molten iron was run off into the channels under the furnace



This map shows how far the Invergarry furnace was from the sea. It also shows the sites of the main charcoal furnaces set up in Scotland

But much more had to be done than just build a furnace. The company planned to ship the iron-ore to Corpach, where a wharf had to be built to get it ashore. An eight mile cart road then had to be made from Corpach to Loch Lochy. Two more wharfs had to be made, one at each end of the water, and special boats built to carry the ore the length of the loch. Then another four mile length of road carried the cartloads of ore to the furnace at Invergarry. Once all was ready, skilled men had to be brought in to work the furnace. Nobody in the Highlands had any experience of making charcoal, so nineteen charcoal burners had to be brought over specially from Ireland. By August 1729 all was ready and the first iron was made and shipped back to England.

The furnace did not do well. The local Highlanders could not see that it was going to help them, since most of the jobs had gone to outsiders. They therefore stole all they could from the works, including wood, horses and cattle. To win the local people over, the company handed out presents and ran tours round the factory. They even presented Lady Glengarry with two silver decanters worth more than twenty pounds in the hope that she would use her influence to prevent thefts. But it was no use. The stealing continued. The company could not afford the loss. The cost of transporting the ore to Scotland meant that Invergarry iron cost more to produce than Lancashire iron. Some of it was sold locally, but most of it had to be shipped back to England for sale – much of it to Bristol. The iron was of poor quality and could only fetch £5 10s a ton, compared with £8 a ton for Lancashire iron. The company found that it was losing money on every ton of iron produced at Invergarry, and in 1736 the works were closed down.

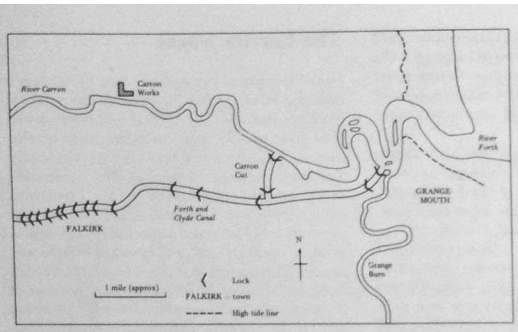
Other Lancashire companies also established ironworks in the Highlands, but they learned from the mistakes of the Backbarrow company and built furnaces near the coast. This meant that they could unload the ore straight from the boats into the furnaces, and ship the iron from the works to the south without a tiresome and expensive journey over miles of road and loch. Thus their iron sold more cheaply than that from Invergarry, and they were able to make a profit and keep the works open for many years. It was not until 1874 that the last of these ironworks closed down.

The old furnace at Bonawe in Argyll still stands, with a large shed built to store the iron-ore and a number of houses put up to accommodate the workers. The works closed in 1874

The Carron works

In the meantime ironmasters had been experimenting in using coke instead of charcoal for smelting iron, and by 1750 it had been shown that good quality iron could be made by this means. This discovery was very important for Scotland, because it meant that ironworks could now be established in the Lowlands, where there was both coal and iron-ore. The years after 1755 seemed a specially good time to set up a works in Scotland, because Britain was at war. This meant that there was an increased demand for guns. At the same time, because of the war, supplies of iron from Sweden were cut off. Thus extra iron was urgently needed from Britain. In 1759 three businessmen, Samuel Garbett, who came from Birmingham, John Roebuck, who had a factory at Prestonpans, and William Cadell, a merchant from Cockenzie, decided to open an ironworks in Scotland. Of the three, Garbett was the most important. Once he and his partners had decided to build an ironworks, he travelled the length and breadth of the Lowlands to find the right place. In the end he chose a site on the river Carron, near Falkirk. There was coal and ironstone nearby, and the river could provide the power to blow the furnaces. It would be easy to get the finished products to the ports on the Forth for export, and there was timber close at hand to supply the charcoal which was still needed to make really high-grade iron. All in all, Garbett was delighted with the site. It was, he said, 'infinitely preferable to all others'.

The partners decided to build a huge works at Carron, with four blast furnaces and factories for making both household goods and cannons out of cast iron. Much of the material for building the works could be obtained locally, but some of it had to be brought from England. The bricks to line the furnaces were brought from Stourbridge, and the axle shafts for the wheels which powered the blast were shipped from Hull. Once the works were finished, skilled men also had to be brought in to man the furnaces. Most of these men came from the Coalbrookdale works in Shropshire, which had more experience of smelting iron



The Carron ironworks was built before the Forth-Clyde canal was made. The river Carron was navigable, but it was much easier to transport finished goods from the works once the canal was complete

with coke than any other factory. Garbett wanted real experts to work at Carron, because he felt that if it was to succeed it must quickly gain a good reputation. 'Our characters will suffer,' he wrote, 'if we make one thing inferior in any respect.' In particular, he wanted to win a contract for supplying cannons to the navy, because he knew that a regular order of this sort would be enough to keep the company in work and make a good profit.

In 1764 Garbett got his way, and Carron received an order for naval guns. But disappointment followed, because the men and machinery at the works could not bore the gun barrels out accurately enough. As a result many of the guns failed the test given to them by the Ordnance Office. Garbett was very upset. 'I was ashamed to see them,' he wrote after inspecting some guns sent from Carron in 1767, 'because they are a disgrace to the works.' Eventually in 1773 Carron lost the contract.

James Watt, who had invented an improved steam-engine, was also let down by the Carron company. He was friendly with Garbett, and together they supervised the building of an engine at Carron. But the works could not bore the cylinder out accurately. This meant that the piston did not fit, and the engine did not work. Watt was forced to leave Scotland and go to John Wilkinson's works in Staffordshire to get an accurate enough bore to make a working engine. As a result he and his partner, Matthew Boulton, eventually set up their engine works at Birmingham, within easy reach of Wilkinson's factory. The Carron works was now losing money, but was saved by the installation of new machinery and by the invention of a new naval gun, called the Carronade. This gun did not have a long range, but it was accurate and easy to load. For much of the time between 1775 and 1815 Britain was at war, the Carronade sold well, and the Carron company prospered. A French visitor who saw the works in 1784 said that the place was 'covered with cannons, mortars, bombs, balls and Carronades'. He saw guns for export to Russia 'of the most perfect workmanship and covered with a thin varnish of a steel colour to preserve them from rust'. He was very impressed by the four furnaces, which 'devoured both day and night enormous masses of coals and ore. Each disgorges every six hours streams of liquid iron. Each furnace is supplied by four air pumps, where the air produces a sharp whistling noise and so violent a tremor that one could hardly avoid a feeling of terror.'

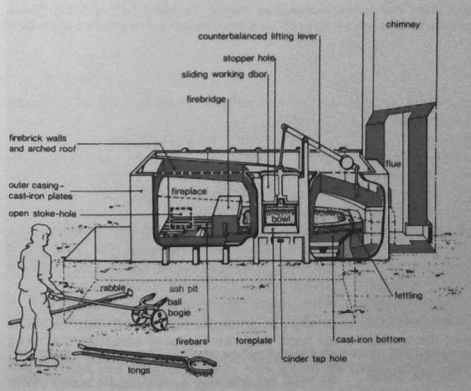
Wrought iron

Carron was the biggest factory of any sort in Scotland and, until a furnace was opened at Wilsontown in 1779, it was the only ironworks in the Lowlands. But in 1784 Henry Cort discovered a new system of purifying iron to make it less brittle. This process was known as *puddling*. About four hundredweight of iron was heated in a special furnace, and once it began to melt, a skilled workman, known as the puddler, stirred it with a wrought-iron rod. He watched the furnace carefully and, in spite of its blinding glare, could tell just when the metal was ready. He then stirred and turned the molten iron so that it was evenly heated through and all of it was exposed to the air. Gradually the impurities were burned out of the iron and it began to solidify. As it did so, it was more and more difficult to stir. 'The puddler,' wrote one observer, 'dare not relax his efforts for a single minute. Though the perspiration trickles from his face and arms, and oozes through his scanty clothing, he must toil on. His eye is never removed from watching the contents of the furnace.' When the iron was ready it was twisted and smoothed into five or six semi-molten balls, known as blooms. These were then pulled from the furnace with a pair of tongs, and dragged away to be hammered and rolled. The whole process took about two hours, and one writer reckoned that the puddler's job was 'the severest kind of labour voluntarily undertaken by men'.

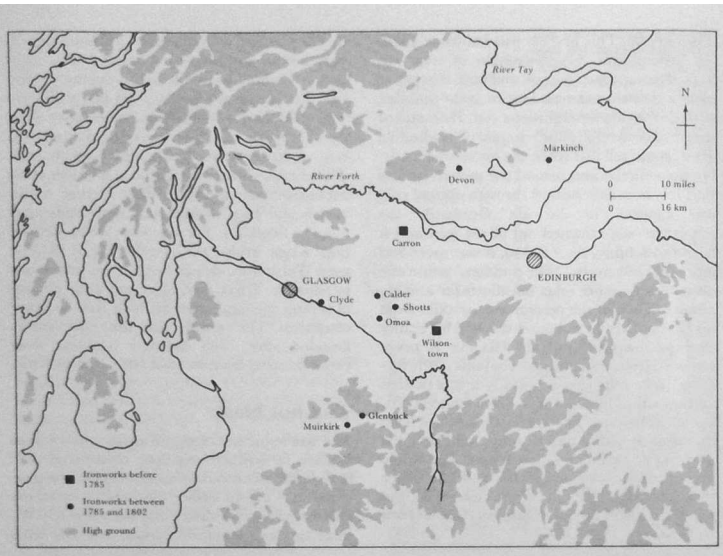
The wrought iron produced by puddling was very useful, and between 1785 and 1802 eight new ironworks were opened in Scotland. But, like the Carron works, they did not at first do very well. This was partly due to the poor quality of Scottish coal, which produced much less coke than the best Welsh and English coal. This meant that Scottish iron was much more expensive than the iron made further south. Welsh and English iron was sometimes used even in Scotland. For instance when Telford built a new bridge at Craigellachie in 1815 he used Welsh iron, cast at Ruabon, in preference to Scottish. There was, of course, little chance of selling the expensive Scottish iron to other countries. The result was that the works founded after 1785 did less business than expected, and no new ones were established.

The hot blast

The whole picture changed again when James Neilson, a Scottish engineer, discovered that low-grade coal could be used to smelt iron provided that hot air rather than cold was blown into the furnace. If the air was heated to 300 °C, three times as much iron could be made with



This was the kind of furnace used to make wrought iron. The coal or coke was kept separate from the iron by the firebridge. The puddler stirred the iron through the working door



The map shows the location of the main ironworks founded in central Scotland before 1802. Those ironworks founded after 1785 were set up to take advantage of Cort's discovery of a new process of making wrought iron

the same amount of coal. This was a very important discovery for the iron industry in Scotland, because there were huge quantities of blackband ironstone in the country, particularly in the Lanark area. This stone consisted of a mixture of iron-ore and coal, and with the hot blast it could easily be smelted into good quality iron. As a result new ironworks opened up in Lanarkshire. Their furnaces were blown by steam-engines, and the finished iron was taken away by train. All kinds of products were made. 'They range,' wrote one reporter, 'from bridges of the largest size to ornamental inkstands and fancy castings.' They went all over the world. In a single warehouse there were drinking fountains for Calcutta, sugar pans for the West Indies and tubular poles to be sent to South America.

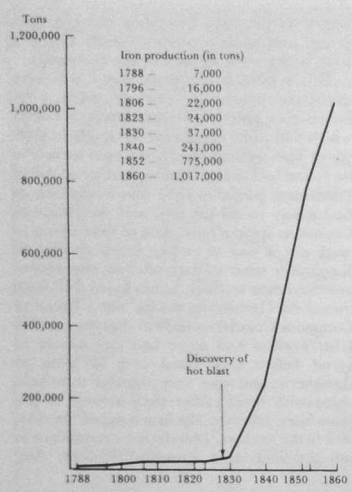
Soon towns grew up which depended entirely on the iron industry. Coatbridge, for instance, was surrounded by furnaces and had a number of forges, rolling mills and tube works. It was an ugly town. Dense clouds of smoke rolled over it all the time, dirtying all the buildings. A visitor noticed that 'a coat of black dust overlies everything', while flakes of soot settled on his face. But at night it was a marvellous sight. The furnaces filled the sky with 'a lurid glow', with the flames sometimes leaping up high into the air, and sometimes sinking back into the mouths of the furnaces. There was no need for any street lighting in Coatbridge.

The Gartsherrie works

Gartsherrie ironworks near Coatbridge was the biggest in Scotland, consuming 1,000 tons of coal a day and producing 100,000 tons of iron a year. More than three thousand men and boys worked there, and many of them lived in houses specially built by the company. These houses had either two or three rooms, and each house had a small garden. Water and gas were laid on, and coal was available at 3s 6d a load. Three schools were provided for the children of the workers, but these schools cost the company nothing to run. They were paid for partly by a government grant, partly by fees and partly by a levy of 2d a week docked from the pay of the workers. There was also a shop selling groceries, wines, spirits, meat and potatoes. At first the employees were forced to buy all they needed from the shop or be dismissed from their jobs. The shop allowed those who worked for the Gartsherrie Company to run up big bills if they had no ready money, and the amount they owed was docked from their wages on pay-day. The shop charged high prices, and made a profit of about £2,000 a year, which went straight to the company.

This system of company shops was very unpopular among the workers. Some companies even paid their workers partly in tokens which had to be exchanged for goods in their store. This method of payment was known as *truck*, and had in fact been banned by an Act of Parliament passed in 1831. But it was easy to find a way round the law, and the House of Commons spent a good deal of time trying to work out a way of ending truck altogether. Employers tried to pretend that the system benefited their workers. James Baird, MP, who owned the Gartsherrie works, told a House of Commons Committee in 1854 that many of his Irish workers had never had any money to spend before they came over to work at Gartsherrie and were 'very thankful' to be provided with meat rather than money. A few years later, however, the firm handed the store over to the workers, who elected a committee to run the shop as a co-operative store. Any

This print dates from 1831. It shows Gartsherrie ironworks in its early days, when it had only two furnaces. The Garnkirk and Glasgow railway runs across the foreground. Steam-engines were only used for long, heavy trains. Horses pulled lighter loads



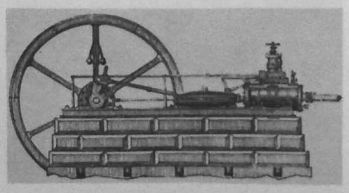
The graph above shows how iron production increased dramatically after the discovery of the hot blast

member of the work force could join the co-operative on payment of a small sum of money, and he was then entitled to a share of the profits. Thus any money made by the shop went to the workers instead of to the firm.

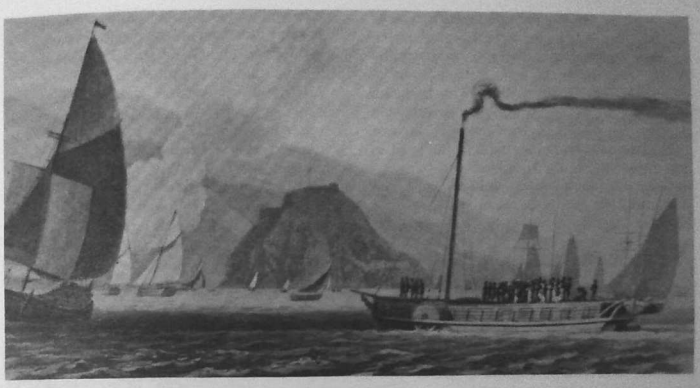
Steam-engines

Some of the iron made in Scotland in the nineteenth century was used to make machinery and engines. The first spinning machines and power looms were made in the north of England and had to be brought to Scotland to be installed in the new mills. In the same way, all the early steam-engines were made by Boulton and Watt at their works in Birmingham and were sent in pieces to the mill, where they were put together with the help of an engineer sent up specially from the Midlands. If anything went wrong with the engine later, a letter had to be sent to Boulton and Watt, who had to contact one of their engineers and tell him to go and carry out repairs. All this time the engine was out of action and the whole factory at a standstill. It was often a couple of weeks before the engineer arrived, and all the time the works was losing money. Scotland needed engineers and machine makers of her own.

As time went on, Scottish blacksmiths and millwrights began to learn how to repair and even to build mill machinery, but it was many years before machinery made in Scotland was as good as that made in England. They also found out how to service steam-engines. Then, in 1800, the patent which gave Boulton and Watt the sole right to make steam-engines expired. This meant that engineers in Scotland were now free to build their own engines based on Watt's designs. To begin with, most of them were mill engines, but William Symington, a canal engineer, was determined to use a steam-engine to power a boat. Twelve years before, in 1788, Patrick Miller, a banker, had given him money to install an engine of his own design in a boat, and in 1789 a vessel travelled at seven miles per hour along the Forth and Clyde canal. This boat was of no practical use because it was not powerful enough to carry cargo or haul barges behind it. But by 1800, engineers knew how to make lighter and more powerful engines. Symington set to work, and in March 1802 launched the *Charlotte Dundas*, a steam-powered tug. This boat was designed for



This horizontal steam-engine was built in 1860 by an Edinburgh firm. The cylinder is on the right. The engine's speed is controlled by a centrifugal governor. Such engines were compact and reliable



An early wooden steamboat sailing on the Clyde. It does not look as if there is any protection for the passengers on deck

canal work, and was able to pull two 70-ton barges along at four miles per hour. The canal directors were interested in the boat until they saw how its paddle wheels stirred up the mud from the bottom of the canal. They feared that the *Charlotte Dundas* would wash away the banks of the canal, and decided that it was safer to continue using horses.

Steamships

Symington's boats attracted a good deal of attention and encouraged other inventors to design steamboats. Robert Fulton, an American who had seen the Charlotte Dundas in 1802, took a Boulton and Watt engine back to America and installed it in a boat in 1807. The engine drove six paddle-wheels, and the boat was such a success that it ran a regular passenger service between Albany and New York, a distance of 150 miles. Meanwhile Henry Bell, a Scottish engineer who had worked with Symington, was trying to raise money to build a sea-going steamship in Britain. He went to the Admiralty, but the experts there said that a steam-engine would never work properly in a boat, because it needed a firm and steady base. In the end Bell returned to Scotland, where he raised enough money to build a small boat, which he called the *Comet*. It was less than thirteen metres long, and its engine only produced four horse power. The *Comet* first sailed in 1812, carrying passengers between Glasgow, Greenock and Helensburgh. It was a success, and two years later a Scottish built steamboat, the *Marjory*, was sailing up and down the Thames.

Scotland now had a clear lead in building steam-engines for boats, and as the years passed this lead increased. This was partly due to the work of the Napier family. David Napier, who owned an ironworks in Glasgow, worked with Bell to make the engine boiler for the *Comet*. He believed that steamships had a great future. The *Comet* and vessels like her were only used for short journeys in river-mouths or up the coast. They burned so much fuel that if they were to go on longer journeys they would need all the cargo and passenger space to carry the coal for the trip. Napier believed that, if they were improved, steamships could be used for

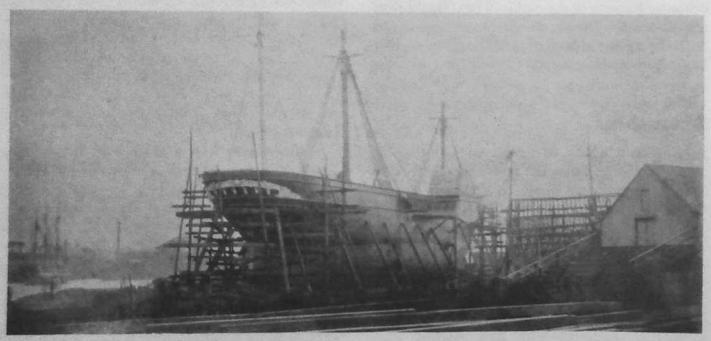
sea crossings. He therefore set to work to make a better engine, and to design a ship which would slip through the water more easily and so use less coal. His work was successful, and in 1818 the *Rob Roy* was launched. This boat had been built to his design and was driven by a thirty horse-power engine. It easily crossed from Greenock to Belfast with a full load of passengers. Within a couple of years regular steamboat services were set up between Liverpool and Belfast, and between the Clyde and Liverpool. All the boats on both services were built on the Clyde.

In 1821 David Napier leased out his ironworks to his cousin, Robert, who was also interested in boat-building, and eventually set up a shipyard at Govan. To begin with he was best known for building fast steam-yachts for rich gentlemen. He became famous for the powerful and reliable engines he put in these boats, and was able to win contracts to build ships for the Admiralty and for the East India Company, the richest trading company in Britain. He also built a number of iron ships. The first sea-going iron ship was built in 1833, and by 1852 it had been shown that iron ships lasted just as well as wooden ones, and were cheaper to build. From then on the number of wooden ships built on the Clyde steadily went down, while the number of iron ships increased.

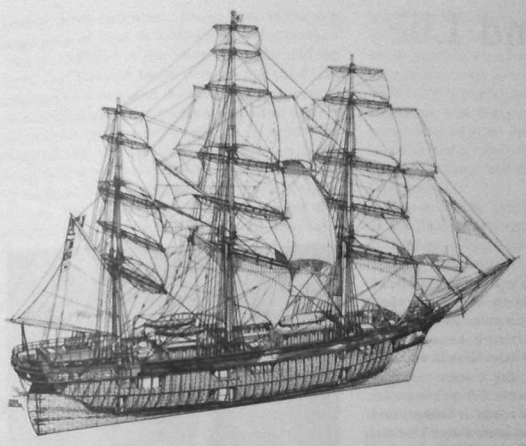
As iron ships became more popular the number of ships built on the Clyde increased, because plenty of cheap iron was produced in the area, and Napier produced the best marine engines in the world. Men who had worked in Napier's shipyards had the chance of learning all there was to know about building steamships, and several of them later set up yards of their own which became famous in their own right. By 1860 the Clyde shipyards were the biggest and busiest in Britain.

The clippers

Until almost the end of the nineteenth century there were some routes for which sailing ships were better than steam. On very long voyages steamships needed coaling stations where they could stop and refuel. It was many years before there were enough of these places and, in the meantime, voyages to the Far East were made in sailing ships. The best and fastest of these



This photograph, taken in 1855, shows the PS *Persia* on the stocks in Robert Napier's yard at Govan. The *Persia* was the first iron ship to be built by Napier for Cunard. When launched it was the largest ship in the world



The *Cutty Sark*, which was launched from Dumbarton in 1869. Fully rigged she carried about 3000 square metres of sail. She continued as a working ship until 1922. She is now on public show in dry dock at Greenwich

ships were the *clippers*, originally designed in America. They could not carry much cargo, but they could sail more than 350 miles a day. At first they were used to carry opium from China, but later they became famous for bringing back tea. Each year they loaded up with the new season's crop at Foochow and raced home to be first back, because the first tea to be landed could always be sold at a higher price than the rest. These races became famous. For instance, there was great excitement in 1866, when the *Ariel* beat the *Taeping* by just ten minutes in a voyage which had lasted ninety nine days.

Many of the best of these clippers were built in Scotland. The *Thermopylae*, which was probably the fastest of all, was launched in Aberdeen by Walter Wood in 1868. The *Cutty Sark*, which went on carrying cargo until after 1920, was built in 1869 at Dumbarton. The first clippers were made entirely of wood, but later a good deal of metal was used. The *Sobraon*, built by Alexander Hall in Aberdeen in 1866, had an iron frame and teak planks. Her lower masts were wrought iron, but her topmasts were made of steel. Aberdeen had a fine reputation for building clippers, but the demand for them fell steadily as steam-engines became more efficient and more coaling stations opened. In addition, the Suez Canal cut the length of the journey to the east for steamships, but sailing ships had to furl their sails and be towed through as the canal was too narrow for them to sail. So more and more business went to the Clyde, and it became the industrial heart of Scotland.

6 Highland Life

The clan system

In the eighteenth century the Highlands of Scotland were quite different from any other part of Britain. In the first place much of the land was so high and barren that it was little better than a wilderness. Only the valleys could be cultivated. Secondly, the country was so mountainous that it was very difficult to travel over. There were very few roads or bridges and in the winter whole communities could be cut off for weeks at a time. This wild and desolate country was inhabited by clans of fighting men, who usually took the name of the chief as their own. The chief was a very important man, and he owned all the clan lands. In war he led the clan into battle and, in addition, he inherited the office of judge along with his title and lands. This meant that he had the power of life and death over his tenants in the local courts.

The clan chiefs had an enormous amount of power. As long as they made no trouble government ministers were happy enough to leave them alone. They knew that it would be very difficult and expensive to try to gain control of the Highlands. As a rule the ministers in charge of Scottish affairs tried to keep on good terms with the most powerful of the chieftains – the Duke of Argyll – and ignored the rest, hoping that Argyll and his Campbells would keep them in order.

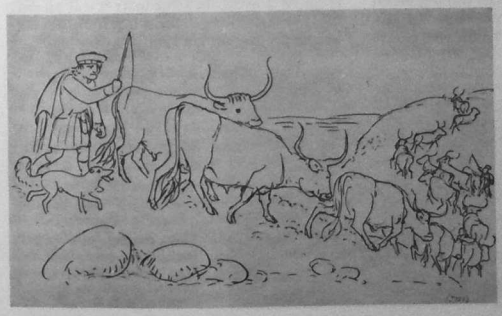
Most clansmen knew little or nothing about the government. Many of them had never even seen their chief. They would only know his representative, the *tacksman*. Every chief had several tacksmen, who were usually members of his family. The chief divided up his estate among these tacksmen, giving each of them a large area of land to look after. The tacksman then let the land to the clansmen, collected the rents and handed them over to the chief. He also had to make sure that the right number of able-bodied armed men were available to turn out whenever they were needed. In return for these duties the tacksman was given a large farm, rent-free, and could call on the clansmen to work on it. Tacksmen varied. Some of them treated the clansmen well. They took the minimum of rent and even allowed poor tenants to live rent-free in really bad times. Others, however, made a lot of money by charging much higher rents than they needed to pay the chieftain, paying him only what he asked, and keeping the rest. Usually the chief did not ask too many questions. As long as the rents came in regularly he was happy.

A highland chief in all his finery could be a very splendid figure. His hat was decorated with eagles' feathers. Since he rode on horseback, he wore trousers rather than a kilt

Highland farming

Most chieftains liked to keep a large number of tenants. It was considered that a chief who was able to call out a lot of men to fight for him was more important than one who had only a few. As a result, as many tenants as possible were crammed together on the land, and each one had only just enough land to live off. It was in any case more difficult to make a living in the Highlands than in the Lowlands. There was much less land that was fit to be cultivated and, except in the large valleys, it tended to be in small patches which were awkward to plough. The climate was worse than in the Lowlands, with more rain and less sun, which meant that the crops took longer to ripen. In fact it was impossible to grow enough grain in the Highlands to feed all the people who lived there, and every year meal had to be brought in from the Lowlands.

To pay for this meal the Highlands exported cattle. There was plenty of rough pasture where these shaggy black beasts could graze. In the summer they wandered high on the hill slopes away from the crops in the valleys, but in the winter they had to be brought down to the lower ground where the weather was kinder. Every year in the early summer a few of the cattle were sold to a *drover*, who handed over in exchange a small quantity of cash and a written and signed promise to pay the remainder in three months' time. Large numbers of these drovers' notes were handed out in the Highlands, and they were circulated among the Highlanders like money, being used to pay rent and buy provisions. Meanwhile the drover moved from valley to valley collecting cattle until he had as large a herd as he and his helpers could manage. He then set out to drive them all to the Lowlands in order to sell them at one of the great cattle markets.



This drawing shows a drove making its way over rough country watched over by two men and a dog

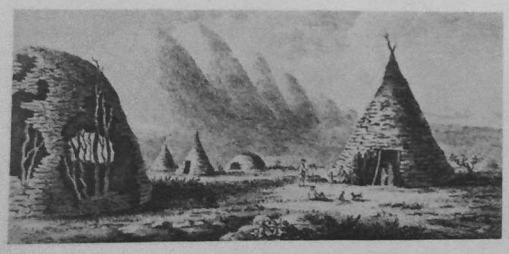
A drover's life

It was a skilled and dangerous job. If the cattle were to be kept in good condition and fetch a good price they had to be treated very carefully and allowed long periods each day to rest and graze. They therefore travelled only about ten or twelve miles a day, spending each night at a stance, a grassy clearing where the cattle could eat their fill and sleep in peace, watched over by the drovers. They, like the cattle, slept out in the open, wrapped in their tartan plaids. Any sign of restlessness among their herd or any unusual sound woke them instantly, for they had to be on the alert to prevent any of the cattle wandering off or being stolen. They followed the same routes year after year. Most of the time the herd moved forward at its own gentle pace but when they came to a river the cattle had to be made to swim across, driven forward by shouts and sticks.

The drovers were hardy men. They slept out in all weathers. Often they were soaked to the skin for days on end, and sometimes they woke up covered with frost. They had to carry their food with them, and lived mostly on oatmeal and water, though sometimes they would bleed one of the cows, mix the blood with the meal and make a kind of black pudding. They were usually armed with a sword and a pistol to fight off thieves and rustlers. Some drovers had highland ponies to ride on and dogs to help with the herding, but some walked all the way and relied on their own skill and that of one or two helpers to keep the herd together. The drovers had to know their way over the wild country they travelled, even when the cloud was down, for they could not afford to get lost and miss their stance for the night.

Eventually the drover would herd his cattle down to Falkirk or one of the other great cattle markets. Here he would find a huddle of tents where the drovers could relax with a pipe and a dram and bargain with dealers from the south, while his cattle stood penned up in a nearby field. As soon as the two men agreed a price for the cattle, the dealer paid over the cash, and the drover could set out, loaded with money, to cash the notes he had handed out to the clansmen in return for their cattle. If he was skilful and lucky he would make money on the deal, and some drovers grew rich and were able to buy land or set up as bankers. But if some of the cattle had died or been stolen, or if the price the dealer paid was less than the drover expected, then he might find himself unable to cash all his notes and have to leave the trade.

While the cattle he had sold were being driven south, the highland farmer was sowing his crops and tending his stock. In addition to cattle, Highlanders usually owned a few sheep, and sometimes some goats and a couple of *garrons*, small, hardy ponies which spent most of their lives wandering half-wild about the hills. If he lived near the coast the Highlander would spend some time fishing from a small boat. Otherwise he relied on his livestock and his crops for a living. In some ways it was an easy life. The farms were so small that it did not take long to prepare the land and sow the crops, and



These rough huts were built to shelter women and children during the summer months spent on the high pastures with the animals

once this was done there was little to do until harvest time in the autumn. The women spent their time spinning, weaving and knitting, or looking after the animals on their summer pasture.

On the summer pasture life could be quite pleasant. Here the people slept in a little hut built specially for the purpose, with one room for eating and sleeping and another to keep the milk in. A visitor wrote that 'they lived in great simplicity, on the produce of the dairy and some oatmeal, contented, healthy, athletic and cheerful. This is the season for singing and dancing on the green. The women while milking the cows, sing a certain plaintive air of which the cows seem very fond. They return about the beginning of August.' Meanwhile, once the peat was cut for the winter, the men did little. This was partly because they thought it was a waste of time to try to improve their farms, and partly because they believed that their real business was fighting, not farming.

Highlanders wore a length of cloth, anything up to eleven metres long. It was fastened round the waist by a belt. The cloth leggings were held in place by cross-garters

Living conditions

Most Highlanders were wretchedly poor. Their houses were even worse than those of the lowland farmers. They are, wrote one traveller, 'built of turf and thatched with straw or heather, the grass growing frequently on the tops of the walls and the roofs. There are no windows, a hole admits the light. The door is low, generally from four to five feet [about 1.5 metres]. The house is from thirty to sixty feet [10-20 metres] long.' Most of the house was used as a byre, the people being separated from the animals by a turf partition. Inside the houses 'some common boards were put together for two or three beds, with one or two cribs on the floor, apparently for the children. The fire, over which hung the pot, was in the centre, and the children were sitting on the floor around, while two or three large stones appeared to serve as seats for the adults.' Their clothes were as poor as their houses. Most of the Highlanders wore only a long length of tartan cloth, wrapped round them and fastened so as to cover the upper and lower parts of their bodies while leaving their arms and legs free. Most of them went bare-headed and barefoot, were red-eyed and reeked of peat smoke. They were very hardy people. 'The Highlander,' wrote Sir John Sinclair, 'has been accustomed to scanty fare, to rude and often wet clothing, to cold and damp houses, to sleep often in the open air or in the most uncomfortable beds, to cross dangerous rivers, to march a number of miles without stopping and with but little nourishment and to be perpetually exposed to the attacks of a stormy atmosphere.' This meant that they were in great demand as soldiers, and in wartime the British army relied on large numbers of recruits from the Highlands to bring it up to fighting strength.

By the early eighteenth century some of the highland landowners thought that the old way of life was out of date. They were no longer interested in clan feuds and cattle rustling, and wanted to make their estates more prosperous. Like the lowland lairds they wanted to find some way of increasing their income from rents

and at the same time help their tenants become richer. This proved to be very difficult. On estates bordering the Lowlands it was possible to lime and enclose land and grow some of the new crops. Mostly, however, the areas of arable land were too small to be worth enclosing, and new crops did not do well in highland conditions. The one exception proved to be the potato, which grew well on the small areas of arable ground. Potatoes were introduced into the Highlands from about the middle of the eighteenth century. This increased the amount of food available, but did not make much difference to the standard of living because the population increased just as fast as the food supply. So everybody was as poor as before. Otherwise, the estates were so scattered, so isolated from each other and from the rest of Scotland, that it was difficult for new ideas to spread and for markets to be set up. Mostly, therefore, life went on as before. It was impossible for a few landowners working on their own to improve the Highlands.

Government action

Meanwhile, the Scottish Highlands twice became for a short time the centre of attention of the whole country. Some of the chieftains believed that when Queen Anne had died in 1714 the throne ought to have gone to her half-brother James, usually known as the Old Pretender. In 1715 and again in 1745 these chieftains rose in rebellion against the government. The 1715 rebellion was easily defeated but in 1745 an army of Highlanders, led by James's son Charles Edward, captured Edinburgh and marched as far south as Derby before it was forced to retreat. It was not finally defeated until the battle of Culloden in April 1746. This frightened the government and they decided that highland life had got to be changed. First, they had to make sure that the Highlanders would never again be able to make war against the rest of Britain. They therefore made it illegal for the chiefs to call their tenants out to fight for them. They also called in all the weapons in the Highlands. Now only cattle drovers were allowed to carry arms. Once these new laws were enforced the danger of a highland rebellion was over.

But the government wanted to do more than make the Highlands safe. It also wanted to change the Highlanders' way of life. The government felt that industries ought to be set up in the Highlands, so that the people could be taught to work hard and regularly. In this way the Highlanders would become richer while the rest of the country would benefit from what they produced. In addition, the government thought that Highlanders must be made to think of themselves as citizens of the United Kingdom, and not just as members of a particular clan. It therefore became illegal to wear tartan, and schools were set up to teach the Highlanders to speak and write English instead of Gaelic and to give instruction in the Protestant faith. This policy was successful. English became the language of most of the Highlands and the Protestant religion was firmly established.

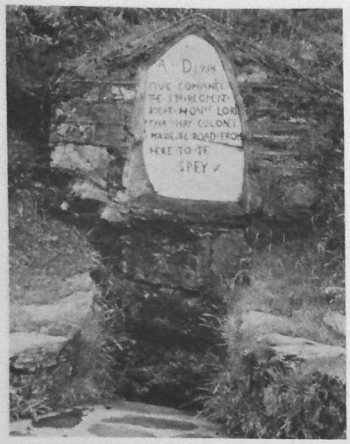
It was, however, not so easy to establish new industries. One of the problems was that apart from wool and flax the Highlands were short of raw material. The government tried to help the cloth industry by setting up schools where girls were taught spinning. It also tried to help the herring fishermen, by making grants to help pay for boats and equipment, and by using money from estates which they had confiscated from the leaders of the rebellion to improve harbours. Later, with the government's blessing, a number of landowners founded the British Fisheries Society, and spent a lot of money setting up fishing villages at Ullapool in Wester Ross, Lochbay on Skye and Tobermory on Mull. These attempts to help the fishing industry failed. The Highlanders were too poor to buy a herring boat, even with the help of a government grant, and in any case did not want to become full-time fishermen. They were used to doing a little fishing but relied mostly on what they could get from the land to make a living. Those Highlanders who went to settle at Ullapool and Lochbay carried on just as they always had. They spent most of their time working on the plots of land they had been given, and only went fishing when the herring shoals came close to shore or when there was nothing to do on their crofts. The Fisheries Society had expected that they would become skilled, full-time fishermen, and were very disappointed by the poor results.

If the settlers at Ullapool had spent all their time fishing they would have found it difficult to sell the fish they had caught, for although a lot of people lived in the Highlands, they were very scattered and there were very few markets. The government, together with various landowners, tried to solve this problem. The Duke of Argyll extended the village of Inveraray, while the government used money from the confiscated estates to establish two new towns. One of these was at Callander, and the other at Beauly. It was hoped that these would become the homes of craftsmen, teaching and practising their trades, as well as market centres, and that they would become so prosperous that other towns would be set up to copy them, until the Highlands would have a whole network of thriving towns. But the industries never developed, and Beauly and Callander did not have the impact the government had hoped for.

New roads

The government realised that part of the problem was that communications in the Highlands were bad. In 1715 it had been very difficult to plan a campaign against the rebels because the roads were too bad for a fully equipped army to move quickly around the country. So during the eighteenth century they put soldiers to work making roads and bridges. By 1780 more than 800 miles of these military roads had been made, but they were of little use to industry. The routes they followed were chosen to enable troops to travel quickly from their barracks to all parts of the Highlands, and were not those used by commercial traffic. In addition, the slopes of these roads were often too steep for the heavy wagons in which goods were carried in the late eighteenth century. By 1802, therefore, the government was convinced that more roads and bridges had to be made in the Highlands, and it set up a commission with powers to make roads in the Highlands. The cost of these roads was to be shared equally between the government and the local landowners. The work was

This bridge carries one of the military roads over the river Gairn in Aberdeenshire. The bridge had to be built high above the water so that it would be safe even when the river was in flood



The soldiers who built the stretch of road from the Well of the Lecht down to the Spey set up this stone so that travellers would know whom to thank for the road they were using. Unfortunately most of today's motor traffic passes without even noticing it

supervised by Thomas Telford, the greatest civil engineer of his day, and the roads were of a very high standard – much better than the rough military roads. Most of the highland roads today follow the same routes as Telford's roads. It was now much easier for goods and people to travel in the Highlands.

The result was a great increase in the number of people visiting the Highlands, since it was now possible for a gentleman's carriage to tour the area. Previously much of the journey had to be done on horseback. However, no new industries arose. The highland population continued to consume almost all that it produced. Similarly, the great Caledonian Canal, which split Scotland in two from the Moray Firth to Loch Linnhe, brought no industry with it, and was of little benefit to the Highlands.

The Sutherland estates

Meanwhile, in the far north, the greatest landowner in the Highlands, the Countess of Sutherland, was trying to bring her estates up to date. She had married the Marquis of Stafford, one of the richest men in Britain, and was prepared to spend a lot of money improving her vast estates in Sutherland. First, she brought in experts and asked their advice. They surveyed the estates and told her that most of Sutherland was quite unsuitable for growing grain crops. It was too damp and the pockets of good soil were too small. The only way to make the land produce more wealth was to use it as pasture for sheep: mutton and wool would be more valuable than the small quantities of grain and potatoes which were grown under the old system. If sheep were brought onto the land the tenants who lived there would have to leave their homes to make way for them. New villages would be laid out on the coast for these people. Harbours would be provided, and factories for processing the wool would be set up. With farming, fishing and employment in the new industries, the tenantry would be much better off than before. At long last they would be able

This cotton mill was built near Dornoch by Dempster of Skibo in 1790. It employed a hundred hands, and twenty houses were erected for the work people. It never made money and when it was burned down in 1808 it was abandoned

The fishing village of Helmsdale was one of those set up by the Countess of Sutherland. The houses in the background date from the beginning of the nineteenth century when the port was established

to learn 'the habits of regular and continued industry', while the rest of the country would benefit from the wool, meat and fish which they would export.

The plan seemed simple enough, but it proved very difficult and expensive to put it into effect. New fishing villages were built at Bettyhill and Helmsdale. New roads were made, and several industries, including salt making and brewing, were established round the coal-pit at Brora. Meanwhile the tenants were evicted from their inland homes and moved to the coast. Most of them did not want to go. They were used to living in their glens, and thought they had every right to stay there as long as they paid their rent. They did not want to alter their way of life, and had no wish to be fishermen or to work in a newly established industry. Perhaps some of them might have been persuaded to go if someone had tried to explain properly why the move was necessary, and what they stood to gain from it. But some at least of the Countess of Sutherland's agents despised the Highlanders. One of them, Patrick Sellar, who had, as one of his colleagues said, 'a quick, sneering, biting way of saying things', described the Sutherland tenants as 'barbarous hordes', and their way of life as 'sneaking indolence'.

Patrick Sellar never troubled too explain anything to the tenants, and in Strathnaver in 1814 he evicted some of them from their homes before their new holdings had been marked out ready for them. The Highlanders had to be shifted by force, and once they had been turned out of their houses these were burned to the ground to make sure that the tenants did not move back into them once the officials had gone. The tenants were very angry and at once made three complaints against Sellar. First, they said he had burned their pastures two months before the moving date, so that their cattle had nowhere to graze. Secondly, as soon as they left their holdings he destroyed all their barns, so that they had nowhere to store the crops which were still growing on the land, and which they had the right to come back and harvest. Lastly, he had not allowed them to

come back to collect all their roof timbers, so that they were unable to build houses on their new holdings.

These were serious complaints, but a year later the local sheriff-substitute, MacKid, also accused Sellar of having caused at least three deaths in Strathnaver by firing houses while there were still people in them. MacKid hated Sellar, who had caught him poaching, and when the case was tried at Dornoch in 1816, Sellar was found not guilty. People argued fiercely about the case, and still do. The Countess of Sutherland was upset by the inconsiderate way in which Sellar had behaved and by all the bad publicity. She ordered that in future plenty of notice was to be given before tenants were evicted, and that no more houses were to be burned. In 1817 Sellar was dismissed, but the clearances went on. Usually the tenants refused to move until they were forced to, and in a couple of cases troops had to be brought in to shift them. They now refused to believe that they had anything to gain by leaving their homes and living on the coast.

As it turned out, they were right. The plans so carefully thought out by the experts did not work. Nearly £130,000 was spent on improving the Sutherland estates between 1807 and 1816, but at the end of it all the new fishing villages and industrial settlements were not prospering as had been hoped, and only a few of the tenants could get a living. This was partly because the Highlanders were not used to the work, and partly because it cost so much to carry goods all the way from Sutherland to the towns in the south. It was therefore impossible to sell them cheaply enough to compete with goods produced closer at hand. In addition, trade all over Britain slumped after 1815, and the prices of all highland products fell. As things turned out everybody was dissatisfied. The tenantry felt that they had simply been turned off their land to make way for sheep so that the Countess could make more money from her estates. The Countess, on the other hand, had spent a fortune on trying to provide a living for her tenants. She then found that she got no return on the money and was also regarded as a greedy and hard-hearted landowner. The misunderstandings and bitterness created by these clearances still persist.

Conclusion

What happened in Sutherland was repeated in different ways on many other highland estates. Some of them were able to do quite well between 1800 and 1815, because the price of cattle was high, and they were able to get a good price for kelp, a kind of seaweed which was gathered from the rocks and burned. The ash which was left was rich in potash, and was used by the growing chemical industry in making soap and other products. Many Highlanders made a few pounds a year cutting kelp and burning it on the beaches, but after 1815 Spain began exporting a cheaper form of potash, and the price of kelp fell until it was no longer worth gathering and burning it. As prices of all highland products fell, more and more landowners evicted their tenants to make way for sheep. Some of them made no effort to provide new homes and jobs for their tenants, but simply left them to fend for themselves. Many Highlanders went abroad, particularly to North America, where they made a new life for themselves. Some went to the growing industrial towns in the central belt, where they soon learned 'habits of regular and continued industry'. Others remained in the Highlands, living wretchedly off tiny potato patches and a part share of a fishing boat, and hoping for better times.

In fact, worse was to come. As the years passed, diseases began to affect the potato crop, and in 1845 and 1846 it failed almost completely. This led to widespread famine, and some landowners who had not cleared their estates had to cope with starving tenants, who could not pay their rents. These landowners now had to get rid of their tenants or go bankrupt, because they had made little or no money from their estates in the last few years and had not been able to save for a crisis like this. Even on the sheep runs all was not well. The lowland shepherds, who had come in with their Cheviot sheep, had tried to graze too many animals on the highland pastures. The pastures had lost

Deer stalking needed even less labour than sheep farming. A shepherd claimed in 1883 that one gamekeeper worked an area on which four full-time shepherds and several part-time assistants had been employed

their fertility and the flocks of sheep had to be reduced in size. As a result the landowners got less rent. Eventually they discovered that they could make more money by letting their land for deer stalking than they could by using it as sheep pasture. So the shepherds and their flocks were in their turn driven from the glens, and their place was taken by gamekeepers, and by sportsmen who paid large sums of money to enjoy a few weeks' shooting in the autumn. The government, the landowners and the experts had all tried to make the Highlands take its place in the new industrial world, and they had all failed.

7 Communications

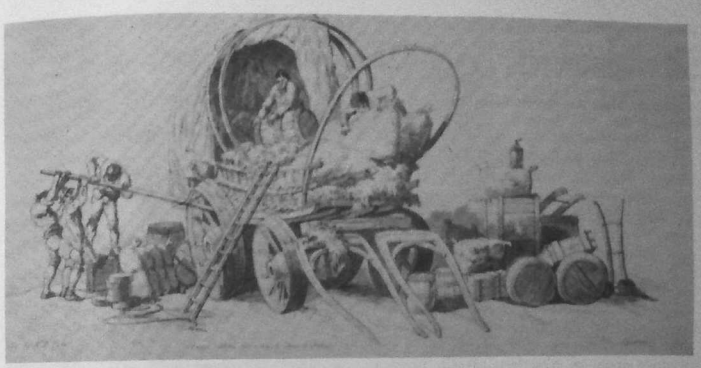
Eighteenth-century roads

Before 1750 the roads in Scotland were very poor. Some of the main streets in the towns were paved, but in the countryside roads were no better than stony tracks, which usually ran along the hillsides to avoid the mud at the bottom of the valleys. They were often steep, and were crossed by many streams and rivulets, most of which had to be forded because there were few bridges. The surface of these roads was rough and broken, with many ruts and potholes. As a rule goods were carried on horseback. George Robertson, writing in the early nineteenth century, said, 'Corn and meal of all kinds were generally conveyed on horseback in sacks. Coals were also conveyed on horseback in a bag containing three hundredweights. Peats too were carried on horseback.' Household goods like fish, salt, eggs, poultry and crockery were sold by a *cadger*, who travelled the roads with a pack-horse which carried all his stock in trade.

Sometimes, however, it was necessary to carry a large quantity of goods from one town to another – more than a couple of horses could manage. Then the carrier would use a crude cart, which would crawl slowly along the road, bumping and jolting from side to side. 'It is said,' wrote George Robertson, 'that the common carrier from Selkirk to Edinburgh, thirty-eight miles distant, required two weeks to make his journey betwixt the two towns, going and returning, with a suitable resting time to his poor horse.' For part of the journey the carrier travelled along the bed of Gala Water, because it was more level than the road. The rest of the country was just as bad. In 1742 Lord Lovat travelled in his coach from Inverness to Edinburgh. It took him eleven days to cover the distance – about a hundred and sixty miles. Much of the time was spent waiting while his coach was repaired. The front axle broke once and the back axle twice. Even as late as 1794, James Anderson complained that for most of the year in Aberdeenshire it was 'more difficult to drag an empty cart along these roads, than it would be to draw one fully loaded, were they in a proper state of repair'.

Sledges like this could be pulled over the roughest roads. But they did not last long and could only carry very small loads

The government realised that good roads were needed, and in the Highlands at any rate tried its best to see that these were provided. In the Lowlands, however, the government at first relied on a law passed by the Scottish Parliament in 1669. This law gave the gentry in each county the right to levy a small rate from all the landowners, and to call all the tenants out to work on the roads for six days every year without pay. This system did not work. The rate brought in very little money, and the tenants did very little work. They hated having to leave their farms to work on the roads, and knew next



Here men are packing goods into a heavy wagon. The men on the left are using the pole as a lever to tighten the rope which is lashed round one of the barrels to hold it in place. Wagons like this needed good roads

to nothing about road-making. In fact, the minister of Grange, in Banffshire, reckoned they made the roads worse. 'The difficult passes,' he wrote, 'are rendered still worse, by having the loose wet clay thrown into them, for proper materials are never sought for, but the mire from the ditches is thrown into the middle of the road, so that a piece of new mended road is generally impassable.'

In some places, where the soil was light and sandy and the water drained away quickly, the situation was not so bad, but most people seemed to agree that the tenants were unwilling to carry out the work and did it 'in an awkward and slovenly manner', so that the roads remained as bad as ever. In the old days, bad roads had been inconvenient, but most people had been prepared to put up with them because they did not need to travel far, and could get most of what they needed from their own farm or from the estate on which they lived. By the end of the eighteenth century this was no longer true. The farmers wanted to buy goods such as cotton clothing and ironware which were now produced in towns many miles away. They also wanted to bring lime and other fertilisers onto their land, and to carry crops to market to pay for all that they needed to buy. The old roads could not carry all this traffic, and as a result many farmers felt cut off from all the advantages which the new discoveries in industry and agriculture were bringing to other people. 'Till good roads be established,' wrote Anderson in 1794, 'agriculture and internal improvements can never proceed with energy.'

Turnpikes

There was a solution to the problem. Enough money to make a good road was borrowed from the local landowners. The road was then built by a proper contractor, and the landowners got their money back by charging all those who used the road a toll, which was collected at gates set up at intervals along the road. These gates were known as *turnpikes*, and the same name was usually given to the roads themselves. Parliament had to give its permission before these roads could be made. The roads cost between £200 and £300 a mile to build, but they were designed to carry heavy traffic. The routes which they followed were chosen to

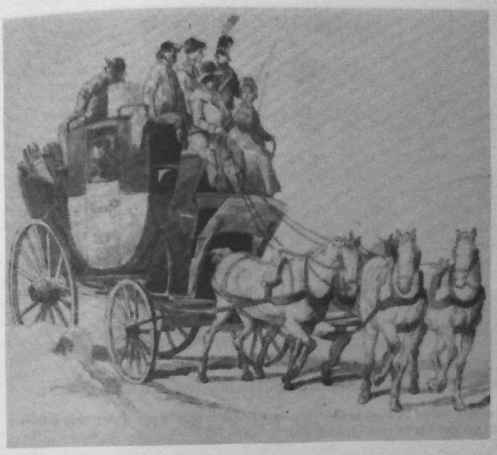
avoid steep hills, and the roads themselves were well made. As a rule a bed about 5 metres wide and 30 centimetres deep was dug out. Into this was tipped a 15-centimetre layer of stones about the size of a man's fist. This was then rammed firm, and covered by a 15-centimetre layer of stones about the size of a hen's egg. Once this layer had been rammed down, it was covered with 5 centimetres of gravel. At intervals drains were cut to carry any water off into the ditches which ran along each side of the road. If it was properly maintained, a road like this could carry goods and passengers along smoothly and quickly. By 1820 all the towns in the Lowlands had been linked by turnpikes.

The new roads made a great difference. The parish minister of Old Meldrum in Aberdeenshire wrote that it was now possible to get farm produce down to Aberdeen to sell 'at every season of the year', and lime and coal were now cheaper. As a result local people had decided to improve their farms and increase their output. His parishioners also found it easy to visit their friends and relatives by travelling in their carts, which could be used to carry either goods or passengers. In a nearby parish the minister reckoned the number of carts rose from fifty in 1790 to more than three hundred in 1835.

People could now make long journeys more easily. Coaches loaded with passengers and luggage and drawn by four horses kept up an average speed of 10 miles per hour over the most important routes. These coaches were very fine vehicles, 'luxurious and handsome, the horses beautifully matched, harness of the best quality. The drivers and guards in their uniform of red coats and yellow collars were steady and respectable men, full of conversation and local knowledge. Time was kept to a minute.' On some runs the horses were changed every ten miles, but on others they had to travel up to twenty miles before being replaced by a new team. The owners of such coaches arranged special terms with the turnpike trustees, and paid what they owed every three months, so that the coaches did not have to stop at every gate on their route. Instead the guard blew a tune on his post-horn as they approached the gate, and the keeper came out and opened it in time for the horses to gallop through without slackening speed. Joseph Mitchell wrote about one night journey into the Highlands on such a coach. 'We swept down one hill and the impetus brought us half up another. The quick turns were taken, sometimes within six inches of the stones placed to define the edge of the road or the corner of a bridge. Still neither these, nor the bolting or kicking of some of the horses, nor the darkness of the night, diminished our steady pace of ten or twelve miles an hour.' As early as 1819 a coach firm boasted that by using their coaches on the new turnpikes a person could travel from Edinburgh to Thurso, 'a distance of nearly four hundred miles, in the short space of three days and a half', sleeping every night at an inn. Seventy years earlier it had taken Lord Lovat three times as long to travel from Inverness to Edinburgh.

Although they were much better than the old roads, turnpikes still had some drawbacks. They needed to be carefully looked after, for if

This was the most common general purpose country vehicle used to carry small loads to market. It was also useful to take the family out visiting or for trips into the country



An early nineteenth-century stage coach. Many coaches were very heavily loaded and put a great strain on the four horses pulling them. The sufferings of coach horses led foreigners to describe Britain as 'a hell for horses'

they were neglected they quickly got into a bad state. John MacDonald inspected the Banff to Fraserburgh turnpike in 1822 and found that the ditches and drains were blocked, while there were a number of holes, some of them 30 centimetres deep, in the road itself. The road would soon, he warned, 'become in many places unfit for travelling on'. The only answer was to employ enough men to keep the drains and ditches clear, and to fill in the ruts and holes as they were made. This was expensive, and on some roads there was so little traffic that the money from the tolls was not enough to keep the road in proper repair. Even on busy roads the tolls had to be quite high to cover all the costs. A four-horse coach could be charged 4 shillings at every toll-gate in Aberdeenshire, and usually there was a gate every six miles. This meant that to cover the cost of the tolls on top of the expense of the coach, the horses, the driver and the guard, coach owners had to charge their passengers high fares. Only the wealthy could afford to travel far. Those with less money still had to stay near home.

Canals

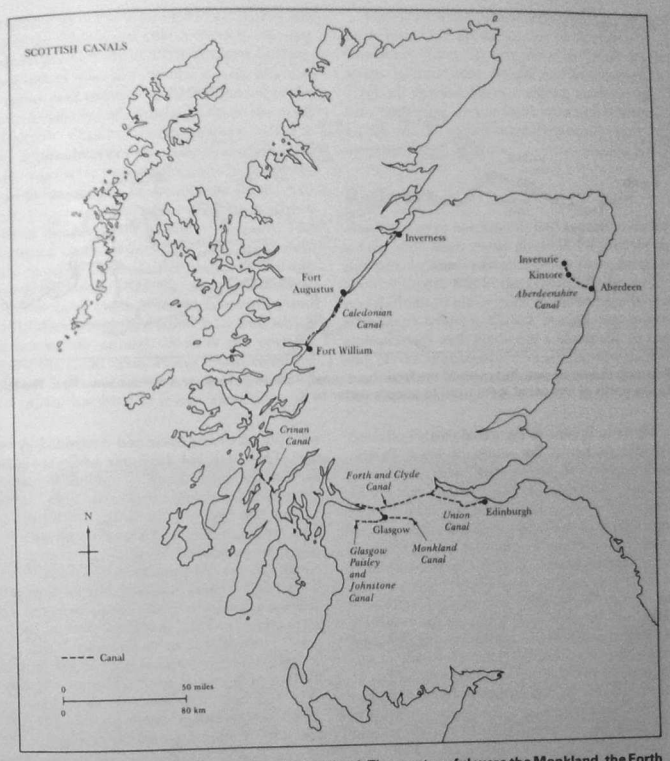
It was also difficult to move really heavy or bulky loads by road. Enormous numbers of horses and carts were needed to shift the output of a coal-mine, and many good seams of coal were left untouched because it would have cost too much to cart the output from them to the nearest town or harbour. It was much easier to move heavy loads by water than by land, and eventually people decided it would pay to make canals so that heavy loads could be shifted more easily.

Canal-making is a difficult and expensive business. The canal bed has to be watertight and dead level. If there are any hills on the route the canal has to go round them, tunnel through them, or go up and down them in a series of locks, which are expensive to build and maintain, and which slow down the traffic. The canal needs a reliable water supply to keep it full and, to add to the expense, every road, path and stream it crosses has to have a bridge. The total cost of building a canal was about £11,000

Sometimes a canal was carried over a valley by means of an aqueduct. In this print a sea-going ship is being towed over the Kelvin aqueduct on the Forth and Clyde canal

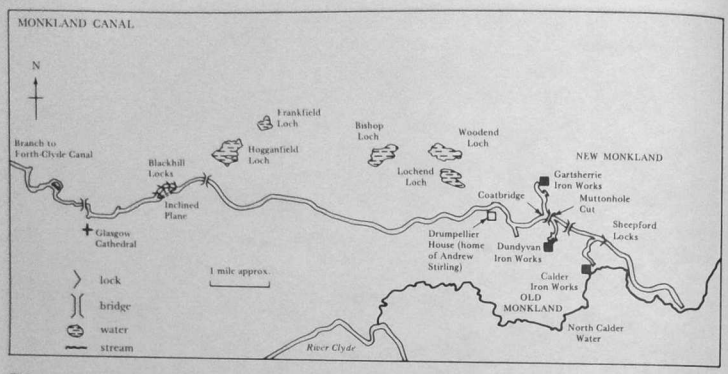
a mile – more than thirty times as expensive as a road. They also took much longer to build. First, the route had to be surveyed very accurately. Then the bed had to be dug out, and lined to make it watertight. As a rule the bottom of the canal bed was covered with a layer of clay and soil. Water was then added and thoroughly mixed into this layer by workmen who stirred it with shovels and trampled it with their boots. This was called *puddling*. By the time they had finished, the soil and water would be a thick sludge. This was left to stand and drain for two or three days, and then another thickness was added, until the puddled clay was just under a metre deep on the bed of the canal. On the sloping banks a layer about twenty-five centimetres thick was usually enough to hold in the water.

The work of digging out and lining the canal bed was very hard, and the men who did it were called *navigators* or navvies. But many other trades were also involved in making a canal. Stone-masons and bricklayers had to be sent for to line the locks and build the bridges. Joiners built the lock gates and blacksmiths made the hinges on which they were hung. In addition the necessary materials and men were sometimes difficult to find anywhere near the canal. For example, clay might have to be carted from a distance and brickmakers might have to be brought in. When Robert Southey visited the Caledonian canal works at Fort Augustus he found on the site two steam pumping engines from Birmingham, iron from Derbyshire and oak from Wales. But above all, canal building needed proper supervision by a really skilled engineer, who could organise all the different trades and find an answer to all the problems that arose. There were only a few men who had the experience and knowledge needed to do this job properly, and they expected to be well paid for their work. Making a canal was thus much more difficult and expensive to organise than making a road, and most of the Scottish canals are in the central Lowlands where the new industries had grown up. Lowland factory and mine owners were willing to risk some of their money to make it easier to shift goods to and from their works. In 1770 coal-mine owners near Glasgow were



This map shows all the canals completed in Scotland. The most useful were the Monkland, the Forth and Clyde, and the Union. Only the Crinan and the Caledonian are still open

charging about 3d a hundredweight for coal, while in the parish of Monkland, twelve miles to the east, it was on sale at the pit-head for less than 1d a hundredweight. Glasgow mill-owners and merchants therefore decided to cut a canal from Glasgow to Monkland. They calculated that it would cost about 1d per hundredweight to carry the coal by barge from Monkland to the city. This meant that, if the canal was made, coal from Monkland would be on sale in Glasgow at about 2d per hundredweight.



This map shows the whole length of the Monkland canal, with all its locks and various branches. The lochs to the north of the canal were used to supply water to it

Those in favour of the canal easily collected £10,000 to begin the work, and got Parliament's approval. James Watt, who was later to become famous for his invention of an improved steam-engine, was appointed chief engineer, and the work went ahead. It proved much more difficult than had been expected. For instance, at one place it had been decided to make a cutting nearly 500 metres long through a hill. This was known as 'Muttonhole Cut', and it took nearly a year to complete because the hill consisted mostly of wet sand which slid down into the cutting as fast as it was dug out. In the end the whole cutting had to be lined with brick, and the soil above it held in place by a layer of turf. All this added to the cost, and after two years' work the money ran out with the canal only half finished. Ten years later a couple of Glasgow merchants and a Monkland mine owner took over the canal and paid for it to be finished. By the time it was opened in 1790 it had cost about £100,000.

In spite of the cost, the canal made a profit. In 1865 alone the receipts were £35,000. The cargo was carried in barges which had to be shorter than 20 metres and narrower than 4 metres to go through the locks. These barges were pulled by one horse and controlled by two men. One man led the horse while the other steered the boat. Each barge carried about sixty tons of coal, and the canal owners charged 1d per ton per mile for using the waterway. This meant that it cost £3 to take a barge full of coal from one end of the canal to the other. The canal also carried passengers in special boats. They had two heated cabins, one for first-class and the other for second-class passengers. The fares were 1 shilling first class, and 8d second class, from Sheepford to Glasgow. Each passenger boat held 150 passengers and was pulled by two horses at a steady 7 miles per hour. When the boat reached the Blackhill locks, the passengers had to get out, walk past the locks, and take another boat for the rest of the journey. This was to save time, for it was a slow business going through the locks. In all, it took passengers two and a half hours to travel the length of the canal. This was slower than by coach, but much smoother and warmer.

The Monkland Canal was a great success. It carried a good supply of cheap coal to Glasgow. This was very important, not just for heating homes, but also as fuel for the growing number of steam-engines which were used to power the machinery in the new factories. The canal also helped the Monkland coal owners to increase production. As early as 1793, Andrew Stirling, a coal owner who also owned a large share in the canal, was producing 30,000 tons of coal a year from his pit and shipping it down the canal to Glasgow. Finally, because it was possible to move goods cheaply and easily along the canal, people who were looking for a site for a factory began to choose places close to the canal. As a result, four large ironworks were built within reach of the Monkland Canal.

In spite of its importance, the canal only really prospered until 1870, when a railway opened between Glasgow and Coatbridge. This took away much of the canal's traffic, and by 1913 the revenue had fallen to £1,915, which was not nearly enough to meet the costs of keeping the canal open. It was finally closed to traffic in 1935, and has since been gradually filled in, so that little of it now remains.

The story of the Monkland Canal is in many ways typical of all the canals of the industrial Lowlands. They all cost more and took much longer to build than people had first expected. They all carried bulky cargoes, such as coal, iron, building stones and manure, cheaply. Lastly, all the canals were eventually replaced by railways.

Railways

Railways were not new. It had been known for a long time that it was possible for a horse to pull heavier loads along iron rails than along an ordinary road. But in the eighteenth century it was difficult to make rails, so the only railways were short lengths of track linking coal-mines and quarries with harbours and canals. At the end of the eighteenth century, however, the iron-masters discovered a new and cheaper way of making rails. Then, in the early years of

The earliest railways were built in industrial areas. This print shows the opening of the Glasgow-Garnkirk railway in 1831. A passenger train is about to pass a goods train loaded with coal, iron, grain and lime. In the background is the St Rollux chemical works, thought at the time to be the largest factory in the world

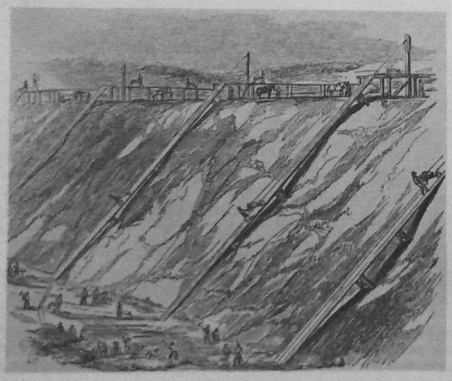
the nineteenth century, engineers developed a powerful steam-engine, light enough to be mounted on wheels, that could pull a number of wagons along faster than a horse could drag a cart or a barge. The new locomotives worked best on rails and could not manage more than a gentle slope. But the job of laying a track for them was easier than making a canal. It was also much cheaper, and when the line was finished and the rails were laid it was possible to travel faster than man had ever travelled before. Passengers and goods could now be carried from place to place at more than 30 miles an hour.

The prospect of quick, cheap travel was exciting:

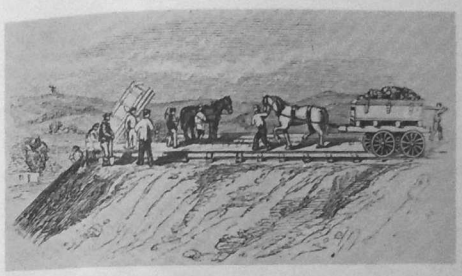
> Hurrah for the mighty engine,
> As he bounds along his track,
> Hurrah for the life that is in him,
> And his breath so thick and black,

wrote Alexander Anderson of Kirkconnel. Anderson worked as a navvy helping to make the railways. Others lent their money to help spread the network, and by 1845 the whole nation was in the grip of 'Railway Mania', with companies being founded to build lines all over the country.

An enormous amount of labour had to go into making a railway. Although the track bed did not have to be dead level, steep slopes had to be smoothed out if the trains were to travel at any speed. This meant that in many places the railway had either to be built up on an embankment or sunk into a cutting, while steep, high hills had to be tunnelled through. All this work was done with picks, shovels, hammers and gunpowder. The men who did it, the railway navvies, had to be skilful and strong. In order to make a cutting through rock, shot holes were drilled with a steel rod known as a jumper. One navvy held this jumper between his knees, while four of his mates, one after the other, swung enormous hammers round over their shoulders and down onto the top of the drill, driving it into the rock. 'A holder,' wrote one navvy, 'is seldom wounded. When he is struck, he dies.' Once the holes had been drilled they were packed with gunpowder which was exploded by lighting a length of fuse. Each explosion loosened and shattered some of the rock, which could then be shifted. On softer ground, teams of navvies dug away under the sides and ends of the cuttings, putting in wooden props as they did so. At the right moment they knocked the props away,



A great many men were needed to make a railway cutting. The plank ways for the barrows and the ropes and pulleys can be clearly seen



In this print a loaded wagon is being drawn towards the end of the embankment. The body of the cart is attached to the lower framework by a hinge, so that when the frame hits the stop the top tilts forward and throws out the soil

and a great mass of soil fell down into the bottom of the cutting, ready to be carted away.

Shifting the soil out of the cutting was not easy. If possible it was carted away along the line of the track to be used to make an embankment somewhere else. Otherwise it had to be wheeled up the side of the cutting in barrows. This was too much for a man to do on his own, so horses were brought in to help. Planks were laid up the sloping sides of the cuttings. Then one end of a rope was attached to the barrow and looped round a navvy's waist belt. The other end of this rope went over a pulley at the top of the cutting and was harnessed to a horse. When the barrow was loaded, the navvy shouted to the horseman, who urged his horse forward, pulling the man and his barrow up the slope. It was not easy for navvies to keep their feet on the muddy planks, but they soon became very sure-footed. Embankments were made by tipping. Rails were laid to the very edge of the embankment, where a piece of timber was tied across them to act as a stop. A loaded wagon was then pulled along the line by a trotting horse with a man running alongside. At the last minute the man unhitched the horse from the wagon and he and the horse moved to one side. The wagon went on, struck the wooden stop, and tipped its contents down the embankment. The wagon was then pulled back to be refilled. A good navvy could fill eight wagons a day. This meant shovelling up about twenty tons of earth and rubble and swinging it more than two metres high into the wagons.

This was cruel, hard work, but the toughest job on the line was tunnelling. Short tunnels were driven from each end until both parties reached the middle, but in long tunnels shafts were sunk at intervals along the line. When the shaft was finished, men went down in great buckets and began to dig out the main tunnel, working in two directions at once. The men worked by candlelight in foul air, and were constantly soaked by the drip of water from the walls and roof. Tunnelling went on day and night, with the navvies working shifts, and everything was done to speed the work so that an unfinished tunnel would not delay the opening of the line. In 1847 the Glasgow Dumfries and Carlisle Railway Company had to dig a 1,400-metre tunnel so that the railway would not spoil the countryside near Drumlanrig Castle, the home of the Duke of Buccleuch. The company used more than a ton of gunpowder a week for blasting, had seven steam-engines at work and, apart from the navvies, employed 300 brickmakers to make the bricks for lining the tunnel. The brickworks alone consumed eighty cartloads of coal a day to fire the kilns, and 100 carters were employed to bring it up from Sanquhar.

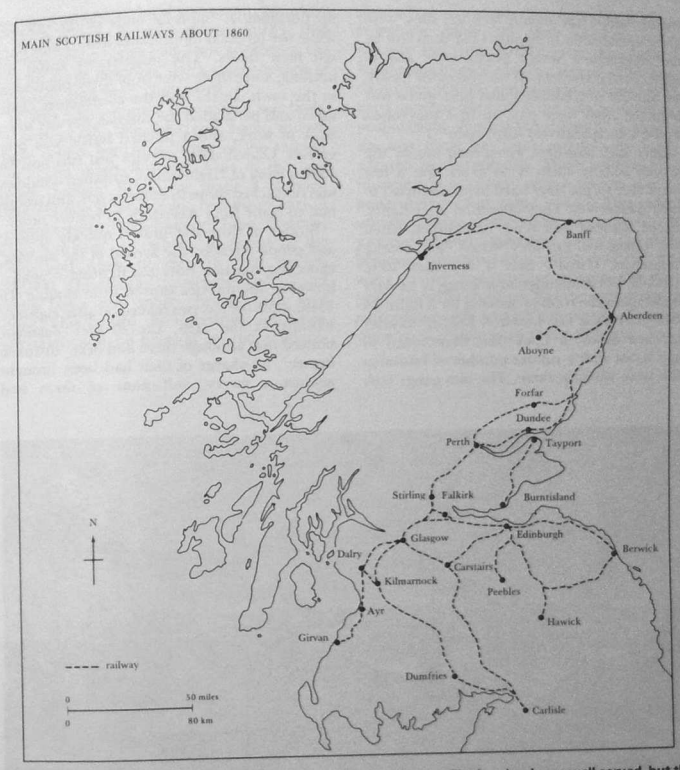
Enormous numbers of men were employed to make the railways. For instance, in 1840 the contractor Thomas Brassey had 20,000 men, most of them navvies, at work on the line between Glasgow and Carlisle. The sudden arrival of these men in the countryside created a great stir, for their way of life was quite different from

This photograph, taken in 1853, shows a group of navvies during a break from their work

that of most country people. They dressed differently. Most navvies wore moleskin trousers, double-thickness canvas shirts, coloured waistcoats, velveteen coats and hobnail boots. They kept brightly coloured handkerchiefs knotted round their necks, and wore white felt hats. Once they had reached their place of work they set about building somewhere to live. As a rule the contractor provided them with timber, which they used, together with turf cut from the fields, to build a number of huts, each about 6 metres long and 3.5 metres wide. Twelve rough wooden bunks, each less than 2 metres long and 1.2 metres wide, were put in two tiers along the side walls. At one end of the hut there was a door, and at the other end there was a fireplace. Usually two navvies shared a bunk, but sometimes they brought wives or other women with them. Occasionally they even brought children along, so that a man, his wife and two small children might have to share one bunk.

The huts had no furniture except the bunks, and no means of cooking except the fire. Sometimes the navvies employed a woman to cook for them, but sometimes they cooked for themselves, using their working shovels as frying pans. Their diet varied. Some lived on bread, tea, barley and oatmeal broth and an occasional piece of beef. Others favoured tea, salt ham, herrings and bread. Many of the navvies ate few if any fresh vegetables, and as a result some suffered from scurvy, which weakened their resistance to other diseases. Their cramped quarters were stuffy and unhealthy, and this, coupled with a fairly high accident rate at work, meant that they tended to die young. Forty was a good age for a navvy.

When a navvy died, his mates saw to it that he had a good funeral. They would club together to buy a decent coffin and pay a clergyman. They would then set out in procession to the churchyard, all in their working clothes and many of them smoking pipes, taking it in turns to carry the coffin. Once the service was over they went back to work. The navvies were usually very generous. A Roman Catholic priest



The main railway routes completed by 1860 are shown on this map. The Lowlands are well served, but the Highlands and the far north are hardly touched

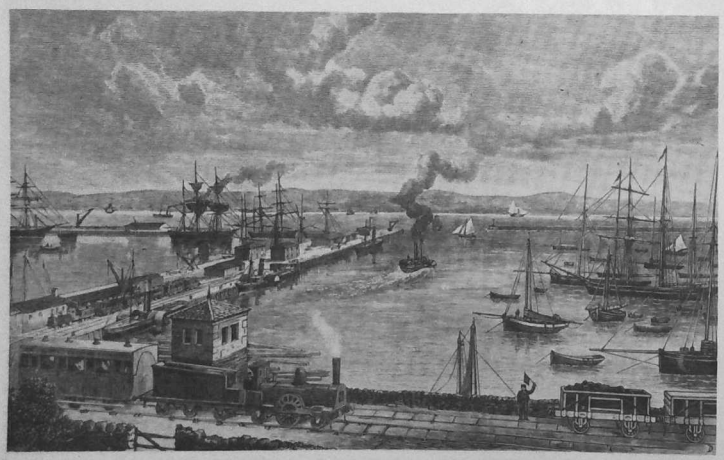
who ministered to a gang of Irish navvies on the Caledonian railway was given a gold watch and chain when they left, and the navvies on the Dingwall and Inverness railway presented a gold snuffbox to the contractor who employed them. They were well paid. In the middle of the nineteenth century, when a farm labourer might have 5 or 6 shillings a week, a navvy could earn 15 or 16 shillings. As a rule they were paid once a month, and if they needed

money before the month was up, they were given credit notes to spend at the shop run by the contractors, where prices were always higher than elsewhere. At the end of the month the amount of credit they had been given was deducted from their pay, so that they often received comparatively little cash.

Once they had been given their money the navvies usually spent it on drink. For a few hours they forgot their hard lives, and tried to enjoy themselves. They organised prize fights, argued, danced and sang. Sometimes, when their blood was up, they would fight among themselves. Usually only a few men were involved, but sometimes large gangs of navvies would roam the country looking for a fight. In 1845 more than two hundred English navvies marched down to Lockerbie, determined to fight it out with a similar number of Irishmen who were working there. The two gangs took up positions at opposite ends of the village, while the terrified inhabitants locked and barred their doors. The magistrates could do nothing, since there were only three policemen in the town. In the end the contractors came down and persuaded the English navvies to go back to work, and a pitched battle was prevented. Occasionally navvies just ran riot. In 1848 a gang of Highlanders smashed windows and ransacked shops in Stonehaven, and troops had to come from Aberdeen to restore order.

Stories of riots and brawls quickly spread, and people dreaded the arrival of the navvies, expecting constant riots and fighting. Usually, however, the navvies caused little trouble. In 1848, when the navvies moved on after eighteen months in the area, the *Berwick Advertiser* noticed that although there had been 'drunken brawls', no charge of theft had been brought against a navvy, and none of them had assaulted any of the local community. Similarly, the *Perthshire Chronicle* reported in 1847 that although 600 navvies had been working in the area for three months, 'not a single breach of the peace' had been committed.

Within a few months the railway was built, the navvies left, and the trains began to run. Many people benefited. Some of the railway contractors made fortunes. One of the best known, Samuel Peto, was made a baronet, while Thomas Brassey's son became an earl. A Kincardineshire wall-builder, John Brebner, began working on railway contracts in the 1840s, and when he died in 1857 he left £300,000. The railway trains moved goods and people faster and more cheaply than ever before. This helped the industries, since raw materials could be brought in and products dispatched more easily. Shopkeepers and their customers could get their supplies more cheaply and from further away than before. Businessmen could now live several miles from their place of work, and suburbs and new towns grew up along the track of the railway. Working people could afford to travel long distances for the first time. Yet some people were badly affected by the railways. Many believed that investing in a railway was a certain way to make money, but some remote lines never attracted much traffic and never paid. Coach proprietors and innkeepers found that their business disappeared overnight once the railways arrived, and canal proprietors saw their profits steadily go down. But the complaints of such people were nothing compared to the welcome most people gave to the railway.

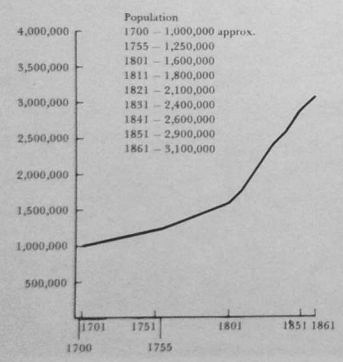


The harbour at Granton was built by the Duke of Buccleuch, who owned the whole area. In 1880 it was very busy. Passengers travelling north from Edinburgh left their trains here to take a boat across to Burntisland. There was also a flourishing cargo trade

8 The Growth of Industry and Trade

Population

By 1860 the population of Scotland had reached 3,000,000 – about three times what it had been in 1700. The population had risen because, from the late eighteenth century onwards, country people were better housed and fed than they had ever been. As a result they suffered from fewer illnesses, and gave birth to healthier children who were less likely to die while they were still very young. A large number of this growing population left the countryside and went to industrial towns for work. The population of these towns therefore grew very rapidly. For instance, Paisley had only 6,800 inhabitants in 1755. By 1821, 47,000 people lived there. This movement of people into the towns meant that in 1861 more than 40 per cent of Scotland's population lived in towns, and more than 75 per cent had their homes in the central belt. Living conditions in the manufacturing towns were bad, and as a result the death-rate was very high. In 1865 the death-rate in a working-class district of Edinburgh was more than twice that in a middle-class area. The large number of deaths meant that towns needed a regular supply of new people coming in from the countryside to keep their numbers up. It was not until after 1860 that conditions in the towns improved and the death-rate began to fall.



The graph above shows how the Scottish population increased. The fastest rate of growth was between 1811 and 1821

Agriculture

By the middle of the nineteenth century, Scottish farming was famous for its efficiency. In parts of England after 1820 farmers found it difficult to make a living out of growing wheat. But Scottish farmers in the Lothians, using all the latest machinery, were able to grow wheat so cheaply that they could export it to England, where it was sold in competition with English grain. In other parts of Scotland the main grain crops were still oats and barley. Scottish livestock, too, had a good reputation. Clydesdale horses, bred near Glasgow, were among the best working horses in the world. Scottish breeds of both beef and dairy cattle were also well known for their quality. Scotland was now easily able to feed her own population, and farm managers who had done some of their training in Scotland found that they could easily get jobs south of the border, because it was taken for granted that in Scotland they would have had the chance to see really good farming practice. It was a far cry from the days when Sir Archibald Grant had to send for a man from England to teach his tenants how to farm.

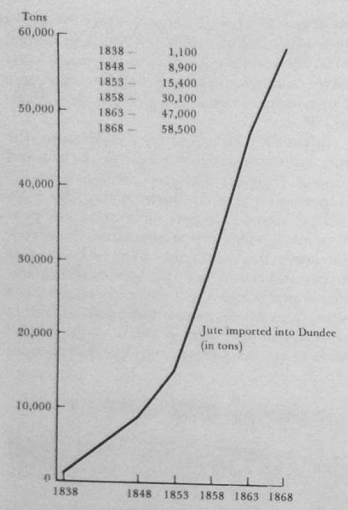
Industry

(a) Cloth

By 1860 Scotland was a well-established industrial country. Yet not all its industries were doing well. The cotton industry, which had grown up between 1780 and 1815, found that after 1825 it was more and more difficult to sell its products abroad because other countries had set up their own mills and no longer needed to buy Scottish goods. As a result, few new mills were established and the number of people employed in manufacturing cotton cloth began to fall.

But as the cotton industry was declining, the jute industry began to grow, particularly in and around Dundee. This had always been an important centre for linen-making but from 1840 it began to import more and more jute. Raw jute is a fibre which comes from the bark of the jute plant, common in parts of India. It is coarse and brittle, but a Dundee manufacturer discovered that if it was soaked in a mixture of water and whale oil it became soft enough to spin. When processed, it can be made into all sorts of canvas and sacking. By 1875 Dundee

A weaving shed in a Dundee jute mill, photographed in 1908. All the workers at the power looms were women



The sudden growth of the jute industry shows up clearly on this graph of jute imports

was importing more than 100,000 tons of jute a year, and nearly 36,000 people were employed in jute mills. Scotland was the only country in the world with such a large and flourishing jute industry, and the finished sacking was exported all over the world – even to India.

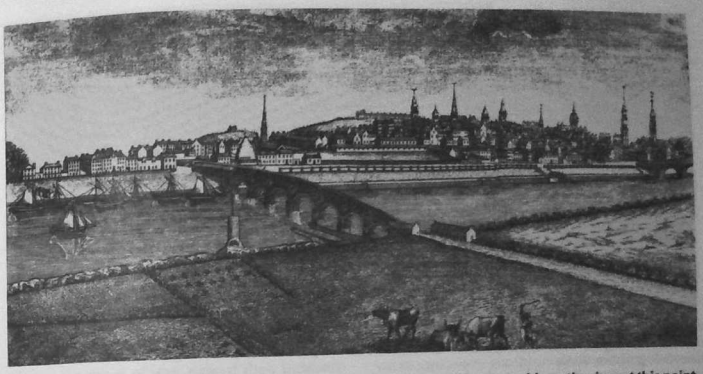
(b) Heavy industry

By the middle of the nineteenth century, however, heavy engineering of various sorts was the most important industry in Scotland. The country had plenty of coal and iron, and as a result was able to manufacture very cheap iron. In 1860 Scotland was producing about one million tons of iron a year. This was far more than she could use so up to half the iron produced in Scotland was exported. Much of the remainder was used to make ships and heavy machinery such as locomotives and ships' engines. It was a great change from the days at the beginning of the eighteenth century when Scotland had to import almost all her iron from Sweden and bought most of her boats from Holland. Like the cloth industry, the new heavy industries were concentrated in the central Lowlands, where coal and iron were both found in large quantities.

Communications

By 1880 the industrial areas of Scotland had a good network of roads, canals and railways. On all the really important routes, goods could now be shifted quickly and cheaply. In addition there were good rail links with England. On the other hand, the railway line up the east coast was still incomplete because there were no bridges across the Tay and the Forth. This meant that passengers from Edinburgh to Aberdeen either had to go via Perth or else had to be ferried by boat across the firths of Forth and Tay. Further north, many parts of the Highlands were still very isolated, with poor roads and no railways. In the west, particularly, it was still often quickest and best to travel by sea. Here, too, journeys were quicker and safer than they had ever been before. There were safe and reliable steamboats, the coast was well provided with lighthouses, and many ports and harbours had been improved. Some had simply been made safer by building new breakwaters. Others had been enlarged to accommodate more ships and to allow larger boats to berth in them.

The greatest work of all, however, had been done on the Clyde estuary. In 1700 the river was too shallow for sea-going boats to sail up as far as Glasgow. Instead cargoes had to be unshipped at Port Glasgow or Greenock, nearly twenty miles away, and then carried to the city over land. About the middle of the eighteenth century, engineers began work making the Clyde deeper. They did this by building jetties which made the river narrower. This speeded up the flow of water and, as it ran faster, the river cut away at its bed. The process was slow, but by 1800, ships of 100 tons could



The Clyde at Glasgow before the river was deepened. Only very small boats could use the river at this point

reach the city. Work went on, helped after 1820 by steam dredgers which scraped up gravel and mud from the bed of the river. By 1840, sea-going ships of 400 tons could reach Glasgow. Still the work continued. The dredgers finally struck rock, and explosives were used to blast out thousands of tons of whin-stone from the bed of the river. At last in 1870, after more than a century's work costing nearly £7,000,000, Glasgow was able to accommodate the largest vessels afloat, and the ships sailed straight past Port Glasgow and Greenock to dock in Glasgow itself.

Trade

(a) Tobacco

It was important that ships should be able to reach Glasgow because the amount of trade carried on from the west of Scotland increased enormously after the Union. Scotland was now able to trade direct with the American colonies, and within fifty years was importing vast quantities of tobacco from Virginia. By 1770, Glasgow merchants were importing nearly half of all the tobacco brought in to the United Kingdom. There were several reasons for the rapid growth of the trade. First, the route from Glasgow to Virginia, going north round Ireland, was much shorter than the route from any other port in Britain. This saved time and money. Secondly, this northerly route across the Atlantic was much safer. For much of the eighteenth century the seas round southern Britain were patrolled by French privateers on the lookout for British merchant ships to rob. There were not so many of these privateers north of Ireland. As a result, fewer ships were lost, and it cost less to insure merchantmen sailing out of Glasgow. Most important of all, however, was the way in which Scottish tobacco merchants organised their trade.

The merchants worked through a system of stores. Each firm set up a number of depots in the colonies. These depots were supplied with goods shipped out from the Clyde. They stocked cloth, cooking pots, tools, harness and other items likely to be needed by the plantation owners. The storekeepers encouraged the planters to run up large bills at the stores, and did all they could, including giving 'drink in abundance', to keep on good terms with their customers. Then, when the tobacco crop was

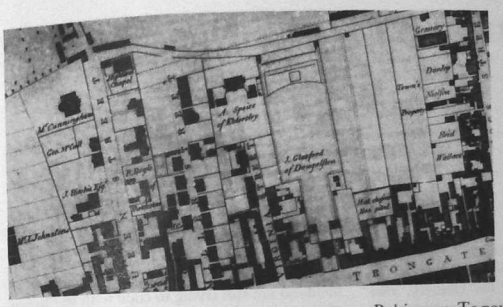
This photograph, taken about 1890, shows ocean-going ships berthed in the Queen's Dock right in the middle of Glasgow. This dock, opened in 1880, was the largest in Scotland. It was made possible by the deepening of the Clyde

ready, the storekeeper offered to buy it. Usually the price offered was as good as the planter could expect to get anywhere else and, because he had been so well treated by the storekeeper, he willingly sold the crop to the company.

The largest Glasgow firm, William Cunningham & Co., had no fewer than fourteen stores in Virginia, controlled by a full-time agent who lived in Falmouth on the Potomak river. The storekeepers were usually young Scotsmen and were often related to the directors of the company. If they did well, they could look forward to a prosperous career, ending up on the board of directors in Glasgow. Storekeepers therefore worked hard. They found out when boats were due in from the Clyde and made sure that they had full cargoes of tobacco ready for them to take back, so that the ships could dock, unload, load up and set sail again without delay. With the shorter voyage and the quick turn-round, many Scottish boats could make two trans-atlantic voyages a year. Most of their competitors from other countries were content with one.

The Glasgow tobacco merchants made a lot of money. Most of the goods they shipped across to America were cheaply produced in Scotland, within easy reach of Glasgow. They sold these at a good profit in the company store, which meant that they could afford to pay a fair price for the tobacco. The short voyage and quick turn-round meant that it cost less to bring the tobacco leaf back to Scotland. As a result the merchants could export their tobacco to other countries at a cheaper rate than their competitors and still make a good profit. Their business increased and so did their wealth.

The tobacco trade benefited Scotland in various ways. Local factories were set to work to make the goods which were exported to pay for the tobacco, while much of the money made by the merchants was also spent locally. Some of it was used to improve their standard of living. The merchants built themselves grand houses on the outskirts of Glasgow, and founded clubs and a theatre for their entertainment. To cater for their expensive tastes, new trades sprang up in the city, ranging from sedan-chair carriers to cabinet makers. Some of the tobacco merchants invested their money in land by buying country estates, and had large and luxurious houses built where they could relax away from the cares of the city. Some of them invested money in industry, helping to set up mills and other factories. Thus the wealth which came from the tobacco trade made the merchants rich, helped to make Glasgow a better place to live in, and speeded up the development of industry in the west of Scotland.



The effect of the tobacco trade is clearly seen on this map of Glasgow dating from 1778. Notice Virginia Street and the houses, amongst others, of Mr Cunningham, Mr Speirs and Mr Glasford. All three were tobacco merchants

The tobacco trade reached its peak between 1770 and 1775. It was brought to an end when the colonies revolted against British rule and, after eight years of war, gained their independence in 1783. Fortunately for the Glasgow merchants their agents in America had warned them that trouble was on the way. Consequently the merchants had plenty of time to get their storekeepers to collect all the money due to them from the planters, and to build up stocks of tobacco in Glasgow. They were able to sell these stocks for a high price once the war began, and they used the money to begin new trading ventures.

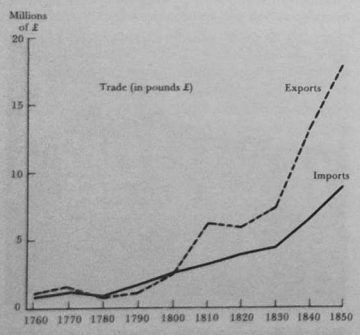
(b) Later developments

Even though the tobacco trade decreased after 1775, the total volume of Scottish trade continued to grow. Some of the Glasgow merchants turned their attention to the West Indies, and imported sugar and rum, much of which was re-exported to Europe. Meanwhile, imports of cotton wool increased enormously to keep pace with the demands of the growing cotton industry. To begin with, most of it came from the West Indies, but later huge quantities were brought in from the United States. To pay for these imports, Scotland exported cloth, dried fish, leather goods, tools, guns and gunpowder. Scotland also did a good trade with Europe. Luxury goods like wine and fruit were brought in from Southern Europe, while flax, hemp, timber and tar were imported from the Baltic area. To pay for these, Scotland was able to export a variety of goods, including cloth, pig-iron, metal goods and, as time went on, more and more machinery, chemicals and coal. By 1850 Scottish trade had altered out of all recognition. In 1755 the total value of all imports was reckoned at about £500,000, while exports were valued at £750,000. In 1850 imports stood at nearly £9,000,000, and exports at £18,000,000. Scotland was thus earning a very good living abroad, far beyond the dreams of the merchants of the early eighteenth century.

Elderslie House was the country residence of Alexander Speirs, who was the most powerful of all the tobacco merchants before the American war

Conclusion

The industrial revolution brought great wealth to Scotland. However, this wealth was not distributed evenly throughout the country. The growth of industry and trade favoured the western half of the central Lowlands above everywhere else. It did little or nothing to help the Highlands. By 1850 all hopes of a prosperous future there had gone, and Highlanders moved in great numbers to the new industrial towns, or else established settlements overseas. If there had been large deposits of coal or iron in the area, then the story might have been different. As it was, large parts of the Highlands were too remote and barren to fit in with the new industrial society.



This graph shows how Scottish imports and exports grew as Scotland's industry developed

Industrialisation brought problems as well as wealth. Large areas in the central belt of Scotland are still trying to cope with the heaps of waste, poisoned rivers and unplanned towns left behind by nineteenth-century industry. More important at the time, there were still plenty of people who remained poor, even in the new industrial areas. This was largely because many of the workers who helped to create the wealth were not paid enough. They were unable to bring up their families properly, and if they fell ill they had no savings to tide them over.

Occasionally, when their situation seemed hopeless, workers were willing to use force to try to put things right. For instance, in 1820 most hand-loom weavers in the west of Scotland were out of work, and the few jobs available were very badly paid. The weavers were angry, and they had nothing to lose, so they decided to begin a revolution. They planned to overthrow the government and set up a new system in which workers would have votes and be certain of a fair day's work at a good rate of pay. Their plot failed. The weavers expected huge numbers of workers to support them, but when the time came only a few poorly armed men assembled to march on Glasgow. They were easily dispersed by the local militia, and three of their leaders were tried and hanged for treason.

Mostly, however, workers tried to improve their lives by organising trade unions to bargain with their employers for better pay and conditions. At first they had little success. In the cloth industry, a union of hand-loom weavers which demanded new minimum rates of pay in 1834 was ignored. In 1837, when spinners' pay was reduced, the Association of Operative Cotton Spinners of Glasgow called a strike. Five of their leaders were promptly arrested and, when the union's funds ran out, the strike ended with nothing gained. As time went on, trade union leaders became more skilled at bargaining. For instance, the United Operative Masons of Scotland Society, founded in 1831, had secured a nine-hour day for its members by 1866. In other trades, the United Coal and Iron Miners Association of Scotland was founded in 1855, while the English Amalgamated Society of Engineers set up branches in Scotland at about the same time. Very slowly the balance began to shift. The power of the workers increased, and so did their share of the country's wealth.

Suggestions for further reading

The following titles in Longman's *Then and There* series are useful:

The Highland Clearances by Finlay McKichan
A Border Woollen Town in the Industrial Revolution by Karen McKechnie
Glasgow and the Tobacco Lords by Norman Nichol

Two titles in Holmes McDougall's *Scottish Search* series are relevant:

Industry: Coal and Iron by Hogg & MacIver
Roads and Canals by Ian Donnachie

Historic Industrial Scenes: Scotland by Donnachie, Hume & Moss (Moorland) contains a lot of good pictures.

In addition, much illustrative material is published in two volumes compiled by Alistair Hogg in Evans's *History at Source* series:

Scotland: The Rise of Cities 1694–1905
Scotland: Revolution in Industry 1703–1913

At a more advanced level:
An Economic History of Modern Scotland by B. Lenman (Batsford) and *A History of the Scottish People* by T. C. Smout are the most approachable books.

Glossary

bearer the person who carried the coal from where it was cut to the pit-head
ben the inner room of a two-roomed cottage
but the outer room of a two-roomed cottage
byre the cowhouse
cadger a wandering pedlar; a travelling salesman
cast to dig
checksman the official who checked how much coal each miner had cut, and worked out his pay
clipper a fast sailing ship used to carry cargo in the nineteenth century
collier a miner
creel a basket in which coal was carried
drover a man who drove cattle
garron a small highland horse
grieve the manager of a mine
heckle to comb out the fibres of flax to prepare them for spinning
hewer the man who cut the coal
horse gin an engine, powered by a horse, for hauling coal up from the bottom of a pit
infield the most fertile land which, under the old system of farming, was ploughed and cropped every year
lead to cart
lum a chimney
manse the minister's house
navigator usually 'navvy' – a workman who earned his living shifting earth and stones to make canals and railways
outfield the less fertile land which, under the old system of farming, was cropped for a few years and then put down to pasture for several years to recover
oversman the foreman who was in charge of the miners down the pit
piecer a child who worked on spinning machines, joining up the threads which snapped while the machine was running
puddling (i) a process for making wrought iron (ii) a method of trampling clay, sand and water to make a waterproof layer
scutching beating the stems of the flax plant to prepare them for the manufacture of linen
steading the farm building
tacksman the clan chief's agent, who collected his rents and supervised his tenants
trapper a small child who opened and shut doors in underground mine passages
truck the system of paying wages in goods instead of cash
turnpike a road which was paid for by tolls collected from those who used it at special gates set up at intervals along it

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The Rise of Scottish Industry is intended mainly for secondary school pupils in Scotland in their third and fourth years, but it will also be very useful supplementary reading for the Scottish O Grade history syllabuses. The author draws vividly on contemporary case studies to explain and illustrate the growth of industrialisation in Scotland and the profound effect it had on people's lives. The admirably clear text is supported by a wealth of closely integrated illustrative material—photographs, maps, plans and graphs.

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