

THE
INDUSTRIES OF SCOTLAND

THEIR
RISE, PROGRESS, AND PRESENT CONDITION.

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LINEN AND JUTE MANUFACTURES.

HISTORY OF THE SCOTCH LINEN TRADE—CURIOUS ACTS OF PARLIAMENT RELATING TO THE MAKING AND USE OF LINEN—THE BOARD OF TRUSTEES FOR MANUFACTURES AND THEIR CONNECTION WITH THE TRADE—THE BRITISH LINEN COMPANY—DOMESTIC CHARACTER OF THE LINEN MANUFACTURE IN ITS EARLY DAYS—VICISSITUDES OF THE TRADE IN THE RURAL DISTRICTS—RISE AND PROGRESS OF THE LINEN TRADE IN FORFARSHIRE, FIFESHIRE, AND PERTHSHIRE—DUNFERMLINE: ITS EARLY CONNECTION WITH THE LINEN TRADE, AND PRESENT CELEBRITY FOR THE MANUFACTURE OF TABLE LINEN—THE EARLY DAYS OF THE LINEN TRADE IN DUNDEE—THE INTRODUCTION OF JUTE, AND ITS EFFECT ON THE MANUFACTURES FROM FLAX—THE GREAT FACTORIES OF DUNDEE—THE PROCESSES OF MANUFACTURING FLAX AND JUTE.

FROM the frequent mention of linen in the history of Scotland, it is evident that the inhabitants were acquainted with the processes of making cloth from flax six hundred years ago at least. It is related that, at the battle of Bannockburn (fought in the year 1314), "the carters, wainmen, lackeys, and women put on shirts, smocks, and other white linens, aloft upon their usual garments, and bound towels and napkins on their spears, staves, &c. Then placing themselves in battle array, and making a great show, they came down the hillside in face of the enemy with much noise and clamour. The English, supposing them to be a reinforcement coming to the Scots, turned and fled." There is good reason for concluding that the linen so successfully displayed on this memorable occasion was home-made. At first the flax was grown, dressed, spun, and woven by the people for their own use; but towards the close of the sixteenth century linengoods formed the chief part of the exports from Scotland to foreign countries. About the same time a considerable quantity of Scotch linen found its way into England. Several attempts were made to establish linen manufactories, so that the trade might be extended and carried on more profitably; but the promoters, though encouraged by royal favours and the concession of

certain privileges, did not succeed. Efforts were made to improve and extend the woollen manufactures of Scotland by various legislative enactments, one of which prohibited the importation of woollen cloths from England. The English people retaliated for this interference with their trade by treating the men who sold Scotch linen in their territory as malefactors, whipping them, and making them give bonds that they would discontinue the traffic. This told seriously on the working population of Scotland, for it was calculated that from 10,000 to 12,000 persons were employed in making linen goods for the English market. An appeal to the king had the effect of removing the restrictions on the trade. In 1686 the first Parliament of James VII. passed an "Act for Burying in Scots Linen," the object of which was to encourage the linen manufacturers in the kingdom, and prevent the exportation of the monies thereof by importing linen. It was enacted that "hereafter no corpse of any persons whatsoever shall be buried in any shirt, sheet, or anything else except in plain linen, or cloth of hards, made and spun within the kingdom, without lace or point." Heavy penalties were attached to breaches of the Act, and it was made the duty of the parish minister to receive and record certificates of the fact that all bodies were buried as directed.

It would appear that the weavers, in order to increase their gains, had, towards the end of the seventeenth century, begun to make linen cloth of inferior quality, and Parliament interposed to put a stop to that practice. In 1693 an Act was passed "anent the right making and measuring of linen cloth." It set forth that "the King and Queen's Majesties considering how much the execution of the good laws for the right making of linen cloth hath been hitherto neglected, to the prejudice of the lieges, and the loss of trade within this kingdom, do therefore, with advice and consent of the Estates of Parliament, ratifie, approve, and confirm all Acts of Parliament made for the right making and improving of linen cloth." The Act then proceeds to describe minutely how yarn is to be made up and sold, and how the cloth is to be woven and measured; and this in consideration of "how much the uniform working and measuring of linen cloth may raise the value thereof with natives and strangers, and render the trade more easy and acceptable to merchants." In order to afford protection against dishonest work, the Act required "that the owner of all linen cloth made for export, before it be exposed to the first sale, shall be obliged to bring the same to a royal burgh where linen is in use to be sold, there to receive the public seal and stamp of the burgh, bearing the coat-of-arms of the

burgh upon both the ends of ilk piece or half piece thereof, which shall be a sufficient proof of the just length and breadth, evenness of working, and the due and sufficient thickness and closeness thereof; and for that effect there shall be in each royal burgh where linen is in use to be sold, an honest man well seen in the trade of linen cloth appointed to keep the said seal for marking linen therewith." The fees to be charged by the stampmaster were also fixed by the Act, and he was subject to penalties if he neglected his duty. For the encouragement of all persons who should establish manufactories of linen cloth it was further "statute and ordained, that all lint, flax, and linen yarn imported for the use of companies or manufactories, and all linen cloth exported by them, shall be free of custom duties or excise."

The linen manufacturers of Scotland derived great advantage from the union with England. The duties charged on goods exported to the sister kingdom were removed, and at the same time the colonies were opened to Scottish enterprise. A period of great industrial activity set in, and the quantity of linen goods produced was much increased. In 1710 upwards of 1,500,000 yards of linen cloth were produced. Ten years afterwards England alone took L.200,000 worth of Scotch linen annually. A great stimulus was given to the trade by the establishment of the Board of Manufactures in 1727. The fifteenth section of the Treaty of Union with England, signed in July 1706, stipulated that "L.2000 per annum for the space of seven years shall be applied towards encouraging and promoting the manufacture of coarse wool within those shires which produce the wool," and that "afterwards the same shall be wholly applied towards the encouraging and promoting of the fisheries and such other manufactures and improvements in Scotland as may most conduce to the general good of the United Kingdom; and it is agreed that Her Majesty (Queen Anne) be empowered to appoint committees who shall be accountable to the Parliament of Great Britain for disposing the said sum." No action was taken to fulfil the conditions of this clause of the Treaty until 1727, when an Act was passed for the appointment of twenty-one commissioners to take charge of the revenues and annuities allotted to the encouragement of manufactures and fisheries. By that time the money which was to be devoted to the improvement of the woollen manufactures had accumulated to the sum of L.14,000; while L.6000 in addition was due for the other purposes referred to in the section of the Treaty under notice. The interest on those sums, added to an annuity of L.2000, placed a considerable amount at the disposal of the "Board of

Trustees for Manufactures," as the commissioners were designated, who laid before the King in council a triennial plan for the apportionment of the revenues.

The first plan prepared was for the three years from Christmas 1727, and provided for the expenditure of L.6000 yearly in the following proportions:—For the herring fisheries, L.2650; for the linen trade, L.2650; and for spinning and manufacturing coarse tarred wool, L.700. The money allotted to the linen trade was divided as follows:—Premiums for growing lint and hemp seed at 15s. per acre, L.1500; encouraging spinning schools for teaching children to spin lint and hemp, L.150; prizes for housewives who shall make the best piece of linen cloth, L.200; salaries to the general riding officers at L.125 each, L.250; salaries to forty lappers and stampmasters at L.10 each, L.400; expenses of prosecutions, L.100; procuring models of the best looms and other instruments, L.50. It would appear from this that technical education is not such a new thing in this country as some persons suppose—the spinning schools referred to being places in which a technical knowledge of a certain branch of industry was imparted to young persons. The sum of L.10 a-year was allotted to the endowment of each seminary, of which sum the teacher or mistress received L.5 as salary; L.4, 1s. 8d. was devoted to the purchase of fourteen spinning wheels, at 5s. 10d. each; 5s. to maintaining pirns, bands, &c.; and the balance, 13s. 4d., went to provide coal and candles for the session, which lasted from the 13th October to the 15th April. The spinning schools were situated chiefly in the Highlands, as the trustees considered it highly desirable to create habits of industry in those regions where indolence and poverty reigned supreme.

The Board lost no time in taking steps for improving the quality of the linen made in Scotland; and their records show, that one of their first acts was to propose to Nicholas d'Assaville, cambric weaver, of St Quentin, France, to bring over ten experienced weavers of cambric, with their families, to settle in this country, and teach their art to others. The offer was accepted, and the Board purchased from the Governors of Heriot's Hospital five acres of ground in Broughton Loan, a suburb of Edinburgh, on which they built houses for the French weavers. The colony was named Little Picardy, and its site is now occupied by Picardy Place, which, with York Place, forms the eastward continuation of Queen Street. The Frenchmen were Protestants, and they began operations in 1729—the men to teach weaving, and their wives and daughters the spinning of cambric yarn. A man skilled in all the branches of the

linen trade was at the same time brought from Ireland, and appointed to travel through the country and instruct the weavers, and others, in the best modes of making cloth.

It may be interesting to note a few facts contained in the minutes and annual reports of the Board. In 1728 premiums were offered to persons who should construct bleachfields. Several persons offered to make fields; and it was agreed that they should receive L.50 for each acre of ground so laid out. Considerable sums were also paid for the introduction of improved modes or appliances for dressing flax. A dispute arose at Irvine in 1732 as to the adjudication of the housewives' prize for making linen cloth. On reference to the Board, the prize was given to the wife of the minister of Dreghorn. At that time the linen manufacture was reported to be in a flourishing condition, and it went on steadily increasing till 1740. During that year the manufacture of coarse linens met with a serious check from the severe frost which prevailed in the winter season. The weavers were badly provided with houses, and were unable to work during the frosty weather. That circumstance, coupled with the high price of provisions, led to many of the men leaving their employment and enlisting in the army. In 1745, L.50 was awarded to John Johnston for the invention of an ingenious method of throwing the shuttle in broad looms. In 1750 premiums for sowing flax-seed were discontinued, owing to want of funds. An Act of Parliament was passed in 1753 giving L.3000 per annum for nine years (in addition to the L.2000 formerly granted) to the trustees, to be applied by them for encouraging and improving the manufacture of linen in the Highlands. No part of the said sum was to be given for any other use than instructing and inciting the inhabitants of that part of Scotland to raise, prepare, and spin flax and hemp, and to weave the same into coarse linens. This was regarded as a judicious act, calculated to wean the turbulent Highlanders from their feudatory propensities, and to impart a spirit of industry to them. With a view to the proper administration of the fund, the surveyor of the Board made a tour of inspection to several districts of the Highlands, and the report he wrote on the condition and manners of the people excited much attention, as it revealed the existence of a state of matters little removed from barbarism. In 1755 the Trustees reported that the cambric manufacture established in Edinburgh by foreign weavers had not succeeded, the prohibition against importing and wearing French cambric having increased smuggling, and thrown great quantities of French cambric into the country duty free. The Trustees opened a Linen Hall in Edinburgh in 1766

for the reception and sale of goods ; and for nearly five and twenty years the hall served its purpose of accommodating the trade. In 1790 a representation was made to the Board to the effect that the manufacturers did not then consider the hall to be any advantage, and therefore it was closed. There were 252 lint mills in Scotland in 1772, distributed as follows :—Aberdeen, 7 ; Ayr, 22 ; Banff, 8 ; Caithness, 1 ; Dumfries, 1 ; Dumbarton, 16 ; Edinburgh, 2 ; Elgin, 3 ; Fife, 11 ; Forfar, 31 ; Haddington, 1 ; Kincardine, 2 ; Kinross, 5 ; Lanark, 31 ; Linlithgow, 4 ; Perth, 73 ; Renfrew, 3 ; Ross, 3 ; Stirling, 28. It was reported in 1773 that several new kinds of manufacture had been introduced—such as the making of gauzes and thread at Paisley ; while the spinning of silk, wool, and cotton, had been considerably extended. In 1787 a premium of L.100 was awarded to Mr Patrick Taylor, Edinburgh, for introducing a mode of figuring linen floorcloth. Many improvements in machinery, &c., are noted, and frequent mention is made of the introduction of the modes or appliances used in other countries. In 1790 a great step in advance was made by Messrs James Ivory & Co., who erected at Brighton, Kinnettles, Forfarshire, a mill for spinning yarn by machinery driven by water power. The trustees resolved to reward the enterprise of the firm by awarding to them a premium of L.300 ; but, in consequence of some matter affecting the patent, they subsequently withdrew the award. In the same year the trustees purchased the vested rights of the foreign weavers in Little Picardy. The weavers had found it necessary, on account of the cambric trade not succeeding, to apply themselves to other occupations. By the close of the century the spinning schools would appear to have accomplished the purpose for which they had been originated, as in the year 1800 the Board refused an application from Sir John Sinclair to have spinning schools established in Caithness, the grounds of refusal being that spinning was then so generally known and so easily acquired as to render schools for teaching it no longer necessary. The awards of the Board were not always made in the strict spirit of the constitution, as in 1802 they gave ten guineas to a man in Alyth “for his ingenuity and industry in weaving with a wooden arm and hand.” The premiums offered to the linen trade in 1807 were for the best and second best ravens-duck, shirting, diaper, huckaback, plain linen, &c. There were eleven prizes in all, and five of the successful competitors belonged to East Wemyss, three to Dunfermline, two to Edinburgh, and one to Culross. It was reported in 1821 that the crop of flax had decreased very much, owing to the low price current. In 1822

the king approved of L.15,000 being expended on building offices for the Trustees at the north end of the Mound, Edinburgh. The building, now called the Royal Institution, was completed in 1828, at a cost of L.20,424. The abolition in 1823 of the law relating to the stamping of linen in Scotland curtailed the functions of the Trustees. The manufacturers had frequently urged the injurious effect of the operations of the Board, and were ultimately successful, as stated, in having all legislative interferences with the trade abolished.

A record is preserved of the quantity and value of linen cloth stamped in each year during which the jurisdiction of the Board of Manufactures extended to the trade. The figures relating to every tenth year up till 1818, as well as those for the last four years in which the stamp-laws were in force, are subjoined :—

Years.	Number of Yards.	Estimated Value.
1728	2,183,978	£103,312 9 .3
1738	4,666,011	185,026 11 9
1748	7,353,098	293,864 12 11
1758	10,624,435	424,141 10 7
1768	11,795,437	599,669 4 2
1778	13,264,410 $\frac{3}{4}$	592,023 5 4 $\frac{1}{2}$
1788	20,506,310 $\frac{1}{8}$	854,900 16 2 $\frac{3}{4}$
1798	21,297,059	850,403 9 9
1808	19,390,497	1,014,629 18 4
1818	31,283,100 $\frac{1}{4}$	1,253,528 8 0 $\frac{1}{2}$
1819	29,334,428 $\frac{1}{4}$	1,157,923 4 11
1820	26,259,011 $\frac{1}{4}$	1,038,708 18 5
1821	30,473,461 $\frac{1}{2}$	1,232,038 15 4 $\frac{3}{4}$
1822	36,268,530 $\frac{1}{2}$	1,396,295 19 11 $\frac{1}{2}$

The above figures show the development of the trade under the encouraging influences extended to it; but the credit does not lie altogether with the Board of Manufactures. The British Linen Company, incorporated at Edinburgh in 1746, did much good by advancing money to the manufacturers, and helping them to dispose of their goods. The company originated with the Duke of Argyll, and other noblemen and gentlemen, who, finding that the linen manufacturers were frequently placed in a position of difficulty by the fluctuations of the market for their goods, and that sales had sometimes to be made under value in order to raise money to meet pressing engagements, resolved to form a company for trading in all branches of the manufacture. With a capital of L.100,000, the subscribers of which were actuated solely by patriotic motives, the company imported flax, linseed, and potashes, which they sold on

credit to suitable persons, afterwards buying at a fair price the yarns and linens made from the material supplied in that way. The company had warehouses in Edinburgh and London, in which they stored their purchases, and thence disposed of them by exportation and otherwise. After a time, the company came to think that they could best promote the branch of industry to which their attention was specially devoted, by advancing money to manufacturers, and allowing them to prosecute the trade on their own account, free from the competition of an incorporated body. The company accordingly suspended operations as dealers in linen, and adopted banking as their sole business. In the latter connection the incorporation still exists, retaining its original designation of "The British Linen Company."

For several years after the repeal of the Act, a system of stamping linen, a system of inspection was in operation; but it was entirely voluntary. The inspectors, in most cases, were the same persons who had acted as stampers under the Act, and so were generally well qualified for the work. Manufacturers either took their cloth to the inspector, or, as was more commonly the case, got the inspector to go to their factories. If the inspector was satisfied with the quality of the cloth he stamped it with his own name. Such a system was liable to abuse, however, and the stamps of the inspectors soon lost whatever value they had. Merchants became better acquainted with the quality of the goods they bought, and were content to deal according to their own judgment, without the intervention of inspectors.

It would appear that linen was an article available in making payments of rent in kind; for the rental lists of the Marquis of Huntly show that in May 1600 the payments of that description included 990 ells of linen. Dressing and spinning lint formed an important part of the domestic duties of the wives of farmers and cottars in those days. In an account of a tour in the Highlands of Scotland made by an Englishman in 1618, it is stated that "the houses of the gentry are like castles, and the master of the house's beaver is his blue bonnet; he will wear no shirts but of the flax that grows on his own ground, or of his wife's, daughters', or servants' spinning; his hose, stockings, and jerkins are made of his own sheep's wool." Sixty years later another visitor wrote:—"But that which employs great part of their land is hemp, of which they have mighty burdens, and on which they bestow much care and pains to dress and prepare it for making linen, the most noted and beneficial manufacture of the kingdom." A third visitor, who came in 1725, wrote as follows:—

“Many of the Scotch ladies are good housewives, and many gentlemen of good estate are not ashamed to wear the clothes of their wives and servants’ spinning.” Among some notes of the manners and customs of the people of Scotland, written by a lady who was born in 1714, is the following:—“Linens being everywhere made at home, the spinning executed by the servants during the long winter evenings, and the weaving by the village webster, there was a general abundance of napery and underclothing. Every woman made her web and bleached it herself, and the price never rose higher than 2s. a-yard, and with this cloth almost every one was clothed. The young men, who were at this time growing more nice, got theirs from Holland for shirts; but the old ones were satisfied with necks and sleeves of the fine, which were put on loose above the country cloth. Table linens were renewed every day in gentlemen’s families, and table napkins were always used. A few years after this, weavers were brought from Holland, and manufactories for linen established in the west. Holland, being about 6s. an ell, was worn only by men of refinement. I remember, in the year ’30 or ’31, of a ball where it was agreed that the company should be dressed in nothing but what was manufactured in the country. My sisters were as well dressed as any, and their gowns were striped linen at 2s. 6d. per yard. Their head-dresses and ruffles were of Paisley muslins, at 4s. 6d., with fourpenny edging from Hamilton—all of them the finest that could be had. At this time hoops were constantly worn four and a half yards wide.”

With reference to the linen trade, Mr Patrick Lindsay, in his book on the “Interest of Scotland,” already quoted, expresses himself strongly on the “woeful neglect” with which it was treated at the time he wrote, in 1733; and he makes suggestions for remedying a state of matters so undesirable. The following extract contains some of his views:—

“If all our spare and idle hands were employed in the linen, and thereby enabled to live comfortably by their own labour, and to bring in a little wealth to the country, the improvement of our other manufactures might be safely left to themselves, for it is more our interest to be served with several kinds of goods from England, so long as they are bought cheaper in England and our linen sells to advantage there, than to be overstocked in any branch of business which we cannot export; and in this our greatest danger lies. Many of our young joiners and other young tradesmen go now and then to the plantations for want of suitable encouragement at home. Were all these supernumerary tradesmen bred to be linen weavers, how

much might this valuable manufacture be increased, by employing in it so many more hands. As manufacture was in no esteem, men of fortune thought it beneath them to breed their children to any business of that sort; and, therefore, since war ceased to be our chief trade, the professions of law, physic, the business of a foreign merchant and shopkeeper, reckoned the only suitable employments for persons of birth and fortune, have been greatly overstocked. Several young men, bred to no business, pretend to turn merchants, and follow trade in the smuggling way, and thereby do great hurt to the fair trader, and to their country, and in the event ruin (for the most part) themselves. After the Revolution many churches continued vacant for several years, and young men were no sooner qualified for the ministry, than they were sure of a settlement; and even too many were admitted (to the discredit of the profession) before they were so well qualified for it as the dignity of the office requires. Our Church livings are but small, and therefore few people of rank or any condition educate their sons for clergymen; whereby these many vacancies were a great temptation, and an encouragement to people of low rank to follow that profession. One bad effect of this way of supplying vacant churches to the public is, that as these clergymen have nothing but their stipends to depend upon, unless they are frugal beyond measure, and parsimonious to a fault; if they have wives and children, these must be left indigent, as burdens upon the public. The case is now much altered as to vacancies, for at present we are so overstocked with young clergymen, that one-half of the probationers who are now candidates for the supplying of churches as they fall vacant can never in reason hope to be provided for. The public suffers greatly under this heavy burden of so many idle and useless hands; and of all professions, an unemployed clergyman is the most helpless and useless member of society. . . . Thus it is evident that every profession, and every trade (except the linen) is, and is very liable to be, overstocked in numbers; but the linen trade, if duly improved, is sufficient to employ our supernumerary hands, and can never be overstocked. . . . The linen manufacture may be brought to as great an extent in value as any other business now carried on in Britain, except the woollen; and it may employ near as many hands as the woollen does. And the linen trade of the north is of as great consequence to the nation in general as the woollen in the south, and equally deserves the same care, countenance, and encouragement from the public."

When the Board of Trustees for Manufactures began operations

in 1727, the manufacture of linen was carried on in twenty-five counties of Scotland, the quantities produced in each varying from 65 yards (valued at L.3, 7s.) in Wigtownshire, to 595,821½ yards (valued at L.13,989, 10s.) in Forfarshire. Perth, Fife, and Lanark came next in order. Subsequently, linen was made in all the counties except Peebles. Forfarshire kept the lead all through, and still occupies the foremost place. In 1822—the last year in which the stamp-laws were in force, and, consequently, the last respecting which any accurate statistics exist—the chief seats of the trade and the quantities of linen stamped were as follow:—Forfarshire, 22,629,553½ yards; Fifeshire, 7,923,388¼ yards; Aberdeenshire, 2,500,403¾ yards; Perthshire, 1,605,321 yards; Kincardineshire, 632,896 yards; Inverness-shire, 318,465 yards; Cromarty, 297,754 yards; Edinburgh, 129,709 yards. During the past thirty or forty years, the manufacture of linen has died out in many towns and villages in which it at one time formed the chief branch of industry, and has been drawn together into the counties of Forfar, Fife, and Perth.

The following notes, drawn chiefly from the "Statistical Account of Scotland," will show how the manufacture was dispersed over the country seventy or eighty years ago; how the people of some districts failed to take it up; and again how it grew and flourished for many years in certain towns in which it is now unknown. Beginning with the "far north," it is recorded that about the year 1790 an attempt was made to introduce the linen manufacture into Shetland, but without success. As the people could purchase linen cheaper than they could make it, they did not take kindly to the new industry; and, besides, their habits and constitutions would appear to have been ill-suited to the vocation, for it is said that "the fair sex were so accustomed to roam about the rocks, that they could not apply themselves with diligence to the manufacturing business; and the constant sitting was said to have brought on hysterical disorders." In Orkney the case was different. The making of linen yarn from home-grown flax was introduced in 1747, and in course of time the trade spread over nearly all the islands. The yarn made acquired a good name in the southern markets, and from 1750 till 1785 about 250,000 spindles were exported annually. After that time the trade gradually declined, and it was abandoned about the close of the century. Weaving was introduced at the same time as spinning, but it never attained much importance. The greatest quantity stamped in any year was under 30,000 yards. The cloth was sold in Edinburgh, Glasgow, and Newcastle, at an average price of eleven pence a-yard. The chief cause of the decline of the trade was the

low price paid by the country agents for spinning and weaving. It is said that latterly the most expert spinners could not earn more than twopence a-day. The substitution of linen underclothing for home-made woollen shirts and vests was alleged to have seriously affected the health of the people, colds and rheumatism having become much more common among them. Before the sea fishing received much attention from the inhabitants of Caithness, and before the now famous pavement quarries of that county were opened up, the making of linen cloth, and other domestic industries, were carried on by the people, but chiefly to supply their own wants. The farmers grew small patches of flax, which supplied the raw material, and in course of time quantities of dressed flax were imported. At Thurso a large number of persons were employed towards the end of last century in spinning flax for the south-country merchants. The Custom-House books show that, in 1794 and the two following years, 253,749 lb. of dressed flax were brought to Thurso, which would produce 162,342 spindles of yarn. The spinners were paid at the rate of 1s. and the agent 2d. a-spindle. From this it would appear that, in the three years mentioned, the total sum paid for spinning, &c., was L.9294, no inconsiderable amount to be set loose in those days in a poor district of the country. In 1851 an attempt was made by Mr Peter Reid, proprietor of the *John o' Groat Journal*, to revive the cultivation of flax in Caithness. Mr Reid erected at Wick a mill for dressing flax by Schenck's process, and with the aid of the Caithness Agricultural Society, got a number of farmers to devote an acre or two of ground to raising flax. He furnished the seed, paid a rent for the ground, and gave prizes to those who produced the heaviest crop per acre. At the time Mr Reid was induced to take up the trade, agricultural affairs in Scotland were not in a prosperous state. Oats could be purchased at 13s. per quarter, and oatmeal at 11s. per boll; and the proposal to cultivate flax was hailed as likely to improve the prospects of farmers. In Aberdeenshire, Fifeshire, and Lanarkshire, mills similar to Mr Reid's were built, and inducements were offered to farmers to undertake the cultivation of flax, and for a time it was thought that matters would turn out advantageously for all concerned. The hopes which had been raised were not realised, however, for in the course of a year or two the price of grain rose, and the farmers refused to have anything more to do with flax, which they considered a troublesome crop, and not so remunerative as they had expected. The failure of the enterprise was a sad blow to the mill-owners, and

in Caithness especially was the subject of much regret, for in that county there is a scarcity of occupation during greater part of the year, and the flax mill was expected to relieve in some measure the overstocked labour market. During the few years that Mr Reid's mill was in operation, the flax scutched at it fetched from L.50 to L.60 a-ton, a higher price than was obtained for flax prepared at mills situated in more favourable localities. About the close of the eighteenth century the spinning of linen yarn from flax imported from the Baltic was carried on in Sutherlandshire, but on a very small scale. Some linen cloth was also woven for home use, and occasionally, when the supply exceeded the demand, a few hundred yards were stamped for sale. In Ross-shire flax and hemp were at one time cultivated. The flax was dressed, spun, and woven to an extent which sufficed for local requirements, and about L.500 worth of cloth was exported annually. The hemp was converted into canvas and cordage for the fishing boats of Avoch and the neighbourhood. Though the trade is now extinct in Cromarty, as well as in the counties mentioned above, it would appear from the stampmaster's returns that the inhabitants were at one time pretty extensively engaged in making linen goods. In 1758 about 7950 yards were stamped; but during the thirty years following there was a considerable falling off, followed, however, by a somewhat sudden and extensive revival. Thus, while the number of yards stamped in 1788 was 4656½, valued at L.186, 8s., in 1822 the figures were—yards stamped, 297,754; value, L.13,461, 17s. At Inverness—a town which possesses great natural facilities for carrying on manufactures, though these have been very little taken advantage of—a large hemp factory was established in 1765, and for some time was so prosperous as to employ 1000 hands. The hemp was brought from the Baltic, and was chiefly converted into sacking and tarpauling cloth, a considerable portion of which was sent to the West Indies to be used in covering bales of cotton. The factory is still in existence, though the business done is not so extensive as it once was. About the year 1780 an enterprising company began the manufacture of linen thread, and for a number of years remarkable success rewarded their efforts. They gave employment to 10,000 persons throughout the county, most of whom worked in their own homes, their labours being superintended by district agents, of whom there were nineteen. The earnings ranged from 1s. to 12s. a-week. The flax was obtained from the Baltic ports; and when the thread was finished, it was forwarded to London, and thence dispersed over the world. The trade was taken up in some other towns, the social

and commercial circumstances of which were more favourable to its prosecution; and many years ago, Inverness retired from competition with them. In the first year following the passing of the Stamp Act, 10,696 yards of linen were stamped for sale in Inverness-shire, and the quantity made increased gradually, until in 1822 it reached 318,465 yards. From that time the trade declined steadily, until it left the county altogether. Nairnshire also figured in the stampers' returns, but to a limited extent, and for a brief period. In the parishes of Elgin and Forres, in Morayshire, flax was grown at a very early date, and in the former it appears that teind was paid on lint in the twelfth century. About 1790 a large number of persons were engaged in spinning flax for the southern markets, and about 50,000 yards of linen cloth were produced annually. A like quantity of cloth was made in Banffshire; but, in addition, nearly 5000 persons were employed in the parish of Banff in making linen thread, in which about 3500 bales of Dutch flax were used every year, and the value of the manufactured article was L.30,000. The thread was sold in Nottingham and Leicester, where it was used in making lace, &c. Competition in various quarters spoiled the trade, and the people took to other kinds of work. In 1748 the Earl of Findlater introduced the linen manufacture into the parish of Cullen. At that time the Earl was President of the Board of Manufactures, and the mode in which he carried out his object is thus recorded:—"The Earl took to Cullen two or three young men, sons of gentlemen in Edinburgh, who had been regularly bred to the business, and who had some patrimony of their own. To encourage them to settle so far north, he gave them L.600 for seven years, the money to be then repaid by yearly instalments, free of interest during the whole period of the loan. He also built weaving shops and furnished every accommodation at reasonable rates. From his position at the Linen Board, he obtained for the young manufacturers premiums of looms, heckles, reels, and spinning-wheels, with a small salary for a spinning-mistress. So good a scheme and so great encouragement could not fail of success, and in a few years the manufacture was established to the extent desired. All the young people were engaged in the business, and even the old found employment in various ways in the manufacture, which prospered for half a century." But Cullen could not escape the influences at work in other quarters, and the trade drooped and became extinct in the early years of this century. The parishes of Keith and Fordyce shared in the prosperity which attended the linen trade, but were as unable to retain it as their neighbours.

The next district to be noticed is that in which the trade has survived to some extent the circumstances which led to its extinction in the counties farther north. Aberdeenshire was early engaged in the manufacture of linen yarn and cloth. About the year 1745 the Board of Manufactures sent a spinning-mistress to Aberdeen, at the request of some persons who desired to provide employment for the working population. Pupils were readily found among the wives and daughters of mechanics and labourers, who soon turned out yarn at the rate of 100,000 spindles a-year, for which they were paid in the aggregate about L.5000. The manufacture of white and coloured linen thread was subsequently begun, and was carried to great perfection. In 1795 the thread manufacture employed 600 men, who earned from 5s. to 12s. a-week; 2000 women, 5s. to 6s.; and 100 boys, 1s. 8d. to 2s. 6d. At the same time upwards of 10,000 women were employed in other parts of the county in spinning yarn for making the thread. Several large manufactories for spinning flax by machinery were established on the Don, near Old Aberdeen, about seventy years ago, and for many years the trade continued in a flourishing condition. At Huntly the trades of dressing flax and making linen cloth were carried on for many years, during the best of which the value of the goods produced was about L.25,000 annually. Peterhead did considerable business in the manufacture of thread. In 1794 there were fifty-two twist mills in the town, at which the yarn spun by women in their own homes was made into thread. About 1200 persons were employed in the various departments of the manufacture. Linen yarn and cloth were made in several other parts of Aberdeenshire. The quantity of linen cloth stamped in the county in 1758 was 103,109 yards. The quantity in any year prior to 1790 did not rise much above these figures; but subsequently a great advance was made, and the quantity stamped in 1822 was 2,500,403 yards. Kincardineshire claims to be the first county in Scotland in which flax-spinning by machinery was established. In 1787 a mill for spinning linen yarn was erected on the Haughs of Bervie by Messrs Sim & Thom, who obtained a license to do so from the inventors of the machinery at Darlington. The mill is still in operation, but the original machinery has given place to more modern contrivances. At Benholm and Auchinblae, in the same county, the linen manufacture still survives, but on a much smaller scale than formerly. 632,896 yards of linen were stamped in the county in 1822.

The early history of the linen trade in the counties of Forfar, Fife, and Perth, in which that branch of industry is now almost entirely

concentrated, will be dealt with when the present condition of the linen manufactures of the country comes to be noticed.

The average quantity of linen cloth made in Kinross-shire, from 1780 till 1790, was 118,434 yards, worth about L.4500. This does not include what was made for home consumption. Between 300 and 400 looms were employed in the trade. The yarn was spun by women, chiefly from flax raised in the county. In 1811 a period of depression of trade was experienced throughout the country ; and the gentlemen of Kinross-shire, with the view of ameliorating the condition of the working population, subscribed L.4000, and began to purchase on their own account and risk, cotton and linen yarn, which they gave out to weavers to be made into cloth. The result did not come up to the expectations that had been formed of the scheme, as the market was overstocked, and the goods could be got rid of only at a losing price. The trade was then abandoned, and has not been tried again. In 1756 the weavers of Kinross formed a trade union, the members of which made themselves subject to stringent laws as to work and recreation. In order to induce all in the trade to become members, it was enacted that "none of the weavers already incorporated, or that may hereafter be incorporated, shall, without the consent of the whole or greater part of the subscribers, have any correspondence with non-subscribing weavers in the way of borrowing or lending any of the utensils of their craft, under pain of incurring such penalties as the incorporated members shall inflict." Small annual payments were made by the members, and breaches of the rules were punished by the infliction of heavy fines. It was usual, on occasions of public rejoicings or fairs, for the president of the society to issue an order enjoining the members to conduct themselves with decorum and sobriety, and to go to their homes at an early hour, under pain of dismissal from the society. The co-operative principle was adopted by the members for maintaining the funds of their union. The records of the society show that sums were advanced to members for the purchase of yarn, which, when made into cloth, was sold ; and whatever profit remained after the cost of the yarn and the labour of the weaver were paid, was returned to the treasurer of the society. The linen trade was several times started in Clackmannanshire, but it does not appear to have attained a sound footing at any period. About the year 1748 the Duke of Argyll introduced the manufacture at Inverary, but it prospered only for a short time. The people of Buteshire also gave it a trial, but without success. In Stirlingshire, from 30,000 to 40,000 yards of linen were made annually

about the beginning of this century, but for many years past no one in the county has engaged in the manufacture. Dumbartonshire produced 310,827 yards of linen cloth in 1758, but after that year the trade declined, until, in 1822, only 11,331 yards were made; and the industry is now extinct. A small quantity of linen was produced in Linlithgow. Mid-Lothian long stood high in the trade, which was chiefly concentrated in Edinburgh, as many as 1500 looms being employed on linens in the city. The manufacturers were famous for making the finest damask table-linen, and linen in the Dutch manner equal to any that came from Holland. So early as 1698 there is mention of a bleachwork having been established at Corstorphine. The following figures show the quantity and value of the linen cloth stamped in the county in the years named:—1728—747 yards, valued at L.198, 17s.; 1738—18,988 yards, L.2986, 11s. 9d.; 1748—236,954 yards, L.9616, 18s. 10d.; 1758—712,719 yards, L.36,132, 16s. 10d.; 1768—389,962 yards, L.32,191, 17s. 6d.; 1778—178,290 yards, L.22,674, 16s. 2d.; 1788—244,710 yards, L.36,338, 1s. 2d.; 1822—129,709 yards, L.22,287, 18s. The price of the cloth made in Edinburgh was always high on account of the fineness of the quality. While the average price over Scotland was about 10d. a-yard, the price of the Edinburgh linen ranged from 2s. 6d. to 2s. 11½d. The manufacture of linen goods has long ceased to rank among the industries of the city. Salton, in Haddingtonshire, is noted as having been the first place in Britain in which weaving of the linen cloth known as “hollands” was established, and the first in which a bleachfield of the British Linen Company was formed. In the beginning of last century the lady of Fletcher of Salton, animated by a desire to increase the manufactures of the country, travelled in Holland with two expert mechanics in the habit of lackeys. Her rank procured her access, with her supposed servants, to the manufactories; and by frequent visits, the secrets of operations were discovered, and models of the various works were made by the disguised artisans. The parish in that way became acquainted with two valuable processes of manufacturing—the making of pot barley, and the weaving of “hollands;” and for several years it supplied the whole of Scotland with those articles. In Lanarkshire linen was manufactured on an extensive scale at Glasgow and East and West Monkland. The trade was established at Glasgow in 1725, and for a long period formed the staple industry of the city. Nearly 3000 looms were in 1780 employed in linen fabrics in the Barony parish alone. Ten years later, however, cotton had almost entirely superseded flax, and the weavers

were mostly occupied in making muslins. At present about a dozen firms are engaged in the manufacture of flax. In 1728 upwards of 272,000 yards of linen were stamped in Lanarkshire; twenty years later the quantity was 1,191,982 yards; in 1768 it was 1,994,906 yards; but in 1822 only 228,692 yards were submitted to the stampmaster. The cotton trade had become the staple of the west, and linen was neglected. Large quantities of linen cloth were made in Renfrewshire. The highest figures are those for the year 1778, when 1,467,935 yards were stamped in the county—being chiefly made in Paisley, where also a large number of persons were engaged in making white sewing thread. The art of making this thread was introduced into the neighbourhood from Holland in 1725, and was carried on for a long time in the family of a lady, who first learned the secret and began the trade. The linen manufacture of Paisley gave way before the introduction of cotton, and was long ago abandoned. Ayr shared in the profits of the linen trade in its early days, but many years since the people took to other pursuits. Kirkcudbright and Wigtown made a small show in the returns; and Roxburgh and Berwick produced from 30,000 to 60,000 yards annually. Melrose was famous for its "land linens" from an early date, and the weavers received many orders from London and the Continent; but the trade began to decline about the year 1770, and never rallied. Linen was a commodity in which a great business was done at St Boswell's fair, held in the parish of that name; but for a number of years past none has been offered, as the trade has died out in the district.

Of 197 flax, hemp, and jute factories ascertained to be in existence in Scotland in September 1867, 176 were situated in the counties of Forfar, Fife, and Perth. This concentration of the trade has, as already shown, taken place in comparatively recent years, and the causes of it are not difficult to discover. The human hand, aided only by the rude appliances of ancient times, can ill compete with modern machinery propelled by steam; and manufacturers in places where circumstances were adverse to the introduction of the tireless agent, naturally found it impossible to succeed in a competition with people more advantageously situated. Hence the spinners and weavers of linen in the outlying districts had to relinquish their wheels and looms, and follow the trade to the absorbing centres, or seek new kinds of employment. The change caused much hardship, and broke up many homes. Not a few of the weavers had been able, in the more prosperous days of

the trade in the rural districts, to acquire little freeholds, on which they lived with their families in the midst of happiness and contentment; and it was a sad day when the failing of occupation compelled the sons and daughters to leave the parental roof and go, it might be, many miles away to find a market for their labour. In the long run, the change has been advantageous to a much greater number of persons than those who suffered by it, and now its effects are almost entirely obliterated, if not forgotten.

The linen and jute manufactures are almost the only branches of Scotch industry dealt with in this book which have previously had their histories written. A few years ago Mr Alexander J. Warden, merchant, Dundee, published under the title of "The Linen Trade, Ancient and Modern," an exhaustive and thoroughly trustworthy treatise on every department of the manufactures referred to, and from a second edition of the work, issued in 1868, some valuable information here embodied has been drawn. Mr Warden gives the following statistics relating to the flax, jute, and hemp factories of Scotland, as existing in September 1867:—

Districts.	Number of Works.	Nominal Horse Power.	Number of Spindles.	Power Looms.	Persons Employed.
FORFARSHIRE.					
Dundee,	72	5,822	202,466	7,992	35,310
Arbroath, &c.,	18	892	36,732	830	4,941
Montrose, &c.,	6	495	33,966	122	2,483
Forfar,	6	232	...	1,401	1,865
Brechin,	4	190	5,400	539	1,322
Carnoustie,	2	84	...	445	650
Total,	108	7,715	278,564	11,329	46,571
FIFESHIRE.					
Kirkcaldy, &c.,	18	909	23,670	1,612	3,887
Dunfermline,	5	410	1,100	1,858	2,410
Leven District,	9	856	32,350	252	3,044
Eden do.,	16	444	10,478	1,271	2,038
Tayport,	3	72	2,000	45	200
Total,	51	2,691	74,658	5,038	11,579
PERTHSHIRE.					
Blairgowrie,	9	562	18,296	393	2,050
Coupar-Angus,	3	62	1,268	224	467
Alyth,	2	42	...	178	315
Perth, &c.,	3	181	1,500	553	908
Total,	17	847	21,064	1,348	3,740

Districts.	Number of Works.	Nominal Horse Power.	Number of Spindles.	Power Looms.	Persons Employed.
GENERAL ABSTRACT					
Forfarshire,	108	7,715	278,564	11,329	46,571
Fifeshire,	51	2,691	74,658	5,038	11,579
Perthshire,	17	847	21,064	1,348	3,740
Kincardineshire,	5	74	2,818	...	120
Aberdeen,	1	785	16,814	428	2,175
Total,	182	12,112	393,918	18,143	64,185
Other Parts } of Scotland, }	15	2,840	93,661	1,774	13,010
Grand Total,	197	14,952	487,579	19,917	77,195

It will be seen from the above figures that Forfarshire has considerably more than half of the entire linen trade of Scotland. Putting Dundee aside for more special notice afterwards, Arbroath claims first attention. Though the conversion of flax into cloth was practised on the banks of the Brothock for a number of years previously, it was not until about 1738 that the trade began to assume importance. The first impulse to the manufacture arose from one of the Arbroath weavers accidentally discovering the mode of making the variety of linen cloth called "Osnaburg," after the place in Germany where it was first made and from which it was imported. The man had worked up a quantity of flax which was unsuited for the kind of cloth then in demand in the home market, and on taking his web to a merchant offered to give him a bargain of it. The merchant recognised the similarity between the web the weaver was disposed to look upon as almost unsaleable and the Osnaburg cloth; and not only purchased the piece, but gave an order for some similar webs. The weaver reluctantly accepted the order, little dreaming what a fortunate discovery he had made. Before many months had elapsed, a large number of weavers in the town and neighbourhood were engaged in the production of Osnaburgs; and thus was laid the foundation of the almost uninterrupted prosperity which the linen manufactures of Arbroath have enjoyed. Soon after the discovery was made, a number of gentlemen of property in the town formed themselves into a company for the manufacture of Osnaburgs and other brown linens. They obtained the best machinery that was then known in the trade; and, by devoting great care to the manufacture, succeeded in producing a better quality of goods of the kind than was made elsewhere, and the brown linens of Arbroath became

famous in the markets at home and abroad. So great did the demand for them become, that most of the weavers in the county, and many beyond it, devoted themselves to making brown goods. In the year 1792 the quantity of Osnaburgs and brown linen stamped in Arbroath was 1,055,303 yards, valued at L.39,660. At that time nearly 500 weavers were engaged in making sail-cloth. Their productions were nearly equal in value to the other linens. In 1740 the manufacture of linen thread was introduced into the district; and, after a run of prosperity extending over nearly half a century, rapidly declined, and became extinct about seventy years ago. Machines for spinning flax had been invented about 1790, but were not brought to any degree of perfection until a number of years afterwards. In 1807 or 1808 a portion of the Inch Flour Mill at Arbroath was devoted to giving the spinning machinery a careful trial. The efficiency of the machines having been established, the flour grinding gear was cleared out, and the entire mill devoted to flax-spinning. Subsequently additions were made, and the mill is still in operation. The experiments at the Inch Mill were watched with much interest; and when their entire success was demonstrated, a change came over the trade, and the erection of factories was proceeded with rapidly. A period of extraordinary prosperity set in about 1820, and continued for five years. What followed is thus recorded by Mr Warden:—"During this halcyon era were erected many spinning and other works of an extent greatly beyond the means of the proprietors, and very much beyond the legitimate requirements of the trade. There was then a plethora of banks in the town, and in their competition for business unwarrantable facilities were afforded to men without capital, and many of them without experience or judgment. The natural consequence followed when, in the beginning of the year 1826 (a year memorable in the annals of the trade for the dire calamity which then burst upon the commercial world), the manufactures of the place were all but unsaleable, money became scarce, credit failed, and almost the whole manufacturing community, adventurer and honourable merchant alike, were engulfed in one common ruin. Almost every mill and factory was silent, distress prevailed throughout the town, and it was some time before Arbroath became its former self again." In 1832 there were sixteen spinning mills in Arbroath and its immediate neighbourhood; but these were not so extensive as those at present in operation. The rates of wages then current were:—Men from 10s. to 15s. a-week; women, 4s. 6d. to 5s. 3d.; boys and girls, 3s. 3d. to 3s. 6d. Ten years later the quantity of flax spun annually in Arbroath was

about 7000 tons, and the value of the yarn, L.300,000. There were then employed 732 linen weavers, of whom a third were women, and 450 canvas weavers, of whom about a fifth were women. In 1851 eighteen firms were engaged in the staple trade of the town. The horse power of their engines was 530; the number of spindles, 30,342; power-looms, 806; persons employed, 4620. These figures show, by comparison with the preceding table, that during the seventeen years ending with 1867, the trade had not increased much. It has, however, been maintained in a healthy state, and the quantity of canvas made in Arbroath annually is about 500,000 pieces.

In the early years of last century an annual market for linen yarn was held at Montrose, and thither manufacturers from the adjoining counties repaired to dispose of their goods. The making of sail-cloth was the first manufacture of any consequence established in the town. It was begun in 1745 by a company, whose success induced others to embark in the trade. The result was that it was overdone, and canvas-weaving became almost extinct. Pennant states that, when he visited the town in 1776, considerable business was being done in the manufacture of sail-cloth, fine linen, lawns, and cambric. He adds that "the men pride themselves in the beauty of their linen, both wearing and household, and with great reason, as it is the effect of the skill and industry of their spouses, who fully emulate the character of the good wife so admirably described by the wisest man." The flax manufacturers of the district readily adopted the machinery which had been invented for spinning, and the first factory was built in 1805. In 1834 there were four large factories in the town, all of which were worked by steam power. Besides these, there were three factories on the North Esk, owned by Montrose firms, and propelled by water. The aggregate spinning power was equal to the production of 1,157,093 spindles of yarn annually. Some of the yarn was woven in the town and district, but the greater part was sold to manufacturers in other towns, or exported. The quantity of canvas and other fabrics made in the town and neighbourhood was then about 50,000 pieces. Though the factories have not increased in number since 1834, the productive power of all has been extended. About 50,000 tons of flax, tow, &c., are used annually. In addition to the persons engaged in the factories, a large number of hand-loom weavers are employed. The chief characteristic of the trade in Montrose is its steadiness, resulting from the caution of the manufacturers.

When the people of Forfar took up the linen trade, they devoted their chief attention to weaving, and to that they have adhered

throughout, obtaining their yarns from other towns which, like Montrose, are for the most part engaged in spinning. In 1792 the linen weaving trade was in a flourishing state in Forfar. The principal kind of cloth made was Osnaburg, and from 15s. to 20s. were paid for weaving a piece of 120 yards in length, which occupied a man eight or ten days, according to his ability and industry. In the early years of this century the quantity of linen stamped in Forfar annually was about 1,800,000 yards; and from 1816 till the abolition of the stamp laws in 1822, it was over 2,600,000 yards. Five and twenty years ago 3000 hand-loom weavers were engaged in weaving coarse linens, of which about 2000 pieces were produced weekly; and the value of the yearly produce would not be less than L.250,000. Since that time the trade has increased considerably. The manufacturers, having found that they could not compete successfully in the markets unless they followed the example of other places and adopted the power-loom, have introduced that machine; and the hand-loom, of which nearly 5000 were in use a few years ago, are being gradually discarded. Upwards of L.100,000 is spent annually in wages among the linen workers of the Forfar district. The linens made are chiefly of the brown kind; and the manufacturers have long been celebrated for the uniform and sterling quality of their goods.

In the parish of Brechin flax was cultivated at an early date; and after the manufacture of Osnaburgs was established in the country, the people paid increased attention to the cultivation of the fibre, and also to working it up into cloth. The quantity of linen stamped at Brechin in the beginning of last century was upwards of 500,000 yards a-year, and in 1818 it reached 750,000 yards. The number of persons employed in the trade at present is less than it was thirty years ago; but the production is much greater, owing to the extensive introduction of improved machinery. The premises of the East Mill Company are very extensive. Though the original building was considered to be a large concern in its day, its bulk is insignificant in comparison with the additions that have from time to time been made. Up till a few years ago all the weaving in Brechin was done by hand, but now there are three power-loom factories in operation. There are two extensive bleach-fields in the town, capable of bleaching about 4000 tons of yarn a-year. The principal fabrics made are bleached shirtings, dowlas, and similar goods.

Kirriemuir, another Forfarshire town which has retained its connection with the linen trade through all its changes, is in the singular position of doing a large and prosperous weaving trade by means of

the hand-loom alone. In 1805, and the two years following, the quantity of linen stamped in Kirriemuir averaged 2,226,200 yards a-year. In 1833 it was calculated that the rate of production had increased to 6,760,000 yards annually; and at present it cannot be less than 9,000,000 yards. About 4000 persons are employed, of whom more than one-half are weavers. The manufacturers are disposed to erect power-loom factories; but hitherto they have been unable to obtain suitable sites. In the local history of the town, the name of David Sands, a weaver of extraordinary ingenuity, who lived about the year 1760, is mentioned. He invented a mode of weaving double cloth for the use of staymakers, and subsequently succeeded in weaving and finishing in the loom three shirts without seam. One of these he sent to the king, one to the Duke of Athole, and the third to the Board of Manufactures.

In various other quarters in Forfarshire, spinning, bleaching, and weaving linen are carried on, but chiefly for manufacturers in the towns mentioned above.

The history of the linen trade in Perthshire differs little from what has been recorded respecting other counties. Blairgowrie is the chief seat of the manufacture—nine of the seventeen firms in the county having their works on the banks of the Ericht at that place. In the end of last century the linen trade was carried on in no fewer than twenty-seven parishes of the county. 477,743 yards of linen cloth were stamped in Perthshire in 1728; 793,228 yards in 1758; 2,651,674 yards in 1778; and 1,605,321 in 1822, the last year in which the stamp-laws were in force. In the New Statistical Account of Scotland a curious remark, emanating from this county, is made respecting the effect of spinning mills on a rural population. The reporter from Caputh (writing so recently as 1839 be it remembered) says:—"Happily for the peace and purity of our quiet rural population, no spinning mills have yet been erected, neither is any great public work going on at present in this parish."

The figures relating to Fifeshire show that, while the number of factories in that county is close upon half the number in Forfarshire, the persons employed show a marked difference in proportion, indicating that the factories of Forfar are, on the average, more extensive than those of Fife. It will also be observed that, in proportion to the spinning power, the number of power-looms at work in Fife is greater than in Forfar—the number of spindles to each loom in the former being about fifteen, while in the latter it is nearly twenty-five. Kirkcaldy is the chief seat of the trade in Fife, and possesses some fine mills. Though the art of making linen was known and prac-

tised in the district about 200 years ago, the quantity produced was insignificant until about 1743, when upwards of 300,000 yards were stamped in the town annually. Kirkcaldy did not make the whole, however, as the figures include the cloth brought in from Abbots-hall, Dysart, Leslie, &c., to be stamped. An annual market for the sale of linen cloth was established in 1739, and various other steps were taken by the magistrates to extend the trade. Handkerchiefs, checks, and coarse ticks were the kinds of goods first made; but the market for these having been spoiled by the war of 1755, which interrupted communication with America and the West Indies, trade became so bad that nearly all the looms were standing idle, and the manufacturers were considering how to employ their capital more profitably. Before abandoning the linen trade, however, Mr James Fergus resolved to try to produce something that would sell in the home market. He studied the making of "ticking," and succeeded in producing a fabric of first-rate quality. This new branch of the trade was readily adopted by the desponding manufacturers, and since then ticking has been one of the principal articles made in the town. Towards the close of last century it was calculated that upwards of 1,000,000 yards of linen, worth about L.50,000, were made annually in Kirkcaldy. In 1818 the quantity stamped in the town (including the produce of the neighbouring towns and villages) was over 2,000,000 yards. About one-seventh of the linen made was from home-grown flax, the remainder being made from flax imported chiefly from Riga. In 1793 three flax-spinning mills were erected at Kinghorn, and two large spinning mills belonging to a Kirkcaldy firm have long been in operation in that town. The number of persons employed in the linen manufacture in Kirkcaldy about seventy years ago was nearly 5000, and their average earnings did not exceed L.7 a-year. The next statement of wages applies to the year 1838, when the net weekly earnings of linen weavers averaged 7s. 3d. for ticks; 5s. 11d. for fine sheeting; 3s. to 6s. 6d. for dowlas; and 9s. 3d. for sail-cloth. In the year 1821 a power-loom factory was built in the town, and is supposed to have been the first establishment of the kind. The late Mr James Aytoun, of Kirkcaldy, made some important improvements in the machinery used for spinning flax, and adapted it to the production of yarn from tow. During the past six or seven years the trade of the district, which had remained almost stationary for twenty years, has been considerably extended, the additions made to the spindles and looms being equal to nearly 100 per cent. There is an extensive linen factory at Dysart, owned by Messrs James Normand & Son.

At Leslie several extensive mills, beautifully situated on the banks of the Leven, give employment to a large number of persons. These mills are owned chiefly by Messrs John Fergus & Co. and Messrs D. Dewar, Son, & Sons, of London. Power-loom factories have recently been erected at Tayport, Auchtermuchty, Falkland, Kingskettle, Ladybank, Strathmiglo, and elsewhere in Fife, all indicating that the trade of the county is in a healthy state.

Dunfermline is the chief seat of the manufacture of table linen in Britain—indeed, it may be said, in the world. When the linen trade was established throughout Scotland in the beginning of last century, the people of Dunfermline shared in its profits, and always aimed at the production of a high class of goods. They were most successful in making table linen, and to that branch they have mainly adhered. Long ago they had outstripped all competitors in their staple industry, and the produce of their looms has for many years graced the tables of royalty at home and abroad. At the Exhibitions of 1851 and 1862, the goods shown by Dunfermline manufacturers attracted much attention, and helped to extend their fame.

In the early days of the linen manufacture only coarse goods were made in Dunfermline—first the variety known as “huckaback,” and subsequently “diapers.” The weavers appear to have been rather fond of trying the more difficult kinds of work, and some of them adapted their looms to producing novel patterns of cloth. Great ingenuity was also expended in weaving articles of dress without a seam. In 1702 a weaver in the town made a seamless shirt in the loom, and a like feat was afterwards successfully accomplished by others. Two of those novel productions are worthy of mention. In 1821 Mr David Anderson completed in the loom a gentleman's shirt elaborately ornamented. It was of very fine linen, and bore on the breast the British arms, worked in heraldic colours and gold. For the accomplishment of the work he received L.10 from a fund which had been formed in Glasgow for the encouragement of inventions and improvements in manufacturing. The shirt was presented to His Majesty George IV., who was graciously pleased to accept it, and to order L.50 to be sent to the maker. Mr Anderson subsequently wove a chemise for Her Majesty Queen Victoria. It was composed of Chinese tram silk and net-warp yarn, and had no seams. The breast bore a portrait of Her Majesty, with the dates of her birth, ascension, and coronation, underneath which were the British arms and a garland of national flowers. The flag of the Weavers' Incorporation is also a remarkable piece of work. It con-

sists of a solid body of silk damask, bearing a different design on each side, and yet both are interwoven.

Damask weaving was introduced into the town in 1718, and the story of its introduction is somewhat curious. Mr James Blake, a man of ingenuity and enterprise, went from Dunfermline to Drumsheugh, near Edinburgh, where damask weaving was carried on. The process of weaving was kept a close secret; but Blake was determined not to be frustrated in his mission, which was to find out the secret and work it for his own advantage. Feigning to be of weak intellect, he lounged about the workshop in which the damask looms were employed, and ultimately ventured in. The expression on his countenance when he saw the looms was so full of puzzled wonder that the weavers allowed him to gratify his curiosity by minutely examining the machines. He asked to be allowed to creep under one of them that he might more closely watch its mysterious working. This odd fancy of an idiot, as the workmen believed him to be, caused some amusement; but no one objected to him going under the loom. While the weavers were smiling at his bewildered stare, Blake was carefully noting in his mind the manner in which the mechanism was arranged and how it operated. He appeared to be fascinated by the looms, and was in no haste to go away. When he did leave, however, he was in full possession of the secret. Returning to Dunfermline, he at once began to construct a loom from memory, and soon had the gratification of possessing a perfect machine. He had a workshop in the old tower of the Abbey, and there, in company with one or two faithful assistants, he devoted his whole time to making damask goods, keeping well the secret which he had become possessed of in such a singular way. It would appear that he was more successful in maintaining the secret than the weavers of Drumsheugh, for his loom was the only one of the kind in the town for many years. After the principle of the damask loom became generally known, however, it was not readily adopted, the machine being costly and difficult to work. Fifty years after Blake had set up his machine, there were only ten or twelve damask looms in Dunfermline; and ten years later, in 1778, the number did not exceed twenty. Three persons were required to work the loom at first—two weavers, one at each side, to throw the shuttle and move the “lay,” and a boy to work a series of cords which raised the warp threads necessary to produce the design. Sometimes one man undertook to work a web two yards wide without an assistant, and in that case he had to rush from one side of the loom to the other continuously in order to keep the shuttle

going. That was a laborious mode of working; but it was more profitable than the other system, as, though a smaller quantity of cloth was produced in a given time, that shortcoming was more than compensated for by saving the wages of an assistant.

An important improvement was made on the damask loom by Mr John Wilson, of Dunfermline, who devised a mechanical arrangement which dispensed with the services of the draw-boy. The value of Mr Wilson's invention was publicly acknowledged by his being made a Burgess of the town in 1780; and a further reward was conferred on him by the Board of Manufactures, who presented him with £20. As damask was then woven, it was necessary that the weavers should commit to memory the details of the patterns; and when a loom was changed from one design to another, the workmen had to devote four or five days, to getting the new pattern by rote. An error of memory was unfailingly registered in the cloth; and as the value of the piece was thereby deteriorated, only persons who had good memories, and who took great pains to learn the patterns, could pass as efficient workmen. Subsequently an invention was made which rendered it unnecessary to trust to memory for the proper working of the design. The new apparatus was known as the "holey-board." In 1803 Mr David Bonnar obtained a patent for what he called a "comb draw-loom," which had the effect of still further simplifying the operations of the damask weaver. The trade gradually increased under these various improvements in the weaving machinery; but it received its greatest impulse from the introduction of the Jacquard machine in 1825. By the year 1830 that machine had come into general use. The advantages derived from the Jacquard machine are numerous; but the most important are that the facility of production enables the damask manufacturer to sell his goods at a lower price per yard on the average than was formerly paid for weaving alone, taking into account also the reduced price of the raw materials, and that there is no limit to the variety of designs that may be produced. The designs of the damask made by the old process were crude and indistinct, but by means of the Jacquard machine the greatest distinctness of outline and delicacy of detail have been attained. The Jacquard machine makes every thread of warp and weft play its part in the design; but by the "draw" system the pattern was brought out by moving four or five threads at a time; the result is that the old damask looks as if the design were worked in mosaic, each spot being a square equal to the thickness of four or five threads, and in some cases even more. A

change of design was a serious matter for the weaver before the Jacquard machine was introduced, as the mounting of a fresh pattern occupied five or six weeks, and during that time he received no remuneration.

When the damask trade had become fairly established in Dunfermline, the manufacturers received orders from noblemen, bishops, and private gentlemen, for sets of table linen bearing their coats of arms, &c. His Majesty William IV. was their first royal customer, and Queen Victoria had some linen made for her household in 1840. Since the latter date many orders have been received from royal personages at home and abroad. Great attention has been paid to the designing department of the trade, which has more than kept pace with the mechanical improvements. In 1826 a drawing academy was established in the town, with the view of teaching young men the principles of drawing, and fitting them to fill the office of designers. The institution did not succeed, and was given up in 1833. Some designers of eminence were trained, however, and good resulted to the trade generally. The academy was supported at the joint cost of the Board of Manufactures and the manufacturers of the town, who expended L.126 on it annually. The Board also gave premiums for excellence of design in damask goods, and one firm received L.516, 10s. in premiums of that kind in eighteen years. Thirty years ago an export trade to America was opened up by the manufacturers, and about L.150,000 worth of damask goods found a market in the United States every year. The Americans have ever since been good customers.

The largest factory in Dunfermline, and the most extensive of the kind in Britain, is the St Leonard's Power-Loom Factory, which belongs to Messrs Erskine Beveridge & Co. The factory is beautifully situated on the south side of the town, and is in every respect a model establishment. The main building is but one storey high, and the roof consists of a series of ridges. Externally, the place is unpretending enough, but there is an air of tidiness and cleanliness in all its accessories which impresses one favourably. The coarser sorts of yarn used in the factory are brought from Dundee, Kirkcaldy, &c., and the finer sorts from Yorkshire and Ireland. Some of the yarn is received in a brown state, some bleached, and some dyed. Many tons are kept in stock in rooms set apart for the purpose. The yarn is given out in hanks to the winders, who, by the use of simple but ingenious machines, wind it on bobbins for the use of the warpers, or on pirns for the weavers. The warpers take a certain number of bobbins and arrange them in a frame. The

threads of the bobbins are then led to the warping-machine, in which they are arranged side by side, and wound with equal strain upon a roller. One of the great difficulties that had to be overcome by the inventors of the power-loom was the tendency which the rapid and somewhat violent motion had to soften and break the warp. That difficulty was removed by "dressing" the warp with paste, and for performing that operation a machine was devised. After the yarn has been wound upon it, the roller is taken to the dressing-machine. The yarn is led between a pair of cylinders, one of which revolves in a bath of paste made either of flour or of Irish moss; it then passes over a number of cylindrical brushes, which smooth down the fibres and remove the superfluous paste; next it is brought into contact with a large cylinder heated by steam; and having been thus thoroughly dried, is wound upon the beam of the loom. Before the warp is placed into the loom, however, a preliminary operation is necessary. The threads have to be drawn through the "heddles" and the "reed," and then the beam is placed into the loom.

In following the warp to the loom, it is necessary to enter a workshop, the floor of which is covered by machinery, while overhead the eye gets lost in a maze of belts, shafts, and other mechanism, the motion of which makes one giddy, while the noise closely resembles the roar of a great waterfall with a metallic tinkle superadded. In this workshop, which is nearly 700 feet long by 160 feet wide, 900 power-looms are at work. Each large loom and each pair of small looms is attended by a young woman. The looms are prepared and kept in order by mechanics and tenters, each of whom has charge of a certain number of looms. The tenters take off the finished webs and put on fresh warps, and the mechanics look after the working portions of the apparatus. The looms employed in weaving damask are each fitted with a Jacquard machine, that beautiful contrivance which, next to the loom itself, is perhaps the most important invention ever made in connection with textile manufactures. The Jacquard machine was invented in the year 1800, and was at once adopted by the silk and muslin weavers of France, as it enabled them to introduce unlimited variety into the figuring of their goods.

In the St Leonard's factory the capabilities of the Jacquard machine are admirably illustrated. Each loom seems to be producing a pattern different from all the others, and yet the beauty and elegance of the designs are nearly equal. Some of the table-covers made bear the arms and insignia of the persons for whom they are intended, while others display designs of exquisite beauty,

composed of flowers, shields, &c. A somewhat coarse variety of table linen worked in brown and white yarn is made in large quantities for the American market; but the chief produce of the establishment consists of the finest quality of white table linen.

Most of the designs are made by Mr Joseph Paton, the father of Sir Noel Paton, the celebrated Scottish artist; and that gentleman has done more, perhaps, than any other to maintain the fame of the local trade. His fine artistic taste and thorough knowledge of the capabilities of the material that he has to work upon have enabled him to produce designs which for elegance and appropriateness are unsurpassed. It would appear that taste in the matter of table linen changes as frequently as taste in matters of dress, and that the favourite design of to-day may be a drug in the market next month. At one time a stately classical style is in vogue, at another nothing but florid Italian will sell, and with the next change perhaps the public taste may be met by a bit of modern device. Sometimes the centre of the cloth is filled with elaborate work, and the border treated in a simple way. Again, the centre is plain, or dotted over with leaves, and the border is composed of a broad band of flowers, &c.

The designs are drawn on paper, the surface of which is divided by lines into minute squares, each square representing a loop of the fabric. The paper bearing the design is taken to the card-maker, who, by means of a curious little machine, punches in a piece of card-board a series of holes corresponding with the design. The cards are attached to the loom, and serve to guide the apparatus through the pattern. The holes in each card relate to one throw of the shuttle, so that a card is required for every thread of weft that goes to make up a table-cover. As many as 50,000 cards have been used in making one piece of damask. When the design is transferred to the cards all trace of it is lost until it reappears in the web on the loom; for the holes in the card convey no idea whatever of the drawing.

Most of the white goods are sent to Perth to be bleached, there being no convenience for conducting that operation at the factory. The bleaching is followed by hot-pressing, which gives a beautiful "finish" to the cloth. Goods that have not to be bleached are calendered on the premises. The "lappers" receive the goods from the finishers, fold them up, and prepare them for the market. These operations are carried on in the warehouse, a stately detached building in the Italian style of architecture, and three storeys in height. The main entrance of the warehouse opens on a spacious hall paved with

ornamental tiles, and otherwise decorated. On the ground floor are the counting-room, manager's offices, and the packing-room, while the floors above are occupied by a series of large halls, fitted with enclosed shelving for storing goods, and tables for exhibiting them upon. The whole place is handsomely fitted up.

In addition to the 900 power-looms in St Leonard's factory, Messrs Beveridge & Co. employ 180 hand-looms in a separate workshop. Altogether they give employment to about 1500 persons, of whom about ninety per cent. are females. The quantity of linen made by the firm averages about 200,000 square yards a-week, so that the yearly produce, supposing the average width of the web to be one yard, amounts to 10,400,000 yards, or upwards of 5900 miles, which would be sufficient to cover a board at which the entire population of Scotland and Ireland might dine at one time. The value of the cloth made is about L.360,000 a-year, and the price per yard ranges from 5d. to 5s. The women and girls employed in the factory earn from 4s. to 15s. a-week, and the men from 10s. to 40s. Many of the women and a few of the men live at a considerable distance, and, when they go to work in the morning, take their day's provisions with them. Two large dining-halls are provided for their accommodation at meal time. These are comfortably fitted up, and adjoining them is a large stove for warming food. Provision is also made for the education of the children of the workpeople. A school-house has for many years been in existence in connection with the factory. The school is open to the public generally, but there is this difference—while the children of persons connected with the factory are charged only half the established fees, other children have to pay full. There are usually about 300 children in attendance.

Next in extent to St Leonard's is the Bothwell Power-Loom Factory, built about five years ago by Messrs D. Dewar, Son, & Sons, of London. It has accommodation for 580 power-looms, but only 470 have yet been set up. Upwards of 500 persons are employed. The goods made are similar to those produced at St Leonard's. Two other factories have recently been erected—one for Mr Alexander, fitted with between 400 and 500 power-looms; and the other for Messrs Inglis & Co., with about 300 power-looms. Messrs Andrew Reid & Co., and Messrs Henry Reid & Son, who have long been engaged in the trade, have made considerable additions to their factories, which now contain about 300 power-looms each. There is another power-loom factory occupied by Messrs Hay & Robertson, but it is of small extent compared with those mentioned. In Mr Darling's factory there are 180 hand-looms.

It is calculated that there are scattered throughout the town and suburbs from 600 to 700 hand-loom, which, with those in the factories of Messrs Beveridge and Mr Darling, give a total of, say, 1000 hand-loom at present in operation. The total number of power-loom is 2670, and the quantity of cloth made annually by hand and power is over 30,000,000 square yards, which, formed into a web of the uniform width of one yard, would measure the distance between Great Britain and New Zealand, with a thousand miles or so to spare. There is more linen cloth manufactured in Dunfermline than was made in all Scotland in any year preceding 1822, and the value of the goods produced cannot be much under L.2,000,000 a-year.

Mr Balfour, the designer at the Bothwell factory, produced a piece of work about ten years ago which excited much attention. It was styled "the Crimean Hero Tablecloth," and many copies of it were supplied by Messrs Dewar to royal and other orders. The cloth was pronounced to be the greatest achievement in damask work ever accomplished. It is thus described in Chalmers's "History of Dunfermline:"—

"The designing and executing of the work occupied about eight months, and occasioned an outlay of nearly L.600. The cloth was inspected and greatly admired by the Queen and Prince Albert at Balmoral, as also by the Emperor and Empress of the French at Paris, who gave an audience to the proprietor, introduced to their majesties by the Earl of Clarendon. Orders were given for the imperial as well as royal tables. The cloth is composed of the finest linen warp and white silk weft, six and a-half yards in length, and three in breadth; but when wrought for sale, it will consist of linen only. The pattern consists of a beautifully elaborate leafy scroll-work for border, in which, at proper intervals, are inserted twenty-four faithful portraits. In one end-border are Her Majesty Queen Victoria in the centre, and on either side the Prince Consort and the Duke of Cambridge. In the other end-border are the Emperor Napoleon in the centre, and on either side the Empress Eugenie and Prince Napoleon. In the centre of one of the side-borders is placed the King of Sardinia, and on either side Bosquet, Brown, F. Nightingale, La Marmora, St Arnaud, Cardigan, Raglan, and Bruat. In the other side-border, the Sultan in centre, with Omer Pasha, Williams, Canrobert, Evans, Campbell, Pelissier, Lyons, and Simpson, on either side. Each portrait of the sovereigns is surmounted with their respective armorial bearings, placed towards the middle of the cloth; and alternately with these are trophies containing the

names of the chief battles, with their dates—Alma, 20th September 1854; Balaclava, 25th October 1854; Inkermann, 5th November 1854; Tchernaya, 16th August 1855; and in the centre of the cloth there are magnificent trophies illustrative of the fall of Sebastopol, with the motto, *Deus proteget justitiam*, and the date 8th September 1855—the ground around all of these being interspersed with the stars of the orders of the different sovereigns. In the corners of the border are the standards of the four powers rising from behind a shield containing their insignia united—the Rose, the Fleur-de-lis, the Crescent, and the Cross. An idea may be formed of the extent of the design by persons acquainted with the nature of the work, when it is mentioned that there were 50,000 cards, and seven 600-cord Jacquard machines employed in forming the pattern on each loom. These machines required to be kept in operation at the same instant, and the whole was put in motion by a single movement of the foot. The web was 1600 threes in the reed, equal to 4800 threads upon the yard, and which, again, multiplied by three, the number of yards in the breadth, gives the total number of threads in the breadth to be 14,400.”

Dundee is the metropolis of the linen trade, and till recently had a monopoly of the manufacture of jute. The perfection to which the latter branch has been brought by the enterprise and ingenuity of those engaged in it is remarkable, considering the comparatively brief period which has elapsed since the fibre was introduced. Capitalists in Dundee had for many years shown a disposition to make the place a seat of manufactures; but though they tried to establish a permanent trade in various articles, they had little success until they turned attention to working in flax. The date at which the manufacture of linen cloth was begun in Dundee is not known; but it is recorded that at the time of the union of England and Scotland 1,500,000 yards of linen were made in the town annually. Then, as now, the chief fabrics were of the coarser kind. A writer in the “Gentleman’s Magazine” in 1742, described the linens of Dundee as being the “poorest and meanest;” but whatever truth may have been in that remark at the time it was written, it certainly could not hold good in recent years. In the account which Pennant gives of his tour through Scotland in 1776, it is stated that Dundee used to be celebrated for the manufacture of “plaiding,” which was exported undressed and undyed to Sweden and Germany for clothing the troops of those countries; but that trade was superseded in 1747 by the manufacture of Osnaburgs, which became the staple trade of

the county of Forfar. In 1789 there were made for sale and stamped in the parish of Dundee 3,181,990 yards of coarse linen, valued at L.80,587. Besides a large share of the above, there were made in the town of Dundee upwards of 700,000 yards of sail-cloth, valued at L.32,000, and esteemed to be superior in quality to any made elsewhere in Britain. The manufacture of cotton was introduced about the year 1790, and several companies engaged in it; but the trade survived for a few years only. During the latter half of last century a considerable trade in the manufacture of coloured sewing thread was carried on in the town. There were seven companies or masters engaged in it, who owned sixty-six twisting-mills, and employed upwards of 1700 persons. 269,568 lb. of thread, valued at L.33,696, were made annually. The writer of the report on Dundee in the Statistical Account of Scotland (1792) says:—"The particular cause of the increase and prosperity of Dundee is undoubtedly the bounty allowed by Parliament on linen manufactured for exportation. By that the industry of the inhabitants was first set in motion and encouraged; and their consequent prosperity, if it be not an evidence in favour of bounties in general, is at least a decisive one that in some cases they are wise and judicious, and may be productive of the greatest benefit."

Whatever effect bounties may have had on the trade in its early days, the present extent and prosperity of the staple industry of Dundee is principally owing to the perseverance of the manufacturers in adopting and improving machinery for superseding hand labour, cheapening production, and improving the quality of the work. Up till the beginning of the present century, all the yarn used was spun by hand chiefly by persons residing in the country districts; and on the market-days the housewives brought the produce of their spinning wheels into Dundee for sale. The manufacturers went to market and bought what yarn they required. Great difficulty was experienced in obtaining any considerable quantity of yarn of similar size and quality, and that defect considerably interfered with the operations of the manufacturers, and caused them to lose much time. The first step taken to remedy that state of matters was the appointment of agents, who travelled through the district and purchased the yarns from the people, carefully selecting and separating the various sizes and qualities. Those agents also got flax from the manufacturers in the town, and employed persons to spin it. The system continued in existence until about forty years ago, when the spinning machinery, which had been introduced, kept the looms fully supplied with yarn.

Flax-spinning by machinery was first tried in Dundee, in a small mill built at Chapelside, by Messrs Fairweather & Marr, about the year 1793. The machinery was propelled by a ten horse power steam-engine. A second mill, of about the same extent, was built soon afterwards; but though both were kept going for some time, the element of success was wanting, and the enterprise was abandoned for a time. In 1798 five spinning mills, having an aggregate of sixty horse power and 2000 spindles, were erected in various parts of the town. One of these—the Bell Mill—was considered to be a gigantic concern at the time, the building and machinery having cost about L.17,000. The early years of this century were disastrous to the trade, owing to the foreign markets being in a state of stagnation, arising from political complications and war. In 1811 only two spinning mills continued in operation, and the Bell Mill, which had come to a stand, was offered for sale. Between that time and the year 1822 a great change took place in the district. In 1822 seventeen flax-spinning mills were in operation in Dundee, all of which were driven by steam-engines, representing in the aggregate 178 horse power. About 2000 persons were employed, and the number of spindles going was 7944. In the neighbourhood of Dundee there were thirty-two spinning mills, containing 6978 spindles. The mills in operation in Dundee and neighbourhood in 1832 were driven by engines of 800 horse power, and the yearly consumption of flax was 15,600 tons, which produced 7,488,000 spindles of yarn. 3000 persons were employed, and the capital invested in machinery was estimated at L.240,000. In 1846 there were thirty-six spinning mills in Dundee, with a motive power equal to 1242 horses, while the number of spindles was 71,670. Five years later the number of factories was forty, but some of these were devoted to power-loom weaving.

Experiments were made with the power-loom in Dundee so early as 1821, but the result does not appear to have been favourable to the introduction of that machine. Messrs W. Baxter & Son built a factory in Lower Dens, into which they proposed to introduce ninety power-looms; but they appear to have had misgivings as to the practicability of weaving by power, and did not carry out their intention. In an account of Dundee written in 1833, it is stated that "power-looms have not been employed here, or at least not to any advantage, and they are understood to be entirely laid aside." In 1836 Messrs Baxter built a power-loom factory at their Upper Dens Works, and that was the first establishment of the kind in Dundee. Three other power-loom factories were erected soon

after, but for a considerable time there was no addition to the number.

The linen trade of Dundee has passed through a series of crises which threatened its destruction; but it has survived them all, and is at present in a healthy state. In 1810 the price of flax suddenly fell from L.150 to L.80 a-ton, and the effect on the manufacturers was most disastrous. Many of them were ruined; and during the succession of violent fluctuations which occurred in the six following years, few of those who withstood the first convulsion were fortunate enough to escape bankruptcy. The stopping of the machinery threw many workpeople idle, and great distress prevailed in consequence. Had this state of matters continued much longer, it is not improbable that the trade would have been abandoned; but, fortunately, a brighter day dawned for the manufacturers, and for seven or eight years preceding 1825 they enjoyed a period of prosperity, which helped to repair their shattered fortunes, and gave them hopes of better things to come. In the autumn of 1825, however, the trade was completely paralysed by the commercial panic which broke out in London, and rapidly spread over the country. The tide of prosperity suddenly turned in Dundee, and again many firms had to suspend payment. The stagnation of business became so serious, that the Government were induced to lend a helping hand to the merchants of the town, to whom they granted Exchequer bills for goods deposited. That aid was timely, and some of the most extensive merchants availed themselves of it. In 1827 a revival of the trade with America took place, and things began to mend. Great quantities of bagging for packing cotton, &c., were made for the United States, and from that article handsome profits were realised. In 1832, the last year in which bounties were paid on goods exported, the value of the linen sent out from Dundee amounted to close upon L.600,000, on which the manufacturers received L.46,854 of bounty. A fire which occurred in New York in 1835 was the cause of the next check which the trade received. A great quantity of bagging had been consumed in the conflagration, and the manufacturers of Dundee were hopeful that an opportunity had occurred for profitable exertion. Most of the machinery was set to work to produce bagging, and the result was that the supply far exceeded the demand, and the market was spoiled. Some of the goods sent out lay in store for years, and the price ultimately obtained entailed serious loss. Again a number of the merchants and manufacturers became insolvent. In order to save the trade from ruin, the banks opened warehouses, and received goods in deposit,

on which they advanced money. After a little time the trade rallied, and continued in a fair state of prosperity until 1847, when it was seriously affected by the crisis brought about by over-speculation in railways. The experience of the linen manufacturers of Dundee goes to prove that the calamity of war may directly promote the arts of peace, for they profited largely by the demand created for their goods, first by the Crimean and subsequently by the American war. In the former case, however, some of them did not act judiciously, for instead of regarding the demand created by the war in the East to be a temporary one, they would appear to have looked upon it as permanent, since they sunk a great deal of capital in extending their factories. When peace was declared, those who had acted thus found out their mistake, and were unable to keep the whole of their machinery going. The American war was the most fortunate event that ever occurred for the linen manufacturers of Dundee. Both armies became extensive customers, and for three years the factories were kept fully employed. Great wealth was realised, and the stability of most of the firms was so well secured by the accumulation of capital, that they are not now likely to sink under fluctuations of trade which would otherwise have ruined them.

Before proceeding further, mention must be made of the introduction of jute, which has had a most beneficial effect on the trade of Dundee. Jute is the fibre of plants of the *cochorus* order, which are common in almost every part of India. In the end of last century the East India Company caused inquiry to be made throughout their vast territory with the view of discovering a substitute for hemp. Among the specimens sent to this country was a quantity of jute, but no particular notice appears to have been taken of the material. Small parcels were sent on several subsequent occasions, and at length some of it fell into the hands of manufacturers at Abingdon, Oxfordshire, a town famous for its sacking, twines, &c., by whom it was spun into yarn, and used in making carpeting. Subsequently, about the year 1824, a bale or two of jute was sent to Dundee, to Mr Anderson, a linen manufacturer. He got his mother, who was an adept at the spinning wheel, to make a trial of spinning it, but she did not succeed to her satisfaction. Mr Anderson seemed to recognise the value of the fibre, and made numerous experiments with it, but without much success, beyond producing a coarse yarn suited only for sacking. The new material was regarded with suspicion by the public, and goods suspected to contain jute were difficult to dispose of. In 1822 Mr Thomas Neish, merchant in Dundee, got a small consignment of jute from London, and tried to get some of the

manufacturers to spin it, but none of them would make the attempt ; and, after lying aside for four or five years, the jute was sold for the purpose of being made into door-mats. Ten years after receiving this parcel of jute, Mr Neish got another consignment, which was again offered to the manufacturers in vain. After being much pressed by Mr Neish, Messrs Balfour & Meldrum reluctantly resolved to make experiments with the fibre. Success attended their efforts, and the foundation of the jute trade in Dundee was laid. Mr James Watt, another merchant in the town, rendered great service in bringing jute into favourable notice. For the first year or two after the possibility of spinning jute had been demonstrated, the manufacturers did not spin it pure, but mixed it with flax and tow. In 1835, however, pure jute yarn was made and regularly sold in the market. The raw material could be bought in 1833 for L.12 a-ton ; but four years afterwards, when the value of the fibre had to some extent been recognised, the price was L.22 to L.23. The growth of jute in the popular favour will be best shown by the increase in the quantities imported into Dundee in successive years since 1838 ; and for the sake of comparison, the quantity of flax, tow, and hemp imported in various years since 1815 is also given—

JUTE.		FLAX, TOW, AND HEMP.			
Year.	Tons.	Year.	Tons.	Year.	Tons.
1838	1,136	1815	2,187	1848	30,585
1848	8,905	1820	4,958	1853	47,113
1853	15,400	1825	13,902	1858	25,842
1858	30,086	1830	20,496	1863	28,988
1863	46,983	1835	27,130	1865	44,821
1865	71,702	1837	15,237	1867	41,409
1867	63,674	1838	30,850	1868	36,712
1868	58,474	1843	26,268		

The present annual consumption of flax in Dundee is estimated to be about 28,000 tons ; of hemp, about 1500 tons ; and of jute, about 60,000 tons—in all, 90,500 tons ; so that in half a century the quantity of raw material used has increased fully fortyfold. It may be mentioned that all the jute is imported from Calcutta. Formerly it was sent through London and Liverpool, but considerable quantities are now brought direct into Dundee as well as into Greenock.

Mr Warden thus describes some of the qualities of jute :—“ It is one of the most easily dyed fabrics known, and the colours it takes

on are bright and beautiful. The common dyes are quickly applied, but they are very fugitive, and when exposed to the sun's rays soon become faint and dull. By the common process the colouring matter strikes little more than the outside of the fibre, and, as it were, paints it; and this mode of dyeing requires little material, and is done at small cost. The fibres of jute do not subdivide so minutely as those of flax, and they are of a hard, dry nature, and to a considerable extent impervious to moisture. It therefore requires a more complex process to make the colouring materials thoroughly penetrate the fibres so as to make the dye lasting. This can, however, be accomplished, and the better class of goods made of dyed jute undergo this process, which makes the colours both brighter and faster. It is hardly possible to make every colour perfectly fast, although some of them are as durable as those upon other materials. Jute is very readily brought to a rich cream colour either in the fibre, in yarn, or in cloth. It is, however, very difficult to bring it to a full white without injuring the strength of the fibre. Many experiments have from time to time been made to bleach jute, but at best they have been only partially successful, and it may be said that a perfect white has never yet been attained without impairing strength. Fresh sound jute of fine quality can without danger be brought to a moderate degree of whiteness; but as the fibre gets older, exposure to the atmosphere changes it to a browner tinge, and it then becomes more difficult to bleach. The slightly nature of jute, the regular even thread which by the improved machinery is formed of it, and the smooth, tidy, and clean appearance of jute cloth, are all pleasing to the eye, and therefore attractive. These qualities, combined with its cheapness, have served to recommend it to consumers, and bring it into general use. Now, instead of being used stealthily by spinners, as of old, it is the only material spun in a large proportion of the factories, and to a greater or less extent it is used in every establishment in the town."

The effect of the introduction of jute on the linen trade of Dundee is shown in the following passage from a paper read before the Social Science Association at Edinburgh in 1863, by Mr Robert Sturrock, Secretary of the Dundee Chamber of Commerce:—"By the introduction of jute into the linen trade great changes have been brought about. In place of sackcloth, bagging, and other coarse fabrics being made from hemp, hemp codilla, flax codilla, and coarse tows, they are all now entirely made from jute, and some of these raw materials are not now known in the trade. Though much the same quantity of flax and tow is now imported as many years ago,

the real linen trade is in this way supplemented, the quantity formerly required in the coarser branches being now available for other purposes. On the first introduction of jute, it was only used for fabrics of the coarsest description—in fact, it was then considered that it never could be used otherwise; but from the improvements in machinery, and from gradually increasing experience, this has been found to be erroneous. The more common descriptions of Osnaburghs, sheetings, and many other fabrics, are now manufactured solely from it; or these goods, in place of being made of flax or tow as formerly, are now composed partly of tow and partly of jute. Fine goods are also manufactured from a combination of jute and cotton. In this manner has the linen trade again been most largely supplemented. The jute trade has increased so rapidly, and the goods made from the fibre are now so highly appreciated over the whole world, that, looking to the future, one is entitled to say that in extent it will probably only be rivalled by the cotton manufacture. The packsheet, baggings, sackings, sacks, and woolpacks of Dundee, are used in almost every quarter of the globe. When I state that they are by far the cheapest manufactures of this description that can be made from any raw material, it will be no matter of surprise though this trade still continues to advance with great strides. There is still one fabric worthy of particular notice, which owes its existence solely to jute. It is the manufacture of jute carpets. These have nearly the appearance of carpets made from wool; and though they are neither so durable nor retain their colour so well, still, when I state that the cost varies from 6d. to 1s. 4d. a-yard, it is not remarkable that they should be greatly used. Rugs, in imitation of wool, are also manufactured from the same material. The reporters appointed by the jury on jute goods at the International Exhibition last year, remarked, ‘It is in Scotland exclusively where goods made from jute represent a large branch of industry. This very cheap raw material is employed there—either pure or mixed—to make ordinary brown cloth, but more especially sacking, packing-cloth, and carpets. The jute yarns used for carpets are of the richest and most varied colours, and are sometimes used with cocoa fibre. Even the Brussels or velvet carpet is imitated with success in appearance, if not in durability.’”

The flax and jute factories of Dundee are substantial edifices. They are fitted with every appliance that has been devised for promoting the health and comfort of the operatives, and facilitating their work. As a rule the proprietors are possessed of a spirit of considerate liberality towards those who toil for them—or, rather, with them, for the life of even a prosperous manufacturer is anything

but a sinecure. Many of the employers are men who had but a humble start in life, and have created their own fortunes by close application to business. Some of those who were leaders in the earlier and more trying days of the trade have retired to spend their remaining time in the enjoyment of fortunes accumulated during years of anxious labour, leaving sons and successors to carry on the work which they brought to such a successful issue. Others who have attained an age and position which would entitle them to retire, continue to work on, as if determined to die in harness. Indications of the prosperity prevailing among the class are abundant in the stately mansions which they have reared for themselves in the outskirts of the town and in quieter localities adjacent.

The most extensive factory in Dundee is that of Messrs Baxter Brothers & Co., which is entirely devoted to the manufacture of flax and hemp. In 1822 the late Mr William Baxter—father of the present head of the firm, Sir David Baxter, Bart. of Kilmaron—who owned a small mill in Glamis, entered into partnership with his eldest son Edward, and built a flax-spinning mill, with an engine of fifteen horse power, on the Dens Burn, in the north-east quarter of Dundee. That was the germ of the present vast establishment. The mill proved a successful speculation, and three years after it was set going, a similar work of double the power was built farther up the “burn.” At that time other members of the family had been taken into the partnership, and the firm was known by the designation, which it at present bears, of Baxter Brothers & Co. Success continued to follow the extended firm, and from time to time the mills were enlarged, until it became necessary to introduce an engine of ninety horse power. In 1833 they built another mill still farther up the stream, and to that they added, in 1836, the first power-loom factory ever erected in Dundee, and in that department alone provided employment for upwards of 300 persons. In 1846 the firm had in operation in Lower Dens Mills one engine of ninety horse power, driving 3028 spindles; and in the Upper Dens Mills two engines, equal together to 105 horse power, and driving 8000 spindles. In the power-loom department they had two engines of thirty horse power each, and 256 looms, with accommodation for nearly double that number. They had also a calendering shop with a ten horse power engine. The site chosen for the works originally was ill adapted for convenient extension, being on the banks of a natural gorge or “den,” as the name of the place implies. The difficulties of the situation have been completely overcome, and the existence of the valley becomes apparent only when one enters the

establishment, and sees how the gorge has been dammed up to form a series of deep ponds, which intercept and retain for the use of the boilers the whole water of the Dens Burn. The ground at Dens belonging to the firm extends to twenty-one acres, of which ten are occupied by buildings, courtyards, and ponds. The extent of the buildings may be judged from the fact, that the superficial area of the floors is not less than twelve acres, the greater part of which is covered by machinery of the finest description. In the spinning department there are 22,000 spindles, with the requisite preparing-machines; and in the weaving-rooms are 1200 power-looms. In such a large place it is, of course, necessary to distribute the steam-power, and no fewer than twenty-two engines are employed, the combined nominal force of which is 750 horse power. There are thirty-two steam-boilers, which consume nearly 300 tons of coal weekly. The largest chimney has twenty-two of these boilers connected with it. By using properly constructed furnaces, and with good management on the part of the firemen, scarcely any smoke is to be seen issuing from the chimneys. No recent census of the establishment has been taken; but the number of persons employed is stated to be from 4000 to 4500, of whom a large percentage are women or girls. 7000 tons of flax are used annually, a quantity far exceeding what is worked up in the same time by any other firm in the world. A considerable quantity of hemp is also manufactured.

The factory occupies a commanding site; and its elegant belfry and obelisk-shaped chimneys are conspicuous objects in the view of the town obtained from the east. A wide public street separates the upper division of the establishment from the lower, but there is direct connection between them by means of a tunnel. Owing to the nature of the site, and the way in which extensions were made, the mills have an irregular appearance, which somewhat masks their extent. The front presented to Princes' Street by the Upper Mills is, however, an imposing piece of masonry. It is 250 feet in length, and consists of five lofty storeys, with attics. Over the centre of the front is a statue of James Watt similar to that which stands in Adam Square, Edinburgh. This building forms the largest division of the spinning department. The flax is imported in bags, which are deposited in a range of extensive warehouses. In order to trace it through the various stages of manufacture, the visitor must follow the flax from the stores to the heckling shops. Heckling is an operation whereby the fibres of the flax, as they come from the scutchers, are subdivided longitudinally into filaments of a fineness suited to the quality of cloth to be made. In order to produce a

fibre of sufficient fineness for cambrics and lawns, only the best quality of flax is used, and the heckling has to be done with great care on fine heckles. Before the invention of heckling-machines the operation was performed by hand, and the persons employed in that occupation formed a large proportion of those engaged in the linen manufacture. The hecklers were generally a rough lot of men, who were continually making unreasonable demands, and "striking" when these were not complied with. The personal annoyance and interruption to trade caused in that way led the manufacturers to devise means which would enable them to dispense with hand heckling. Machines were invented which performed the work as well as, and more expeditiously than, the hecklers, and the result was that the hand hecklers were thrown out of employment. The heckling machines used in the Dens Works are most ingeniously constructed. The flax is taken from the bales in small bunches, and each bunch has its ends presented to the "ending machine," which draws the fibres into a parallel position and removes any entanglement from the extremities. The bunches then pass to a heckling-machine, where each is spread out and fixed between two pieces of wood, leaving the ends free. Thus held, the flax is placed on the machine, the chief part of which consists of a revolving apron of stout leather studded with spikes arranged in five or six bands, the spikes increasing in fineness from the feeding side of the machine. The wood clamps, with their dependent flakes of flax, slide along a rail placed above, and running transversely to the apron of the machine. When a fresh flake is laid on all the others move one space to the left, and are brought into contact with the various bands of heckles in succession, and finally emerge with all the fibres nicely dressed, and bearing a gloss which makes the flax look almost like silk. The clamps are then unscrewed, the flax fixed by the end which has passed over the heckles, and again put into the machine, which completes the process by bringing the fresh end of the fibres to the same degree of fineness as the other. Both sides, as well as both ends of each flake, are brought into contact with the heckles, a self-acting motion in the machine turning the clamps over each set of heckles. When the flakes of flax come from the machine the second time they are twisted in the central part, by which means each is kept separate for convenience of handling. The occupation of the hecklers is not a pleasant one, and, to those not acquainted with the trade, it seems wonderful how people can live for many days in an atmosphere so laden with dust as that of the heckling-rooms of a flax-mill. So

dense is the air that it is almost impossible to distinguish persons at the remote end of a room thirty yards in length; but, despite that fact, the workers do not suffer so much in their health as would be supposed. Some of them wear respirators, extemporised from a bunch of flax; but few of them take the trouble to use that simple preventive. The rooms are fitted with "dust extractors"—openings in the floor, through which a strong current of air is drawn from the room—and by these the more deleterious particles of dust are removed.

The next process is spinning, which involves several operations—such as spreading and drawing—the object of which is to increase the fineness of the fibres, give them a parallel arrangement, and unite them in a continuous line or sliver. The flax is sent through the drawing-machine again and again, until it comes forth in a smooth even band, about an inch in width and a quarter of an inch in thickness. As the flax in this state has no twist to keep the fibres in place, it is caught off the machine in tall tin cans, and is not subjected to any handling. From the cans the sliver is fed into the roving-machine, by which it is still further drawn out, and slightly twisted. The roving is wound upon large bobbins, which are next placed in the spinning frames, whereby the roving is drawn out to the required degree of fineness, and firmly twisted. Some of the flax is spun by the wet process, which better adapts it to certain purposes. In wet spinning, the roving, in passing over the spinning frame, is made to dip into a receptacle filled with water heated by a steam-pipe. The hot water softens and separates the fibres, and admits of their being drawn out into a finer thread than if spun dry, while at the same time it causes the loose fibres to combine better with the body of the thread. The machinery used in these processes has been much improved in recent years, and is as great an advance upon that employed fifty years ago as the first spinning-jenny was upon the rock and spindle. The full bobbins from the spinning frames are passed to the reelers, who make the yarn up into cuts, heers, hanks, and spindles, each spindle containing 14,400 yards. In some cases the yarn is prepared for the loom directly from the spinning frame; but generally it is bleached first. Messrs Baxter are the principal proprietors of a large bleachfield, and are also the chief employers of several works of the same kind in the district. It would be impossible to conduct the bleaching at their mills in town in consequence of the smoky atmosphere and scarcity of water.

Leaving the bleaching process to be described afterwards, we shall follow the yarn through the other departments. In the winding and warping lofts the hanks of yarn are placed on a frame and

wound upon bobbins for the warping-machines, or upon pirns for the shuttles. After the yarn is warped it is dressed by being coated with paste; and when the threads have been drawn through the heddles and reed, the yarn, together with the beam on which it is wound, is placed in the loom. These processes have already been described. At the Dens Works they are all carried on in lofty, well-ventilated, and well-lighted rooms.

The weaving department, in which, as already stated, 1200 power-looms are employed, is broken up by the peculiar construction of the factory; but the principal section of it presents an interesting sight. In a noble apartment most conveniently situated 754 looms are congregated, and a walk along the avenues between the lines in which these are arranged affords an opportunity for seeing the various kinds of fabrics produced by the firm. The principal is navy sail-cloth, of which an immense quantity is made, the chief supply for the British navy being furnished at present, as for many years past, by Messrs Baxter & Co. Bleached and brown sheeting, ducks, paddings, towellings, hammocking, Osnaburgs, and Hessians, are among the other goods manufactured. The total quantity turned out yearly is about 20,000,000 yards. When the webs are taken from the looms they are passed through rubbing-machines, which, by a peculiar action, draw the warp threads closer to each other, and give a more solid body to the cloth. A web, which in the loom measures forty-two inches in width, will, after being rubbed, measure two inches less, and its length is at the same time increased. The cloth is next picked and cropped. The cropping-machine, which is similar to that used by woollen manufacturers, removes loose fibres and any roughness of surface. Calendering is the next operation, and on it the appearance of the cloth greatly depends. There are in Dundee a number of establishments solely devoted to calendering and press-packing linen and jute goods; but in the Dens and other extensive factories the work is done on the premises in a special department. The calender generally consists of five massive rollers, from five to six feet in length, set in an upright frame. Two of the rollers are composed of paper and the others of iron, one of the latter being hollow to admit of its being heated by steam. The rollers may be raised or lowered by hydraulic power, according to the degree of pressure desired. The treatment to which the goods are subjected in the calender varies according to the nature of the fabrics. Thus the cloth may be either beetled, sarceneted, cylindered, chested, or mangled, as may be desired, the different style of finish given being the effect of putting the cloth through the rollers in particular ways,

and continuing the operation for a longer or shorter period. The goods are next measured and folded by machinery, and the pieces pressed separately in a hydraulic press worked by steam. When the goods are made up into bales they are again put into the press and reduced to the smallest possible bulk, the amount of pressure put on being upwards of 1000 tons. Previous to the adoption of this mode of treating the goods, the bales were so light in proportion to their bulk that the vessels laden with them had to carry a large quantity of ballast. As the bales are made up a consecutive number is painted upon each, along with the trade-mark of the firm, &c. For the removal of the raw material and goods to and from the factory a dozen horses are constantly employed. In addition to the persons directly engaged in the working of flax, Messrs Baxter & Co. employ a large staff of mechanics, who make and repair all the machinery required about the works. The machine shop and foundry occupy an extensive building, fitted with the finest and most improved machines and tools for working in iron and wood, and, taken apart from the great establishment of which it forms a component part, would be reckoned a considerable place of its kind.

The great care taken to preserve the health and promote the comfort of the bodies of the workpeople has already been mentioned; and now some notice may be taken of what is done for the improvement of their minds. Adjoining the works is a handsome and commodious school-house, to which all employed about the establishment have free access. Every expense connected with the school is defrayed by the proprietors, who take great interest in the education of their operatives, and, by a liberal distribution of prizes, encourage them to persevere in acquiring knowledge. There has been a school in connection with the works for upwards of thirty-eight years, but the present building is only ten years old. The thirty-eighth anniversary festival was held in May 1868, when upwards of 100 prizes were distributed to the pupils. The chair was occupied by Sir David Baxter, the much respected head of the firm, a gentleman who is known far and wide for the liberal and substantial aid which he has given to every good cause that commended itself to him. The annual report of the teacher showed that the average attendance was 570 day scholars and 356 evening scholars, making a total of 926. For the instruction of these there are, in addition to the master and mistress, thirty paid monitors for the evening school and twenty-four for the day school. The branches taught are reading, writing, and arithmetic, in addition to which the girls are instructed in sewing, knitting, and fancy work. There is a library in connection with the

school, to which the elder pupils have access. The workpeople generally appear to appreciate the kindness of their employers, to whom they have never given any trouble by combinations or strikes. They are a steady, well-conducted class; but this remark, it is but justice to say, applies equally to the other factory operatives in the town. In order to meet in some measure the rapidly-increasing demand for house accommodation by the working classes, Messrs Baxter & Co. recently built a large number of houses in the neighbourhood of their factory.

To complete the description given above of the various operations in manufacturing flax, some account of the bleaching process is necessary. About a hundred and fifty years ago the Dutch were esteemed the best bleachers in Europe. Their method was to steep the cloth for about eight days in ley made from vegetable ashes. It was then washed out with black soap, and placed to steep for about a week in a vessel filled with butter milk. After another washing with black soap, the cloth was spread on the grass for two or three weeks, during which time it was sprinkled at regular intervals with clear water. All these operations had to be repeated several times before the cloth was brought to the required degree of purity, so that the material was for six or seven months in the hands of the bleachers. All the fine linen made in Scotland was at one time sent to Holland to be bleached. The Board of Manufactures paid great attention to this department of the linen trade, and, as already stated, granted liberal rewards to persons who established bleach-fields. The Board paid the following sums for experiments in bleaching:—To James Spalding, L.180; to Dr Wm. Cullen, Glasgow, L.21; and to Dr Francis Home, L.100. The first important improvement in bleaching in this country was made by Dr Home, who for butter milk substituted water acidulated by sulphuric acid. This greatly facilitated operations, as it enabled the bleachers to do in twelve hours what formerly required nearly as many days. In 1785 chlorine was discovered and successfully applied to bleaching by Berthollet, a French chemist. An establishment for bleaching by chlorine was erected at Aberdeen in 1787, and was the first of the kind in this country. Chloride of lime, a substance of more convenient application, was discovered in 1798 by Mr Tennant of Glasgow, and is now the principal chemical stuff used in bleaching. Mr Alexander Drimmie, in 1820, substituted soda ash for potash ley in bleaching, thereby reducing the cost of the operation, while linen cloth might be bleached in a few days by the use of the soda ash alone, almost without exposure on the grass. In 1825 Mr Drimmie effected a

further and important improvement by inventing a machine for washing the cloth. The substances which require to be got rid of by bleaching are—first, the organic colouring matter naturally present in the fibre; second, resinous and fatty bodies, also inherent in the fibre; third, weavers' dressing and perspiration taken up during the process of weaving; and fourth, certain saline or earthy substances. To separate these from the cloth, it is subjected to a series of operations such as washing, boiling in lime-water, steeping in a solution of sulphuric acid, and so forth. The cloth is then sent to the calender and finished. Cotton loses about one-twentieth of its weight by bleaching, and linen about one-third. There are a number of extensive bleach-fields in Forfarshire, Perthshire, Fifeshire, &c., some having a direct connection with linen factories, and others being carried on as separate undertakings.

The importance to Dundee of the introduction of jute has already been pointed out. In the course of a few years the Indian fibre has come so extensively into use, that the manufacture of linen on which it was grafted has been deposed from the position which it long occupied as the staple trade of the town. In dealing with the trade of Dundee, however, it would be difficult to dissociate flax and jute; for, though one or two firms confine their attention solely to the manufacture of flax, and a few to jute alone, all the other manufacturers work both fibres, sometimes mixing them in certain proportions, and at others keeping them distinct. The establishment of Messrs Baxter Brothers & Co. was chosen to illustrate the manufacture of pure flax, and now some account will be given of an equally extensive factory in which jute alone is used—namely, the Camperdown Linen Works at Lochee, belonging to Messrs Cox Brothers.

The village of Lochee, which lies within the municipal boundary of Dundee, had an early connection with the linen trade. Towards the close of last century there were nearly 300 looms in the village, and these were chiefly employed on coarse linens, of which 4860 pieces, valued at L.12,520, were produced annually. The cloth was bought by several merchant weavers, who disposed of it in Dundee and Perth, or sent it into the English market. The first of those merchant weavers was a Mr Cox, who died in 1741, and whose family are mentioned in the statistical account of the parish, published in 1793. It is stated that the family were then engaged in the same line, much to the credit and advantage of themselves, and that to their industry and example the district was principally

indebted for its flourishing condition. They bought cloth from the weavers, as their ancestors had done, and after bleaching it at their bleach-work near Lochee, sent it into the market. The trade they carried on would appear to have always been in a healthy state, and a gradual extension of the bleaching department took place, until the fields in connection with the work measured not less than twenty-five acres. At the close of the bleaching season in 1819, when the warehouses were filled with finished cloth, a fire broke out and consumed the whole, entailing enormous loss on the representative of the fourth generation of the family who then owned the premises. Instead of rebuilding the bleach-work in a permanent way, Mr Cox ran up a few temporary buildings to serve till the expiry of his lease. Meantime he had turned attention to the manufacturing department of the trade, and established a weaving factory in Lochee. Mr Cox was succeeded in 1827 by his eldest son, who in 1841 took three of his brothers into partnership with him, and these gentlemen constitute the present firm of Cox Brothers, whose factory is one of the most extensive and complete of the kind in Britain. Messrs Cox were among the first who made experiments with jute, and such was their success therein, that they gradually discarded flax, and now their vast establishment is entirely devoted to the manufacture of jute. They have their own buyers at Calcutta, and import the raw material direct; while they are, perhaps, the only firm in the district who complete within their works all the operations of spinning, bleaching, dyeing, weaving, printing, calendering, and packing.

The Camperdown Linen Works, the chief portion of which was built between the years 1845 and 1850, occupy eighteen acres of level ground on the north side of the village of Lochee. The works have been constructed on a regular and well-considered plan, so as to admit of almost unlimited extensions without interfering with the convenience of arrangements whereby the various processes are conducted without waste of time or labour in shifting the material about. The design of the buildings is characterised by much neatness; and an elegance and airiness pervade the place which show an extraordinary advance on the notions as to what a factory should be. It is not many years since the ideal of a factory was a hideously plain building of many low storeys, into which the light struggled through windows about two feet square, the dust and dirt on which it would have been considered something like sacrilege to have removed. Anything approaching to ventilation was not thought of, and, consequently, no provision was made for the admission of air to

the sickly operatives. Now, and particularly in the case of the factory under notice, the storeys are from fourteen to seventeen feet in height, and every room is thoroughly ventilated ; indeed, no class of workers are better cared for in the matters of light and ventilation than those in the more extensive factories in the linen manufacturing districts. It may be that the Factory Acts are to some extent to be credited with this ; but it is due to the owners of many of the factories to say that in the matters referred to they have far exceeded the requirements of the law.

A branch line of railway connects the Camperdown Works with the main system, and by it some of the raw material is brought in and the finished goods are sent out. The jute is deposited in two large stores, detached from the main body of the factory, whence it is withdrawn as required. The first operation in manufacturing the fibre is "batching." One of the great obstacles which the early workers in jute had to contend with was the hard and dry nature of the fibre. They could neither get it to spin nor weave satisfactorily. Old machines were altered and new ones devised with the view of overcoming this peculiarity of the jute ; but none of these were successful until the idea occurred to some one that the jute might be softened by being moistened with oil. This was tried and found successful to a degree beyond expectation. The oil is applied in a special apartment called the "batching-room," in which the jute is spread in layers, each layer receiving an abundant sprinkling of oil and water. In that condition the material is allowed to lie a certain time, according to the season and temperature. The fibres of jute are from five to eight feet in length, and sometimes even more, and in order to bring them to a spinning condition, they used to be cut ; but as a square end was not favourable to complete hackling nor correct spinning, the fibres are now torn asunder by being fastened by the ends to iron bars placed on either side of a wheel having a number of stout spikes on its rim. After a handful of jute is fastened to the bars, the latter are thrown forward, the spikes strike the jute in the centre, the fibres are dissevered, and a fine pointed end appears on each side. From this stage the processes which the jute goes through in being converted into cloth are so similar to those to which flax is subjected that it is unnecessary to describe them in detail. The machinery used in the Camperdown Works is of the latest and most improved construction, and is all made on the premises.

In the weaving-shed 700 power-looms are employed in making plain and twilled sackings, and all the other fabrics usually made of

jute; and in another part of the establishment 300 hand-loom are engaged on carpeting. The firm have paid much attention to the last-named branch, and have brought the manufacture of jute carpets to great perfection. For certain kinds of carpeting Messrs Cox hold a patent, and some of their productions are characterised by considerable beauty of design. There is an extensive dyeing shop at the works in which all the yarns required for coloured goods are dyed. The colours used are of the most brilliant hues, and the jute takes them on more readily than any other fibre known. Jute carpeting is so cheap that it is within the reach of the humblest householder. Some of it is sold so low as 8d. a-yard, and, considering its appearance and durability, is a wonderful bargain.

A few statistics relating to the factory will show its extent and importance in a more forcible way than any minute description of the departments. As already stated, the works occupy 18 acres of ground, a considerable portion of which is covered by buildings. The area of the floors is 50,000 square yards, or about 10½ acres. The machinery is propelled by steam-engines, varying from 3 to 120 horse power; the aggregate nominal horse power is 580; and the indicated horse power 1850. The steam for the engines is generated in 22 boilers ranged side by side in one line. The smoke from the furnaces is carried off by an ornamental chimney 300 feet in height and 35 feet in diameter at the base. The chimney alone cost over L.3000. The quantity of coal consumed is about 15,000 tons annually. There are 4300 persons employed within the works, and, in addition to these, the firm employ 400 sack-sewers, who work in their own houses. The wages paid are the same as those current in the trade. 14,000,000 yards of sacking are turned out annually, and about half that quantity of other fabrics. There is a free school for the workers, at which there is a regular attendance of about 400 pupils. The factory operatives are informed of the flight of time by a splendid turret clock, which chimes the quarters.

In order to complete this record of the linen and jute trade, it is essential that some mention should be made of a factory devoted to the production of mixed fabrics. Messrs James Smieton & Son, Dundee, have for many years taken the lead in introducing new fabrics made of combinations of various materials. In 1857 they selected a piece of ground to the west of the village of Carnoustie, and thereon built a power-loom factory, which bears the name of Panmure Works, and is regarded by the trade as a model establishment. It is small in size compared with the great factories which have

been previously described, but in convenient arrangement of departments and completeness of organisation it is unsurpassed. The ground occupied by and pertaining to the factory is about 10 acres in extent, and has a frontage to the Caledonian Railway of 700 feet. The central part of that frontage is occupied by a fine two-storey building, 325 feet in length. There is a siding on the railway for the service of the factory. The waggons containing the yarn are passed on to this siding, and brought into the works one by one. The yarns used are respectively composed of flax, tow, hemp, cotton, and jute. Some of these are made in Forfarshire and Glasgow, and some are imported from France and Ireland. The weaving shed occupies a central position in the works, being bounded in front by the main building, in rear by the calendering and finishing department; on one side by the warping and dressing room, and on the other by the engines and packing warehouse. The weaving shed is 180 feet in length by 150 in width, and contains 400 power-looms. The departments in which the successive operations are carried on adjoin each other; and the yarn, which passes in at one side of the main entrance, makes a circuit of the place, and emerges at the other side packed up ready for transportation. This is an admirable arrangement, which at once facilitates operations and saves expense. The variety of fabrics that may be produced by using different qualities and combinations of yarn is immense. Usually there are no fewer than 80 different kinds of cloth in the looms at one time, and the list of fabrics made embraces upwards of 500 varieties. Mixtures of tow with jute and of flax with jute are the principal; but a great variety of fabrics are produced by mixing cotton with jute and cotton with flax. The quantity of cloth made is about 5,000,000 yards annually, a large proportion of which consists of "drills," "paddingings," and "Russian sheetings" for the United States, West Indian, and Mexican markets. Checks and stripes in endless variety are also made for the same countries. The machinery, which is of the most improved kind, includes 4 cropping-machines, 3 calenders, and 1 mangle, the latter working under a pressure of 60 tons. The combined force of the 3 steam-engines in use is upwards of 200 horse power. The number of persons employed is about 600.

About five years ago Messrs Smieton spent L.2000 in the erection of an institute for the use of the workpeople. The building, which is two storeys in height, is one of the finest in or near Carnoustie, and is a handsome monument of the liberality of the founders. The ground-floor of the institute is occupied by a house for the keeper, a class-room, library, reading-room, and cloak-room. The reading-

room is liberally supplied with newspapers and magazines, and furnished with a bagatelle board, draught boards, &c. The upper portion of the building consists of a fine hall, provided with a piano and a harmonium. The day scholars are taught in the class-room, and in the evening such of the female workers as choose attend in the hall to receive instruction in reading, writing, and needlework. Two teachers, and all the books, stationery, newspapers, magazines, &c., are provided free of charge. Indeed, the whole expenses of the institute are defrayed by Messrs Smieton, to whom the yearly cost is about L.300. Finding that their workpeople had difficulty in obtaining suitable accommodation in Carnoustie, the firm recently built eighty houses in the neighbourhood of the factory.

At the close of 1867 there were in Scotland sixteen firms engaged in the manufacture of flax, hemp, and jute, who employed 1000 persons or upwards, the aggregate number of operatives being 31,162, or an average of about 1948. Four of those firms were spinners, but not weavers, and all the others were spinners and weavers. The number of spindles employed by them was 205,454; of power-looms, 5177; and the nominal horse power of their engines was 6057. The works of eight of the firms are in Dundee, two in Glasgow, two in Greenock, and one each in Aberdeen, Johnstone, Markinch, and Arbroath.

Of the great firms in Dundee, two have already been noticed. The third in order is that of Messrs A. & D. Edward & Co., established in 1828. Their factory is situated in the Scouringburn, and the main portion of it consists of a fine building 300 feet in length, and five storeys in height, in which the spinning operations are carried on. The weaving department occupies an extensive range of buildings behind the main block. In the spinning mill there are 18,476 spindles; and in the weaving factory, 600 power-looms. All the goods are finished and packed on the premises. The works, like nearly all those recently built, are fire-proof throughout. The goods manufactured embrace all varieties of flax and jute fabrics; and the establishment is exceptional, as being the only one in the district in which linen damasks are made on an extensive scale. The number of persons employed is 3300. Messrs Gilroy Brothers employ upwards of 2000 persons in their Tay Works in the Lochee Road. The establishment has a frontage of 1000 feet, of which 400 feet are occupied by a splendid block of building recently erected. The latter is by far the largest and most imposing structure in Dundee. It is five storeys in height in the centre, and four in the wings.

The central part terminates in a pediment, in the tympanum of which the Dundee arms are boldly sculptured in stone, and on the apex there is a colossal figure of Minerva with her spindle and distaff. The firm have greatly extended their works since 1851. Then they employed engines of 80 horse power; now more than four times that power is required to move their machinery. The material manufactured consists chiefly of jute. Messrs Gilroy are extensive shipowners, and the jute used in the factory is brought from India in their own vessels. A spinning mill, built by Messrs J. & A. D. Grimond at Bow Bridge, Dundee, in 1857, was, and is still considered to be, the finest structure of the kind in existence. The machinery is of the best construction, and the building throughout is elegantly fitted up. There are 3600 spindles in the mill, and 136 power-looms in the weaving department. Messrs Grimond have hand-loom and power-loom factories at Maxwelltown, and altogether employ about 2000 persons. Among the goods manufactured are carpeting, matting, and hearth-rugs. Mr O. G. Miller owns five mills in Dundee. They stand contiguous to each other, and all are devoted to spinning. There are ten steam-engines of 260 horse power, 16,970 spindles, and nearly 2000 workpeople. The St Roque Spinning Mill, and the Wallace Power-Loom Factory, owned by Messrs W. R. Morrison & Co., are extensive concerns. They contain 5000 spindles, 510 power-looms, and the motive power is supplied by engines of 220 horse power. The workpeople number about 2100. The Seafield Works, belonging to Messrs Thomson, Shepherd, & Briggs, were started about fourteen years ago, and have had a rapid growth. They now contain 6000 spindles, 120 power-looms, and give employment to upwards of 1000 persons. The firms out of Dundee who, at the period to which these remarks refer, employed 1000 persons and upwards were:—Messrs Richards & Co., Aberdeen; City of Glasgow Flax-Spinning Company; Glasgow Jute Company; Messrs Finlayson, Bousefield, & Co., Johnstone; Gourock Rope-Work Company, Greenock; Messrs John Fergus & Co., Prinlaws; Mr Andrew Lowson, Arbroath; and the Greenock Sacking Company.

The following figures compiled towards the close of 1867 represent pretty exactly the extent of the linen and jute trades of Dundee:—The estimated quantity of yarn spun annually in the town is 31,000,000 spindles, valued at L.3,487,500; in the surrounding district, 29,000,000 spindles, valued at L.3,262,500—making a total of 60,000,000 spindles, valued at L.6,750,000. Taking the power-looms at 8000, and the quantity of cloth produced by each at 200

yards a-week, the cloth turned out in a year will amount to the prodigious quantity of 83,200,000 yards, or 47,272 miles. The value of the yarn and linen together is estimated at L.8,000,000. The capital invested in the factories in Dundee is stated to be L.2,500,000 in the district of which that town is the centre, L.2,200,000; in other parts of Scotland, L.1,000,000—total, L.5,700,000, to which has to be added the value of the bleach-works, calenders, &c., in the trade, which cannot be put down at less than L.1,300,000. It takes about six months from the purchase of the raw material before the goods can be manufactured and the proceeds drawn, so that the stock-in-trade of manufacturers and merchants will amount to L.5,000,000. It would thus appear that a capital of L.12,000,000 is required for carrying on the linen trade of Scotland.