HANDBOOK OF BIRMINGHAM

ISSUED BY THE

LOCAL COMMITTEE OF THE

BRITISH ASSOCIATION

SEPTEMBER 1886

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HANDBOOK OF BIRMINGHAM ***

HANDBOOK
OF
BIRMINGHAM.



PREPARED FOR THE
MEMBERS OF THE BRITISH ASSOCIATION.
1886.

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INTRODUCTION.

BY G.J. JOHNSON.

This Handbook, being prepared for the use of the

members of the British Association, at their meeting in Birmingham, in 1886, it is deemed desirable to preface it by a very brief sketch of the progress of the town since the first meeting here of the Association in 1839, a period only three years short of half a century.

The Corporation.[1]—When the Association met in Birmingham, on the 26th of August, 1839, the Borough had recently been incorporated—the first meeting of the Town Council having been held on the 27th of the previous December; but when the Council attempted to exercise the power of making a Borough Rate, the Overseers refused to levy it in consequence of objections which had been raised to the validity of the Charter. In addition to these pecuniary difficulties, the town was just recovering from the effects of the Chartist riots, in the Bull Ring, seven weeks before. The Corporation had not the control of a single policeman or constable, and the town was in charge of a body of London police.

The same day on which the Association met, the Royal assent was given to an Act (2 and 3 Vic., c. 88), hurriedly passed, to appoint a Commissioner of Police in the Borough for two years, and to authorise an advance of £10,000, for the purpose of organizing and paying a police force.

The validity of the charter of incorporation was ultimately settled by a statutory confirmation (5 and 6 Vic., c. III), which received the royal assent on the 12th of August, 1842. As a consequence, the control of the police was transferred to the Watch Committee of the Corporation. At the time of the transfer the strength of the force was 300 men, and the population of the borough 183,000. The population is now about 427,000, and the police force is 550 in

number, and is both efficient and adequate.

The great cost of conveying prisoners and lunatics to the County Gaol and Asylum at Warwick, and the inadequacy of both to the increasing population, rendered the building of a Borough Gaol and Lunatic Asylum at Winson Green a necessity, and as soon as the Corporation obtained the control of the police the gaol was proceeded with and opened in 1849. In the following year the Lunatic Asylum was opened, to which was added, in 1882, another Asylum at Rubery Hill, near Bromsgrove.

The year 1851 is memorable in our municipal history for the vesting in the Corporation, for the first time, of complete control over the entire borough by the transfer to it of the conflicting powers and jurisdictions of the other governing bodies (see pp. 18 and 19.) Up to that date the formation and maintenance of the streets, roads, and footways of the town, the lighting and drainage, and all the other important work now undertaken by the Public Works Committee of the Corporation could not be dealt with in any uniform system, because six other governing bodies or officials had statutory powers over the portions of the Borough which were outside the *parish* of Birmingham. With the year 1852 a new and uniform system commenced, and not an hour too soon, having regard to the rapid increase of the population and the consequent multiplication of new streets and roads. The aspect of the town has been completely changed in the paving of the roads and footways, the lighting of the streets, the widening of many of the principal thoroughfares, and the carrying into operation of a complete and uniform system of drainage and sewerage. To the Public Works Committee belongs also the control of

the numerous tramways which lead from the centre of the town to the suburbs in every direction, except the upper part of Edgbaston, the approach to which is rendered difficult by the narrowness of Broad Street. The improved system of drainage and sewerage brought to an issue the serious question of how the sewage of the town was to be dealt with. From the year 1858 this had become a serious and increasing difficulty, involving the Corporation in constant and costly litigation with the neighbouring landowners, resulting in injunctions from the Court of Chancery. In 1871 a special Committee called "The Sewage Enquiry Committee" was instituted, who recommended the course ultimately adopted, viz.: the formation of a board representing the whole drainage area, and the establishment of a large sewage farm at Saltley. The latter was first undertaken and found to be a solution of the difficulty, and in the year 1877 the other object was attained by the constitution of the "Birmingham Tame and Rea District Drainage Board," composed of twenty-two representatives from the different governing bodies in the drainage area, of whom twelve are elected by the Town Council of Birmingham. To this body the sewage farm has been transferred, and is now carried on with the most beneficial result.

Immediately after the passing of the Public Health Act, 1872, the Borough was constituted an Urban Sanitary District and the Council as the Urban Sanitary Authority, set itself vigorously to the work of improving the public health. A Borough Hospital for the treatment of small pox and scarlet fever was established in 1874. The Public Health Act, 1875, indirectly removed for sanitary purposes the limit on rating powers to which the Council were obliged to

submit in their Act of 1851. By the zealous labours of the Health Committee, and the liberal application of the pecuniary resources placed at its command by the Act of 1875, the death rate has been reduced from 24.8 per 1,000 in 1874 to 19.1 in 1885, although the mean density of the population has increased in the same period 20 per cent.

In 1851 the first of the four sets of public baths was opened in Kent Street, followed by other sets in Woodcock Street (1860), Northwood Street (1862), and Monument Road (1883). Under the management of the same Committee of the Council are placed the ten public parks and recreation grounds of the Borough, of which five have been given to the Corporation and five have been acquired by purchase. The list is as follows:—

Name.	Date of Acquisition.	Area. A.	R.	P.	Gift or Purchase.
Adderley Park	1856	10	0	22	Gift of Mr. C. B. Adderley (now Lord Norton).
Calthorpe Park	1857	21	1	13	Lease by Lord Calthorpe at a nominal rent.
Aston Park and Hall	1864	43	0	0	Purchased for £26,000, of which £7,000 was raised by subscriptions.

Aston Park and Hall	1873	6	2	8	Purchased for £4,750.
Cannon Hill Park	1873	57	1	9	Gift by Miss Ryland.
Highgate Park	1876	8	0	28	Land purchased for £8,000 and £7,000 expended in laying out.
Summerfield Park	1876	12	0	20	Land purchased for £8,000 £3,857 expended in laying out.
Burbury St. Recreation Ground	1877	4	1	3	Gift by Mr. William Middlemore.
Small Heath Park	1879	41	3	34	Gift by Miss Ryland.
Park St. Gardens	1880	4	1	35	
St. Mary's Gardens	1882	2	2	0	} Disused burial grounds laid out at cost of £12,099.
		221	3	12	

In 1860 the Free Libraries Act was adopted, and the first branch library was opened in Constitution Hill, on the 3rd of April, 1861. The first Central Lending Library and Art Gallery were opened on the

6th Sept., 1865, on the occasion of the meeting of the British Association. (See for the subsequent history of the Free Libraries p. 69 *et seq.*)

In 1863 the Borough Cemetery at Witton was completed. (See p. 117.)

In 1874, a Fire Brigade was established, which now consists of thirty well-trained men, with six engines, and all suitable apparatus.

From the year 1851 to 1873 was a period of steady progress in our municipal affairs; but the mayoralty of the Right Hon. (then Mr.) Joseph Chamberlain, 1873-6, was signalised by the building of the Council House; the acquisition of the undertakings of the two Gas Companies of the Borough, as well as that of the Waterworks Company, and the authorisation of a great scheme of street improvement of which the formation of Corporation Street is the principal feature. Curiously enough, the acquisition of the gas supply of the Borough had a consequence, apparently as far removed as Tenterden steeple from the Goodwin Sands, viz., the provision of the present commodious Art Gallery (p. 123.) The explanation is, that under the Free Libraries Act, the Town Council had the power to appropriate the site for the purpose of an Art Gallery, but no power to raise money to erect the building otherwise than by the penny rate, which was then hardly sufficient for the annual cost of the Free Libraries. The Gas department of the Corporation requiring to build larger offices, the Council, at the request of the Free Libraries Committee, granted the land to the Gas Committee, on condition that they should build over their offices the new Art Gallery, which they have done at an estimated cost of £40,000. By this means a difficulty which seemed insuperable was overcome. In addition

to this benefit to the town, the Gas Committee have earned for the Corporation a profit of more than £25,000 a year.

Thirty years of municipal activity, such as has been described, commencing with the Act of 1851, of course involved repeated applications to Parliament, and in 1882 the mass of legislation was found to be enormous, and a consolidation of twenty separate Acts was effected by the Birmingham (Corporation) Consolidation Act, 1883, which removed the limit of the Free Library rate, and enabled the Corporation to establish the Municipal School of Art (see p. xviii.), and to provide adequate funds for the maintenance of the Corporation Art Gallery.

Thus the same Corporation which, in 1839, had no revenue, nor means of obtaining any, and required to be assisted by the Government with a loan of £10,000 for police purposes, in the year 1885, levied rates for municipal purposes (exclusive of poor's rate and the School Board rate) to the amount of £318,882, being 4s. 5d. in the pound on the annual value of the rateable property of the borough, and now borrows money readily at three-and-a-quarter per cent. Its revenue, and the income received from some of the Committees, sufficed to keep the operations of the Corporation in working order, and to pay the interest on £7,606,269—the aggregate amount of the liabilities on capital account on 31st December, 1885. With reference to this large amount of indebtedness it should be noted that £2,720,061 is the capitalized value at twenty-five years' purchase of the annuities granted as the purchase moneys of the Birmingham and Staffordshire Gas Company, and the Water Works Company, and that £450,000 was paid in cash for the purchase of The Birmingham Gas

Company, and also that £1,520,567 has been expended on the Improvement Scheme. This reduces the sum still due for the debts of the former governing bodies and all the public works executed by the Corporation since 1839, to £2,915,630, and there can be no doubt that the whole of the indebtedness is more than balanced by the value of the property belonging to the Corporation.

It remains to be noticed that the Corporation is the largest landowner in the Borough, owning more than 2,000 acres of land (including its share of the sewage farm) and is the largest employer of labour, employing upwards of 4,000 persons. Also that in July, 1884, Birmingham was made an assize town; whereupon the Town Council took into immediate consideration the necessity of building Courts for Assizes, Quarter Sessions and Petty Sessions, and in July, 1886, approved of plans for the purpose. The "New Law Courts" as they are termed, will be erected in Corporation Street.

Population.—In the year 1839 the population of the Borough was estimated at 180,000. The following is the result of each subsequent census, namely:—

YEAR.	HOUSES.	POPULATION.	INCREASE PER CENT.
1841	40,000	182,894	28·57
1851	48,894	232,841	27·30
1861	59,200	296,076	27·11
1871	74,416	343,787	16·10
1881	78,301	408,004	18·67

The population in 1886 is estimated to be about 427,000.

A still more striking example of the progress of the town is afforded by the following statement kindly prepared by Mr. S. Walliker, the energetic and courteous Postmaster of the town.

STATEMENT SHEWING THE GROWTH OF THE BIRMINGHAM POST OFFICE DURING THE PAST 20 YEARS.

	Total number of Letters, &c., delivered during the year.	Proportion of Letters, &c., to population, or number of letters to each individual.	No. of Telegraph Offices.	No. of Money-Order Offices.	No. Box fo Lett
1866	13,023,200	39·46	9	9	
1885-6	30,983,625	72·05	33	78	2

In 1871 (the year after the Telegraphs were transferred to the Post Office), the number of Telegraph Messages dealt with was 1,081,825, and in 1885-6, 3,111,662. The number of Parcels dealt with in 1885-6 was 2,492,689.

Gifts for public purposes.—"More than princely, *civic* munificence" was a happy phrase of Professor Max Müller on the occasion of the opening of the Mason Science College, and it is certain that in proportion as the feeling of citizenship in any community becomes strong it will manifest itself in the establishment or assistance of institutions for public purposes. Birmingham has never been without

examples of this kind. The earliest of the existing charities of the town is—

Lench's Trust, originated by a feoffment, 11th March, 1525, by William Lench, of lands in and near Birmingham to trustees. With this trust many other smaller gifts have been incorporated, and the income of the whole is now applied to the maintenance of four sets of almshouses for aged women, in Conybere Street, Hospital Street, Ladywood Road, and Ravenhurst Street. The total number of inmates is 178, and each of them has a house and four shillings a week. The income of this charity has grown with the growth of the town like that of the Grammar School (see p. 26.) In 1839 it was £758, in 1886 it is £3,085.

The next endowment in order of time was that of the Free Grammar School (see p. 26) to which has since been added one half of the endowment of Milward's Charity (A.D. 1684). Then came—

Fentham's Charity (A.D. 1712), part of the revenue of which is appropriated to the maintenance of certain boys in the Blue Coat School, distinguished by a dark green dress.

With the exception of a number of smaller charities for apprenticing boys, relieving poor widows, giving doles of bread, no important public benefactions were bestowed for nearly a century. Almshouses in imitation of Lench's Trust, twenty in number, were built by Joseph Dowell, in Warner Street, in 1820, and another set by Mrs. Glover, in Steelhouse Lane, for thirty-six aged women, in 1832.

The last twenty years have been fruitful in gifts by our wealthier citizens beginning with—

Evans' Cottage Homes, Founded in 1867, by Alfred Smith Evans (of the then well-known firm of Evans and Askin), are six cottages at Selly Oak, of a superior kind to the ordinary almshouse, for ladies of reduced means. Each inmate is required to possess an income of £25 a year, and receives £20 a year from the trust. Vacancies in the trustees are supplied by magistrates of the borough, appointed by the Town Council.

The Orphanage and **Almshouses** at Erdington, completed in 1868, at a cost of £60,000, by the late Sir Josiah (then Josiah) Mason, and endowed with an annual income from landed property, which in 1885 produced £6,400. The Orphanage contains upwards of 300 children, in the proportion of two girls to one boy. The Almshouses contain 30 poor women. Seven of the fourteen trustees are appointed by the Town Council.

Crowley's Orphanage.—Thomas Crowley, a timber merchant, of Birmingham, who died 28th February, 1869, by deed dated 15th February, 1869, settled £10,000 upon trusts to educate poor orphan girls. No orphanage has yet been built, but temporary homes have been opened in Ladywood Road.

The James' Trust.—The Misses Elizabeth and Emma James, by deed dated 1st November, 1869, conveyed a freehold estate in Paradise Street, as an endowment for "The James' Almhouses" they had built at Nechells for aged women, to provide five annuities of £20 each for poor and decayed gentlewomen, and a scholarship of £50 a year from the Free Grammar School at Birmingham to the Universities of Oxford or Cambridge. The net income is about £750 per annum, the surplus beyond £450

per annum is to be accumulated, and applied in building additional almshouses.

The Public Picture Gallery Fund originated in a gift in the year 1871, by Mr. T. Clarkson Osler (of the well-known firm of glass manufacturers) of a sum of £3,000 for the purchase of pictures for the Corporation Art Gallery. This sum is augmented by other donations and amounts subscribed, and has been the means of adorning the Art Gallery with many valuable pictures.

Dudley Trust.—Mr. William Dudley, a Jeweller of Birmingham, by deed dated 8th May, 1875, settled £100,000 in the hands of Trustees to be used in (1) Loans to young tradesmen at low rates of interest; (2) Annuities to aged tradesmen, and (3) Surplus to be applied in aid of the charitable institutions of the Borough. Four of the Trustees are to be appointed by the Town Council.

Free Libraries.—In order of time reference should be made to the fund of nearly £15,000 raised in 1879 to refurnish the Reference Library after the fire, and to the valuable gifts of books detailed at p. 72 *et seq.*

The Art Gallery Purchase Fund originated in an offer of Messrs. Tangye, on 3rd July, 1880, to contribute £5,000 to a fund for the purchase of examples of art for the New Art Gallery, since built by the Gas Committee as previously stated (p. xiii.), and a further £5,000 on condition that an equal sum was raised by public subscription. The sum of £7,000 additional was raised and placed at the disposal of a Special Committee of the Town Council, called the "Art Gallery Purchase Committee."

The Mason Science College.—For a full account

of which (see p. 45), was opened 1st October, 1880. Its cost was £60,000, and it is endowed with landed property producing £3,600 per annum. Of the eleven Trustees, five are appointed by the Town Council.

The Wilkes Bequest.—Mr. Alfred Salt Wilkes, a Manufacturer in Birmingham, who died on the 29th July, 1881, left a sum of money expected to realise £98,000 for division, after two life interests, between the Birmingham and Midland Institute and the General Hospital.

Municipal School of Art.—On the 9th of November, 1881, the retiring Mayor, Mr. Richard Chamberlain, announced to the Council that Miss Ryland had offered £10,000, Messrs. Richard and George Tangye, another £10,000 (afterwards increased to £10,937), and Mr. Cregoe Colmore a piece of land worth £14,000 for the building of the present School of Art. The foundation stone was laid 31st March, 1884, by Mr. Richard Tangye, and the building (see p. 125) finished and opened on 14th September, 1885. The former School of Art, a voluntary association supported by public subscription (and to which Miss Ryland had been a generous donor) being transferred to the Corporation.

The Princess Alice Orphanage, at Chester Road, was established, 1882, partly by a donation of £10,000 by Mr. Solomon Jevons, of Birmingham.

The Lloyds' Almshouses, in Belgrave Road, were founded by the widow of Mr. James Lloyd, a banker, of Birmingham.

The Jaffray Suburban Hospital, at Erdington, for the treatment of chronic and non-contagious cases in connection with the Birmingham General Hospital, is

the latest, but not the least of the gifts to the town. It was built and furnished at the sole cost of Mr. John Jaffray, and opened on the 27th November, 1885.

An enumeration of these gifts would not be complete without reference to the five gifts of public parks particularised in the list at page xii.

In addition to these benefactions, mention ought to be made of the numerous gifts of pictures, sculptures and bronzes, given to the Art Gallery by our leading citizens, which will be found detailed in the Art Gallery Catalogue. Five of these gifts are deserving of special mention, namely, (1) the collection of arms given 17th August, 1876, by the Guardians of the Birmingham Proof House, and now arranged in the south gallery; (2) the collection of pictures of David Cox given by the late J. H. Nettlefold; (3) Müller's well known "Prayers in the Desert," and others given by the Rt. Hon. Joseph Chamberlain; (4) a collection of Wedgwood ware given by Messrs. Richard and George Tangye; and (5) the clock in the tower of the Art Gallery given by Mr. Follett Osler, F.R.S. Now that so admirable a gallery has been provided for the reception of such gifts, it may be confidently hoped that others equally valuable will be constantly added by the public spirit and liberality of the citizens of Birmingham.

It is computed that the value of these and other smaller gifts for public purposes for the last twenty years approaches, if it does not exceed, one million sterling.

Hospital Sunday and Saturday Collections.—The suggestion of a collection in the churches and chapels of the town on the last Sunday in October, for the medical charities was made by the Midland Counties' Herald Newspaper, October, 1859. It was

warmly taken up by the then Rector of Birmingham, Dr. Miller, and has been continued annually since 27th October, 1859. The total sum contributed up to and including the collection in October, 1885, is £124,433, the average for twenty-seven years being £4,608.

Hospital Saturday Collection.—The first Hospital Saturday Collection, designed to reach a class differing from the contributors to the Hospital Sunday Collection, took place March 15th, 1873. It has gradually grown in amount, and now produces a larger annual sum than the Hospital Sunday Collection. The amount raised in fourteen years is £63,250, or an average of £4,517. The last collection produced £6,521.

Clubs.—Small clubs, meeting at stated times for social purposes, were always common in Birmingham. The Bean Club, which meets annually, has existed since 1660. The "parlours" of the better class of public houses were places where tradesmen used to assemble in the evenings and were social clubs in the old sense. In 1840 the present Waterloo Rooms, now occupied by the Midland Conservative Club, were built for a club house, but the time was not ripe and they were let to the Government for the Old Bankruptcy Court.

THE UNION CLUB (non-political) was the first club in the modern sense, and was established in 1856, in rooms in Bennett's Hill, and succeeded so well that the present club-house, at the corner of Colmore Row and Newhall Street, was built for it, and the club removed there in May, 1869.

THE MIDLAND CLUB, in New Street, was established in the year 1869, and is a non-political

club.

THE CONSERVATIVE CLUB was established in 1872. The present club house is in Union Street, but a larger club house in Temple Row is being built.

THE LIBERAL CLUB was established in the year 1877, in New Street, and in November, 1885, was removed to the stately building at the corner of Congreve Street and Edmund Street.

THE REFORM CLUB was established in the year 1879, under the title of the Junior Liberal Club. It occupies rooms in New Street.

THE MIDLAND CONSERVATIVE CLUB, which now occupies the Waterloo Rooms, in Waterloo Street, was established in the year 1882.

All the above clubs are open to members of the Association during the meeting of 1886, on presentation of their cards of membership.

For an account of The Clef Club see page 148.

Other clubs of a political, social, or scientific character are very numerous in Birmingham.

The matters touched upon in this Introduction must be regarded as illustrative of the progress of the town in a few particulars which did not fall within any of the divisions of Part II. of this Handbook (see Table of Contents). Fully to realize the development in every direction of our municipal, educational, ecclesiastical, literary, artistic, and industrial life, the whole of that part should be consulted. The remainder of the book will shew how assiduously various branches of science are cultivated amongst

us.

PART I.
HISTORY AND ANTIQUITIES.
1086—1800.

BY SAM: TIMMINS.

Origin of Name.—Eight hundred years ago the name of Birmingham first appeared in history, and almost exactly with the present name of the town. In the famous Domesday Book (1083-1086), compiled for William the Norman, the name is spelled "Bermingeha'," but the varieties of spelling, from the conquest, have been remarkable. Some curious collector has summed up one hundred and forty variations, but most of these may be resolved into two forms of pronunciation—either Birmingham or Bromicham. It is curious that no other town or village in England seems to have a similar name to that of Birmingham, and hence its etymology is somewhat obscure. Hutton's favourite origin was Broom from the plant, Wych, a dwelling or a descent, and Ham a home, so that Bromwycham was supposed to be the original name indicating local details; but Hutton had forgotten to look at Domesday Book, or to explain how Bromwycham had been turned into Birmingham. Still more, he had neglected Dugdale's remark that while "ham," for home, explained the final syllable, the other two

syllables certainly denoted some personal name. All later researches have tended to confirm this suggestion, and modern philologists, including Prof. E. A. Freeman, are almost unanimous in agreeing that “Berm,” or “Beorm,” or some similar form represents the name of some Saxon tribe or people, and that Bermingham would be a patronymic or family name, with the “ing” or “iung” denoting some progeny or tribe, and giving the name to the “de Berminghams,” who flourished in the place, as Dugdale fully shows.

Early History.—As to the ante-Norman holders, Dugdale says on the authority of Domesday Book, that in “Edward the Confessor’s days (Birmingham was) the freehold of one Ulvvine,” but the history begins with the Domesday Book which gives the following details:—“Richard holds of William (Fitz Ausculf) four hides in Bermingha’. The arable employs six ploughs; one is in the demesne. There are five villeins and four bordars with two ploughs. Wood half a mile long, and four furlongs broad. It was, and is worth 20s.” These few facts compare very favourably with the description of other places, and show that Birmingham was then a place of some importance. No church is mentioned, and no priest, but those omissions do not necessarily prove that the place had neither, and probably it had both. The extent of the “hide” is very uncertain and it seems to have varied from sixty to one hundred acres. This entry obviously relates to Birmingham only, and Edgbaston, Aston, and other places are similarly described. This extract is merely given to show that some sort of town existed long before 1083-1086, and that its name was nearly as we spell and sound it now.

After Domesday Book a long blank occurs, except as to certain documentary evidence as to Fairs, (1166 and 1251), and the help given to Simon de Montfort against Henry III., by William de Bermingham. But a little light is thrown on the condition of Birmingham by further examination of a curious and unique old map of England and Scotland now in the Bodleian Library, but which was known to Gough and included in his Topography, (Vol. I., p. 77,) with an engraving by Basire, which, however, is very imperfect and inaccurate. A photo-zincograph of this ancient map was produced by the Ordnance Office in 1875, with a description by Mr. W. Basevi Saunders, who settles the date of the map as *circa* 1286-1300. In this map, which is remarkably interesting but ludicrously wrong in many parts, especially as to Scotland, Birmingham distinctly appears. Cathedral cities and large churches are generally indicated, rivers are marked, and even miles on roads, while a large number of single houses are marked to show towns, when no names are given. In the portion marked "Ardene" one house, with "Brmynghā," clearly appears between Worcester and Lichfield, and is the only town in Warwickshire which is described by name, not even Coventry or Warwick being named. This seems to show that Birmingham was a place of some importance even six hundred years ago, and that its name was then spelled nearly as now, the abbreviations probably indicating "Bermyngham."

As Dugdale's Warwickshire is generally limited to the territorial and family history, which is difficult to condense, and rarely refers to the existence or state of the buildings in his time, there is very little material for the history of the town for several centuries. He mentions, however, that Peter de

Bermingham “had a Castle here which stood nearre a Bow-shoot from the Church south-westwards” (12 Henry II., 1166), doubtless on the site of Smithfield market, which had buildings and moat till 1815. A market was granted by the same king, and on Thursdays, and was probably largely frequented and helped the progress of the town. From this de Bermingham family, Dugdale says, “doubtless came the de Berminghams of Ireland, who settled there very antiently: perhaps in Hen. II. days on the first conquest of that realm by Ric. Strongbow:” but the family connection with Birmingham ended with Edward and his tragic story in 1545.

The Priory.—The Hospital or Priory of St. Thomas the Apostle has had its name and site preserved by the names “Upper and Lower Priory,” “Minories,” &c., but the exact site of the buildings and the date of the foundation are uncertain. The grounds occupied a large space along Bull Street, Dale End, John Street, and Steelhouse Lane; but even in the recent excavations for new streets scarcely a fragment has been found. A century ago the pseudo-antiquarian William Hutton, who did his best to write a History of Birmingham, records that in 1775 he removed “twenty waggon loads of old stones, great numbers of which were highly finished in the Gothic taste; parts of porticos, windows, arches, ceilings—some fluted, some ciphered, yet complete as the day they left the chisel,” and that after letting the builders destroy the greater portion, he used some in making a fire-place in “an under-ground kitchen.” There is little hope now of finding any of these relics or of settling the site on which the Priory buildings stood. Even Dugdale failed to find its origin, and simply records that the first mention occurs in 13 Edwd. I. (1285), and that the

Commissioners of Henry VIII. (1545) valued it at £8. 8s. 10d., and that it was duly dissolved.

St. Martin's Church.—The Mother Church, St. Martin's, claims great antiquity, but its exact date has not been found. During the recent restoration some early wall-paintings were discovered, with the still more valuable remains which formed part of a Norman Church, very evidently on the same site, but all traces of whose history have been lost. The existing Church has, however, some highly interesting monuments of some of the de Berminghams of the thirteenth, fourteenth, and fifteenth centuries, one in alabaster, representing an ecclesiastic, being well known as an almost unique example of fifteenth century art. The present restored church has replaced an ugly brick casing which covered the decaying portion of an earlier church supposed to have been of the latter part of the thirteenth century with later alterations. The Registers begin in 1555, and have been carefully preserved, as well as various Church Books which have been used in the History of St. Martin's by Mr. J. Thackray Bunce.

St. John's Chapel.—Another ecclesiastical relic, in name only, is to be found in the ugly last century brick building, St. John's Chapel, Deritend, which has replaced the "propper chappel," which Leland saw in 1538, an early English building among the trees by the river side. This "chapel" was founded in 1375, by some of the inhabitants of Deritend and Bordesley, who found the floods often preventing access to their Parish Church at Aston. Thirteen of the inhabitants of the hamlets contributed the funds, and acquired the right of "appointing one Chaplain" for the services, and such Chaplain is appointed to

this day by the parishioners' votes. Tradition records that John Rogers, one of the early translators of the Bible, and the first Martyr of the reign of Mary, was born in Deritend near this Chapel, and a marble slab records his fame, but the tradition is doubtful, and has not been fully confirmed.

The Guild of the Holy Cross, whose Hall was on the site of the present King Edward's School, was founded in 6 Rich. II. (1382), for the maintenance of two priests to celebrate service daily in the Church of St. Martin, but ten years later was formed into a "Guild or Fraternitie, consisting of men and women of Birmingham," in the names of the "Bailiffs and Communaltie of Birmingham and other adjacent places, for a Chantrie of priests and services in the Church, for the souls of the Founders and all the Fraternitie," but in 37 Hen. VIII. (1545) the lands were valued at £31. 2s. 10d., and appropriated by the Crown, and afterwards, 5 Edw. VI. (1550), were used for the foundation of the "Free Grammar School of King Edward the Sixth, for the Education and Instruction of Children in Grammar for ever,"—the basis of the present noble foundation, not only in New Street, but in several important Branch Schools.

Leland's Description, 1538.—Nearly half of the sixteenth century had passed before Birmingham was visited and described by any stranger, and the visit of John Leland is a memorable landmark in the history of the town. His few words are familiar but worth quoting again, not merely as a record, but as a contrast with the changed conditions of over three hundred years. In the reign of Henry VIII., he made his famous journey through England, and in 1538 he visited Birmingham and rode through the town, which he describes in picturesque words:—"I came

through a pretty street or ever I entred into Bermingham towne. This street, as I remember, is called Dirtey [Deriten]. In it dwell smithes and cutlers, and there is a brooke [Rea] that divideth this street from Bermingham, and is an hamlett or member belonginge to the Parish therebye. There is at the end of Dirtey a propper chappell and mansion house of tymber, hard on the rype [bank] as the brooke runneth downe: and as I went through the ford by the [foot] bridge, the water ranne downe on the right hand, and a fewe miles below goeth into Tame, *ripâ dextrâ*. * * * * The beauty of Bermigham, a good markett towne in the extreame parts of Warwike-shire, is one street going up alonge, almost from the left ripe of the brooke up a meane hill by the length of a quarter of a mile. I saw but one Paroch Church in the towne. There be many smiths in the towne that use to make knives and all mannour of cuttinge tooles, and many loriners that make bittes, and a great many naylors. Soe that a great part of the towne is maintained by smithes whoe have their iron and sea-cole out of Stafford-shire."

This description of the town is minute and careful. The "mansion house of tymber" still remains as the Old Crown House in Deritend; and nearly opposite other half-timbered houses of the same period survive. The "propper chappell" has greatly changed its form, and the descriptions of trade are no longer strictly accurate, as some of the handicrafts are now better known at Sheffield, Walsall, and Halesowen. Some other old houses of the sixteenth century still remain, one notably in Digbeth, which has been carefully preserved; and one early sixteenth century house in Bull Street, near Dale End, has just been removed (1886). One remarkable change has

occurred since Leland's days; for the streams which crossed the roads have disappeared beneath, and the pumps and wells and water courses are long since gone.

Camden's Description, 1584.—The visit of William Camden confirms Leland's account, and shows considerable progress, as the town was "swarming with inhabitants and echoing with the noise of anvils," and the general prosperity evidently continued through the century, and far into the next century too, for it is clear that the manufacture of swords, if not of guns and pistols, had begun and was destined to extend the fame and improve the industrial condition of the town.

Prince Rupert.—The busy occupants of the line of road traversed by Leland and Camden had serious trouble a century later. Charles I. on his way, in 1642, to Edge Hill had stopped at Aston Hall, which had been built early in the seventeenth century, and was believed to be from a design by Inigo Jones. Sir Thomas Holte had been true to the King, but had become unpopular with the Birmingham people, who were on the Parliamentary side. Aston Hall was attacked and besieged for three days, and the traces of the cannonading still remain. In the April of the next year, 1643, the fiery Rupert advanced to Birmingham from Camp Hill, and was stopped in Deritend by the barricades and valour of the people, but he forced his way, plundered and fired eighty houses, and left the town on the other side after heavy losses of life and limb. Clarendon has described Birmingham "as of great fame for hearty wilful affected disloyalty to the King as any town in England," and the town had supplied the Parliamentary army with 15,000 swords, but "Prince

Rupert's Burning Cruelty to Birmingham" only intensified the opposition to the King and his cause.

A City of Refuge.—The latter part of the seventeenth century saw many marked advances in the prosperity of the town. The extravagances of the restoration period greatly increased the demand for many of the products of Birmingham ingenuity and skill. The demand for fire-arms also encouraged and extended one of the trades which was afterwards to become one of the great industries of the town; not only so, but Birmingham had become a sort of City of Refuge for reformers of all sorts, and a sort of Free Port for many sorts of manufactures which, owing to the customs of corporate towns, were restricted elsewhere. The "five mile," and other acts, drove out many useful and able people and sent them to reside in a place where there was more elbow room and more free air, and thus not only the population but the energy and usefulness of the inhabitants rapidly increased. The visits of George Fox had stimulated many people, like those of Wesley a century later, and every influence, industrial, political, religious, social, seemed to continue and develop and intensify the life and progress of the town.

Early Printers and Booksellers—The eighteenth century added but little to the antiquities, but much to the history of Birmingham. The industrial developments which Leland and Camden noted made far more rapid progress towards the end of the seventeenth century, when Birmingham became as famous for fire-arms as it had been for pikes and swords half a century before. Even that progress was, however, to be far exceeded before the eighteenth century ended, and the almost infinite variety of manufactures had become established. Birmingham

was, in fact, in those times, what London has since become, the centre towards which the foremost men of the day tended for many years. In the early years of the century, Dr. Johnson's father came to Birmingham weekly with a small stock of books—the only supply the town seems to have had—but a few years later Thomas Warren had begun to print, newspapers were started, and books of considerable importance were published. Dr. Johnson's first literary work, his translation of Lobo's Abyssinia, was dictated to Warren, but probably not printed in Birmingham, although as early as 1712, and possibly ten years sooner, books were printed in the town. So early as 1652 a master of the Grammar School had published a Latin Grammar—the earliest Birmingham book—and in 1717 the first book printed in Birmingham appeared from Matthew Unwin's press.

Early Maps and Engravings—Thomas Warren's first known book is dated 1728, and many important works afterwards came from his press. Engraving, as well as printing, soon became common, and many excellent examples soon came forth. In 1731, William Westley published the first map or Plan of Birmingham, followed by others of great value, as Bradford's, in 1751, and Hanson's, in 1779; and Bradford also issued a "View of Birmingham," of a size and quality unsurpassed in line-engraving, of which only two copies have survived. Many folio and quarto volumes appeared in the middle of the century from Thomas Aris, C. Earl, and others, and were remarkably fine productions for a midland town a century and a half ago.

John Baskerville—All these, however, were surpassed by the far-famed productions of John

Baskerville's press, for his experience as a gravestone cutter in Moor Street, and his fine taste and restless energy enabled him to produce type and paper, and to print in so excellent a style, that his productions soon won European fame. At Easy Hill—the house, in ruins, still remains—he made his own presses, type, and probably paper to some extent, and spent hundreds of pounds before he had formed letters to please his fastidious eyes and excellent taste. Birmingham has few greater claims to honour in the industries and arts than those which have so universally been given to the Baskerville Press.

Directories—The later half of the century was even more distinguished in many other ways. The modern Directories were not popular or common till late in the last century. Even the rare London Directory of 1677 does not seem to have had many imitators, but about 1750 the increasing number of trades stimulated the demand. In Newcastle-on-Tyne, and in Sheffield and other towns, Directories appeared, and Birmingham was among the first, and one of great interest and value appeared in 1770, and probably earlier, followed by others, ever increasing as the population increased, but very curiously contrasting with the huge volumes of later days.

Cotton Spinning—One of the most remarkable, perhaps, of the industrial schemes in Birmingham, was the establishment of a cotton mill, which still remains as a building and shows its origin, although now a rolling mill. It was the natural result of the genius of John Wyatt and of Lewis Paul, for in a room in the Upper Priory—now covered by the schools of the Society of Friends—the first cotton spinning machine was erected and worked, and the

old distaff and spindle, and spinning machine doomed. Thomas Warren, Edward Cave, Dr. James, and others, took up the speculation of Lewis Paul, and mills were built at Birmingham and Northampton, but before the century closed they had failed to pay.

The Soho Works—The most famous of all the classes of industrial enterprises in Birmingham was the famous "Soho." From the manufacture of "toys"—steel toys, buckles, buttons, sword-hilts, &c. —in Snow Hill, Matthew Boulton had removed to Soho in 1763. There he erected machinery for water power, but by happy accident, James Watt visited the place, and Boulton was so struck with his improvements in the steam engine, which Soho only seemed able to produce, that a connection began which has immortalised the names of Boulton and Watt, and shed undying glory on the industrial history of Birmingham. The story has been too often told to require repetition, but even now it has scarcely been fully told. Soho itself has perished, scarcely a relic remains, but James Watt's house at Heathfield still exists with relics which will ever be an honour to his genius, and will keep his memory green. All admirers of the genius of Watt will hope and desire that these remains of an industrial hero, a genius of the useful arts, may become a public trust, to show posterity how so illustrious a man of science was valued in his life, and is honoured by those who rejoice in the fruits of his genius and skill.

Famous Men: the Soho Circle—One of the most remarkable chapters in the history of Birmingham would be a full record of the men of the latter half, or even the last quarter, of the last century who gave lustre to the town, and who materially helped its

constant progress. “Soho” had not only supplied what the world had long wanted, “power,” but it had set up a standard of excellence, and had trained a class of workmen who were to go forth to conquer, at home and abroad, in all industrial work. The spirit of Soho is still abroad in the land, and Birmingham may claim to have been one of the foremost in the mechanical progress of the past hundred years.

The galaxy of great men, as it has been called, who met in Birmingham a century ago is certainly remarkable. Boulton was a native of the town, but many “strangers came within the gates.” James Watt —almost all-accomplished—was soon followed by Joseph Priestley, who lived here for eleven years. His fame had preceded him, his great discoveries had been made. A storm of popular and ignorant bigotry drove him from the town, wrecked his home, ruined his laboratory, and burned his library; but the sons have “blushed to find their fathers were his foes;” and a statue honoured his memory and his great discovery of oxygen on the centenary of that day. Dr. Darwin, of Lichfield and Derby, the father of a noble line, and himself a man of genius and power, was a constant visitor. William Murdock, one of the ablest of the Soho group, the first maker of a locomotive, and the practical inventor of gas-lighting, was long a resident in the town, and is buried near Boulton and Watt. John Baskerville, the printer; Josiah Wedgwood, the famous art-potter; James Keir, the great chemist; Richard Edgeworth and Thomas Day, authors; Joseph Berington, the learned Roman Catholic; Dr. Withering, the botanist; Dr. Parr, the famous Greek scholar; Samuel Galton, the Quaker; John Proud, the Swedenborgian; John Wyatt, the inventor; Edmund Hector, Johnson’s friend; and many others, formed such a “happy family” of genius

and worth as few towns of the period could surpass or equal; and that "golden age" of Birmingham, the men and names, and works and progress of the last century, must ever be remembered and honoured, even in these days of quicker progress and greater victories in scientific and industrial pursuits.

[Many very interesting details of the History of Birmingham are necessarily omitted in this brief summary and may be found in the following works: —

Aston Hall, (A. E. Everitt)	1846
"" and the Holte Family (Davidson)	1854
"" Monograph of (Niven)	1880
Birmingham, History of (W. Hutton)	1781 &c.
"" Presbyterian Nonconformity in (J. R. Wreford)	1832
"" and its Vicinity (W. Hawkes Smith)	1838
"" General Hospital & Musical Festivals (J. T. Bunce)	1858
"" Free Schools, Colleges, &c. (G. Griffith)	1861
"" Memorials of Old,—"Old Crown House," and "Men and Names" (Toulmin Smith)	1864
"" and Midland Hardware District (S. Timmins)	1866

”” Buildings of, Two Series (“Este”)	1866
”” Life, A Century of, 1741 to 1841 (J. A. Langford)	1868
”” Queen’s College, Annals of (W. S. Cox)	1873
”” Modern, 1841 to 1871 (J. A. Langford)	1873 &c.
”” Old St. Martin’s Church (J. T. Bunce)	1875
”” Men (E. Edwards)	1877
”” Corporation, History of (J. T. Bunce) 2 vols.	1878 &c.
”” Old and New (R. K. Dent)	1880
”” Inventors & Inventions (R. B. Prosser)	1881
”” Old Meeting House and Burial Ground (C. H. Beale)	1882
”” Dictionary of (T. T. Harman)	1884
Boulton and Watt (S. Smiles)	1865
Keir, Jas., Life of (J. K. Moilliett)	1868
Watt, Jas., Life of (J. P. Muirhead)	1858
” Mechanical Inventions (J. P. Muirhead)	1854
” Mechanical Inventions (E. A. Cowper), Transactions of Mechanical Engineers, November	1883

The Reference Library contains all the works named, and many others,—every known book or pamphlet, map or directory, relating to the History of Birmingham; and the detailed catalogue (pp. 93) classifies the collection under numerous headings, including all the Acts of Parliament relating to

Birmingham and its neighbourhood.]

PART II.

Chapter I.
LOCAL GOVERNING BODIES.

BY J. THACKRAY BUNCE.

The Local Government of Birmingham is administered by five sets of authorities:—

1. Justices of the Peace.
2. Town Council.
3. Drainage Board.
4. Boards of Guardians.
5. School Board.

Justices of the Peace.—The first of these bodies was constituted by Royal Grant in 1838, when the town was incorporated as a municipal borough. A Court of Quarter Sessions was then next established, for the trial of prisoners, and a Recorder was appointed. The Court of Petty Sessions for the borough was instituted at the same time, under special commission of the peace. The duties of the justices are to maintain peace and order in the borough, to administer justice at petty sessions, to appoint visitors to the prison, and to grant licences for public houses, theatres, and concert halls, and licences for music and dancing in houses kept for the

sale of liquor. They are invested with powers of control over the police on occasions of actual or threatened disturbance of public order; and any two of them, sitting in petty sessions, are empowered to suspend or dismiss any police constable for sufficient cause.

The Town Council has charge of the general administration of the affairs of the borough; watching; lighting; making, draining, and repairing streets and roads; the care of the public health, by the prevention and removal of nuisances, the enforcement of a system of house inspection, the collection and disposal of night soil and house refuse, and the maintenance of a Borough Hospital; the control of the Borough Cemetery, (for which it acts as a Burial Board;) the provision and management of Baths and Parks; of Free Libraries, Museums, and Schools of Art; and it also has control of the manufacture and sale of Gas, and the provision of Water. The powers of the Corporation, originally and to a limited extent conferred by Royal Charter in 1838, were by degrees enlarged by twenty special local Acts or Orders sanctioned by Parliament, for various purposes. The whole of these were, in 1883, consolidated in the Birmingham Corporation Consolidation Act, which, together with the Municipal Corporations Amendment Act of 1882, and the Public Health Act of 1875, constitute the Municipal Law under which the affairs of the Borough are administered.

The Drainage Board is a body composed in part of representatives elected by the Town Council, and in part of representatives elected by the Local Boards of districts adjoining the Borough. There are twenty-two members of this Board, two of them, the Mayor

of Birmingham, and the Chairman of the Aston Manor Local Board being ex-officio, and the others being elected in the following proportions: Birmingham Town Council eleven; one each from the Local Boards of Aston Manor, Balsall Heath, Handsworth, Harborne, Saltley, and Smethwick; and one each (elected by the respective Boards of Guardians) for Aston Rural District and Sutton Coldfield, King's Norton and Northfield, and Perry Barr. The Board has charge of the sewage from the districts above named, extending over an area of 45,000 acres. The whole of the sewers are made to converge to a common outlet at Saltley, where the sewage is received into tanks, and is then purified, first by precipitation, and next by passing it through the land of the sewage farm, the effluent water, thus rendered clear and harmless, being poured into the rivers Cole and Tame. The sludge remaining in the sewage tanks is dug into the land. For the purposes of sewage treatment the Drainage Board has acquired about 1,200 acres of land in the Tame Valley. The Board has borrowing powers, exercised to the extent of £400,000 for the acquisition of land and the execution of works; and it has also rating powers for the payment of interest and repayment of capital, and for current expenditure. These powers are exercised by serving precepts upon the several local authorities included in the Drainage area, in proportion to the number of their rated tenements.

The Boards of Guardians have charge of the poor law administration of the Borough. There are three parishes in the Borough, namely, Birmingham, Edgbaston, and part of Aston. The parish of Birmingham is separately administered by a Board of Guardians, originally constituted under a Local Act of 23 Geo. III. (1782) modified by a local Act of 1

and 2 Wm. IV. (1831) and further modified by "orders" of the Poor Law Board, and the Local Government Board; the last of these was issued in 1882. The number of Guardians for the parish is 60, and the twelve overseers (the rating authority for poor law purposes) also have seats on the Board.

The parish of Edgbaston is wholly in the Borough, but it forms part of the King's Norton Union, and as to the poor law is governed by the Guardians of that Union. The parish of Aston is only partially within the Borough; it is administered by the Guardians of Aston Union. Edgbaston and Aston parochial affairs are governed under the general poor law Acts, there being no local Act for either parish.

The School Board, which consists of fifteen members, was first elected in November, 1870, under the Elementary Education Act passed in that year. It has charge of the Board Schools throughout the Borough.

The above described bodies are all of them representative, but are elected on different franchises, and by different methods.

The Town Council is elected by the votes of all occupiers in the sixteen wards in which the Borough is divided, women householders being entitled to vote; three Councillors being chosen for each ward, and one of the three retiring each year; and the votes being given by ballot. The Drainage Board is elected by the governing authorities. The Guardians of the Poor are chosen, in Birmingham; by ratepayers of £12 annual value, the whole Board being elected at one time, by voting papers delivered at the place of election; and in the other parishes by all occupying householders, by voting papers collected from the electors. The School Board is elected by the votes of

all householders, the whole Board retiring at the end of three years, and the votes being taken on the cumulative plan, each elector giving the whole of his votes to one candidate, or dividing them in any other proportion, at pleasure.

Each of the bodies is invested with borrowing and rating powers, limited by local or general acts. The Town Council levies rates on the whole Borough—a Municipal or Borough Rate for general municipal purposes, under the Municipal Corporations Acts, and an Improvement Rate, for purposes specified in the Local Improvement Act. The Drainage Board and the School Board serve precepts upon the Town Council for the amounts they respectively require, and these amounts are included in the Borough Rate. The Guardians of the Poor make rates for their respective parishes for poor law purposes; and they collect, on behalf of the Town Council, the rates levied for municipal expenditure, including the money required by the Drainage Board and the School Board. There is one assessment for local rates, made (under a recent agreement with the Town Council) by the parish overseers.

The preceding statement shortly describes the existing arrangement of local government in Birmingham; but, in order to explain the growth of the system now in operation, it is necessary briefly to sketch the history of local administration. Birmingham has always been what is called a free town, that is, until after the passing of the Municipal Corporations Act in 1835, it had no Corporation, with a restricted burgess roll, and consequently the community was open to all who cared to settle in the town for the purposes of residence or trade, a circumstance which largely contributed to the rapid

growth of Birmingham in population, industry, and wealth. Down to the year 1769, the government of the place was controlled by the three sets of authorities existing in all non-chartered communities.—1, the justices, to keep the peace, and to punish crime. 2, the court leet (with its elected jury, its high and low bailiffs, its ale tasters, flesh connors, and leather sealers) meeting at irregular intervals, under the direction of the Lord of the Manor, and invested with the care of markets, nuisances, and other matters pertaining to, or interfering with, the rights of the lord. 3, the Churchwardens, who transacted the church and parish business, and held vestry meetings for general town purposes, and for the choice of surveyors of the highways.

In 1769, an Act of Parliament was obtained, constituting a body of Commissioners for the purposes of maintaining, improving, and lighting the town, and invested with general powers affecting the health and safety of the inhabitants, and the common welfare. By subsequent Acts—five in number, the last of these being passed in 1828—the powers of the Street Commissioners were extended, and they were authorised by the last named Act to build a Town Hall. Their authority was confined to what was then known as “the town of Birmingham,” the boundaries of which were co-extensive with the parish of Birmingham. The first Commissioners were named in the Act constituting them, and vacancies were thereafter filled up by the Commissioners themselves, without reference to the inhabitants. The system of local government thus instituted continued unchanged until the year 1838. In 1832, Birmingham was, for the first time, under the provisions of the Reform Act, constituted a Parliamentary borough,

with the right of returning two members to the House of Commons. The boundaries of the Borough were so arranged as to include the parish of Birmingham, the parish of Edgbaston, and the hamlets of Deritend and Bordesley, and Duddeston and Nechells, in the parish of Aston, the area thus formed being 8,240 acres. The Parliamentary Reform Act was followed by the passing of the Municipal Corporations Act, in 1835. For a considerable time there had been a strong feeling in favour of some completer form of local government than that afforded by the Commissioners Acts, and especially for government founded upon the representative principle. In 1837, steps were taken to obtain a charter of incorporation for the town, under the authority of the Municipal Corporations Act; and in October, 1838, after much opposition, both locally and in Parliament, a charter was granted, and the Corporation of Birmingham came into existence.

The boundaries of the new Municipal Borough were fixed so as to correspond with those of the Parliamentary Borough, above described. The area was divided into thirteen wards (extended in 1873 to sixteen wards), and the Council was constituted of 16 aldermen and 48 councillors. The first elections of councillors took place on the 26th of December, 1838, and on the day following the Council met, and elected the aldermen, the governing body being then fully constituted. Mr. William Scholefield was elected the first Mayor.

Although Birmingham had now obtained a system of representative government, the state of affairs was by no means satisfactory. In the parish of Birmingham the self-elected Commissioners of the Street Act retained their full authority, and in the

district of Deritend and Bordesley local government was for certain purposes still exercised by a body of Commissioners constituted by an Act passed in 1791, while Duddeston and Nechells were governed by Commissioners appointed under an Act of 1829. There were consequently four governing bodies within the borough, and the powers of the new Corporation were consequently seriously limited and its action impeded. Other difficulties of a peculiarly embarrassing character speedily developed themselves. The validity of the Charter was contested both in the Law Courts and in Parliament; disputes arose between the Borough Magistracy and the County Bench; hindrances were put in the way of the Court of Quarter Sessions granted for the Borough. In addition to these causes of disquiet the occurrence of the Chartist riots of 1839 furnished a pretext for withdrawing from the Corporation the right of establishing a constabulary or police force for the town, and a special Police Act was passed by which, while paid for by the ratepayers, the police force was placed under the absolute control of a Government Commissioner. In 1842 this perplexing condition of affairs was, however, brought to an end, by the passing of an Act of Parliament confirming the Charters of Birmingham and Manchester, and an Act was also passed transferring to the Corporation of Birmingham the control of the local police force. The powers of the Town Council, however, were still very limited, owing to the conflicting local authorities existing in the Borough, and it became evident in the course of time that, in the public interests, the representative body must finally be made supreme. The minor bodies did not yield without a contest, but in the end the pressure of opinion overcame their resistance, and in 1851 the passing of the

Birmingham Improvement Act put an end to all the bodies of Commissioners, and transferred their powers, with others provided by the Act, to the Town Council, as the representative of the ratepayers of the borough, and the Town Council became thenceforward the sole governing authority for all municipal purposes. The Act mentioned further authorised the borrowing of loans for purposes of town improvements and for a system of sewerage, and empowered the Council to levy a special rate for such purposes, in addition to the ordinary municipal rate levied under the Municipal Corporations Act. Ten years later, in 1861, a second Improvement Act invested the Corporation with further powers of administration and of borrowing; and numerous other Acts were subsequently obtained for specific purposes. Among these were the Parks Act, 1854; an order (1873) extending to sixteen the number of Wards in the Borough;—an Act giving the Council power to acquire closed burial grounds and to lay them out as places of public recreation, passed in 1878; Acts for the purchase of the Gas and Water undertakings in 1875; an Act for a Sanitary Improvement Scheme under the provisions of the Artisans' Dwellings Act, 1876; for the constitution of a Drainage Board, in 1878; and for the issue of Corporation Stock in 1880. The powers of most of these enactments, with additional powers, were embodied in the Birmingham Corporation Consolidation Act of 1883, which, amongst other provisions, abolished the restriction to one penny in the pound previously imposed upon the Free Libraries Rate (under the General Libraries Act) and authorised the Council to conduct a Municipal School of Art.

The Consolidation Act, therefore, now constitutes

the authority under which (in addition to the powers conferred by general municipal law) the government of the borough is now administered. The following statement, extracted from the "History of the Corporation of Birmingham," explains the scope and working of the system:—

"The municipal government, under the Charter of Incorporation and the Acts of Parliament relating to municipal corporations, is conducted by a council, consisting of forty-eight councillors and sixteen aldermen.

"Three councillors are allotted to and elected by each of the sixteen wards into which the borough is divided, and each councillor is elected for three years, the elections being so arranged that one-third of the councillors (one in each ward) retire every year, and elections for the choice of their successors are held on the first of November. The aldermen are chosen by the members of the Council, and are elected for six years; they may be chosen from amongst the members of the Council, or from fit persons not members of the Council, but who are qualified for election to it. The Mayor is chosen by the Council, on the ninth of November, for a term of one year. Under the Municipal Corporations Act of 1835, it was obligatory that, at the time of being elected, he should be a member of the Council; but by the Municipal Corporations Act of 1882 it is provided (sec. 15) that 'the Mayor shall be a fit person elected by the Council from among the aldermen or councillors, or persons qualified to be such.' There is now no property qualification required for any members of the Council.

"The Council, as a whole, is the rating and controlling authority for the Borough. In all matters

subjected to its authority it acts upon communications from the Mayor, upon motions made upon its own initiative (regulated by its standing orders for the conduct of business) and upon reports and proposals from the Committees it appoints, and to which it delegates specified branches of municipal work, under such regulations and with such limitations as it may direct.

"These Committees have varied from time to time; at present they are sixteen in number, and are named, constituted, and empowered as follows, taking them in the order in which they are stated in the 'Borough of Birmingham Municipal Diary,' issued by the Town Clerk, under the direction of the Council:—

1.—Baths and Parks Committee.—"To have charge of the public baths, parks, gardens, and recreation grounds, and the buildings thereon (excepting the recreation ground in St. Clement's Road, in charge of the Gas Committee, and the buildings in Adderley Park, in charge of the Free Libraries Committee); to have charge of the trees planted in the streets; to lay out disused burial grounds acquired by the Council; and to arrange for supplies of coal and coke to the several departments of the Corporation, excepting the Lunatic Asylum, Public Works, Gas and Water Committees.

2.—Estates Committee.—"To take charge of all estates and buildings belonging to the Corporation, not in charge of other Committees (including the Council House); to make rules for granting the use of the Town Hall; to sell, let or exchange lands or buildings not required for public purposes, as the Council may resolve; to superintend the arrangements of the Borough Cemetery, and perform

the functions of the Burial Board; and to arrange for the acquisition of closed burial grounds.

3.—Finance Committee.—"Generally to have charge of the accounts and financial departments of the Borough, reporting thereon to the Council—and thus to present estimates of income and expenditure for the year; to recommend rates, and to see to the collection of rates; to cause the valuations of rateable property to be maintained, and to hear and decide appeals against assessments; to negotiate loans, and to conduct and manage the Birmingham Corporation Stock, 'with all the powers conferred upon the Council by the Birmingham Corporation Stock Orders;' to effect fire insurances, insurances on property belonging to the Corporation (excepting that in charge of the Water and Improvement Committees); to print and issue the Council Minutes; and to make orders upon the Borough Treasurer for payments of interest on loans and annuities, and for accounts for moneys which the several Committees of the Council are authorised to expend.

4.—General Purposes Committee.—"To attend to all business and matters referred to it by the Council, of a general character, not entrusted to the various other Committees, and to suggest to the Council, from time to time, any new business, which, in its opinion, is important to the public interest.

5.—Markets and Fairs Committee.—"To transact all matters relating to the regulation, control, and management of the Markets and Fairs holden in the Borough; to administer the Weights and Measures Act, the Dairies Act (so far as it relates to cow-sheds), and the Contagious Diseases (Animals) Act; to regulate slaughterhouses; to inspect meat, game, fish, poultry, and other similar articles of food offered for

sale.

6.—Health Committee.—"To exercise the powers conferred by legislation for the regulation of lodging-houses, smoke nuisances, nuisances generally, offensive trades, and infectious diseases; to enforce the powers of the Council with reference to drains, closets, ashpits, &c., to carry out the Acts for preventing adulteration of food and drugs; to have charge of the Small-pox and other Borough Hospitals; to have charge of the collection, removal, and disposal of the night soil of the Borough; to 'proceed with the work of the interception of the contents of privies and ashpits, so far as the powers of the Council will enable them;' to enforce the Canal Boats Act, the Factories Act (1883), and the Dairies and Milkshops Orders, so far as relates to dairies and milkshops.

7.—Public Works Committee.—"To have charge of all works connected with draining, paving, maintaining, cleansing, and lighting the streets and roads within the Borough; to submit to the Council (and under its authority to execute) all necessary street alterations and improvements, and to act in all other matters arising out of the Acts and Bye-laws relating to streets and buildings, to fix cab-stands; to take charge of public monuments and statues (excepting the Chamberlain Memorial Fountain in charge of the Water Committee); and to construct and maintain the lines of tramways authorised to be laid within the Borough.

8.—Watch Committee.—"To execute the powers relating to the police force given by law; to take charge of the fire brigade; to execute bye-laws regulating cabs and omnibuses, and to license drivers of such vehicles and of tramway cars; to administer

the Steam Whistles Act, the Explosives Act, the Petroleum Acts; to control the public mortuaries; to license marine store dealers; to enforce the provisions of the Consolidation Act (1883) relating to the employment of children, and the means of ingress and egress to and from public buildings; and to enforce the bye-laws for the suppression of shouting in the public streets. [By general Acts of Parliament the Watch Committee is authorised to appoint, dismiss, control, and fix the rate of payment of the police constables.]

9.—Lunatic Asylums Committee.—"To have the management and control of the Lunatic Asylums at Winson Green and Rubery Hill, 'with all the powers, and subject to all the provisions of the several Acts of Parliament now in force with regard to such lunatic asylums.'

10.—Free Libraries Committee.—"To carry into effect the provisions of the Free Libraries and Museums Act, as amended by the Corporation Consolidation Act (1883); reporting to the Council from time to time for approval.

11.—Industrial School Committee.—"To carry into effect the Industrial Schools Act, and to have charge of the Borough Industrial School (at Shustoke), and the land and buildings connected therewith.

12.—Gas Committee.—"To conduct and manage the Corporation Gas Department, with all the powers conferred upon the Council; reporting from time to time thereon.

13.—Water Committee.—"To conduct and manage the Corporation Water Department, with all the powers conferred upon the Council, reporting from time to time; to have charge of all public fountains;

to institute and prosecute proceedings for 'restraining and preventing the pollution of the river Tame, and of any of the tributaries thereof, of the streams at Witton, Plant's Brook, and Whitacre, and of all other rivers and streams from which the water supply of the borough is obtained.'

14.—Improvement Committee.—"To receive representations from the Medical Officer of Health with regard to unhealthy areas within the borough, and to submit schemes thereon. To conduct the business arising out of the orders granted under the Artisans' Dwellings Act, with all the powers thereby vested in the Council, excepting that agreements for sales of land, and for the grant of leases for terms longer than fourteen years, shall be provisional only, until confirmed by the Council, and that no new street shall be laid out, or any existing street widened, until approved by the Council.

15.—Art Gallery Purchase Committee.—"To have the expenditure of £10,000, given by Messrs. Tangye, and of the amounts subscribed in addition thereto, in the purchase of objects of art for the Art Gallery of the Borough.

16.—Museum and School of Art Committee.—"To carry out the powers of the Consolidation Act with reference to the erection of a School of Art, and to superintend the arrangements and completion of the Art Gallery." This Committee has the charge of the School of Art, and is also empowered to manage the Corporation Art Gallery and Museums.

With the exceptions undermentioned, these committees consist of eight members each. The exceptions are—the Lunatic Asylums Committee (eleven members), the Free Libraries Committee (ten

members of the Council and six members elected by the Council outside its own body), the Art Gallery Purchase Committee (consisting of the Free Libraries Committee and nine other members); the Museum and School of Art Committee, which consists of eight members appointed for life by the Society of Arts and School of Art; and the General Purposes Committee, which consists of one member (usually the chairman) elected by each of the committees of the Council. The mayor, by virtue of his office, is a member of all committees.

The Town Council is also invested with a share of the management of the chief educational institutions of the town, with the exception of the School Board. It appoints eight Governors (holding office for six years) on the Board of King Edward the Sixth's Grammar School; five members (holding office for life) on the Trust of Sir Josiah Mason's College; and four Governors (appointed annually) on the Council of the Midland Institute, the Mayor for the time being being also a Governor of the Institute, by virtue of his office. It also appoints representative Governors on the governing bodies of Lench's Trust, and several other charities, and further appoints representative Guardians of the Birmingham Proof House, for the proving of fire-arms.

The progress of Birmingham since the establishment of local representative government is exhibited in the following table:—

	1838.	1884.
Population	170,000	421,000
Parliamentary Elections	7,300	63,718
Burgesses	5,023	74,167

Rateable Value	£407,000	£1,563,000
Rated Tenements	39,000	98,787
Death Rate, 1842 to 1851 yearly average,		24.96
”1872 ” 1881”		23.25
”1882 ” 1884”		21.6

Chapter II.
EDUCATION.

BY OSMUND AIRY, M.A.,
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It can fairly be said that there is probably no town in England which possesses a more complete educational system than Birmingham. This system has been no effect of a pre-conceived design, but has grown up, piece by piece, in the stress of the life of a great manufacturing centre, where people of leisure may be counted on the fingers of one hand. All the more, probably, it has been constantly and definitely adapting itself to the needs of the locality. The boast is at any rate a just one, that in this busy population the road is clear, clear that is of all artificial obstructions, clearer far than in many a more polished and cultivated society, for a boy to rise from the gutter to the University, or to eminence in any science or art.

Foundation of the Grammar School.—King Edward’s School owes its origin to an institution more than a century and a half older than itself. The Gild of the Holy Cross, the earliest record of which is

to be found in a writ of Richard II., July 10, 1392, was a body which concerned itself, not of course with education, but with functions partly religious and partly quasi-municipal. It possessed a Gild Hall, a building of wood and plaster, standing at a distance from the town on the south side of the highway to Hales Owen, now New Street. In 1547 its possessions were seized by the King, and they continued in the Crown until 1552, when Edward VI., upon the petition of the inhabitants, gave them back to the town for the maintenance of a Free Grammar School, for the instruction of children in grammar. The clear yearly value of these lands was then £21,[2] and they were assigned to William Symmons, gent., Richard Smallbrook, Bailiff, and 18 other inhabitants, "to hold by fealty only, in free soccage" on condition of an annual payment at Michaelmas of £1 (apparently commuted in 1810 for £25. 15s. 6d.). These twenty assignees were to hold their position for life, and all vacancies by death or removal were to be filled up by co-optation. In the first instance they were to be inhabitants of the manor of Birmingham, but the restriction was modified in 1830. They were to nominate a Pedagogue and a Sub-pedagogue, to whose support the revenues were to be exclusively employed; and they were permitted to acquire further revenues to an amount not exceeding £20 per annum.

FIRST STATUTES.—More than one hundred years later, Oct. 20, 1676, the Governors issued their first statutes. No tenant of school property might be a Governor. The house, then occupied by the chief schoolmaster, with a barn and croft in New Street,[3] a close called the Lower Leasowe or Broom close, in the "foreign" of Birmingham, and the pit on the lower side of the Leasowe, were appropriated to the

use of himself and his successors for ever; while the usher's house, with the garden, use of the pump, and other appurtenances, a barn and croft in New Street, and Kimberley's croft in Moor Street, were similarly appropriated to the usher. The salaries of the chief master and usher were to be £68. 15s. 0d. and £34. 6s. 8d. respectively. There were appointed also a chief master's assistant; an English master, to teach in a distinct school fifty boys[4] to read English; and a scrivener, to teach twenty boys to write and cast accounts. The first two were to be unmarried, but the Governor reserved the power of allowing the scrivener to marry. £30 per annum was allowed for repairs to the school and masters' houses, payment of dues, etc. Another statute permitted the Governors, when their funds allowed, "to set out to Poore Tradesmen, when they come out of their apprenticeship, or others who want stock to manage their trade, £10 a piece, *gratis*, for 6 months, on good security;" but no record exists of this having been acted upon.

SCHOLARSHIPS.—£70 a year was devoted to forming seven scholarships of £10 a year each, tenable at any college in either University.[5] Children from the manor had the preference; then those from adjacent places, who had spent the last three years in the school; failing such, the poorest and most capable, to be selected from the upper form by an independent body.[6]

At the end of the reign of Charles II., the charter was surrendered to the Crown, probably under a writ of "Quo warranto;" a new one dated February 20, 1685, being granted by James II. Six years later, a decree in chancery was obtained annulling the new charter, and restoring the old one.

THE SECOND BUILDING.—In 1707, the old Gild Hall was removed, and a new building erected, consisting of a centre and two wings, the latter coming close up to the street, enclosing three sides of a small quadrangle, comprising a dwelling house for the head master, one large and two small school rooms, and a library. A separate house for the second master stood behind. A large tower in the centre was "ornamented with a sleepy figure of the donor, Edward VI., dressed in a royal mantle, with the ensigns of the garter, holding a Bible and a sceptre." In 1756, a set of urns was placed on the parapet, to relieve the stiff air of the building.[7]

ESTABLISHMENT OF BRANCH SCHOOLS.—In 1751, a step of far-reaching importance to the town was taken. The Governors ordained that (having regard to "the great numbers of children who, by reason of their poverty or the negligence of their parents, were never taught to read the English tongue, and the advantages from having many such children taught to read English, more than could be taught in the School") four masters or mistresses[8] should be chosen to teach English to not more than forty boys or girls apiece in various parts of the town, with a salary of £15, or less in proportion to the numbers. In October, 1790, we read that the Governors "have very laudably opened an evening school in their rooms in Shutt Lane" (used as a *branch* school previous to 1788), "for the instruction of forty boys in writing and accounts; another school is also opened in Mr. Peele's in Great Charles Street for twenty boys."[9]

CORRUPTION IN THE MANAGEMENT.—Up to 1824, however, the school was far from doing its duty. The revenues disappeared in mysterious ways. The Head

Master, Mr. Cooke, gave leases as he thought proper, both as to terms and duration. No money was granted for scholarships. The parents paid the most exorbitant terms for books and stationery. "Altogether the school was a nest of peculation, and greediness became so paramount that the statue of the Royal Founder was allowed to decay and to tumble from its time-honoured elevation into the quadrangle in front of the school." In 1824, an intrigue between the Governors, the Masters, and the Bishop of Lichfield (whose consent was necessary to all changes), to move the school from the town, and make it select, was frustrated by the vigorous action of the inhabitants, and a commission was appointed by the Court of Chancery to carry out a thorough investigation into the conduct of the school. In 1825 the Master was ordered to draw up a scheme for its future establishment, and to report whether it should be rebuilt; and in 1828 it was further referred to him to enquire whether the old site or a new one should be chosen, and how the money required should be raised.

THE BILL OF 1830-1.—In May, 1830, after a prolonged struggle of the Governors and Master against the people, a bill was presented to parliament to enable the Governors to build a new school, to raise £50,000 for the purpose, and to regulate the school according to a scheme approved by Chancery. It was vehemently opposed by the Dissenters, on the clause directing that "no person shall be elected a governor who is not a member of the Established Church of England," and was thrown out on the third reading in the Lords, but passed in the following year, the obnoxious clauses having been removed. In the first place, the school was to be rebuilt on the old site, at a cost of £30,000, and all branches of an

English education, in addition to the dead languages, were to be taught. No boy was to be admitted under eight years of age, or retained after nineteen (no limits of age had existed hitherto); and boys, not sons of inhabitants, were to pay fees. In the second place, a new school was to be built distinct from the Grammar School, for the teaching of modern languages; while four branch schools for the free education of boys and girls of the humbler classes were to be erected before 1840, £1,000 being spent upon each. Ten exhibitions, each of £50 per annum, were created, Birmingham boys taking precedence. Ratepayers, though non-resident, might be governors, provided they were not tenants of school property, and attended once in two years. The accounts were to be published yearly, and there was also to be an annual examination of the school.

THE PRESENT BUILDING.—The new building was erected from the designs of Mr. Charles Barry, the architect of the Houses of Parliament. The style is the latest pure Gothic in England, that which prevailed immediately before the commencement of the 16th century. "The school is entered by a spacious porch, highly ornamented: two large apartments, with oak pannelled walls and ceilings, are the school room for the commercial school;[10] the classical school is 120 feet long, 45 high, 30 wide, with a lofty angular roof, supported by a series of magnificent obtuse angled arches of the Tudor style. At the end, where the chair of the Head Master is placed, is a handsome lofty oak carved screen. The Second Master's chair is opposite to this, and the Usher's chairs are on the sides. There is a library and a fine bust of Edward VI. by Scheemaker."

It was not until 1836 that the Governors were able

to carry out actively the provisions of the Act of 1831. A fresh Act in 1837 amended the former one by repealing the power to build a separate modern school, which it was now arranged should be carried on in the premises of the Grammar School. The new building had cost £67,000, instead of £30,000; and the excess was to be defrayed out of the £50,000 mentioned in the Act of 1831. By the scheme approved in Chancery, in 1838, masters were ordered to be appointed during that year in elementary literature, geography, elements of composition, sacred and profane history, mathematics, natural philosophy, writing, and arithmetic; French and German masters in 1839 and 1840; and Spanish and Italian when advisable. Temporary lecturers might also be employed, and a visitation of the school was to take place once a year. A branch school was in progress in Aston Street, in 1837, and a second was proposed in Cottage Lane, near the Sandpits. Mr. E. Oxenbould and Miss A. Corbett were elected master and mistress of two others in the Parade, in August, 1838; and a fourth for boys, was opened in Meriden Street, on April 10, 1839. These branch schools, the history of which it is difficult to make out clearly, were for the time regulated by the statute of 1852, which established four schools, Gem Street, Edward Street, Meriden Street, and Bath Row, accommodating altogether 510 boys, from 8 to 14 years of age, and 490 girls from 7 to 13. The children were nominated by the Governors, and examined for admission by the Head Master, who had entire control of these schools, visited them once a month, and made an annual report on their condition to the Governors. A general English and religious education was given; the boys learning in addition bookkeeping and the elements of

geometry, and the girls, knitting and plain needlework.

In 1861 it was ordered that the second master should have the general supervision of the English school, under the direction of the head master, who retained in his hands the admission and promotion of scholars, and most other matters of importance.

DISCONTENT IN THE TOWN.—Meanwhile serious discontent had arisen with the constitution of the body of governors. By the original charter it was laid down that they should be "twenty of the more discreet inhabitants." But, by the operation of the method of co-optation in filling up vacancies, the following state of things, as given by Mr. T. H. Green, one of the assistant commissioners of 1864, had arisen. "The Board has fairly represented the upper or more select section of society in Birmingham, so far as this section is politically conservative and attached to the established Church. It has been necessarily antagonistic to the Town Council, and careless or contemptuous of local politics. To belong to it has been a certain social distinction. Social and municipal distinction have not coincided, and hence the Board has been an object of public animosity, irrespectively of the manner in which it has exercised its functions."[11] And this it still more strongly put in the report of the Commission. "No dissenter, within the memory of man, has been a governor; till recently no one of liberal politics has been a governor; no mayor of the town has till the present year been a governor; no member of the borough except one, a conservative; not one Town Councillor."

Abortive attempts were made in 1831, 1842, and 1861, to introduce the Town Council element; and in

1864, after much newspaper agitation, signalised especially by the letters of "Historicus,"[12] a grammar school Reform Association was formed, which, in 1865, in conjunction with the Town Council, endeavoured in vain to induce the Governors to surrender the principle of co-optation. Both appealed to the Endowed Schools Commissioners, who proposed that there should be 21 governors, of whom 10 should be chosen by the Town Council, and the rest by co-optation; and that for the future free education should be given only to those who had passed a competitive examination. In 1868, however, the Town Council resolved to demand that all the governors should be elected from their body, a demand they repeated in 1872 (in answer to a slight modification by the Commissioners of the above scheme). They also objected to the proposed entrance and tuition fees.

THE NEW SCHEME.—Finally, in 1875, the Charity Commissioners proposed the scheme in a great measure now in force.[13] There were to be 21 governors, of whom eight were to be nominated by the Town Council, and four by Oxford, Cambridge, and London Universities, and the Teachers on the foundation; the remainder by the governors themselves. Those nominated by the Town Council were to serve for six years, those by the Universities and Teachers for seven: all were to be eligible for reappointment. Boys were to enter the school by competitive examination in two classes, (1) free foundation scholars; (2) those paying entrance and tuition fees.[14] This scheme was vehemently but unsuccessfully contested by the Town Council. All efforts to move the Charity Commissioners were unavailing. When at length it reached the Commons, on March 5th, 1878, Mr. Bright, supported by the

other Borough members, Mr. Chamberlain, and Mr. Muntz, moved its rejection; but the motion was defeated by a majority of 59, in a house of 199, and the scheme received the royal assent on March 16th.

Immediately previous to 1878, the schools on the foundation were (1) The Grammar School (Classical, English, and Lower) with 584 boys: (2) the Branch Elementary Schools with 607 boys and 554 girls.[15] A great development was now arranged for. There were now to be (1) a High School for Boys up to the age of 19, with preparation for the Universities; (2) a Middle School for Boys to age of 16, when Latin, at least one modern language, natural science, and drawing, were to be taught. (3) An Upper School for Girls. (4) The existing branch Elementary Schools, or "Lower Middle" School for children to age of 14, teaching all subjects included in the possible curriculum of the best public Elementary Schools[16] though reaching a far higher standard than is there obtained. The necessity for the head and second masters being in Orders was done away with; the religious teaching was to be undoctrinal, and there was to be an emphatic conscience clause: no master might hold any benefice or cure of souls, nor might he in future,[17] without the express permission of the Governors, take boarders. The jurisdiction of the Master of the Middle School was increased, though supreme authority in matters of discipline was still reserved to the Head Master. Provision was made for the subdivision of the Middle School and the Upper Girls' School, when desirable, and for the establishment of evening schools.

SCHOLARSHIPS were arranged as follows:—(1) Foundation Scholarships in all the Schools, the holders of which received education free. The

number of these was not to exceed a third of the total number in each school. Half of those given in the Lower Middle Schools were restricted to scholars attending Public Elementary Schools within the Borough, for not less than two consecutive years immediately preceding admission, and a third of the remainder were offered for competition among the candidates for admission; the rest being competed for by scholars already in the School. (2) King Edward VI. Scholarships, viz.: annual payments to deserving scholars while at the school, to an amount not less than £200 a year; the value of each to be not more than £25 a year *plus* tuition fees. (3) Besides the James Charities exhibitions of £50 a year at Oxford or Cambridge, £400 a year was to be given for exhibitions at either of the Universities, to scholars of at least two years standing in the High School; and £200 for exhibitions tenable at any educational institution for boys or girls at either High or Middle School. All these scholarships were to be gained by competition.[18]

In the competitive examination for entrance, preference was to be given to boys and girls resident within ten miles of Birmingham.

DEVELOPMENT OF 1883.—In 1883, the final step in development was taken. It was felt that the "Lower Middle" Schools, were now doing work which largely overlapped that of the Middle School, and the consent of the Charity Commissioners was obtained to the following change. These Schools were converted into Schools of the same grade as the "Middle" School of the 1878 scheme, (1) The Girls' School at Meriden street had been transferred to Camp hill, in 1881, and a Boys' School was now erected on the same site. (2) The Proprietary School

at the Five Ways was absorbed into the foundation, and the staff of the old Middle School, hitherto domiciled at New Street, was transferred to improved buildings there, the boys from the Bath Row School also being taken in. The *pupils* from the old Middle School were dispersed throughout the various Boys' Schools now opened. (3) This enabled the provision of 1878 for a High School for Girls to be carried out[19] in the New Street Buildings thus left vacant. (4) A new school for Boys and Girls was erected in Albert Road, Aston, to which the scholars from Gem Street were transferred. In 1882, the Boys Schools at Edward Street, Meriden Street, and Bath Row were closed. Thus, at the present time, the Schools under the foundation are—High Schools for Boys and Girls at New Street; Grammar Schools for Boys at the Five Ways, Boys and Girls at Aston and Camp Hill, Girls at Summer Hill and Bath Row. The admission fee is at the High School, 10/-, and at the Grammar Schools, 2/6; the annual tuition fee at the High Schools, £9; at the Grammar Schools, £3.

Among the numerous honours gained at the Universities since 1800 should be mentioned the following:—at *Cambridge*, 8 chancellor's medallists, and 10 university scholars; 6 senior classics, 28 first class-men in the classical tripos, and 6 first class-men in the moral science tripos; 35 wranglers: at *Oxford*, 8 university scholars, 5 first class-men *in Literis Humanioribus*, 11 in classical moderations, and 2 *in Disciplinis Mathematicis et Physicis*. The present Archbishop of Canterbury, one Bishop (Lightfoot), and one Regius Professor of Divinity (Westcott), are also old Birmingham boys. During the past few years the school has also gained high and numerous distinctions at London University, Queen's College (Birmingham), and the Mason Science College.

LIST OF THE HEAD MASTERS from the earliest date now known:—*circa* 1650, John Barton; 1654, Nathaniel Brooksby; 1685, John Hickes, M.A.; 1694, James Parkinson; 1722, John Hansted; 1726, Edward Mainwaring; 1746, John Wilkinson; 1759, Thomas Green; 1766, John Brailsford; 1775, Thomas Price; 1797, John Cooke; 1830, Francis Jeune (afterwards Dean of Jersey, Master of Pembroke College, Oxford, and Bishop of Peterborough); 1838, James Prince Lee (afterwards Bishop of Manchester); 1848, Edwin Hamilton Gifford, Archdeacon of London; 1862, Charles Evans; 1872, A. R. Vardy. It should also be mentioned that in 1830, the second master was the Rev. Rann Kennedy, father of the celebrated Head Master of Shrewsbury, himself a classic of the highest attainments.

Queen's College.—The story of Queen's College is an interesting record of mingled success and failure; of success where it set about doing much needed work, and of failure where it appeared to be placing itself in antagonism to the prevailing spirit and influences of the town.

The formation of a School of Medicine and Surgery for Birmingham and the Midland Counties was suggested in 1828 by Mr. Sands Cox, who had made a diligent inspection of all the chief medical schools at home and abroad; and it was immediately carried out by the help of Dr. Johnstone and the unstinted liberality of Dr. Warneford. Lectureships in various branches of Medicine were at once established, and in 1830 a Museum and Library were fitted up. From 1836 to 1843 the new Institution was known as "The Birmingham Royal School of Medicine and Surgery," the royal patronage having been obtained in the former year. But in 1843 a Royal Charter of

Incorporation was granted to it under the title of "The Queen's College, at Birmingham." By the munificent endowments of Dr. Warneford,[20] the Governors were soon enabled to widen the scope of the college. Departments were created for literature, science, and art, and for instruction in the doctrines and duties of Christianity according to the Church of England. Queen's Hospital was founded with a chaplaincy, also endowed with £1,000 by Dr. Warneford, who, in addition, appears to have borne almost the whole expense of the College Chapel. An arrangement was now made whereby the London University admitted students of the college for the degrees of Bachelor and Doctor of Medicine, and, upon the college Certificate, for B.A., M.A., B.C.L., and D.C.L. The exclusively Church of England character of the college and all concerned with it was untiringly insisted upon by its promoters. A chapel was established with daily services at which the attendance was compulsory. By the supplemental charter of 1847 it was laid down that the Lord Bishop of the Diocese was to be the visitor; the Principal, who was to be a Nobleman, or one of the Hon. Governors, must also belong to the Church of England. The Vice-President must be a dignitary of the Church near Birmingham: all the classical, mathematical, and medical tutors must also be churchmen. The feelings which prompted these rigorous regulations are concisely expressed in a letter of Dr. Warneford to Mr. Sands Cox in 1849, in which he says, "to guard against the subtle designs of the Jesuits, and the insidious intrusion of malignant dissenters, imperatively requires much deliberation!" From a second supplemental charter of 1851, it appears that Dr. Warneford had given £4,400, increased in 1852 by £6,500, for a Professorship of

Pastoral Theology; and £3,500, increased in 1852 by £2,500, for a Wardenship, the holder of which must necessarily be a clergyman. All resident students were to be members of the Church, and attendance at Chapel service was compulsory.

There can be little doubt that the attempt to erect an exclusively Church of England College in a town in which dissent was overwhelmingly predominant was a leading cause of the failure which awaited the institution.

The affairs of the college were by the original charter to be conducted by a council of eighteen, of whom twelve were to be elected by the first body of Governors, and two were to be Professors elected from their own body; the Principal, Vice-Principal, Treasurer, and Dean of the Faculty completed the number. Vacancies in the council were to be filled up by co-optation, and vacancies in the Professorial staff by the council from a list supplied by the Professors. By the supplemental charter of 1847, the Principal and Council were constituted one body politic and corporate, and were allowed to acquire property of an annual value not exceeding £2,500, and the same amount for the hospital. The council was also greatly widened by twelve *ex-officio* Governors, of whom two were members of the council of the hospital, which was represented also by the senior Physician and senior Surgeon; the others were the Lord-Lieutenant and High Sheriff of Warwickshire, the Dean of Worcester, Archdeacon of Coventry, the Mayor of the borough, the High Bailiff of the Manor, and the Rectors of St. Martin's and St. Philip's.

To this body of *ex-officio* governors was entrusted the appointment of the Warden, who later became the real ruler of the college, all matters of general

organisation and discipline, and all religious duties, being in his hands. The council was further widened by the admission of two members of the Institute of Mechanical Engineers, and two each from the Birmingham Architectural and Law Societies. An east wing was added to the college, for engineering and architecture, containing lecture rooms and an engineering workshop. A three years' course and the passing of two public examinations constituted the requirements for the degree of C.E. of Queen's College. A Department of General Literature was formed, Dr. Warneford endowing it in 1852 with £2,000. A full collegiate system was established for this department, with resident, and later non-resident students, at which a three years' course was to be passed. The subjects of study were to be Greek, Latin, Mathematics, Logic, Modern Languages, History, Civil Engineering, Natural, Political, and Moral Philosophy, and the doctrines of the Church of England; the subjects selected having particular reference to the requirements for the examination of the University of London. A Junior Department was also established in or about 1851, for a two years' preparatory course with collegiate discipline. The whole constitution of the college was, however, codified by the "Rules and Regulations" of 1857; by which it appears that these somewhat ambitious views, pointing to the establishment of a University, had become modified. The design of the college, as now laid down, was "to provide instruction for young men intending to engage in one or other of the following professions:—(1) Medicine and Surgery; (2) Civil Architecture and Engineering; (3) Theology (with a view to ordination); and any other professional study which may from time to time be added.[21] This instruction is combined with a

system of collegiate training and moral discipline according to the religious principles of the English schools and colleges connected with the Church of England, and with so much of the ordinary branches of a liberal education, in a department of arts and general literature, as may be properly given in subordination and in reference to such special studies." For the collegiate education the inclusive fees were to be £75 a year.

There can be little doubt that this idea of creating a resident University in Birmingham was the result of mistaken, though religious, zeal. For the deep and earnest feelings which prompted it we must refer to the record of the meeting of April 20, 1843, contained in Mr. Sands-Cox's *Annals of Queen's College*, published in 1873. But the conditions of life in the town were not favourable, and the scheme broke down through its own weight. Resident students there were, indeed, in small numbers; but the pecuniary loss which they caused to the college was considerable, and in 1873 that part of the scheme from which, thirty years before, so much had been hoped, was declared not to be "an essential part of the College," and was allowed to lapse. Lord Lyttelton, the President, in a letter written in December, 1873, strongly, though reluctantly, urged this step. As strongly, too, he urged that the theological department should be discontinued. "The more simply and singly the college can henceforth be limited to the objects of a place of instruction for medical students, the better and more likely it is to attain those objects. The hopes that the college might become a University, with the consequent attempt to engraft upon it Faculties of Arts, Law, and others, are now, as I fear, mere dreams of the past."

Meanwhile the work of the college appears for some years to have been conducted with considerable vigour, and a certain success. Gradually, however, whether from bad management, or from the inherent faults of the constitution, it began to decay, and then its decline was rapid. In 1863, an appeal was put out to relieve it from a debt of nearly £4,000; and in 1864, its condition fell under the eyes of the Charity Commissioners. As the result of their enquiry "it appeared in effect that the college had fallen into a state of decay, and was on the verge of bankruptcy; that the buildings were suffering from want of funds for repairs, and the students diminishing, and that the college could not be made effective and answer the purpose for which it was founded, without the interference of the Court of Chancery, and that the present constitution of the said college was defective." Accordingly, in February, 1867, a scheme was ordered to be drawn up for the future management, approved by the Master of the Rolls, May 7, 1867, and confirmed by "The Queen's College, Birmingham, Act." The council was henceforth to consist of the President, Vice-President, Warden, and twelve others. No condition of churchmanship was attached to the last named. All vacancies were to be filled up, no longer by co-optation, but by the annual meetings. Officers of the college might serve on the Council, but no one who was concerned in the profits of any work done or materials provided for the college. The three original departments, theology, medicine, and arts,[22] were maintained, the Warden to be the resident head of all three. Architecture and engineering were dropped out. Until the debt was cleared off, the offices of Warden and Professor of Theology were to be held by the same person, afterwards by different persons,

the Professor to be appointed by the President, Vice-President, and Visitor. There were to be also Professors of Classics and Mathematics and a Medical Tutor. The rights of the church were further secured by a clause referring all questions touching her doctrine and discipline to the President and Vice-President, and in the last resort to the Visitor, whose decision was to be final. With the obvious exceptions, however, of the Warden and Theology Professor, all religious tests on the members of the staff were abolished. Methods were laid down for the payment of the existing debt. A clause, specially declaring that the natural history and anatomy museum were to be preserved in the college, along with the models of machinery and philosophical apparatus, and were to be open to properly qualified persons free of charge, was violated in 1870 by their being removed to Aston Hall, the rooms thus set free being given up to the School of Art. Finally, the college and hospital were entirely separated, the latter being compelled to repay Warneford's endowment of £1,000.

During 1873 and 1874, evening classes in connection with the Arts Department were started "to afford to young men who have had a good education, and who desire to maintain and improve their acquirements, an opportunity of doing this at a small expense." Morning Classes for ladies in connection with the Birmingham Higher Education Association were also attempted. The Arts Department of the College itself appears to have died a natural death in 1872: in 1871 it contained "three or four students preparing for admission into the Theological or Medical Departments."

The Theological Department also has led a

languishing existence. In 1874 it contained but 11 students[23] and from then until 1882 the number fluctuated between 11 and 23. Since then it has again been declining. The report of 1885 laments this fact, but gives no figures. An attempt has been made in this year to raise the standard of this department by appointing the Cambridge Preliminary Examination as the final examination of the College.

It is by the Medical School, its original *raison d'être*, that Queen's College has a distinct claim upon Birmingham and the Midlands. This part of the scheme has always flourished and still is flourishing; and it is justly regarded as one of the most important provincial schools of medicine in the kingdom. It started with almost its full development from the beginning. Thus in 1828 the plan of lectures included anatomy, physiology, and pathology, materia medica and medical botany, chemistry, and pharmacy, principles and practice of physic and surgery, midwifery and other diseases of women and children. In 1845, we find this list increased by the division of anatomy into "General and Surgical," and "Descriptive and Comparative." Chemistry also was added. In 1874, the Chair of Pathology, which had dropped out of the original list, was recreated, and an additional Professorship of Physiology and Anatomy appointed. In 1880, following the Act for the Registration of Dentists, a School of Dental Medicine and Surgery was formed, and this was recognised in 1882 by the Royal College of Surgeons. The lectures on anatomy and chemistry were recognised as qualifying for the degrees of the University of Edinburgh. In 1885, the Borough Lunatic Asylum was associated with the College, students being now at liberty to obtain instruction in

lunacy and mental diseases. Summer dissections were also carried on for the first time in this year.

In 1882, consequent upon the organisation of the Mason Science College, an important change was made. It was felt that if both institutions carried on, within a stone's throw of each other, parallel courses of lectures, great waste of power would ensue. It was therefore arranged that the lectures on chemistry, botany, and physiology should in future be delivered by the Professors of Mason College, acting as lecturers for Queen's College, and delivering courses of lectures suited to the requirements of medical students. In this way not only was the overlapping avoided, but the endowments of Queen's College were materially relieved, while the resources of the Mason College magnificent library were also available to the students of the former. The Birmingham Medical School was now placed in a position of equality with the richest and best organised Colleges in the United Kingdom.

It should be mentioned that in 1879, in addition to the already existing Ingleby Scholarships, two new classes of entrance scholarships were created by the Council, the Sydenham and Queen's. The former were to be given by the vote of the Council to the orphan sons of legally qualified medical men; the Queen's were to be awarded by examination to sons of medical men; the sons of former students having the preference in both cases. At the present time the college contains considerably more than 100 students, that being the normal number. That its condition, so far as medicine is concerned, is one of vigorous vitality, may be gathered from the following extract from the last Report. "The students have passed examinations at five Universities, in six

cases gaining distinction, one being the highest attainable. At the Primary Examination for the Membership of the Royal College of Surgeons of England, thirty students passed in one or both branches. At the above mentioned examinations there were only four complete rejections during the year. It must be borne in mind, also, that this result does not accrue from careful weeding out of students by a test examination. All students, having attended the required number of lectures, were permitted to present themselves for examination."

Mason College.—The scheme of a University at Queen's College had, as we have seen, broken down through the inherent defects of its design. We come now to the establishment of another University, which in its building, equipment, and aims, forms a worthy completion to the educational system of the town.

Indirectly the result, no doubt, of that movement for University extension which has characterized the last twenty years, the establishment of this college was directly the work of one man, Sir Josiah Mason, whose fortune had been made during sixty years' residence in Birmingham, and who was already a benefactor to the town through the Orphanage and Almshouses he had established at Erdington. The considerations which prompted him to this noble foundation are thus expressed by himself:—"When I was a young man—it is so long ago that while still living in this generation I can recall the memories of a time long past—there were no means of scientific teaching open to the artisan classes of our manufacturing towns; and those who, like myself, would gladly have benefited by them were compelled to plod their weary way, under

disadvantages and through difficulties of which our young men of this day can form no adequate idea. Schools at that time were few and poor, there were no institutions of popular teaching, no evening classes to which youths might go after their day's work was ended." At eighty years of age, therefore, he determined to provide "enlarged means of scientific instruction, on the scale required by the necessities of this town and district, and upon terms which render it easily available by persons of all classes, even the very humblest." Whatever was necessary for the improvement of scientific industry, and for the cultivation of art, especially as applied to manufactures, was to be taught; facilities were to be afforded, if desirable, for medical instruction, and, most wisely, the door was left open for any further development necessary to adapt the scheme to the requirements of future years.

The plan of the college first began to assume shape about 1868, under the advice of Mr. G. J. Johnson, formerly Professor of Law in Queen's College; Mr. George Shaw, formerly Professor of Chemistry at Queen's College; and Mr. J. Thackray Bunce. It was not, however, until December 12, 1870, that the Foundation Deed was executed, by which Dr. Blake and Mr. Johnson were constituted the first trustees. The Founder had already purchased some land in Edmund Street, and an endeavour was made to secure the ground at the corner of Edmund Street and Congreve Street (upon which the new Liberal Club now stands); failing that the land stretching through Edmund Street to Great Charles Street was, after many difficulties and delays, obtained. The site contains about an acre.

In September, 1872, the six trustees required by

the foundation deed were thus nominated: Dr. Blake, Messrs. G. J. Johnson, W. C. Aitken, J. T. Bunce, George Shaw, and Dr. Heslop; and their first meeting was held on Feb. 23rd, 1873. The architect selected by the founder, Mr. J. A. Cossins, had meanwhile been visiting the principal science colleges at home and abroad; and his plans, prepared from this experience, were approved in the autumn of 1874. On the founder's 80th birthday, February 25th, 1875, the first stone was laid by himself, when, in replying to a congratulatory address, he gave an interesting sketch of his career from the day when he cobbled shoes in Kidderminster, to the time when he became the owner of the largest pen factory in the world. A full description of the college buildings as completed may be found in the *Birmingham Daily Post* for October 2nd, 1880.[24] Since that time an important addition has been made by the erection of a series of rooms for the Physiological department.

The Foundation Deed lays down this general statement as to the aims of the proposed college:—

"It being understood that the institution intended to be hereby founded is to be called Josiah Mason's Scientific College, or Josiah Mason's College for the study of Practical Science, he, the said Josiah Mason, hereby declares that his intention in founding the same is to promote thorough systematic education and instruction specially adapted to the practical, mechanical, and artistic requirements of the manufactures and industrial pursuits of the midland district, and particularly the boroughs of Birmingham and Kidderminster, *to the exclusion of mere literary education and instruction, and of all teaching of theology and of subjects purely theological*, which limitations the said Josiah Mason hereby

declares to be fundamental."

The deed then provides for two courses of instruction, namely:—

1.—*Regular systematic instruction* (to qualify students either for the B.Sc. and D.Sc. of the University of London, or for any profession or pursuit in which scientific knowledge can be usefully applied.)

2.—*Popular instruction*, which it is intended shall be given by evening lectures to artisans and others who cannot attend the classes for regular systematic instruction.

The regular instruction was to include the following:—*Mathematics*, abstract and applied; *Physics*, mathematical and experimental; *Chemistry*, theoretical, practical, and applied; *The Natural Sciences*, especially geology and mineralogy, with their application to mines and metallurgy; *Botany* and *Zoology*; *Physiology*, with reference to the Laws of Health; *English*, *French*, and *German Languages*. By a subsequent deed of February 23, 1874, Anatomy, and Greek and Latin languages, were added to the list. And by a third deed, February 23, 1881, it is provided that (in order to qualify the College for admission as a constituent member of the London or Victoria Universities) regular systematic instruction may at the discretion of the Trustees include *all such other subjects* as the Trustees may for the time being judge necessary or desirable for the benefit of the students. Similar liberty to vary the course of instruction, either by the addition of fresh subjects, or discontinuance of any subject previously taught, according to the discretion of the Trustees, is given in the case of the Popular Instruction.

Moreover, once in every fifteen years the provisions of the deed may be varied, so as better to adapt the regulations to the circumstances of the time. It is impossible to exaggerate the importance of this provision, which formed the subject of the peroration of a beautiful speech by Prof. Max Müller at the opening ceremony, which ended thus:—"Let him rest assured that such faith is never belied, and that rising and coming generations, while applauding his munificence, will honour and cherish his memory for nothing so much as for that one clause in which he seems to say, like a wise father, 'Children, I trust you.'" (College Calendar, 1880-81.)

One class of subjects alone is emphatically excluded. It is "provided always, that no lectures, or teaching, or examination, shall be permitted in the institution upon theology, or any question or subject in its nature purely theological, or upon any question which for the time being shall be the subject of party political controversy." And this condition "the said Josiah Mason doth declare to be fundamental." Similarly it is declared to be a fundamental condition that "no principal, vice-principal, professor, teacher, or other officer, servant, or assistant of the institution shall be required to make any declaration as to, or to submit to any test whatever of their religious or theological opinions, or be presumed to be qualified or disqualified by any such religious or theological opinions, but shall be appointed solely for their fitness to give the scientific or artistic instruction required from them." The contrast with Queen's College was complete.

Fees were to be paid by students, the admission of whom is subject to no limitation whatever in the popular classes.[25] The only limitation as regards

the regular classes is that the Trustees are to give the preference, all other things being equal, to candidates who have been or are inmates of the Orphanage, to the extent of not more than one-fifth of the whole number of regular students, and thereafter to candidates born within the borough of Birmingham and Kidderminster, in the proportion of two Birmingham to one Kidderminster student. The original deed provided that no student not wholly dependent for a livelihood upon his own skill or labour, or depending upon the support of his parents or some other person, should be admitted to the college; and that students should not be under fourteen nor above twenty-five years of age. By the deed of variation, December 12, 1870, the limit of age was done away with, and the conditions above laid down were made to apply to the remission of fees. A preliminary examination for admission is imposed only upon students under the age of sixteen years.

In every line the deed breathes the spirit of modern Birmingham; it contains regulations directed to a clear aim, with absolute freedom to vary those regulations so as best, at any given time, to secure that aim by recognising new conditions; it excludes from its scheme no subject of useful learning; and it maintains the idea that secular instruction is of too high a dignity to be fettered, as regards either pupils or instructors, by theological or political considerations. In one provision not yet noticed it recognises with equal directness, the principle by which Birmingham has for long been pervaded, viz., that over all the great institutions of the town, popular control ought to be exercised. Until the death of the founder, the governing body was to consist of six trustees; but it was ordered that after

his death the Town Council was to nominate five others. Vacancies in the Borough Trustees were to be filled up by the Town Council; those in the other six by the whole body. One single qualification is laid down as fundamental for the trusteeship. The holder must be a Protestant and a layman.

On October 1st, 1880, the College was formally opened, when a brilliant address was delivered in the Town Hall, by Professor Huxley, before a meeting attended by representatives of the Universities, and many leading scientific bodies, and presided over by the Mayor; and, in the evening of the same day took place the formal transfer of the building by the Founder to the Trustees. “Thus was completed a work which stands without parallel in the annals of modern education in England, the gift of a college, amply planned, nobly built, liberally endowed; the generous benefaction of one man, who looked for no reward but the consciousness that, by the foundation, others would have the means of acquiring knowledge denied by the poverty of his early life to himself; trusting that though unblessed with children of his own, he might, in the students of his college, leave behind him an intelligent, earnest, industrious, and truth loving and truth seeking progeny for many generations to come.” During the first year of work, 53 students attended: in 1884-85, 523, of whom 199 were in the evening classes.

During the session, 1882-3, the college began receiving a grant from the science and art department, in aid of the instruction of a limited number of teachers engaged in science teaching. During the same year, by arrangement with the School Board, the Council granted six Wright Memorial Scholarships, to enable scholars from

Board Schools to go through a science course at Mason College.[26] These scholarships are tenable for three years, and relieve the scholars of the payment of all fees.

The Mason College Union, formed with the sanction of the council, was now opened.[27] The circumstances attending the admission of students from Queen's College to certain classes will be found detailed in the section treating of that institution. The completion of the scheme necessitated the creation of a new Chair of Botany. In the early part of the session, the council constituted the Professors of the College an Academic Board, to act generally under the superintendence of the council in regulating and co-ordinating the various departments of the college; the chairmanship being held by the Professors in turn. In July, 1883, a department of Coal Mining and Colliery Management was established, and upwards of twenty students attended, principally young mining engineers, preparing for the government examination. During the year courses of lectures upon education, provided by Mr. George Dixon, were delivered by Professor Meiklejohn and Mr. H. Courthope Bowen. During 1884, the council were enabled to fill up a gap which they had often deplored by the creation of nine scholarships, as follows: Two entrance scholarships of £30 each; one of £30 for students of one year's standing; two of £30 each for students of two years' standing; two of £20 each, connected with the examinations of the University of London; and two technical scholarships of £30 each. Each of these is tenable for one year. In the following year, Messrs. Richard and George Tangye each created a scholarship of the annual value of £30. Free popular lectures for artisans were given throughout the

winter, the tickets being distributed among about one hundred of the leading firms. So much were they valued, that it was found necessary to repeat each lecture.

One of the most important and interesting features of the college is its noble library. With this will always be connected the name of the late Dr. Heslop, its chief benefactor, indeed, it may be said, its maker. As early as 1882, out of its 4,869 volumes, he had contributed 3,130. On the 23rd February, 1886, the library contained 17,554 vols. The geological museum contained at the same date 19,115 specimens.

The Birmingham and Midland Institute is at present educating more than 4000 persons of both sexes and of all ranks; and this fact alone is sufficient to show its importance. The principle upon which it proceeds is one which at the time of its establishment was entirely novel, though it has since been adopted in other similar institutions. It has never professed to lay down *a priori* a course of instruction which it considers ought to be given; but, by supplying a want wherever such want has been made known, it has endeavoured to adapt itself constantly to requirements of the people which otherwise would never be satisfied. In the words of Mr. J. H. Chamberlain, “We have never made up our minds to teach any particular subject, unless we were convinced that there existed outside our walls a present readiness to study it. But, once convinced of such a desire, we have done whatever we could to meet it.”

The Institute had its origin, strangely enough, at a time of marked intellectual decadence in Birmingham. The existing societies, the Philosophical

Institution, the Mechanics' Institution, and the Polytechnic Institution, were dead or moribund. On June 10th, 1852, at the suggestion of Mr. Arthur Ryland, a few members of the first-named society met and appointed a committee which reported in January, 1853. On September 6th the Town Council gave a grant of the present site, and by an Act obtained in 1854 the Institute was incorporated. In this Act the objects of the Institute are defined to be the "diffusion and advancement of Science, Literature, and Art." There were to be two departments, (a) *General*, to provide (1) Reading and News Rooms; (2) Libraries, Museums, a gallery of the fine arts, collection of mining records, and other collections for scientific purposes; (3) Lectures and meetings for discussion in the higher branches of knowledge, (b) *Industrial*, to provide (1) classes for elementary and progressive instruction in Mathematics and Practical Science, and such other subjects as may seem fit to the Council of the Institute; (2) laboratories, models, philosophical apparatus, and all other things necessary for the objects of the Institute.[28] The Institute was to be governed by a Council of twenty-five consisting of (1) *Official Governors*, a President, two Vice-presidents, and a Treasurer; the head master of King Edward's Grammar School, the warden of Queen's College, the chairmen of the Committee of the Birmingham Society of Arts, and of the government School of ornamental Art. (2) *Borough Governors*, the Mayor and four members of the Town Council, elected annually by that body; and (3) thirteen *Elected Governors*, viz: eleven members of the Institute, and two students of the Industrial Department. The President, the Vice-Presidents, and the thirteen, were to be chosen by the members of

the Institute at the annual general meeting. Casual vacancies were to be filled up by the Council, which was to meet at least once a month. Not less than three of the thirteen were to be regarded as ineligible for re-election each year. Among the Presidents will be found the men most eminent in their various branches of knowledge.

A start was made in the beginning of 1854, the salary of a Science teacher for the first year having been guaranteed by the Science and Art department. Classes were opened in Chemistry, Physics, and Physiology, for both sexes, and were carried on in the room of the Philosophical Institute in Cannon Street, until 1857. On November 22nd, 1855, £10,000 having previously been subscribed to the building fund, the first stone of the new buildings was laid by the Prince Consort. Penny Scientific lectures were now started; and, in deference to a most remarkable expression of opinion on the part of the artisans themselves that they had not education sufficient to enable them to profit by the lectures as given, Penny Lectures on elementary Mathematics and Science were also given. In 1856 Mr. George Dawson and Mr. Sam: Timmins volunteered to conduct an English Literature class, which they continued for three years, and classes, also taught voluntarily, were established in Arithmetic, Latin, French, English History, Logic, Languages, and Thought.[29]

In 1859, a subscription of £5,000 having been raised to pay off the debt incurred, the Institute now located in its own buildings, founded a Chemical Society—at present the Institute Scientific Society—members of which delivered lectures to the men in workshops, as well as Natural History and

Microscopical Societies. In the examination by the Society of Arts in 1859, one Institute student, C. J. Woodward, now at the head of the Chemical department of the Institute, took the first prize in chemistry, twelve others gaining certificates; while in 1860 both the English literature prizes were carried off by two other students, Henry Simpson and Howard S. Pearson, now Lecturer on English Literature at the Institute. That the right classes were being touched is shown by the fact that 33 per cent. of the students were artisans, 33 per cent. shopmen and clerks, and 16 per cent. women of the same ranks. In 1868 the numbers were 45, 29, and 21 per cent. A steady increase both of students and subscribers (the latter induced by the annual conversazione and the high quality of the occasional lectures) took place during the following years; and the students were stimulated by the many valuable prizes offered by leading inhabitants and by the Central Literary Association. So crowded had the classes now become, that it was imperative to secure further space; and in 1873 the prospect of this was secured by a re-arrangement of buildings and an exchange of land with the Free Libraries, £15,000 being subscribed for the alterations proposed. In the previous year Charles Kingsley had delivered a famous presidential address, one result of which was an anonymous gift of £2,500 to found a class in the Laws of Health. This class was opened in October, 1873, with 400 students, and ever since that time has formed an important feature in the Institute's programme, branch classes in the subject being established in 1878 in four of the Board Schools.

At the same date a new departure was made by founding branch classes at three Board Schools in the outskirts of the borough. Of the success of the

Industrial Department up to this time we cannot do better than quote from an article by Mr. Edwin Smith, for many years secretary to the Institute, in the *Central Literary Magazine* for April, 1874:—

> "It has enabled a pupil teacher from a national school to win a Whitworth scholarship against competitors from the universities and from the principal science colleges in the kingdom; a working rule maker to win a scholarship at one of the Royal Colleges of Science, and a working electro-plater to win the first prizes from the Society of Arts in four modern languages; it has sent out distinguished pupils to take part in the civil service of India, to conduct mining operations in America, to take part in the telegraphic service of Australia, to fill an important commercial post in Japan, to conduct the laboratory work in some of the largest manufactories in the country, to become head masters and assistant masters in our Grammar Schools, to help in the science teaching of the University of Cambridge, and to fill responsible posts on newspapers of the provincial press; twelve of its own teachers have been educated in its classes, and it has sent into the manufactories and workshops of the town, men who have applied to numerous useful purposes in their trade the knowledge which they have acquired within the walls of the Institute."

During 1878 was begun the erection of the new buildings from the designs of Mr. J. H. Chamberlain, at an estimated cost of £30,000. The great fire of January 11th, 1879, which utterly destroyed the Free Libraries, greatly interfered with the work, and it was not until the summer of 1881, that the beautiful buildings fronting to Paradise Street, were ready for occupation. The burden of the heavy debt incurred was somewhat lightened by the prospects of a bequest, subject to two lives, of £50,000.

Hitherto, the annual examination of the classes

which did not fall under the Science and Art Departments had been conducted by volunteers. An endeavour was made in 1880 to induce the Senate of the London University to undertake this work. The Senate did not see its way to do this, but it suggested that the council should apply to the Rev. Philip Magnus, one of the University Examiners, and later a member of the Commission on Technical Education. Mr. Magnus undertook the duty, and the plan has been retained since then, the standard for the council certificate being made as nearly as possible that of the matriculation examinations at London. In this year was founded the Institute Union of Teachers and Students, and it was now, too, that the Institute gave birth to a number of local institutes, environing the town in a continuous chain, formed on the lines of the parent body, and serving local requirements.[30] During 1882, a musical section was begun, with 157 members, and an instrumental class with 500. A still more noteworthy movement was the establishment of a class in practical metallurgy. During the following year this had developed into an excellent laboratory, furnaces, balance room, fume chambers, and benches for twenty-three students; the class being under the care of Mr. A. H. Hiorns. A new class was also formed in iron and steel, in connection with the City and Guilds of London Institute. The council co-operated, too, in organizing a course of lectures on Health by eminent medical men in the town, similar to those delivered in Edinburgh and elsewhere, and these have since been an annual institution. During this fruitful year were founded the Institute Magazine, and the Debating, Dramatic, and Literary Sections. An Archæological Section, still in full vitality, had been organized as early as 1870, and continues to issue quarto volumes of

Transactions, containing the Papers read, with original illustrations and records of excursions to local and other places of archæological interests.

Fruitful, however, though this year of 1883 was, it stands out as one peculiarly sad in the Institute history, for during it took place the sudden death of Mr. John Henry Chamberlain, who as Hon. Secretary since 1865, had continuously devoted himself to its interest. In the words of the Report for 1883, "Under his guidance the Institute had undergone development which is truly marvellous … he had genius to see the needs of the time, and the direction in which the Institute could be developed to meet them.… The wisdom of his counsel, the extent and variety of his knowledge, the grace of his eloquence, and the wonderful charm of his personal presence, made him a colleague whom it is impossible to replace. He expired almost in the act of serving the Institute."

During 1884, a meteorological observatory was formed at the Monument, in Monument Road, an anemometer being erected there at the cost of Mr. Follett Osler, and the Birmingham Chess Club became a new section of the Institute. In 1885, the School of Art was removed from the Institute Buildings, where it had hitherto found a home, to the beautiful building in Edmund Street erected by the town for its reception. This gave great additional space, sorely needed, for the industrial department, and, on the initiative of Mr. G. H. Kenrick, it was at once utilised, at a cost of £2,000 (guaranteed by Mr. Kenrick) for a great expansion of the metallurgical classes. An engineering workshop was formed, and the laboratory greatly increased, so that the Institute now possesses—and it is perhaps its most interesting

feature—the most extensive metallurgical school in Great Britain, one indeed well-nigh worthy of the position of Birmingham in the manufacturing world. In this year too, classes in singing and in the practice of several musical instruments were formed, the violin class being particularly successful. And a teachers' board was established, from which valuable suggestions are offered to the council for improvements in the education given to the classes.

The following figures are worth recording. In 1854, there were *one* member[31] and 165 students; in 1874, 1591 members, and 2179 students; in 1886, 1927 members, and (in the central and branch classes) 4190 students, thus distributed: science, 1474; language and literature, 1046; arithmetic, 324; matriculation, 13; music, 1233; ladies 100.

Elementary Education.—The work performed by the School Board may be best realized from the following figures. Previous to the passing of the Elementary Education Act, 1870, there were within the Borough public elementary schools with accommodation for 28,983 children, and shortly afterwards further accommodation was made for 1,476; so that in round numbers there were places for about 30,000 children. There were also the so called elementary schools on the King Edward VI.'s foundation, noticed under that head, and a few private adventure schools. The official enquiry of 1871 showed, however, that accommodation was then necessary for 55,000, so that even then the town was scarcely more than half supplied. But, further, this half supply was but half utilized, since the average attendance in the schools was only about 16,000.

During the fifteen years of its existence the School

Board has provided thirty-two large sets of new buildings, most of them with extensive playgrounds, and it also occupies three sets of school premises which are rented. The total accommodation provided in these schools is sufficient for 35,277 children; while that in the Denominational Schools is now about the same as in 1871, the total being 29,141. A few certified efficient schools accommodate 794 children; so that there is at the present date a total accommodation of 65,212, or more than double that of 1871. Still more remarkable is the change wrought in the average attendance. In 1871 this was 50.3 per cent. of the number on the books. In other words, out of every 100 places provided 50 were vacant. The average attendance is now 85 per cent.

Even now the accommodation provided does not reach that required. The population being 420,000 there should be places for one-sixth of that number, according to the government scale, that is for 70,000. Thus the Board is still behind-hand to the amount of 5,000 places. Moreover, according to the average of the last eight years, the population of the Borough is increasing at the rate of 60,000 per annum, and consequently the accommodation required at the rate of 1,000 per annum. In other words, the Board has to provide five new schools to catch up the present deficit, and one school every year to keep pace with the yearly increase.

Besides the schools whose curriculum is confined to the subjects named in the New Code, the Board has established, upon the initiative and in a great measure at the cost of the Chairman, George Dixon, Esq., M.P., a Technical School for boys in the 7th standard, which provides an education in elementary science, machine construction, &c.; and which is

furnished with a large chemical laboratory, and an admirably fitted lecture room, a special room for teaching technical drawing, and a workshop in which the boys are trained to the use of tools and to working from scale. This school, which is well worth a visit, is in Bridge Street, five minutes' walk from the Town Hall, in premises handed over to the Board, rent free, and partially fitted up by Mr. Dixon.

Many of the Board Schools form real architectural ornaments of the town. They are in three stages of design, the earliest being that in which boys, girls, and infants form separate departments, the boys and the infants being usually on the ground floor, the girls on the floor above the boys. In the second stage a large centre hall is surrounded by class-rooms on the ground floor; half way to the roof runs a gallery, from which doors open into another set of class-rooms. The infants are on the ground floor (except in Hope Street), in a separate part of the building; the whole school being under the supervision of a master. In the last stage everything is on the ground floor. The latest erected buildings of this stage are models of airiness and light. The specimens of the three styles easiest reached and most worth seeing are respectively Bristol Street, Icknield Street, and Stratford Road or Foundry Road.

It should be noticed that half-time scholars are now almost unknown, although the conditions of life would seem to point to a wide extension of the system.

A few scholarships, far fewer than could be wished, are at the disposal of the Board. They are of three classes, Major, Elementary Science, and Minor. Boys who hold the Wright, Piddock, and J. H. Chamberlain Memorial Scholarships receive £15 a

year, on certain conditions, during a two years' course at King Edward's School, and £25 a year, with remittance of fees, for three years more at Mason College. Several Elementary Science Scholarships, in connection with the Science and Art Department, have hitherto been provided out of a fund called the Higher Education Fund, raised for the purpose of assisting poor but deserving scholars, by which a grant of £5 is guaranteed, with an additional £5 on passing a good examination under the Science and Art Department. It is greatly to be regretted that the funds raised for providing Minor Scholarships are all exhausted, except the Chamberlain and Edgbaston Day School for Girls Trust Funds.

In the early stages of the Board's work, when a Church majority was elected, religious education was given in the Birmingham schools. Upon the accession of the Liberal and Non-Conformist party to power such education was entirely done away with. The result of frequent and somewhat bitter controversy has been that at present a small portion of the Bible is read each day by the head teacher without note or comment.

The Voluntary Schools have, up till quite recently, had no common organization. There has now, however, been formed an Association of Voluntary School Managers, under whose auspices it is proposed to undertake some amount of inspection, and which will frame and discuss all measures directed to their common welfare. The Chairman is the Rev. Canon Bowlby, Rector of St. Philip's.

Municipal School of Art.—[By Mr. E. R. TAYLOR, Head Master.]—The Society of Arts and School of Art were, in June, 1885, transferred to the Corporation under the above title. This Society was established at

a meeting held in the Public Office, Moor Street, on 7th February, 1821, at which it was resolved:—(1.) "That an Institution be now established in Birmingham for the encouragement of arts and manufactures, and that it be called 'The Birmingham Society of Arts.'" (2.) "That a Museum be formed for the reception of the most approved specimens of sculpture, and of all such other works illustrative of the different branches of Art as the Society may have the means of procuring." (3.) "That suitable accommodation be provided for students." A subscription list was forthwith opened, and Sir Robert Lawley, Bart., gave in addition a valuable collection of casts from the antique. The Museum thus formed was opened for members and students in May, 1822, and in 1827 the first annual exhibition of pictures was held. In 1829 the Society erected the galleries in New Street, now occupied by the Royal Society of Artists, and in this year the first conversazione of the Society of Arts took place. Until 1842 the Society was managed by a joint committee, composed of lay and professional members with equal powers. The lay committee, representing the subscribers, were desirous of furthering the original intention of providing means for art education by applying for aid from the Government School of Design, newly formed in London. Hitherto the teaching had been carried on by the members of the professional, or artists' committee, who acted as visitors to the School for Drawing from the Antique. The school was open on two evenings in each week, but the average nightly attendance was only fourteen.

The professional committee demurred against these proposed changes, and, on their being adopted by the subscribers, withdrew from the Society, and

afterwards formed the present Royal Society of Artists. In 1843, Mr. Dobson, who is now an Associate of the Royal Academy, became the first Head Master, and the title of the Society was at this time altered to "The Society of Arts and School of Design."

In 1845, Mr. Heavyside succeeded Mr. Dobson, but held the office for a year only, being in turn succeeded by Mr. Thos. Clarke. The number of students at this time was 448.

Mr. George Wallis became Head Master in 1851, and introduced many changes in the organization and work of the school. He resigned in 1857, Mr. D. Raimbach being his successor.

By an agreement between the Society of Artists and the Council of the newly founded Birmingham and Midland Institute, the latter undertook to provide double the existing accommodation for the Society of Arts in their proposed building; and the school was transferred in the summer of 1858 to the rooms which it continued to occupy until last year.

The record of the school from the first seems to be one of continuously increasing success; for in 1864 the number of students had more than doubled, being 939, including elementary and advanced classes.

In its early days the school was much indebted to the Rev. James Prince Lee, M.A., who held the post of Chairman until he was removed to the See of Manchester, and in more recent times to the late Mr. John Henry Chamberlain, Chairman, and Mr. Edwin Smith, Secretary.

In 1875 the whole of the elementary teaching in the evening was transferred to branch classes held in

Board Schools.

A most generous offer was made to the school in 1876. An anonymous donor placed the sum of £10,000 at the disposal of the Committee, with a request that it should be chiefly, if not altogether, employed in the improvement of the teaching department, and in the foundation of scholarships or exhibitions.

On the resignation of Mr. Raimbach, the present Head Master (Mr. Edward R. Taylor) was appointed in May, 1877. In the year 1880 a scheme was initiated by a donation of £5,000 from Messrs. Richard and George Tangye, which has resulted in the present Museum and Art Gallery, with its noble collection of pictures and objects of industrial art, the gifts of wealthy citizens to the town. The increasing difficulties under which the School of Art laboured in providing room for the education by which alone these art treasures could be made of use to the town were not lost sight of, and in 1881 the Mayor (Mr. Richard Chamberlain, M.P.) was enabled to announce to the Corporation that land would be given by Mr. Cregoe Colmore, in the centre of the town, on which to build a School of Art, and that Miss Ryland would give £10,000, and Messrs. Richard and George Tangye would also give £10,000 towards the cost of building a School on condition that the Town Council would undertake its management. The result of this generosity is the beautiful building in Margaret Street, the last work of the late Mr. J. H. Chamberlain, who had for many years acted as Chairman of the School, and had taken the deepest interest in its success. It may fairly claim to be one of the best schools of art ever erected. The lighting is bright and cheerful,

furnishing in this a contrast to most of such institutions; and the accommodation, especially for the modelling classes and those for studies bearing on design, is most ample, and a great improvement on that given in the old premises.

In the Central and Branch Schools there are this Session 733 students, and in the seven Branch Schools 706 students, mostly artisans. The following are some of their occupations:—

Architects & Assistants	41
Art Students	57
Art Teachers	15
Artists	7
Brassfounders & Workers	40
Cabinet Makers	7
Carpenters and Joiners	28
Clerks and Office Boys	94
Designers	11
Die Sinkers	54
Draughtsmen	36
Engineers, Fitters, and Turners	88
Engravers, Embossers, and Chasers	49
Glass Painters	27
Glass Cutters	9
Japanners	5
Jewellers & Silversmiths	37
Lithographers	40
Modellers	8
Nail Cutters	9
Pattern Makers	12
Photographers	6

Teachers	103
Turners	6
Tool Makers	6
Watchmakers	7
Wood Carvers	3

Thirty-four other trades are also represented, besides the children of artisans.

The Awards of the Science and Art Department to the school in 1877 and in 1885, will shew the more recent progress of the school.

1877, Medals, Prizes, and Scholarships,	110
1885””””	320
1877, Certificates	157
1885”	658

Of these prizes and certificates, 40 prizes and 273 certificates were last year awarded for examinations in the advanced sections, including painting, design, drawing from the figure, modelling the figure, history of ornament, anatomy, etc.; the total of awards obtained by all the 198 Schools of Art in the United Kingdom being only 205 prizes, and 1,924 certificates.

By the munificence of “the anonymous donor,” the Corporation are enabled to offer the following free admissions and scholarships tenable in the school for two years:—

Eighty free admissions to the Branch Schools; Fifty free admissions to the Central Schools; Ten scholarships of £5 per annum; Two scholarships of £20 per annum; Two scholarships of £40 per annum.

Chapter III.
LIBRARIES: PAST AND PRESENT.

BY J. D. MULLINS.

The first Public Library, 1733, was one which still exists, and was founded by the Rev. W. Higgs, first Rector of St. Philip's, who left his Library and a sum of money for a Parochial Library "free to all Clergymen of the Church of England in the town and neighbourhood of Birmingham, and of all other students who shall be recommended either by the Rector of St. Philip's, or the Rector of St. Martin's, in Birmingham, or the Rector of Sheldon, near Birmingham," and which was "designed for the encouragement and promotion of useful Literature, more especially of theological learning." The books were to be lent out at the discretion of the Trustees to suitable persons, and a folio was to be kept six weeks, a quarto one month, and an octavo or duodecimo fourteen days. The Endowment was £200 in 3 per cents., and it was announced that donations would be very acceptable "for the increase of the Library," as no payment was required for admission to the use of it. The Library was long kept in a room adjoining St. Philip's Rectory, (and is duly provided for in the New Rectory) and deserves this mention as the first Free Library in our town.

Subscription Libraries.—Subscription Libraries had been established by William Hutton in Bull Street (in 1751), Joseph Crompton in Colmore Row, and others in the latter half of the last century, but the most important was that of John Lowe, at the Stamp Office in Cherry Street, which was established in 1776, and the catalogue of which in 1796 included 103 pages; and more than 10,000 Standard

Books, to which the price of each was added in case of a purchase. The annual subscriptions were 16/- or a guinea according to the privileges, and not only were quarterly subscribers taken, but non-subscribers could have books to read on depositing their value, at twopence per volume per week; or if over four shillings in value at threepence per volume per week. And the Library was to be open from eight o'clock in the morning till nine o'clock in the evening. It is to the credit of the readers of a century ago that a large number of French books were provided for their use.

In 1787 a Subscription Library was opened at 13 Suffolk Street, by M. and S. Olds. The subscription was 12/- per year, 7/- the half year, and 4/- the quarter.

The Birmingham (Old) Library was founded about November, 1779, (though the exact place of its origination is not known), by nineteen subscribers, nearly all being Dissenters, in fact, only one being a member of the Established Church. The proposal was made to the laity generally, and to some of the Clergy, several of whom became members when the Library had become a success. It was founded on broad principles to supply the numerous readers with books, which few private persons could afford to buy, and it was based on principles so sound that it has been highly successful, and has been one of the most prosperous and long-lived of all provincial Libraries. At first, its progress seems to have been slow, and its history obscure; but on the arrival of Dr. Priestley in Birmingham, in 1780, its real prosperity commenced. His experience of a similar Library at Leeds, and his characteristic energy and enthusiasm were given to the young Institution. He not only wrote the various advertisements which

appeared, but he drew up a code of laws on the principle adopted at Leeds, and the best testimony to their merit is that they have been substantially without important changes for 100 years.

The books were to be bought by a Committee of twenty chosen annually. The Laws could be made or repealed only at an Annual Meeting or by special notice. Books were to be proposed by the Subscribers, and selected by the Committee. The plan proved highly successful, and the Subscribers rapidly increased. The entrance fee was One Guinea, and the Subscription Six Shillings a year, raised to Eight Shillings in 1781. The Librarian was paid £10 a year, attendance 2 to 5 p.m.

During the first two years the Library had its home at the house of Mr. John Lee, junr., 115, Snow Hill, but was afterwards removed to Messrs. Pearson and Rollason's, Swan Yard, High Street. By January, 1782, a Library Room was taken, and the books removed there, "hours 2 to 5," within those hours any Subscriber might see the books, read and make extracts, etc., at his pleasure; in 1785, eleven to one was added to the hours.

In 1790, May 5th, the Library was re-opened at the Upper Priory (late Mr. Payton's Repository)[32] with 4,000 volumes. About this time a plan was started to build a Library on a Tontine System of 181 shares, "near to a street called Cherry Street, and then lately used as a Bowling Green, formerly called Corbett's Bowling Green." An extension doubling the area of the Library Buildings was made about 1843.

At its Centenary, 1879, this Library contained 50,000 volumes. It has now (1886) 1,591 proprietors and subscribers; an annual income of £1,680; an expenditure of £1,531; and 984 volumes were added

to the Library in 1885. The Librarian is Mr. C. E. Scarse.

Birmingham New Library.—In 1794 the New Library was founded by some who were dissatisfied with the management of the Parent Institution. The Laws of the Old Library were adopted, with two exceptions. It was originally started in Cannon Street. Rooms were then built on the Tontine plan, in Temple Row West, where the Joint Stock Bank now stands, and after a more or less successful career the New Library was amalgamated with the Union Street or Old Birmingham Library in 1860.

The Medical Library and Institute.—This Library was formed in 1790 at a meeting at the Union Tavern in Cherry Street, and remained for many years as part of the Old Birmingham Library, accessible to the ordinary subscribers, but on the formation of the Medical Institute, in 1878, the books were given up to the promoters of the Institute. It is now a library of some 11,500 vols. at the new building in Edmund Street. Mr. T. G. Johnson is the Librarian. The Institute is supported by the chief medical men of the town and neighbourhood.

The Birmingham Law Library was founded in 1831, by the Barristers and Attorneys practising in Birmingham and the neighbourhood. This is supported by annual subscriptions. It contains nearly 6,000 volumes of Law Works, Reports, Acts, etc. It is in Wellington Passage, Bennett's Hill. An admirable Catalogue of this Library has been compiled by Mr. Thomas Horton.

The Mason College in Edmund Street, opened in 1880, has now a very choice Scientific Library. It is especially rich in English and Foreign Serials,

Transactions, Journals, Magazines, Reviews, Reports, etc., of which Mr. S. Allport the Librarian published a Catalogue in 1883. It owes much of its high character to the late Dr. Heslop, who took great interest in its formation and gave three-fourths of the books.

Other Libraries.—Among the Libraries of the past should be recorded: (1) The Mechanics' Institution founded in 1826, and carried on till 1842. It had a Reference and Circulating Library with a Reading Room for the use of the members. (2) The Artisans' Library, founded in 1831, open three evenings a week. Of smaller Libraries, the Parochial one of St. Martin's, founded by the Rector (Dr. Miller) in 1850, was far above the average character of such Institutions; it was located in Inge Street, and was much used.

News Rooms, either with Libraries or alone, were not numerous in the early part of this century. In August, 1808, the first subscription News Room appears to have been opened at Messrs. Thomson and Wrightson's Stamp Office, New Street, open from 9 a.m. to 9 p.m. Four London Daily Papers, Lloyd's List, Prices Current, one Sunday, three Provincial, and three Birmingham Papers, with Reviews and Magazines were provided.

A Commercial News Room was established in 1823, by a number of gentlemen, who took Shares of £20 each to erect a Building and carry on the work.

A News Room of large size and importance was built in 1825, in Waterloo Street, corner of Bennett's Hill, where the old County Court stood, and where the Inland Revenue Office now stands. As this contained all the leading London Periodicals and

Foreign Newspapers, Shipping, Commercial and Law Intelligence, files of important Papers, London Gazette, Times and local Journals, it may almost be included among our Libraries.

As a contrast with this, the only News Room of that time, there are now *Nine*, in addition to the Reference Reading Room, viz.:—*Three Subscription*, the Old Library, the Midland Institute, and the Exchange respectively, and six *free News Rooms*, viz., the Central News Room, and five Branches in different parts of the town.

The Free Libraries of Birmingham.—These were originated, and are sustained, by the municipality, at the cost of the ratepayers, by the levying of a rate of a little over one penny in the pound on the rents or rateable value of the Borough. This rate produces £9,500 a year and maintains the principal or Central Libraries, which include Reference Department of 80,000 volumes, Central Lending Library of 25,000 volumes, and a News Room used regularly by about 5,000 readers a day. It also maintains three Branch Libraries of 10,000 volumes each, with capacious and well supplied News Rooms, and two others of smaller dimensions opened only at night. Altogether these various departments issue more than 2,000 volumes, and accommodate in the Reading and News Rooms more than 11,000 readers *daily*.

These Free Libraries were commenced tentatively and modestly in a leased house and shopping in Constitution Hill (or Northern part) in 1861, some doubts apparently existing then whether such institutions were really needed or would be appreciated here.

The Library commenced with 6,000 volumes, and an issue for the first year of 108,000. *Now* there are

nearly 140,000 volumes available, with an issue of 844,000 per annum, and one of the most urgent pleas on behalf of and *by* the population now before the Town Council is for *more* Free Libraries.

So strong is the desire for the privileges these Libraries afford, that at Ward Elections the question has been asked of Councillors as a test of political fitness: "Will you vote for a Free Library and News Room for this Ward?"

This general willingness of the people to be taxed for the higher benefits of knowledge and culture for themselves and their children is sufficiently novel to be worthy of notice.

The success of the experiment at Constitution Hill induced the Free Libraries' Committee to prepare plans on a scale commensurate with the demands of the Town, and it was resolved to commence the Central and Western Libraries consisting of Reference Department and Reading Room, Central Lending Library and News Room, and to provide Branch Libraries and News Rooms for the Eastern District at Gosta Green, and for the Southern District at Deritend.

This plan has since been extended to provide Libraries and News Rooms at Nechells, Small Heath, and Spring Hill, (these three have yet to be built). The small and incommodious Room at Constitution Hill or Northern District, the starting point in 1861 of the Libraries, was superseded by a large and handsome building in July 1883. The cost of these buildings was defrayed from loans borrowed on the system of an annual repayment of loan and interest in one hundred years.

The first Reference Library of 16,000 volumes,

with the Central Lending Department and News Room, was opened in October, 1866, and an eloquent and original address by the late George Dawson, declared these Libraries open and free for ever, and started them on their course of usefulness. As regards the character of books read, it may be said that by far the largest demand in the Reference Library is for books of practical value in Science and Art, and that the taste for Scientific Works in the Lending Libraries is steadily growing, and the Committee are only too glad to meet the demand.

These Free Lending Libraries seem to reach all classes with their elevating and gladdening influence. There are not only books for the student and worker by which they may be helped in the business of life, but there are books for the weary, books of standard music, books for little children, and even books for the blind.

The History of the Libraries has been, with one exception, an unbroken record of success, and what a world of happiness and growth twenty-five years of successful Library work means it is very difficult to measure or estimate.

The exception was the calamitous fire which occurred on January 11, 1879. The Building was in process of enlargement, and had been to a considerable extent given up into the builders' hands during its reconstruction. A strong wall had given place for the time being—to avoid the closing of the Reference Library and News Room during the alterations—to temporary arrangements of wood and similar material. The winter was severe, the gas was frozen, an energetic workman in attempting to produce a thaw ignited a flame which blazed up beyond his control, set fire to the temporary screen

dividing the existing Library from the extension, and, spreading to the adjoining shelves, soon embraced the whole of the Library in one vast blaze. As this occurred at mid-day on a Saturday, the Rooms of the Library were crowded with Readers, but no one was injured. All sorts and conditions of men strove to save what could be saved of the precious books, but the fire was master, and the salvage was small. The pride the people had in *their* Free Library, and their grief at its destruction were shewn in a most pathetic manner, books being offered from their own collections, great and small, toward the restoration. Nor was this feeling confined to the town. Her Majesty sent a note through Lieutenant-General Ponsonby, in which she offered a valuable selection of books as follows:—

"Buckingham Palace, March 24, 1879.

Sir,

I am commanded by the Queen to enquire if the Managers of the Birmingham Library will accept from Her Majesty the volumes, a list of which I enclose.

Not being certain to whom I should address myself, I have ventured to trouble you with this letter, in the hope that you will communicate the Queen's offer in the proper quarter.

I have the honour to be, Sir,

Your obedient servant,

HENRY F. PONSONBY."

"The Mayor of Birmingham."

The books offered were:

Lepsius, (C. R.)—Denkmaeler aus Aegypten und Aethiopien. 12 vols., large folio.

Bock, (F.)—Die Kleinodien des heiligen Römischen Reiches Deutscher Nation. 1 vol., large folio. 1864.

Nash, (Joseph)—Windsor Castle. Folio. 1848.

Wyatt, (M. Digby)—The Industrial Arts of the 19th Century. 2 vols., folio. 1853.

[These works, the noblest of their kind, and on the subjects of which they treat, are not only costly but exceedingly useful, more especially the fine illustrations in the "Monuments of Egypt and Ethiopia," and the "Art Treasures of the Holy Roman Empire of the German Nation."]

Expressions of sympathy and gifts of books came from Germany, Italy, America, and, from nearly every town in England.

The chief men of Birmingham met, and subscriptions amounting to nearly £15,000 were given to supplement the amount for which the books had been insured—to raise again and at once what all classes proudly and lovingly called "Our Free Library."

The buildings in Ratcliff Place have risen again in nobler proportions, and on extended space, the rates for their support are ungrudgingly given, and there is no place better used.

The issue of books extends yearly with the advance of education, and goes on to supply that for which the school creates a demand.

The student will here find placed at his service the most complete and costly works in art, architecture, archæology, botany, natural history, science, theology, politics, poetry, as well as county histories, and topographical works, and sets of all the principal weekly, monthly, quarterly and annual publications, with files of important newspapers, etc., from very early periods to the present time.

The Library contains several *special* collections:

The BYRON collection (275 vols.), given by Mr. Richard Tangye.

The CERVANTES collection (400 vols.), given by the late Mr. William Bragge.

The MILTON collection (182 vols.), given by Mr. Frank Wright.

A collection of local literature of unequalled extent,—the acquisition of many years by David Malins, Sam: Timmins and others—has been generously placed at the disposal of the town. This remarkable collection of books, pamphlets, Acts of Parliament, maps, views of the buildings, portraits, etc., already consists of over 6,000 articles, and is catalogued in a pamphlet of 93 pages.

The Shakespeare Memorial Library was founded at the Tercentenary of Shakespeare's Birth (in 1864) by the united exertions of Mr. Sam: Timmins and the late George Dawson. The original collection destroyed by the fire has been restored to more than its former proportions, and now consists of upwards

of 7,000 volumes, editions, plays, and Shakespeariana in twenty-six languages, including the first four folio editions of Shakespeare's Works, and nearly every edition issued since, as well as various translations from all parts of the world. This collection, like the rest of the Library is open to all students free, and is largely used, students of Shakespeare coming here from Cambridge, Dublin, and even from Berlin.

The disastrous fire of 1879 destroyed the larger part of the Cervantes Library, and of the splendid Staunton Collection of Warwickshire Books, Manuscripts, Engravings, Portraits, etc., but these are being replaced as fully as possible by gifts and purchases as opportunities occur.

The Reference Library (only) has been opened on Sundays, from 3 to 9, since April, 1872, and is generally well used. The readers are supplied with books by six Assistants, of whom five are Jews.

Suburban Libraries.—The influence of the Birmingham Free Libraries has not been confined to the boundaries of the Borough. In the spirited suburban Manor of Aston a Free Library was established in May 1877; this was followed by Handsworth in 1880; and both these Suburbs have handsome provision made in the public buildings, for good Libraries and News Rooms. The Librarian of Aston Manor Free Library is Mr. R. K. Dent, the author of "Old and New Birmingham," and Mr. J. W. Roberts is the Librarian of Handsworth.

Within a circle of ten or twelve miles there are substantial Free Libraries at Darlaston, Dudley, Bilston, Brierley Hill, Smethwick, West Bromwich, Walsall, Wednesbury and Willenhall; and within a

little wider radius will be found the Free Libraries of Burslem, Coventry, Hanley, Kidderminster, Leamington, Lichfield, Tamworth, Tipton, Wolverhampton, and Worcester; a larger number within such an area than will be found in any other part of the kingdom.

The brief account here given is compiled from the following works, in each of which further details of interest may be found:—

Hutton's History of Birmingham. Sixth Edition, 1835.

Langford's Century of Birmingham Life, 1868.

Langford's Modern Birmingham and its Institutions, 1873-1877.

Dawson's Inaugural Address at opening of Reference Library, 1866.

Dent's Old and New Birmingham, 1880.

Centenary of the Birmingham Library, by Sam: Timmins, 1879.

Showell's Dictionary of Birmingham, 1885.

Chapter IV.
LITERARY, SCIENTIFIC AND ARTISTIC SOCIETIES.

BY SAM: TIMMINS.

The Chapter II., on "Education," has included the more active and valuable societies which have developed into important organizations for the full and regular teaching of Literature, Science, and Art, but it has been thought desirable to give a brief

summary of the local societies which for nearly a century have assisted in creating the demand which the larger institutions have been established to supply. Birmingham has not been so remarkable as some other towns for its societies formed of lovers of literature and science, and it is certainly remarkable, and almost reprehensible, that so large a centre has never had a definite Literary Society or Literary Club, associating all, and they are many, who are lovers of books in all departments, and not merely of literature of a scientific, technical, and practical kind. Such a society, or such a club, should certainly exist in a great Midland town, as in Manchester, Liverpool, and other places.

The Lunar Society of the last century, which included among its members or visitors, Priestley, Boulton, Watt, Darwin, Withering, Keir, Galton, Sir Joseph Banks, Smeaton, Edgeworth, Day, Wedgwood, Baskerville, was founded about 1765, and as the houses of the members were distant from each other, and the roads dark and sometimes dangerous at night, the meetings were held at "full moon," hence "The Lunatics" or "Lunar Society" derived its name. Its objects were social and scientific rather than literary and it has left no literary memorials of its meetings.

Debating Societies.—Among the earliest of the societies, common in later days, and which were the more needful when newspapers were few, were the Debating Societies, the first of which, the "Robin Hood Free Debating Society," was a tavern-society, founded in 1774, and was followed in the same year by another, and probably a rival, or seceded body, as a "Society for the Encouragement of Free and Candid Disputation," but both soon discussed themselves out

of existence. In 1789 a “Society for Free Debate” was formed, and like the others it discussed social, moral, and political questions, so that in 1792 the magistrates interfered, on the ground that the recent riots should discourage public discussions of dangerous subjects.

Philosophical Institution.—At the close of the century, about the year 1794, a Philosophic and Artistic Society was proposed, and in 1800 the first steps were taken to found the Birmingham Philosophical Institution, which was so successful that, in 1813, a suitable building, with a lecture room for two hundred hearers, a news room, a museum, and other necessary rooms, were erected, and were opened by a lecture by Rev. J. Corrie, a friend and biographer of Priestley, in October, 1814. This society flourished for many years, with lectures from eminent men, a good library and museum, and was finally succeeded by the Midland Institute on a much larger and more popular scale. One of its notable practical uses was the erection of Mr. Follett Osler’s first Anemometer, and excellent Clock for public convenience. For many years papers were read and discussed by members, and published in Transactions in which meteorological, industrial, and scientific facts of historic importance have been preserved.

Society of Arts and Exhibitions.—In April, 1814, the “artists and amateurs,” proposed to form a society, and to hold an annual exhibition of pictures, and the promoters secured as honorary members, Benjamin West, Sir J. Soane, J. M. W. Turner, John Flaxman, and Richard Westmacott. The first exhibition was held in the “Academy of Arts,”—a building still remaining in Union Passage—and

proved very attractive. In 1821, the Artistic Society proposed to expand and to form a Society of Arts, and in 1822, the site of the present large building (then temporary) was secured, and replaced, in 1827, by a permanent building, chiefly from the liberality of Sir Robert Lawley, who gave a large number of casts from antique, and in that year the first great exhibition of pictures was held. As a proof of the necessity of such an exhibition and of such a Society, it will be worth while to quote the remarks of Catherine Hutton, the daughter of the historian, herself a woman of good sense and good taste, since she predicted that the proposed society would "die a natural death," that the "genius of the artists of Birmingham was more calculated to paint tea boards than pictures," and that the proposed rooms would soon "serve for a Methodist Meeting House." For more than sixty years since that prophecy, the rooms have been used, with one interval, caused by quarrels, for a series of exhibitions of paintings and drawings, not only in autumn, but in spring exhibitions too, which secure some of the best pictures by the foremost artists of the day.

School of Medicine and Surgery.—In 1828, the School of Medicine and Surgery was begun in Snow Hill, by the late W. Sands Cox, and was finally expanded into the Queen's College, which has been fully described, but the "Society" side of this and other similar institutions, was originally a series of meetings of members, and not any sort of college or school.

Mechanics' Institute and Artisans' Library.—The success of Dr. Birkbeck's popular institution in London led to the formation of a Mechanics' Institution in Birmingham, in 1825, and the

establishment of an Artisan's Library. From various causes this society was not successful, but it was one of the first attempts to reach the masses of the people with literary and scientific teaching, and numerous classes were well taught and gave valuable help to the young men of that day. One of the most remarkable results of the Mechanics' Institution, and one of the causes, unfortunately, of its failure, was one of the first of Industrial Exhibitions of manufactures and processes in 1840, and followed by a second which was financially a failure. In 1841 another "Institution" on a somewhat different plan was established under the patronage of Lord John Manners and the "Young England" party as the "Athenic Institute" for mental, moral, and physical improvement, combined with rational amusements—athletic and others. In 1843 the Polytechnic Institution followed and was carried on successfully till 1853 on rather broader lines than the Mechanics' Institution, but it attracted rather the middle than the humbler classes, and finally failed, to be followed by the Midland Institute as previously described.

In 1850 an important society was founded in Birmingham to advocate the establishment of "free, secular, and compulsory" education, and this developed into the "National Public School Association," and in 1867 into the "National Education League," which was the most important factor in the education of the country by the agitation which resulted in the Elementary Education Act of 1870.

In 1852-53 another attempt was made to form a Literary and Scientific Institution, to take up the work which the Mechanics' Institution and the Polytechnic Institution had failed to accomplish. The

first public help given was by one of the first public readings of the Christmas Carol, by Charles Dickens, which produced for the three readings, £227. 19s. 9d., and continued the interest and help which Dickens had given as President of the Polytechnic Institution some years before. From this date the Midland Institute has most successfully provided for all classes, by its literature and science classes, its public lectures, and its musical and archæological sections, and has become one of the most successful of all similar institutions.

Magazines and Pamphlets.—So early as 1764 a "Birmingham Register and Entertaining Museum" had been published on the lines of the Gentleman's Magazine, and ten years later a "Medical Miscellany" appeared which, however, did not live long, and no similar serial appeared till 1817. During the whole of this period, and especially just before or after the riots in 1791, the town was deluged with pamphlets, chiefly on political subjects, and great feuds arose. The pupils of the famous "Hazelwood School" issued the "Hazelwood Magazine," often illustrated with etchings and lithographs from 1822 to 1830, and the pupils of King Edward's School have from time to time had a "Magazine" of their own. This example was followed by the "Proprietary School" on two or three occasions. "The Oscotian" in 1828 reached 3 vols., and was resumed later, and is still issued. For several years, *circa* 1830, several Magazines devoted to the drama were published, and were useful in their day.

Newspapers.—The pamphlets of the last century were superseded by the newspaper press; Birmingham, which had a "Journal" in 1731, and a "Gazette" in 1741; had its first "Daily Press" in 1855,

when the taxes on knowledge were repealed, and "Daily Post" in 1857, and "Daily Gazette" in 1862. In 1869, an attempt was made to establish a Midland "Illustrated News," which continued for some two years. In the same year the first halfpenny evening paper appeared, the "Daily Mail," and in 1871, the "Birmingham Morning News" was established, with the late George Dawson as its first editor.

Magazines.—Magazine literature has often been attempted since 1764, but not successfully. In 1876, the "Birmingham Examiner," a weekly newspaper of politics and literature was tried for some months, and about the same time the "Medical Review," the "Midland Naturalist," and the "Central Literary Magazine," were founded and flourish still. An illustrated Magazine, "Mid-England" appeared in 1879, but failed to secure the "Midland" readers; and the "Midland Antiquary," devoted to archæology, genealogy, and heraldry, since 1879.

Debating Societies have been numerous, and have generally held their ground, and helped to train some of the best speakers and debaters of our day. The Birmingham Debating Society was founded in 1846, and amalgamated with the Edgbaston Society in 1855. Parliamentary Debating Societies—"echoes" of the House of Commons—have been tried two or three times but without success, although flourishing for some years. The Central Literary Association has been one of the most long-lived and popular of debating societies, and its Magazine has also been a marked success. In 1856 an Amateur Dramatic Club was formed, and many very excellent performances were given. A Dramatic Club, holding winter meetings, has been established since for the reading of papers, and the celebration of the Shakespeare

Anniversary; and "Our Shakespeare Club" has met for more than thirty years as a social rather than literary club, whose chief work was to found the Shakespeare Memorial Library. A Graduates Club was founded by the late Dr. C. Badham for social meetings of University Graduates; a Clef Club has recently been opened for lovers of music; the Historical Society, at Mason College, has been merged into the Philosophical Society, which meets in the same building; the Natural History and Microscopical Society has many and devoted members; the Law Society has its learned discussions; the Medical Institute has its Library and Meetings; the students of the Midland Institute and of Mason College have their respective societies and magazines; the Archæological section of the Institute has its meetings, excursions, and transactions; the Natural History Society its numerous members, and its excursions and magazine,—all being social as well as scientific, and helping to raise the standard of taste and knowledge among all classes of the town.

Chapter V.
CHARITABLE INSTITUTIONS.

BY C.E. MATHEWS.

The Birmingham General Hospital.—At the commencement of the second half of the last century, Birmingham was a small manufacturing town with a population but little in excess of 30,000 souls. At that time no medical or surgical relief could be obtained by its suffering poor except at the Infirmary

attached to the Workhouse. But in November, 1765, Dr. Ash, an eminent member of the local medical profession, called a meeting of the principal inhabitants "to consider the advisability of establishing a general hospital for the relief of the sick and lame."

A public meeting was held at the Swan, November 21, 1765, which resulted in "Benefactions" £1,555 18s. 0d. and "Annual Subscriptions" £424 10s. 0d.

Little was done (other than the creation of a building debt) until the year 1779, when this great charity fairly entered upon its long career of humanity, usefulness, and honour.

Its income in those early years was scanty, its patients few and far between, it had no endowment whatever. It was a privileged institution, that is, except in cases of extreme urgency, its benefits were given only to the holders of subscribers' tickets.

During the year 1885, 3,545 in-patients and 38,501 out-patients were treated at this Institution. Its subscription list amounted to £5,448; the income of its endowments reached the respectable figure of £2,787, and the total income from all sources, ordinary and extraordinary, was nearly £15,000.

It is still in theory a privileged institution; but more than two-thirds of the in-patients, and more than half of the out-patients were admitted in 1885 as "accidents and urgent cases" without recommendation.

In recent years enormous improvements have been made both in the laws and in the administration of this Hospital.

The old system by which every Governor had a

vote in the election of a Medical Officer has been abolished, and vacancies for the much coveted position of Physician or Surgeon to the charity are now filled by a sufficiently large and representative Committee.

The legacies, which are very numerous, are funded to the extent of one half of their amount; and the annual reports are models for clearness and accuracy of information.

A great extension of the hospital work has recently been made. A branch Hospital for chronic cases has been established by the munificence of Mr. John Jaffray, and has recently been opened by the Prince of Wales. The Endowment Fund of this department already exceeds £30,000, and special subscriptions have been obtained amounting to nearly £500 a year.

The great Triennial Musical Festivals, which in late years have ceased to be peculiar to Birmingham, were first established in connection with the Birmingham General Hospital. A Committee of the Governors is specially appointed to carry out these important undertakings, and they have spared no effort in procuring the finest music from the ablest Composers, rendered by the foremost artists of the time. The Elijah of Mendelssohn, the Eli and Naaman of Costa, the Light of the World of Sullivan, the St. Peter of Benedict, and the Redemption and Mors et Vita of Gounod, are some of the great works first produced at Birmingham under the management of the "Orchestral Committee," whose aim has been on the one hand to obtain the perfection of music, and on the other to augment the income of the Hospital.

These Festivals have been held since the year 1768, and have resulted in a net profit to the

Hospital of over £120,000. Since the year 1849, the gross receipts at any Festival have never been less than £10,000, and in one year they exceeded £16,000. In the year 1885, when the last Festival was held, the gross receipts were £13,715, and the net profit accruing to the Charity was £3,500.

The Queen's Hospital.—This great Hospital is the second general Hospital in Birmingham. It was founded in the year 1840, in connection with the Birmingham School of Medicine and Surgery; a School which in 1843 became incorporated under the name of the "Queen's College."

It has an unusually large acting Medical and Surgical Staff consisting of three Physicians, four Surgeons, one Physician for Out-patients, two casualty Surgeons, an Ophthalmic Surgeon, a Dental Surgeon, and an Obstetric Officer. It was established as a privileged Institution, but in the year 1875 the regulations then existing were changed, and it became a Free Hospital. From that time no privileges of any kind have been given to subscribers, and the suffering and deserving poor have been received and treated without any conditions or qualifications other than the urgency of their need of relief.

There is no doubt that since the Hospital became free, it has gained greatly in public confidence and popularity.

The In-patients treated in 1885 were 1,944, the Out-patients were 24,063. Some years ago it had a considerable endowment, but great enlargements and improvements of the Hospital were necessary, and were carried out a few years since at a cost of £26,000, of which sum £10,000 was taken from the endowment, and the remainder was raised by an active and intelligent Committee. The present

endowment is only about £5,000. The annual income from all sources may be taken at £8,000, and the annual expenditure is about the same, though there is no doubt that with a larger income the Committee could provide in the present buildings a great increase in the number of beds, and so materially reduce the average cost per patient. The ordinary income of a medical charity is derived from subscriptions, donations, legacies, and the income resulting from investments. By the laws of many charities legacies are invested, and the income only of such investments is applied to the annual purposes of the charity.

The Queen's Hospital has not been able to take this course; all legacies paid in any year being applied to the general purposes of the institution.

In the year 1885 the income of the Hospital was made up as follows:—From Subscriptions £2,648, from Donations £256, from Legacies £1,621, from Registration Fees £852, from Income of Investments £197; but these figures amount in all only to £5,574, and it has been stated that the income of the Hospital is about £8,000 a year. How then has the balance been obtained? In England there is no compulsory rate in aid of our charitable institutions. M. Guizot left it on record that when he first visited this country nothing surprised him more than the constant recurrence of the words that met him at every turn in London—"supported by voluntary contributions." But the income arising from "ordinary sources" was rarely sufficient to enable Hospital managers to cope with the responsibilities thrown upon them without incurring constant deficits and sometimes financial disaster.

Twenty-five years ago some Birmingham men,

amongst whom the late Rector of Birmingham (Dr. J. C. Miller) deserves most honourable mention, grappled with the difficulty. The various Clergy and Ministers of Religion, assisted by prominent lay townsmen, determined to organise a general Collection once a year in all the Churches and Chapels of the town and neighbourhood, for the benefit of the local Medical Charities. Thus originated "Hospital Sunday." It was resolved that every third year the whole collection should go to the General Hospital, every third year to the Queen's Hospital, and every third year that it should be divided among the smaller Medical Charities in certain proportions based upon the number of patients relieved.

"Hospital Sunday" became immensely popular, and the example set by Birmingham was imitated by the metropolis and by the larger towns and cities of England. Since its establishment up to last year the medical charities of Birmingham have received from the Hospital Sunday Fund the enormous subsidy of £124,430.

From this source the Queen's Hospital has received, up to the year 1884, £42,188; its triennial collection amounted to £4,356 in 1881, and to £4,181 in 1884. But the year 1873 witnessed a new departure. It was felt that it was not enough to make collections only from the habitual frequenters of churches and chapels, most of whom might be assumed to be regular subscribers to the various charities or donors to their funds. It was felt too that the great body of the artisan population were able and willing to do something for the support of the great institutions founded almost wholly for their benefit; and thus "Hospital Saturday" became a

friendly but formidable rival to “Hospital Sunday.” Once a year collections are made in all the manufactories and large workshops in the town and district, and up to, and including the year 1885, the hospitals have been subsidised from this welcome source to the extent of £46,800. Not only so, but these annual collections are steadily growing in amount, to the great credit of the industrial population and to the lasting benefit of the charities of the town.

It is interesting to note the increasing annual amount the Queen’s Hospital has thus received. In the year 1880 it was £670; in 1881, £711; in 1882, £852; in 1883, £931; in 1884, £1,056; in 1885, £1,135, and the accounts for the present year shew a large increase on any figures hitherto recorded.

The Birmingham General Dispensary.—This Institution is the oldest medical charity in Birmingham except the General Hospital. It was founded in 1794, and has deservedly enjoyed a very large share of public confidence. It is a strictly privileged institution. Every subscriber has so many tickets for his subscription, and has also the power of procuring supernumerary tickets. There are of course no beds, all patients being attended at their own homes. Accidents or urgent cases, such as sometimes put great pressure upon the resources of a general hospital, are here extremely rare. There is, therefore, no debt. The services of the medical staff can be purchased at a rate sufficient to cover the cost. Consequently the subscription list has always been large, the finances invariably prosperous, the revenue always in excess of the expenditure. So great has been the success of this institution, that the managers sometimes hardly know what to do with

their money.

The income for the year 1885 from all sources was considerably in excess of £6,000. The whole expenditure was under £5,000, and the managers were able out of the income of the year to put by £1,500. The income from investments alone was £608. There was a considerable sum on deposit, and a large credit balance at the Bank. There is a central dispensary in Union Street, and branches at Camp Hill, Aston, and Ladywood, all with Resident Surgeons attached.

In former days it had a large midwifery and vaccination department, but the former was abandoned in 1869 and the latter in 1870. The dispensary, therefore, now addresses itself only to the ordinary medical treatment of the sick poor. All the medical officers, including the consulting officers, are paid for their services. The patients who, in 1871, numbered 10,570, had increased in 1885 to 21,888.

The Orthopædic and Spinal Hospital.—This small but useful institution has existed since the year 1817. It has three Acting-Surgeons, and one Assistant Surgeon. The Surgeons attend daily and give gratuitous advice to the deformed poor. Ordinary cases are admitted without letters of recommendation, but in the numerous cases where supports or instruments are required, subscribers' tickets are necessary to cover the cost. The instruments supplied in 1885 cost upwards of £500. The new cases in that year were 1,654, the attendances 7,439. The total expenditure was about £1,400.

The Eye Hospital.—The Birmingham and Midland Eye Hospital is one of the best special Hospitals in

the provinces. It has not only been of incalculable service to the poor of the town and neighbourhood, but it has founded an important school of ophthalmic science in the Midland district. Diseases of the eye cannot be adequately dealt with at general hospitals. Where the delicacies and difficulties of any disorder are such as to require minute manipulative skill and practitioners of great experience, a special Institution is imperatively necessary. This Hospital has had a really splendid career. It was founded in 1824, and commenced its operations in a humble manner in Cannon Street. It then migrated into improved premises in Steelhouse Lane. In 1861 it found a third home in Temple Row, and in 1884 a new Hospital was erected and opened in Church Street capable of accommodating 70 beds.

The acting Medical Officers of the Institution (exclusive of House or Resident Surgeons) are by the laws to consist of not less than four and not more than six Honorary Surgeons, so that ample provision is made to secure the adequate surgical treatment of the present patients and of any probable increase in their number.

In order to insure the maximum of surgical ability every acting Surgeon is bound to resign his appointment on his attaining the age of 55 years, or on becoming physically unable to discharge his duties in an efficient manner.

In the year 1885 there were 925 in-patients and 13,461 out-patients. 590 operations were performed during the year on in-patients alone.

The annual income is large, but as yet hardly adequate to meet the requirements of the new Hospital. The income for 1884 was £3,807, and the expenditure £3,213; but the income for 1885 was

only £3,098, whilst the expenditure was £4,187.

The Lying-in Charity.—This is a small but most useful and deserving Institution. It was founded as a Lying-in Hospital in the year 1842. Its original managers attempted to deal not only with lying-in cases in the wards of the Hospital, but also with the ordinary diseases of women, and with children. The Institution was never successful, chiefly because it attempted too much. As a rule no Institution devoted to more than one speciality succeeds. Moreover, when the statistics of Lying-in Hospitals came to be examined, it was discovered that there was a great difference in the mortality of patients treated in Hospitals and of patients treated at their own homes. In the year 1874, the system of the charity was remodelled, a large building was abandoned, and patients were attended only at home. The change has proved eminently successful. Four competent Midwives are regularly employed, all of whom have large experience. The medical staff consists of a consulting Surgeon and four acting Surgeons who are called in in cases of difficulty or danger. The competence of the Midwives is best tested by the fact that the services of the members of the honorary medical staff are only required on an average once in 44 cases.

In the year 1885, 931 cases were attended at a cost of less than £500. Few institutions in Birmingham have in recent years done better work at a more reasonable cost than the Lying-in Charity.

Free Hospital for Sick Children.—This Hospital has been one of the most successful ever founded in Birmingham. It is a general Hospital so far as regards disease, but a special Hospital so far as regards age.

It was founded in 1861, and was opened for the

reception of patients on the 1st January, 1862, and during that year its income and expenditure were about £700. In the year 1885, its in-patients were 713. Home patients, 27. Out-patients, 12,692. Its income and expenditure exceeded £4,000.

Few local institutions have ever enjoyed greater popularity. The Charity from its very name appeals to a very wide circle, and the administration has been marked by foresight and discretion. Not only was it the first Free Hospital in the town, but it was established on principles then considered novel, but which have since in part at least been adopted by other local institutions.

For instance, the tenure of office of physicians and surgeons is limited, and the medical officers, though absolute in their own department, cannot sit upon the Board of Management.

Again, at this Hospital, first in Birmingham, was an honest effort made to limit the relief given to the *Hospital population* only, that is to those who were above pauperism, but below the capability of paying for medical advice. Here too, the system was first adopted of paying the Junior members of the Medical Staff, and here also was the principle first laid down of vesting the election of medical officers of the charity in a large and representative Committee. This rule has been almost unanimously followed by other local institutions.

The Hospital has a dispensary and out-patient department in the centre of the town, an in-patient department with detached fever wards in Broad Street, and a convalescent department with separate management, many miles from the town. 151 children were received in the convalescent home

during the year 1885.

The work of the Committee of Management of this Hospital is supplemented by the kindly aid of a large Committee of Lady Visitors, and by a Special Committee of Ladies for the management of the Convalescent Home.

The Ear and Throat Hospital.—This is a small institution, having for its object the treatment of diseases of the ear and throat. It has lately been reconstructed upon a new basis. It is rather a dispensary than a hospital, having no in-patient department. Tickets can be obtained by patients desiring the advice of the Medical officers. The subscription list is under £100 a year, the income being made up by contributions from the Hospital Sunday and Hospital Saturday Funds, together with the amount realised by the sale of supplementary tickets. The total number of cases treated during the year 1885, was 2,398.

The Dental Hospital.—This institution was founded in 1860, and should rather have been termed the Dental Dispensary than the Dental Hospital. It has five honorary dental surgeons and four honorary administrators of anæsthetics. Thus the advantages and resources of modern dentistry are placed within the reach of those who but for this institution would undergo much preventable pain. Every fitting applicant suffering pain is entitled to advice and attention, but special operations are performed only upon patients who have a recommendation from a Governor.

There were 9,453 patients in 1885. The expenditure was less than £300.

The Sanatorium.—This Institution was founded in

1866, and has proved a most valuable supplement to the work of our local hospitals. It enables convalescent patients to obtain rest, pure air and nutritious diet at one of the most healthy and beautiful spots within a reasonable distance of Birmingham.

Some years ago a fund had been raised for relief of distress in the cotton districts, and when the distress had subsided a considerable portion of the fund remained undisposed of. With the consent of the donors £4,500 was devoted to forming a nucleus for the Building Fund of the Sanatorium. The work was completed in 1873. The total cost of the site, buildings, and furniture was £16,800.

The institution receives 40 male, and 40 female patients, and every possible effort is made to provide for their health and their amusement.

No privileges are given to subscribers; but patients are received either from the Medical Charities in Birmingham, or from the general public, on the recommendation of a medical practitioner.

The income and expenditure are about £2,000 a year. The charity applies all donations exceeding £10 to a deposit or investment fund, and ten per cent. of the amount of the fund so created is withdrawn each year for the current purposes of the institution.

The Homœopathic Hospital and Dispensary.—This hospital is supported by the friends of the system of homœopathy. It has one honorary physician and five honorary surgeons. It is a general hospital, and has departments for in-patients, out-patients, and home patients. The in-patient system is different from that of most general hospitals, a certain number of beds being reserved for patients

who can afford to pay for the benefits they receive. Again, all in-patients are admitted at the discretion of the medical staff, so that as regards this department the hospital is free, no subscriber having the privilege of ensuring a bed. Subscribers have tickets for out-patients and for home visits. This provision for visiting patients at their own homes is of great value in connection with this Charity. The in-patients in 1885 were 167. The home-patients 584. The out-patients 18,752.

The expenditure for 1885 was £1,640. The income £1,380, leaving a deficit of £260.

Ladies as well as gentlemen serve on the Committee of Management.

The Hospital for Women.—This is a valuable and important Institution. When the Lying-in Hospital gave up the treatment of women's special diseases and devoted itself exclusively to midwifery, there was an opening for an institution for the reception and treatment of women afflicted with diseases peculiar to their sex.

Two classes of patients are admitted. Paying patients who contribute the whole or part of the cost of treatment, and general cases, which are admitted without any subscriber's ticket of recommendation. The expenditure for the year 1884 (no report has been issued for 1885) was £1,736. The income was £1,466, leaving a deficit of £270.

During the same year the out-patients were 3,299, and the in-patients 294.

The acting Medical staff consists of five Surgeons, one of whom is a lady. It will be obvious that in a Hospital of this character many operations of cardinal importance are constantly performed. No

fewer than 217 operations were performed during the year 1884.

The Skin and Lock Hospital.—This Institution was opened in 1881 for the treatment of skin and lock diseases. There was ample room for it, no special department for cases of this kind existing in any of the general Hospitals of the town.

During the year 1885 nearly 2,000 cases were treated. The income of the year amounted to £1,081, and the expenditure only to £624. The Committee of Management, however, are desirous of erecting a Hospital, and thus be enabled to deal with serious cases as in-patients. A site has been secured for this purpose in John Bright Street. It is estimated that £5,000 will be required. £1,200 of which has already been obtained.

The Hospital is conducted on the free system, but some patients are received on payment of a sum sufficient to cover the bare cost of their treatment.

The Deaf and Dumb Institution.—This Charity is an educational establishment. It was founded nearly three quarters of a century ago for the instruction of deaf and dumb children. 70 boys and 58 girls were on the books during the year 1885. The Charity is supported by voluntary contributions, supplemented to a considerable extent by payments on behalf of the inmates.

Children are admitted by election, and the election takes place at the Annual General Meeting. Every Governor is entitled to one vote in respect of a donation of £10, or an annual subscription of £1. 1s. Children admitted without election pay £25 per annum. Elected children pay £10 if they come from Warwickshire, Worcestershire, or Staffordshire; £15

if they come from other Counties, and £20 if maintained by Boards of Guardians. The system of education is excellent. Children are taught not only by means of the manual alphabet but by articulation and lip reading, in cases where that system can be advantageously employed.

The Institution is placed in a healthy and beautiful situation in Church Road, Edgbaston.

The income for the year 1885 was £2,726, made up as follows:—Subscriptions £461, Legacies £804, Donations £63, Interest on Investments £400, Payments for Pupils £986, Sundries £12. Total £2,726.

The expenditure was about £100 in excess of the income. There is no rule as to funding legacies. The charity does excellent work and is deservedly popular.

The General Institution for the Blind.—This Institution has been of immense benefit to the town and neighbourhood. The buildings are handsome and commodious, and are situated in a charming part of Edgbaston, about two miles from the centre of Birmingham. The Charity was founded thirty-eight years ago. The expenditure in 1885 was a little in excess of £4,200, whilst the income, including sales of materials manufactured by the inmates, reached the large sum of £6,270. The subscriptions and donations amounted to £778, Legacies £2,119, the interest on investments was £734. Payments by Pupils £765, Sales £1,874. Here too the legacies are not funded. But the large sum received from legacies in 1885, together with the balance in hand at the commencement of that year, enabled the managers to invest over £2,000 out of the year's income.

46 males and 32 females were in the Institution in 1885, and 257 adult blind persons were visited and taught at their own homes.

Great efforts are made by the managers to find permanent employment for pupils who have been taught at this excellent charity. Many pupils are turned out fully competent organists, and many become professional piano tuners, and follow the trade of basket making.

Chapter VI.
ECCLESIASTICAL.

BY G. J. JOHNSON.

The municipal borough of Birmingham comprises the whole of the parishes of Birmingham and Edgbaston, and part of the adjoining parish of Aston.

All these parishes were formerly in the Archdeaconry of Coventry, as part of the diocese of Lichfield and Coventry, and are now in the same Archdeaconry as part of the diocese of Worcester. By an Order in Council, dated 22nd December, 1836, made in pursuance of the 6 & 7 Will. IV., c. 77, the Archdeaconry of Coventry was taken away from the diocese of Lichfield and Coventry, and annexed to that of Worcester, and the former diocese became the diocese of Lichfield only. The testamentary jurisdiction of the Bishop of Lichfield over the archdeaconry, however, continued until the jurisdiction of all the ecclesiastical courts in such matters was abolished as from the 1st of January,

1858, by the 20 and 21 Vic., c. 77.

The original parish of Birmingham (otherwise called the parish of St. Martin, from the mother church of the parish dedicated to that Saint) contains 2,660 acres only, whilst the acreage of the entire borough is 8,420 acres. The difference is made up of the entire parish of Edgbaston, 2,790 acres, and part of the parish of Aston, 2,970 acres.

Taking the parishes separately, we commence with the

PARISH OF BIRMINGHAM.[33]

St. Martin's.—We find that the earliest mention of the mother church of St. Martin in our national records is a licence of the 6th of May, 1330 (4 Edward III.), to Walter de Clodeshale, of Saltley (then an adjoining hamlet), to grant lands for the endowment of a priest to say mass daily at the altar of the Virgin in St. Martin's. Seventeen years afterwards (21 Edward III.), Richard, son of Walter de Clodeshale, obtained a licence for a further grant to endow a second priest to say daily mass.

In 1392 (16 Richard II.), there is a record of a licence to found and endow a guild in honour of The Holy Cross, and another chantry in St. Martin's for two chaplains. All these charities were suppressed at the time of the dissolution of the monasteries. The endowments of the Clodeshale charities were sold,[34] as was also a small part of the endowments of the Guild of the Holy Cross. The rest were re-granted by Edward VI. for the foundation and endowment of the Grammar School.

For three centuries after its foundation St. Martin's

Church must have been nearly at the top of the town, which consisted, as Leland saw it even in 1538, of one long street, namely, the present Digbeth and High Street, and the old church sufficed for all its wants, especially as the lower part of the town below Digbeth was served by the chapel of St. John, noticed under Aston parish.[35]

The tower and spire, having become unsafe, were taken down and rebuilt in 1855, and in 1872 the rebuilding of the rest of the church was commenced, and it was finished and re-consecrated on the 20th of July, 1875. Attached to the church are mission rooms in Barwick Street and Park Street.

The original parish has been, by the successive agencies of special acts of parliament, the orders of the Church Building Commissioners (1818 to 1856), and afterwards of the Ecclesiastical Commissioners, or by the Bishop in exercise of powers given by 1 and 2, W. IV., c. 38 (now repealed), divided into five rectories and twenty-one vicarages (all incumbents of churches entitled to perform marriages, churchings, and baptisms, and receive the fees for their own use, being now termed vicars under the statute 31 and 32 Vic., c. 117). The successive divisions are detailed in chronological order.

St. Philip's.—In the early part of the reign of Queen Anne, Birmingham had extended northwards and upwards from the mother church, and this necessitated the foundation of St. Philip's Church and parish, created by special Act of Parliament (7 Anne, c. 131, A.D. 1708) entitled "An Act for building a parish church and parsonage house, and making a new church and new parish in Birmingham, to be called the parish of St. Philip." The preamble recites that there was only one church in the parish of

Birmingham, and that it was expedient to build another in the "high town quarter." It then carves out of the parish of St. Martin, the parish of St. Philip, and constitutes it a rectory. The church was consecrated in 1715, and partly rebuilt and enlarged in 1884. Its situation, between Colmore Row and Temple Row, is the finest in the town.

St. Bartholomew.—The next ecclesiastical structure in order of time, was St. Bartholomew's, built in 1749 as a chapel of ease to St. Martin's, to accommodate the then rapidly increasing population east of St. Martin's. The land was the gift of Joseph Jennens, whose name is still commemorated in Jennens Row. In the year 1847, it was created a district chapelry, and in 1869, a part of the district was assigned to the consolidated chapelry of St. Gabriel. The churchyard and the adjoining burial ground of St. Martin, containing four acres and a half (called the Park Street Burial Ground) were, in the year 1880, converted by the Corporation into a public garden. There is a mission room in Fox street, attached to the church.

In the year 1772, the first Church Extension Society was formed in Birmingham for the purpose of building "one or more churches," which resulted in the passing of another Act of Parliament (12 Geo. III., c. 64, A.D. 1772) "for building two new chapels, and providing burial places thereto." The first built of these two chapels was—

St. Mary's, completed in 1774 on land granted by Mary Weaman, who gave her christian name to the church and her surname to the adjoining street. It was originally a chapel of ease to St. Martin's, but was created a district chapelry in 1841. The chapel was thoroughly renovated in 1857, and in 1882 the

disused burial ground was, at the cost of the Corporation, laid out as a garden for public use.

St. Paul's.—The other of the two churches built under the act of 1772 was St. Paul's, in what was then the northernmost part of Birmingham. It was built in 1779, on land given by Charles Colmore out of a large estate he had there. It was created a district in the year 1841.

Christ Church, at the top of New Street, which enjoys the unenviable distinction of being the ugliest church in the town, was authorised by a special act of parliament of the year 1803 "for erecting a new church to be called Christ Church, in the town of Birmingham." All the sittings were to be free, and it therefore obtained the name of "the Free Church." It was consecrated in 1813, but not finished until three years later. In 1865 it was constituted a consolidated chapelry out of the parishes of St. Martin and St. Philip. Attached to the church are mission rooms in Pinfold street and Fleet street.

This was the last of the churches for which a special Act of Parliament was required, for in the year 1818, the Act 58, Geo. III. c. 45, was passed, establishing the Church Building Commission and granting a sum of one million (increased six years afterwards to a million and a half) for building additional churches throughout the kingdom, and for the division of parishes.

St. George's.—The first result of this in Birmingham was St. George's Church near Tower Street, consecrated July 30th, 1822. At that time the site was surrounded by green fields, and it was known as St. George's in the Fields. In pursuance of the provisions of the Act of 1818, it was constituted a separate parish, taken out of St. Martin's, and

because St. Martin's was a rectory, St. George's became a rectory also. The Church itself was enlarged in 1882. There are mission rooms in New Summer Street and Smith Street, licensed for worship. The district chapelries of St. Stephen and St. Matthias, have been constituted out of the original parish of St. George.

St. Peter's in Dale End was consecrated August 10th, 1827, as a chapel of ease to St. Philip's Church, in which parish it was. It was destroyed by fire in 1831, and rebuilt in 1837. In 1847, it was constituted a district chapelry.

St. Thomas's in Holloway Head was consecrated October 22nd, 1829, and like St. George's, was constituted a new parish, carved out of St. Martin's, and a rectory under the 58 Geo. III. c. 45. Parts of the original parish have been assigned to the districts of Immanuel and St. Asaph.

All Saints, built near Lodge Road at Birmingham Heath, was originally a small Church, consecrated September 28th, 1833, and greatly enlarged in 1881. It is a parish and rectory formed in the year 1834, out of St. Martin's parish, and a portion of the parish has been since assigned to the district chapelry of St. Cuthbert. There are two mission halls, one in Heaton Street, and the other at Nineveh Schoolroom, attached to All Saints. This was the last of the rectories created under the Act of 1818. All the districts subsequently created have been either assigned by the Bishop or formed under the Peel Acts, 1843 and 1844, or the New Parishes (Marquis of Blandford's) Act, 1856.

Bishop Ryder's Church, in Gem Street, was built in 1838, on land granted by the Governors of King Edward's Grammar School. It is so called after Dr.

Ryder (b. 1777, d. 1836) who was successively Bishop of Gloucester (1815-1824), and afterwards of Lichfield and Coventry (1824-1836), and who greatly interested himself in church extension in the poorer and more populous parts of his diocese. In the year 1840 a separate district was assigned to it.

In the year 1838 a society was formed for building ten new churches in Birmingham; only five were built, and these were St. Matthew's, St. Mark's, St. Luke's, St. Stephen's, and St. Andrew's. Three of these, namely, St. Mark's, St. Luke's, and St. Stephen's were in the parish of Birmingham. The other two will be noticed under Aston parish.

St. Mark's is in King Edward's Road, Summer Hill, and is built on land granted by the Governors of King Edward's Grammar School. It was consecrated in 1841, and in the same year constituted a district out of St. Martin's parish. There is a mission room in Steward Street.

St. Luke's, in the Bristol Road, almost on the border of the parish of Edgbaston. It was consecrated September 28th, 1842. In the year 1844 it was constituted a district parish out of St. Martin's.

St. Stephen's, Newtown Row, built on part of the estate of the Governors of King Edward's Grammar School, was consecrated July 23rd, 1844, and then constituted a district chapelry out of the parish of St. George. A portion of it has since been assigned to the district of St. Nicolas. There is a mission room in Theodore Street.

St. Jude's, in Tonk Street, in the midst of one of the poorest districts of the town, was consecrated 26th July, 1851, and enlarged in 1879. In the year 1845, before the building of the church, it was

constituted a district out of the parishes of St. Martin and St. Philip.

St. John's (Ladywood), Monument Road, built on land granted by the Governors of the Free Grammar School, was consecrated March 15th, 1854. By an order in Council, gazetted June 20th, 1854, it was constituted a district chapelry out of St. Martin's parish, and has since (1876) had the district chapelry of St. Margaret's carved out of it. The church was greatly enlarged in 1881.

St. Matthias', Wheeler Street, is the church of a new district chapelry formed in the year 1856 out of the parish of St. George, and part of that district has since been assigned to St. Saviour's. The church was consecrated June 4th, 1856, and enlarged in 1879.

St. Barnabas', Ryland Street North. The parish was formed out of St. Martin's in the year 1861, the church having been built and consecrated October 24th, 1860. At a very little distance is

Immanuel Church, in Broad Street, which occupies the site of what was once the chapel of the Magdalen Asylum. It was consecrated May 7th, 1865, and is the church of a parish formed in that year out of St. Thomas's parish.

St. David's, Bissell Street, is the church of a district chapelry formed in the year 1866 out of St. Luke's parish. The church was consecrated in July, 1865.

In January, 1865, The Birmingham Church Extension Society was formed. In 1867 Miss Ryland contributed a sum of £10,000 towards the same objects and subsequently a second donation of £10,000. Out of these donations the cost of the

churches of St. Gabriel, St. Lawrence (see Aston), and St. Nicolas was mainly defrayed.

St. Nicolas', in Lower Tower Street, consecrated July 12th, 1868, and, by order in Council, 18th June, 1869, constituted a district chapelry out of St. Stephen's parish.

St. Asaph's, Great Colmore Street, of which the site was presented by Mr. Cregoe Colmore, was consecrated December 8th, 1868. By order in Council, 18th June, 1869, it was constituted a district chapelry out of the parish of St. Thomas.

St. Gabriel's, in Pickford Street, Digbeth, was consecrated January 5th, 1869, and by order in Council 7th August, 1869, was formed as a consolidated chapelry out of the parishes of St. Martin and St. Bartholomew.

St. Cuthbert's, St. Cuthbert's Road, Birmingham Heath, was consecrated March 19th, 1872, and is a vicarage constituted by order in Council 15th October, 1872, out of the parish of All Saints.

St. Saviour's, Bridge Street, Hockley, was consecrated May 1st, 1874, and in the same year constituted a district chapelry out of the new parish of St. Matthias.

St. Margaret's, Ledsam Street, Ladywood, consecrated October 2nd, 1875, and by order in council 12th February, 1876, constituted a district chapelry out of the parish of St. John, Ladywood.

Christ Church, Gillott Road, Summerfield, built in memory of the forty-nine years' ministry of the late Rev. George Lea, M.A., at Christ Church, Birmingham, and St. George's, Edgbaston. It was consecrated April 30th, 1885; the same year it was

created a district chapelry out of St. John's, Ladywood.

Now passing into the

PARISH OF EDGBASTON.

St. Bartholomew.—The parish church, dedicated to St. Bartholomew, is at the junction of Church Road and Priory Road, and close to Edgbaston Park and Hall. There is said to have been a church on the site in 775. The present church now (1886) in course of enlargement was rebuilt in 1810. The vicars of Edgbaston have been remarkable for longevity. The Rev. John Pixell, who was inducted in 1760, was succeeded by his son the Rev. Charles Pixell in 1794, and he held the living for 54 years. On his death, in 1848, the late Rev. Isaac Spooner became vicar, and held it until his death in 1884.

St. George's.—The rapid increase of population in this parish, the West End of Birmingham, led to the building of St. George's Church, at the end of Calthorpe Road, about half a mile nearer the town than the old church, to which it was a chapel of ease. It was consecrated November 28th, 1838. It was greatly enlarged in 1885, and constituted a separate district in 1852, by the Church Building Commissioners.

St. James's in St. James's Road, was another chapel of ease, consecrated 1st June, 1852. In the same year it had a separate district assigned to it by the Church Building Commissioners.

St. Augustine's, near the top of the Hagley Road, was built in the year 1867, as another chapel of ease to Edgbaston Old Church, to serve the increasing

population of the northern portion of the parish. It was consecrated September 12th, 1868, and cost £9,000. A tower and spire, added in 1876, cost £4,000 more. It has not yet (1886) any district legally assigned to it.

St. Ambrose, a temporary church, in the Pershore Road, is another chapel of ease in the southern portion of the parish. It is the gift of Mrs. Spooner, as a memorial of her late husband, the Rev. Isaac Spooner, vicar of the parish 1848 to 1884.

PARISH OF ASTON.

We have to deal only with the portion of this parish which is included in the Borough, and commence with the chapel of

St. John's, Deritend, which is the second most ancient church in the town. It is situate just over the Aston side of the stream which divides that parish from Birmingham, and was founded in 1375 by some inhabitants of the hamlets of Deritend and Bordesley, because of the inconvenience of resorting to the parish church of Aston, three miles away. The then Lord of the Manor of Birmingham gave the land, and the inhabitants built the chapel, and by an agreement, still extant, dated 29th May, 1381, and made between the Prior and monks of Tykeford, patrons of the parish church of Aston, the vicar of Aston, the Lord of the Manor of Birmingham, and thirteen of the inhabitants of Deritend and Bordesley, with the consent of the Bishop of the diocese, then called Coventry and Lichfield, the inhabitants of Deritend and Bordesley were empowered to appoint, "at their own charges," a chaplain to celebrate divine service in a certain chapel in honor of St. John the

Baptist there lately built.[36] The chaplain is still elected by the vote of the inhabitants of Deritend and Bordesley, and down to the year 1842 the proceedings did not differ from those of a contested political election. The last election took place June 15th, 1870, when the present chaplain, the Rev. W. C. Badger, M.A., was elected by a majority of 1561 votes over his opponent. The present chapel dates from 1735. There is a mission room in Darwin Street. Part of the district conventionally assigned to it was, by order dated 29th December, 1885, legally created a "Peel district" without a church, by the name of **St. Basil's**.

This chapel of St. John remained from the fourteenth to the eighteenth century the only chapel of ease to the parish church of Aston for the increasing population of that part of the town which gradually extended itself into Aston parish. In the early part of this century a genteel suburb had formed itself at the east end of the town, on the Coleshill road, of which the eastern portions of Great Brook Street and Ashted Row are still evidences.

Dr. Ash, a celebrated physician of Birmingham, and founder of the General Hospital, built what Hutton calls a "sumptuous house" there. When he left it to live in London it was altered into a proprietary chapel by a Mr. Brooke, an attorney, who gave his name to the street. The chapel was opened on the 9th of October, 1791, but was sold in 1798 and afterwards became—

St. James's Chapel, Ashted, consecrated August 7th, 1807. From its close proximity to the cavalry barracks, it was called "The Barrack's Chapel." A separate parish was allotted to it out of the Aston parish, in the year 1853. There is a mission room in

Vauxhall Road.

Holy Trinity Chapel, at the top of Bradford Street, was the result of a meeting for church extension, held in October, 1818. It was consecrated 23rd January, 1823, and a district carved out of Aston parish was allotted to it in the year 1864. Parts of that district have since been assigned to St. Alban and All Saints', Smallheath. There is a mission hall in Sandy Lane.

St. Matthew's, Great Lister Street, was consecrated 20th October, 1840, and made the church of a district, 1842. The town has since extended for a mile eastward, and districts out of St. Matthew's district have been carved out and assigned to the district chapelries of St. Clement, St. Lawrence, and St. Anne, Duddeston, (*q.v.*) There is a mission room in Lupin Street.

St. Andrew's, in St. Andrew's Road, near the Coventry Road, was consecrated September 30th, 1846, having been constituted a district chapelry out of the parish of Aston. Attached is an iron church, dedicated to **St. Oswald**, opposite Smallheath Park.

St. Clement's, in Nechells Park Road, was consecrated August 30th, 1859, and a district out of St. Matthew's, Duddeston, assigned to it in 1860. It has a mission room in High Park Street, and a mission hall in Cuckoo Road.

Christ Church, near the Stratford Road, Sparkbrook, built on land given by Mr. S. S. Lloyd, was consecrated October 1, 1867, and a particular district assigned to it 21st November, 1867. There is a mission hall in Dolobran Road.

St. Lawrence's, in Dartmouth Street, was

consecrated June 25th, 1868, and by order in Council, 14th September, in the same year, constituted a district chapelry out of the parish of St. Matthew.

St. Anne's, in Cato Street, Nechells, built partly out of funds provided by the Church Extension Society, was consecrated 22nd October, 1869, and by order in Council of December 7th, was constituted a district chapelry out of the district of St. Matthew. Attached is a mission room in Great Francis Street.

All Saints', Cooksey Road, Smallheath, was built by the friends of the late Rev. Joseph Oldknow, D.D., who was for many years vicar of Holy Trinity, Bordesley (*q.v.*) in memory of him. It was consecrated July 28th, 1883. It had been previously made a district by order in Council, 5th August, 1875.

St. Catherine's in Scholefield Street, Nechells, consecrated November 8th, 1878, and constituted a district chapelry out of St. Clement's, Nechells, by order in Council, dated 20th March, 1879. There is a mission room in Smith Street.

St. Alban the Martyr, at the corner of Conybere Street and Ryland Street, consecrated May 3rd, 1881. This is one of the finest churches in the Borough, and the services are ritualistic. A mission chapel dedicated to St. Alban was first opened in September, 1865, and, in 1873, a school chapel dedicated to St. Patrick, and situated in Highgate Street. These are now both attached to the larger church. By order in Council dated 19th August, 1871, a district had been previously assigned to it out of Holy Trinity parish.

The other particulars relating to the Churches in the Borough will be found in the following

alphabetical list.

ALPHABETICAL LIST OF THE CHURCHES IN THE BOROUGH OF BIRMINGHAM.

A means Aston Parish, B Birmingham Parish, E Edgbaston Parish, R Rectory, and V Vicarage.

Parish of	Benefice		Incumbent and Degree, and Year of admission.		Patron.
B	All Saints	R	P. E. Wilson, M.A.	1882	Trustees
A	All Saints, Small Heath	V	G. F. B. Cross, M.A.	1875	Trustees
B	Bishop Ryder	V	J. Phelps Gardiner, D.D.	1875	Trustees
B	Christ Church	V	E. R. Mason, M.A.	1881	The Bishop
A	Christ Church, Sparkbrook	V	G. Tonge, M.A.	1867	Trustees
B	Christ Church, Summerfield	V	G. S. Walker, M.A.	1885	The Bishop
E	Edgbaston Old Church	V	Cresswell Strange, M.A.	1885	Lord Calthorpe
A	Holy Trinity, Bordesley	V	A. H. Watts	1883	Trustees

B	Immanuel	V	R. Bren, M.A.	1885	Trustees
A	St. Alban the Martyr, Dist.		J. S. Pollock, M.A.	1871	Trustees
E	St. Ambrose				
A	St. Andrew, Bordesley	V	J. Williamson, M.A.	1876	Bishop and Trustees al
A	St. Anne	V	T. J. Haworth, M.A.	1873	The Bishop
B	St. Asaph	V	R. Fletcher, M.A.	1879	Trustees
E	St. Augustine	Ch.	J. C. Blissard, M.A.	1868	The Bishop
B	St. Barnabas	V	Percy Waller	1881	Trustees
B	St. Bartholomew	V	James Eagles, M.A.	1851	Rector of St. Martin
A	St. Catherine	V	T. H. Nock, M.A.	1879	Trustees
A	St. Clement	V	J. T. Butlin, B.A.	1879	Vicar of St. Matthew
B	St. Cuthbert	V	W. H. Tarleton, M.A.	1872	Trustees
B	St. David	V	H. Boyden, B.A.	1866	Trustees
B	St. Gabriel	V	W. H. Cariss, M.A.	1884	The Bishop

B	St. George	R	J. G. Dixon, M.A.	1875	Trustees
E	St. George	V	C. M. Owen, M.A.	1883	Lord Calthorpe
A	St. James, Ashted	V	J. Orr, M.A.	1885	Trustees
E	St. James	V	W. E. Ivens, M.A.	1885	Lord Calthorpe
A	St. John, Deritend	Ch.	W. C. Badger, M.A.	1870	Parishioner of Deritend and Bordesley
B	St. John, Ladywood	V	J. L. Porter, M.A.	1869	Rector of St. Martin
B	St. Jude	V	T. G. Watton, M.A.	1873	The Bishop
A	St. Lawrence	V	J. F. M. Whish, B.A.	1879	The Bishop
B	St. Luke	V	W. B. Wilkinson, M.A.	1875	Trustees
B	ST. MARTIN	R	W. Wilkinson, D.D.	1866	Trustees
B	St. Margaret P. C.		H. A. Nash	1875	The Bishop
B	St. Mark	V	R. L. G. Pidcock, M.A.	1877	The Bishop and Trustees
B	St. Mary	V	H. Foster Pegg, M.A.	1866	Trustees
A	St. Matthew, Duddeston	V	J. Byrchmore	1879	Trustees

B	St. Matthias	V	J. S. Davies, M.A.	1886	Trustees
B	St. Nicolas	V	W. H. Connor, M.A.	1876	The Bishop
B	St. Paul	V	R. B. Burges, M.A.	1867	Trustees
B	St. Peter	V	R. Dell, M.A.	1870	The Bishop
B	St. Philip	R	H. B. Bowlby, M.A.	1875	The Bishop
B	St. Saviour	V	M. Parker	1874	Trustees
B	St. Stephen	V	P. Reynolds, LL.B.	1854	The Bishop
B	St. Thomas	R	T. D. Halsted, M.A.	1870	Trustees

NON-CONFORMISTS.[37]

The earliest Nonconformist place of worship, of which any record remains, was “The Old Meeting,” which, with its graveyard, has so recently as the year 1882 been removed for the enlargement of the railway station in New Street.

As old Birmingham was not a corporate town it did not come within the provisions of The Five-Mile Act (A.D. 1665), and was naturally the resort of persecuted Nonconformists from the neighbouring boroughs. On the first Declaration of Indulgence put

forth by Charles the Second in 1672, rooms were licensed for public worship, and in 1687 eleven dissenters bought a plot of land in what was then called Philip Street, and built a meeting house, finished in 1689, the year of the passing of The Toleration Act. As the total cost of land and building was only £220, it could not have accommodated many hearers, and we find that another meeting house, called the "Lower Meeting House," was built in Deritend in a yard which was until lately called "Meeting House Yard," now taken into the continuation of Milk Street into Deritend. This second chapel was injured in the Sacheverell Riots in 1715, and afterwards the congregation removed, in 1732, to what was formerly the "New Meeting," in Moor Street, where they remained until the last day of the year 1861.

The worshippers at both these two original meeting houses called themselves, and were called "Presbyterians," used as the antithesis to "Episcopalian," although they were really "Independent" in their form of church government. In theology both congregations were at first Calvinistic, but Mr. Howell, the sixth in succession of the ministers of the Old Meeting, having become an avowed Arian, the more orthodox minority withdrew in the year 1747, and founded the church in Carr's Lane—(see "Congregationalists.") It is creditable to the good feeling of the separatists that none of them sold their shares in the "Old Meeting" and one of them was re-appointed a trustee thirty years afterwards. From Arianism the congregations of both the Old and New Meetings gradually became Unitarian and are henceforth treated under that title.

Unitarians.—The Old Meeting House, built in

1689, was burned in the riots of 1791, and afterwards rebuilt. It had attached a burial ground which was used by both the congregations of the Old and New Meetings, and in which were interred the remains of many of the foremost men in the public life of Birmingham for two centuries.[38] As before stated the meeting house and ground were sold to the London and North Western Railway Company in 1882, and the remains of the dead were transferred to a separate piece of ground in the Borough Cemetery at Witton, and the Congregation have built a new

OLD MEETING CHURCH, in the Bristol Road, which was opened in 1885.

THE NEW MEETING HOUSE, of which Dr. Priestley was the minister from 1780 to 1791, was destroyed in the riots of 1791 and rebuilt on its original site in Moor Street. The situation having become inconvenient it was (1861) sold to the Roman Catholics and became St. Michael's, Moor Street (*q.v.*), and the New Meeting congregation removed to

THE CHURCH OF THE MESSIAH, Broad Street, opened 1st January, 1862. The Rev. H. W. Crosskey, LL.D., is the minister.

NEWHALL HILL CHAPEL was next in order of time to the Old and New Meetings, and was built in 1840 by members of both congregations, who had previously a house for worship and Sunday schools in Cambridge Street.

HURST STREET CHAPEL was built in the year 1844 as a mission chapel and has been since enlarged. Another mission more immediately connected with the New Meeting is

LAWRENCE STREET CHAPEL, which was originally

built as a place of worship for the Baptists then occupied by the disciples of Zion Ward, and afterwards used by the followers of Robert Owen, who were at one time numerous in Birmingham.

THE BIRMINGHAM FREE CHRISTIAN SOCIETY have a chapel in Fazeley Street, served by Lay preachers.

Baptists.—It is somewhat singular that two of the oldest chapels belonging to this body, namely, Cannon Street and Freeman Street, have now ceased to exist. Cannon Street Chapel was built in 1737 on a part of what was then a cherry orchard (which gave its name to Cherry Street). The original building was greatly enlarged in 1806. In those days the well-to-do tradesmen of Birmingham lived in the town, and the town chapels consequently drew their occupants from the immediate neighbourhood. Gradually, however, the old members died, and their sons and daughters went to live in the suburbs, and so Cannon Street, which was the flourishing mother church of the Particular Baptists, dwindled in numbers. Fortunately the site of it was required by the Corporation of Birmingham, and it was sold for £26,500, and is now occupied by the Central Arcade in Corporation Street. The purchase money was, under a scheme sanctioned by the Court of Chancery, expended in aid of several Baptist chapels in the town and suburbs.

The Chapel in Freeman Street is said to have been older than Cannon Street to which place the worshippers at Freeman Street joined themselves in 1752, and the edifice itself was taken down in 1856. The next Chapel in order of date was built in Bond Street (near Constitution Hill) was opened in the year 1786, and was for many years a flourishing church, but gradually decayed in numbers and

influence, and is now occupied by the United Methodists (*q.v.*).

The chief existing places of worship now belonging to the Baptists are

NEWHALL STREET CHAPEL, originally built in 1791 by the followers of Emanuel Swedenborg.

GRAHAM STREET or MOUNT ZION CHAPEL, opened in 1824 by the celebrated Edward Irving. Twenty years afterwards the pulpit was occupied for some time by the late George Dawson, and subsequently, from 1851 to 1874, by the Rev. Charles Vince, whose death was felt as a public calamity.

HENEAGE STREET CHAPEL, of which the foundation stone was laid 1st of August, 1838, to commemorate the emancipation of the West Indian negroes.

CIRCUS CHAPEL, Bradford Street, opened 1848, so called because it was formerly a circus.

WYCLIFFE CHURCH, in the Bristol Road, opened in 1861.

CHURCH OF THE REDEEMER, Hagley Road, built by a portion of the congregation of Graham Street, aided by a contribution of the Cannon Street trustees, and opened in 1882.

There are also chapels in Guildford Street, Hope Street, Lodge Road (Hockley), Great King Street, Stratford Road, Spring Hill, Victoria Street (Small Heath), Warwick Street (Deritend), and Wynn Street (Great Colmore Street).

There is also a chapel belonging to the Particular Baptists of Calvinistic views in Frederick Street (Newhall Hill), built in 1850 with the proceeds of an

old chapel in Bartholomew Street, which was called the "Cave of Adullam," and removed by the extension of the railway into New Street.

The General or Arminian Baptists had the chapel in Freeman Street (now removed), and in September, 1786, opened the existing chapel in LOMBARD STREET.

Congregationalists.—CARR'S LANE.—This Church was formed, as before stated, in 1747, by members of the first Nonconformist Meeting house, the "Old Meeting," who did not agree with the Arianism of the then minister, Mr. Howell. The first building was opened in 1748, and was then, as was the custom with meeting houses, built in a yard to screen it from observation. It has been several times enlarged and rebuilt. The names of the Rev. John Angell James, who was minister here from 1806 to his death, 1st October, 1859, and of his successor R. W. Dale, LL.D., the present minister, are known throughout the christian world.

EBENEZER CHAPEL, in Steelhouse Lane, was built in 1818 by the admirers of a minister celebrated in his day, the Rev. Jehoiada Brewer, who laid the foundation stone in 1816, but died before the building was finished.[39] From endowments furnished by three members of this congregation, Mr. Mansfield and his two sisters, Miss Mansfield and Mrs. Glover, a college for the education of ministers was established at Spring Hill, Dudley Road, then removed to Moseley, and is now intended to be reconstituted at Oxford as "Mansfield College."

HIGHBURY CHAPEL, Graham Street, originally formed by the remnant of the Livery Street congregation, was opened in 1845.

FRANCIS ROAD (Edgbaston) CHAPEL was built to commemorate the fiftieth year of the pastorate of Carr's Lane Chapel, by the late Rev. J. A. James. He laid the foundation stone 11th September, 1855.

The Congregationalists have also chapels in Gooch Street, Moseley Road, St. Andrew's Road, Saltley, Small Heath, Parade (Tabernacle), and Winson Green Road, and several others outside the Borough, but in immediate proximity to it..

Society of Friends.—George Fox records in his journal that he held a meeting in Birmingham in the year 1655, and there is good reason to believe in the existence of a small society from that date, meeting in private houses until 1703, when a plain brick meeting house fronting Bull Street was built. There may have been an earlier meeting house in Monmouth Street, where there was a burial ground, acquired in 1851 by the Great Western Railway, and now the site of the Arcade. The meeting house in Bull Street was several times enlarged, and in 1856 it was pulled down, shops built fronting the street, and a more commodious meeting house built in the rear. There is also another meeting place in Bath Row. Meetings for religious worship and instruction, conducted by members of the Society, are held on Sundays at Severn Street Schools, and the Board Schools in Moseley Street and Bristol Street. The Early First-Day Morning School, and the other schools and classes at Severn Street, established by the Friends, have done, and are doing an incalculable amount of good.

Wesleyan Methodists.—John Wesley preached his first sermon in Birmingham in 1743, but it was not until 1764 that his followers acquired an old play house in Moor Street as their first chapel which he

opened. In 1782 they had so prospered as to build a chapel in Cherry Street, which was opened by John Wesley himself, then in his eightieth year. This chapel, enlarged in the year 1823, is now (July, 1886) to be pulled down, and a new chapel built in Corporation Street.

The rapid increase of numbers necessitated additional chapels in Bradford Street (1786), BELMONT ROW (1789), MARTIN STREET, (Broad Street) (1834), NEWTOWN ROW CHAPEL (1837), WESLEY CHAPEL, Constitution Hill (1838), besides a chapel in Bell Barn Road for which the present BRISTOL ROAD CHAPEL (1854) was substituted.

For the purposes of connexional organization the Birmingham district is divided into seven circuits, which include not only the chapels already mentioned but also thirty-three others within the Borough and its suburbs, including Smethwick.

METHODIST NEW CONNEXION.—This section of the Methodist Community, which separated from the Wesleyans in 1797, only on questions of the share of the laity in church government, first built a chapel in Oxford Street (1811) now disused, then another in the northern part of the town, Unett Street (1838), and have since built smaller ones in Moseley Street, Priestley Road (Stratford Road) Ladywood, Heath Street and Crabtree Road (Brookfields) in the Borough. These and a chapel at Smethwick are divided into two circuits supplied by three circuit ministers.

THE PRIMITIVE METHODISTS.—This body has thirteen chapels in and near to the Borough, divided into three circuits, and served by four regular ministers. The largest of these is in Gooch Street, and the others in the Borough are in Sparkbrook, King

Street, Lord Street, Nechells, Garrison Lane, Whitmore Street (Hockley) and Ladywood.

THE UNITED METHODIST FREE CHURCHES have two circuits and two circuit ministers and chapels in Rocky Lane (Nechells) Bond Street, (recently acquired from the Baptists, *q.v.*) and Muntz Street (Birmingham Heath) besides one at Washwood Heath.

THE WESLEYAN REFORMERS.—Have one regular minister and two chapels in Upper Trinity Street and Floodgate Street.

The English Presbyterian Church.—These are the orthodox Presbyterians, as distinguished from the churches which, like the Old Meeting congregation, became Arian or Unitarian. They first occupied what is now the Baptist Chapel at Mount Zion, which was opened by the celebrated Edward Irving (see Baptists), and then a chapel in Newhall Street, afterwards the church in BROAD STREET, which is their principal edifice. They have also churches at Camp Hill and New John Street West.

The Christian Brethren have a head place of worship at the Central Hall, Great Charles Street, and other meeting places in Green Lane (Small Heath), New John Street West, Camp Hill, and Icknield Port Road in the Borough, and four others in the outskirts.

Several other religious bodies have only one or two places of worship, and among these may be named—

The Bloomsbury Institution Mission Hall, in Bloomsbury Street.

The Boatmen's Hall in Bridge Street (Broad

Street).

The Catholic Apostolic Church, in Summer Hill Terrace, a new church built by the congregation formerly assembling at what was called the Irvingite Church, in Newhall Street.

The Christadelphians, who meet in the Temperance Hall, in Temple Street.

The Church of the Saviour, in Edward Street (Parade), built in 1847 for Mr. George Dawson, M.A., on his leaving the Mount Zion (Baptists) Chapel (*q.v.*). A free church, founded on the principle that common Christian worship and pursuit of religious truth, and not doctrinal agreement, are the true bases of Christian union.

The Jewish Synagogue, in Blucher Street, top of Severn Street, was built in 1856, to supply the place of a smaller synagogue in Severn Street. It cost upwards of £8,000.

The New Church, or Swedenborgians, had for their first chapel the one in Newhall Street (now occupied by the Baptists, *q.v.*) then, in 1830, removed to a new chapel in Summer Lane, and subsequently, in 1875, to an elegant church, a little way over the Borough boundary, in Wretham Road (Soho Hill).

The Welsh Calvinistic Methodists, who have a chapel in Granville Street (Bath Row), and another in Hockley Hill, just over the Borough boundary.

The Welsh Congregationalists have a chapel in Wheeler Street.

Roman Catholics.—There is no record of any Roman Catholic place of worship in Birmingham

from the Reformation until the publication, by James the Second, of the illegal Declaration of Indulgence in 1687. In that year the foundation of a church and convent, dedicated to St. Mary Magdalene, was laid near the street still called Masshouse Lane, and probably on the site of the present Church of St. Bartholomew (*q.v.*). It was scarcely built when it was pulled down at the Revolution of 1688. The priests (who were of the order of St. Francis) removed to a farm house in a lane near Harborne, the approach to which, at the top of Richmond Hill Road, Edgbaston, was known as Masshouse Lane.

The first chapel in the town was the one dedicated to ST. PETER, in St. Peter's Place, a little way out of Broad Street, built in 1786, and a burial ground and schools added and subsequently enlarged.

The next was a chapel in Shadwell Street, built in 1809, and dedicated to St. Chad, which afterwards gave place to ST. CHAD'S CATHEDRAL, Bath Street, built after the designs of A. Welby Pugin at a cost of £60,000, and consecrated June 22, 1841.

ST. ANNE'S, Alcester Street, was originally a distillery, and was acquired by the Fathers of the Oratory of St. Philip Neri, of whom John Henry (now Cardinal) Newman was one. In 1852, the Fathers removed to the Hagley Road (*q.v.*), and St. Anne's became a secular mission.

CHURCH OF THE IMMACULATE CONCEPTION, Hagley Road, Edgbaston. Here, in addition to the Church, is a residence for the Fathers of the Order of St. Philip Neri, and a school for the education of the sons of the Catholic gentry. It is interesting to every educated man as having been for more than a quarter of a century the abode of John Henry (Cardinal) Newman.

ST. MICHAEL'S, Moor Street, formerly the New Meeting House of the Unitarians (*q.v.*), and purchased from that body in 1861, and opened in 1862.

ST. JOSEPH'S, Nechells, formerly only a chapel of the cemetery there served from St. Chad's, became a church with two priests in the year 1872.

ST. CATHERINE OF SIENNA in the Horse Fair was consecrated September 28, 1875, and

ST. PATRICK'S in the Dudley Road was opened in 1876.

Birmingham is one of the Roman Catholic Sees created by the celebrated Papal-Decree of 29th September, 1850. To that date from 1584, when the last of the old Roman Catholic Prelates died, the English Romanists had been governed in matters ecclesiastical by Vicars-Apostolic, of whom the last and best known was Bishop (*in partibus*) afterwards Cardinal Wiseman.

After this enumeration of the numerous churches and chapels, which the limited number of pages at the writer's disposal necessarily reduces to almost a catalogue, it may be useful to summarise the general results of the religious life of the town.

It must never be forgotten that every church and chapel is a centre of educational and philanthropic work of many kinds. The clergy of the established church have almost a monopoly of day schools, whilst the various denominations of dissenters for the most part leave the education of the poor to the Board schools. Night schools are common to both

churches and chapels—Sunday schools are universally attached to both. Then there are the auxiliary organisations of Bible Classes, Lending Libraries, Provident Societies, Sick Clubs, Saving Clubs, Clothing Clubs, Improvement Societies, Mothers' Meetings, Dorcas Societies, Lectures on Health and Domestic Economy by ladies, and, attached to some churches and chapels, classes for instruction in elementary Science and Literature.

Of the three parties into which the established church is commonly divided, viz., Low, High, and Broad, the general tone of the Birmingham clergy for the last fifty years has been decidedly low. A glance at the table will shew that the rights of presentation to the mother church of St. Martin and the other three rectories of All Saints, St. George, and St. Thomas, and also to many of the newly-created vicarages, are vested in trustees. With the exception of two or three of the new churches, such as those of St. Alban the Martyr, and the Oldknow Memorial Church, these trustees have been of the type of the Simeon Trustees.

For many years Holy Trinity, Bordesley, was the sole representative of High Church ritual and doctrine, both of which have made great progress the last quarter of a century, and at many of the churches the services are distinctly "higher" than formerly. The same influences have been at work among Nonconformists. The old pattern of meetinghouse has given place everywhere to a more ecclesiastical style, and even where the structure cannot be altered, the walls are coloured and decorated. The congregational plain song of half a century ago is varied and improved by chanting and anthems, and in one Nonconformist Church may be

seen a surpliced choir.

The “Broad” Church party is scarcely represented in Birmingham, and with the exceptions of the Head Master and some of the other Masters of the Free Grammar School, and the Rector of St. Martin’s, who, from his position, is naturally a representative man, the Birmingham clergy do not concern themselves much with either the political, municipal, scientific, or literary pursuits of their fellow townsmen. They have the good reason that the work of their parishes makes such demands upon them that they have neither time nor strength for any other labours. Hence the public work of the town (with the exception of the School Board, on which the clergy have been always strongly represented) has for the last forty years been more influenced by the leading Nonconformist ministers than by the clergy.

Whilst the religious activity of the Nonconformists has not abated, they have gained immensely in influence in all the governing bodies and public institutions. For example, for a century previous to the year 1873, no dissenter had been elected a Governor of the Free Grammar School; now there are nine Nonconformists out of the twenty-one Governors. The religious activity of the Church has been widened and deepened by the development of the parochial system, whilst the natural “set” of nonconformist activity towards political and social reforms has won for them the control of political and municipal affairs. This cannot be better illustrated than by a few particulars of the composition of the Birmingham Town Council, which has acquired the reputation of being above the average of Town Councils in the social standing and ability of its

members. Of the sixty-four members of which the Town Council is composed, seventeen only are churchmen. Of the sixteen Aldermen (assumed to be elected by the Council on account of services either exceptional in kind or duration) only one is a churchman. The forty-seven members of the Council not belonging to the Established Church, are composed of six Baptists, nine Congregationalists, six members of the Society of Friends, one Jew, one Presbyterian, two Roman Catholics, nine Unitarians, six Undenominational, and seven members of the Wesleyan and other Methodist bodies. The preponderance of Quakers and Unitarians in the Council, in proportion to their numerical strength in the country, is very remarkable. The number of members of the Society of Friends in England and Wales, is about one to every 1,725 of the population, according to the census of 1881. The number of their members and attendants on their services in Birmingham, is about one to every 527 of the population of the Borough; whilst in the Council their numbers are nearly one in ten (accurately 9.375 per cent.) or more than fifty times their numerical proportion. It is not possible to determine so accurately the number of Unitarians, but it may be safely asserted that their representation in the Council is many times in excess of *their* numerical proportion.

BURIAL GROUNDS AND CEMETERIES.

Most of the Churches built in Birmingham up to the year 1834 had churchyards added to them. The Churchyard of St. Martin being found inadequate, nearly three acres of land in Park Street was consecrated in the year 1813 as a burial ground, and

have been since laid out as a public garden (see St. Bartholomew). There were burial grounds attached to the Old Meeting, to the Baptist Chapel, Cannon Street, and to the Friends Meeting House; there was also a piece of ground in Walmer Lane, appropriated by a Congregationalist, Joseph Scott, for the burial of Protestant Dissenters (A.D. 1779). There were also burial grounds for the Jewish Community in a spot called the Froggery, now part of New Street Station, in Granville Street and Betholom Row.

In 1832, a joint stock company was formed for constructing the General Cemetery at Key Hill—the area of which is about twelve acres. Divided from it by Pitsford Street is the Church of England Cemetery, consecrated in 1848. In 1850 the Catholic Cemetery of St. Joseph was established.

By successive orders in Council most of the intra-mural burial grounds were closed, and in the year 1860 the Corporation purchased 105 acres of land at Witton for a Borough Cemetery. Of this area, fifty-three acres are consecrated for use by members of the Established Church; thirty-five are set apart for Nonconformists, two acres and a half have been sold for the use of the Hebrew Community, and the residue is appropriated for the use of Roman Catholics. There are four distinct buildings for the use of the Church of England, Roman Catholics, Nonconformists, and Jews. To this Cemetery the coffins from Scott's burial ground (72), Cannon Street Chapel (142), and the Old Meeting House (1503), have been removed.

Chapter VII.
ART.

Architecture.—[By J. A. COSSINS.]—Although anciently possessing a Church, a Priory and a Castle, Birmingham now retains hardly a vestige of the work of the builders of the middle ages. When the old Parish Church of St. Martin was pulled down in 1872 to make way for its very fine successor, the indications of its history, hidden for nearly two centuries by a casing of brickwork, were revealed: traces were found of the work of the 12th and 13th centuries, and considerable remains of what must have been a fine building, mainly of the 14th century. The altar tombs, with effigies of the Lords de Birmingham, were carefully preserved and refixed in the new Church, and are well worthy of examination.[40]

A few houses of the framed timber and plaster construction common in the 17th century, remain in Digbeth, and one of a very interesting kind was this year removed from the corner of Bull Street. The earliest in date is the Old Crown House, which is probably of the first half of the 16th century. This was a very interesting specimen of the more massively constructed, but simpler kind, with gables at the extremities of the front, and a central porch of two stories; but the whole of the ground floor was reconstructed about twenty years ago, and it has recently been further disfigured by painting and graining. At Camp Hill there is a very fine half-timbered house in good preservation. This has the date 1601 cut on the porch. Most of the houses burnt by Prince Rupert, when he sacked the town in 1643, were probably of the half-timbered kind, since

several still remain.

ST. PHILIP'S CHURCH.—From this time there is nothing to mark the architectural progress of the town until the important event of the making by Act of Parliament, passed in 1711, of a new parish of St. Philip in Birmingham. This was immediately followed by the building of the Church of St. Philip, a remarkably good example of the School of English Renaissance founded by Wren and continued by his pupils, of whom the architect of this Church, Thomas Archer, was one of the most successful. The first stone of the Church was laid in 1711, and it was consecrated in 1715. It is a large building, the area divided into nave and aisles by square, fluted pillars, carrying semicircular arches, and supporting galleries which extend over the aisles. With the exception of the steeple, the whole has been restored, and within the last year the chancel, which was but a shallow recess, has been lengthened by one bay. The fine east window by Mr. Burne Jones, a native of Birmingham, is considered to be one of his most successful works.

The building of the Church was soon followed by the erection of rows of houses of an uniform character on the north and south sides of the churchyard. These have nearly all disappeared: they were built of brick in the good domestic style of the early part of the last century, with picturesque doorways, with curved and broken pediments, balustraded parapets, and heavy white sashes with broad moulded frames. The interiors had fine oak staircases with turned and twisted balusters, and were good examples of the cheery home-like dwellings of their time. Other buildings, forming "The Old Square," of a somewhat similar character,

have lately been pulled down to make way for a new street, and very little that is even as old as the "Georges" will be left us after a very short time.

THE TOWN HALL.—The building of the Town Hall, begun in 1832, was the first great local architectural event of the present century. It was designed by Messrs. Hansom & Welch, architects, of Liverpool, in professed imitation of the Corinthian Temple of Jupiter Stator at Rome, but it falls far below its prototype in the scale and richness of the "order." To properly adapt a temple of the Romans to the various wants and requirements of a Town Hall for the people of Birmingham required considerable inventive skill, and to obtain the required height the temple was mounted on a lofty rusticated basement. The grand flights of steps to the colonnades, which add so much dignity to the Greek and Roman temples, are here accessible only by means of a ladder. It is nevertheless a noble building, of Anglesey marble, though what we admire in the exterior is due to the ancient architect, and not to the adapters. The interior is well suited to its many and varied uses, but the entrances are narrow and undignified, and the lobbies insufficient.

THE FREE GRAMMAR SCHOOL, or King Edward's School, was founded on the property belonging to the Gild of the Holy Cross, taken possession of by Henry VIII., and restored to the town by Edward VI. in the shape of an educational endowment. The old hall used by the Gild stood on the site of the present school, and it is probable that it was used as a school until new buildings were erected in 1707. Of that edifice drawings are in existence, which show it to have been of two storeys, and forming three sides of a quadrangle, with a tower over the central and chief

entrance, terminated by a cupola. The buildings were of brick, with stone dressings; the windows square-headed, of the heavy-sashed description used in the domestic architecture of the time. A high balustraded parapet hid the roofs from sight.

The School was pulled down in 1832, and the present noble building erected on its site. The style is that of the latter half of the fifteenth century, commonly called Tudor, and although erected so soon after the revival of Gothic architecture, it has scarcely been excelled for boldness and propriety of design or for purity of detail. It forms on plan a nearly equal-sided square. The chief front, facing New Street, has slightly projecting wings, in which are fine Oriel windows, of two stories, the intermediate length being divided by boldly projecting buttresses, terminated by crocketed pinnacles, into nine bays of two stories in height. The entrance is in the middle bay, through a handsome moulded and carved doorway, to a vestibule finely groined in stone. The upper floor of the central part of the front is now occupied by the Girls' School, and is lighted by grand traceried and transomed windows of three lights. The south front, looking towards the railway station, contains the Boys' School, and is of a simpler, but quite as good a design as the main elevation. The two principal schoolrooms are very fine, with open timber roofs. The architect was Sir Charles Barry, and a striking similarity between the details of this building and of those of the Houses of Parliament of about this time may be observed.

CHRIST CHURCH.—Christ Church, consecrated in 1813, stands at the junction of New Street with Ann Street, and occupies the most prominent and the best position in the town, but is quite unworthy of its site.

It is in the quasi-Classic style prevailing in the time of George III., with a lofty but ill-proportioned tower and spire, and a western portico of the Roman Doric order.

ST. PETER'S.—Several of the churches succeeding the last were built by the well known Thomas Rickman; among these were St. Peter's in Dale End, a heavy, uninteresting building, with a Grecian Doric portico, surmounted by a "Temple-of-the-Winds"-like structure as a steeple.

ST. THOMAS'S.—St. Thomas's, at Holloway Head, another of Rickman's, is designed in the same spirit, but with details of the Ionic order. Some of the earliest efforts of the revival of Gothic architecture were made here by Rickman, the most important of which,

ST. GEORGE'S, a large perpendicular structure, is for its time fairly good, but the details are thin and wiry.

A number of cheap churches followed in the first half of the present century, none of them deserving of notice; but some better things were being done.

ST. CHAD'S.—The Roman Catholic Cathedral Church of St. Chad, in Bath Street, by the elder Pugin, though in some parts bare and mean from want of funds, shews the genius of the architect in its plan, its imposing interior, and its fine western front.

Of the churches of quite modern date, we have first the rebuilt Mother Church of St. Martin before referred to. The tower was re-cased and the spire rebuilt in 1854-5, and in 1873-5 the present building was erected by Mr. J. A. Chatwin, architect, of Birmingham, and completed in 1875, at a cost of

£28,256. The style is Gothic, as it had become perfected in the middle of the 14th century, and it has been used by the architect with great skill and judgment. The interior is exceedingly fine, and the exterior not unworthy of it. Preserved in the north and south chapels at the east end, are the fine sepulchral monuments of the Lords de Birmingham. It has excellent stained glass windows by Wm. Morris, Hardman, and others.

ST. AUGUSTINE'S and the LEA MEMORIAL CHURCH, both at Edgbaston, are also fine churches by the same architect. The noble spire of the former is a conspicuous and beautiful object from a large extent of country.

ASTON CHURCH has lately been rebuilt by Mr. Chatwin, with the exception of the tower and spire, at a cost of £15,000. The church contains many monuments of the Erdingtons, Ardens, Holts, Devereux, and other Warwickshire families. The very beautiful tower and spire are of the 15th century.

HANDSWORTH PARISH CHURCH has also been rebuilt by the same architect, with the exception of the tower and the "Watt Chapel." Besides the monument by Chantry to James Watt, there are interesting monuments to Boulton, Murdock, and other local celebrities.

THE CHURCH OF ST. ALBAN, in Conybere Street, lately erected by Mr. Hansom, of London, in the style of the 13th century, has an extremely fine interior, groined throughout with stone. The tower and spire are unfinished.

Another good church by the same architect, is that of ST. CATHERINE (R. C.) in the Horse Fair, also with unfinished tower and spire.

THE DISSENTING CONGREGATIONS have some noteworthy buildings. Amongst those of the Unitarians, the Church of the Messiah, in Broad Street, by Mr. Bateman, and the "Old Meeting Trust" Church, in the Bristol Road, lately erected by Mr. J. A. Cossins, are the most important. The Baptists have two handsome churches, the Church of the Redeemer, in Hagley Road, by Cubitt, of London, and Wycliffe Church, by the late Mr. Cranston, in Bristol Street. The Catholic Apostolic Church of the Irvingites, in the "Sand Pits," is a bold building of brick and terra cotta, with a noble nave, by Mr. Chatwin.

THE MUNICIPAL BUILDINGS of the town, with the exception of the Town Hall, are nearly all of quite recent construction. First among these is the Council House in Colmore Row, near the top of New Street. This noble and commodious building was opened in 1878, and comprises a grand suite of reception rooms, a fine Council Chamber, semicircular on plan, offices for the Mayor, Town Clerk, Surveyor, Treasurer, Chief of Police and other officers, and a large number of committee rooms. The approaches, staircases and corridors are all handsome and spacious. The fronts are constructed of Derbyshire stone in the Italian style, the principal elevation towards Colmore Row consisting of an imposing centre, with *porte-cocher*, and wings. The tympanums of the pediments are filled with groups of sculpture, and the large arch over the portico contains some fine work in Mosaic by Salviati. The architect was Mr. Yeoville Thomason.

ART GALLERY.—Adjoining the Council House, is the Art Gallery, by the same architect, which forms with it one block of buildings surrounding a

quadrangle. This was opened last year, and is a series of galleries probably not excelled by any in England. The principal feature of the interior is a vast domed circular room, from which the other rooms are entered.

THE PAROCHIAL OFFICES, in Edmund and Newhall Streets, by Mr. Ward, form a large and handsome block, containing the offices of the Poor Law Guardians, the Superintendent Registrar of Births, Deaths and Marriages, &c.

THE GALLERIES OF THE SOCIETY OF ARTISTS, New Street.—The principal room is circular, 52 feet in diameter, and there are several other rooms, which, with the fine Corinthian Portico, were completed in 1829. They have since been much improved and enlarged, and now form a very excellent set of galleries.

To describe properly the Educational Buildings of the town would require a volume; a few only of the principal ones can be noticed. The Grammar School, the oldest of them, has already been referred to. The Mason College, founded by the late Sir Josiah Mason, is a fine building of brick and stone in Edmund street, the first stone of which was laid in 1875, and the building opened in October, 1880. This institution comprises large and complete Laboratories for Chemistry, Physics, Physiology, Botany, and Engineering; four Lecture Theatres, and a very great number of class and other rooms of all sizes, suited to their varied requirements, the whole covering an area of about 2,500 square yards. The style of Architecture is that of the 13th century. The principal front in Edmund Street, of about 150 feet in length, is symmetrically arranged with a lofty centre and gabled side wings. The principal entrance in the

middle of the front is a very large and deeply recessed moulded and shafted archway opening to a fine groined vestibule, the cross passages leading from which are also groined in stone. Over the entrance is a lofty double oriel beneath a gable, the terminal of which is a mermaid (the crest of Sir Josiah Mason), 122 feet from the pavement. The cost was about £60,000, including the elaborate and costly fittings of the laboratories. The whole of the buildings and fittings were designed by Mr. Jethro A. Cossins, Architect, of Birmingham.

THE BIRMINGHAM AND MIDLAND INSTITUTE and the FREE LIBRARIES form one united group. The Institute buildings, by Mr. Edward Barry, were opened in 1856 by the Prince Consort. The completion of the design to receive the Reference and Lending Libraries was carried out by Messrs. Martin and Chamberlain; the whole has since been largely added to, the Lending and Reference Libraries have been rebuilt, and a new wing erected in Paradise Street, by the same architects.

THE SCHOOL OF ART, also by Martin & Chamberlain, in Edmund Street, is in the very original modern Gothic style, almost created by the late J. H. Chamberlain, and practised with such great success by the firm to which he belonged. The School is perhaps the finest of their works, and possesses a rare grace and refinement in every detail. The arrangements for the convenience of masters and students are also excellent.

BOARD SCHOOLS.—Since the passing of the Elementary Education Act, in 1870, about thirty large Board Schools have been erected in the town, most of them by Messrs. Martin and Chamberlain, they are nearly all of great excellence and are

ornaments to the town.

THE EXCHANGE, in Stephenson Place, was built in 1865, by Mr. Edward Holmes, architect, of Birmingham, and has since been considerably enlarged. It has a large exchange room on the ground floor, over a part of which is a room for assemblies. The building also contains a Restaurant, shops on the ground floor, and a large number of offices. The fronts, towards Stephenson Place and New Street, in a Gothic style, are lofty and imposing.

THE "ARCADES" are a feature of modern Birmingham. The Great Western Arcade was built in 1876, at a cost of £70,000. Mr. W. H. Ward, of Birmingham, was the architect. The avenue, four hundred feet long, has eighty-four shops on two stories, the upper tier opening to a balcony. The length is divided equally by a circular space covered by a lofty dome. The glazed roof is carried by a series of semicircular arches, the perspective effect of which is very striking.

In an almost straight line with the last, and only divided from it by the width of a street, is the North Western Arcade, by Mr. W. Jenkins. In its general features it is much like the first, but of greater width, and the shops are larger.

It may be added that these arcades have been financially a great success, and are much used as a convenient and pleasant thoroughfare from the Great Western Station to Corporation Street.

There are several other arcades in the town, some of which are worthy of a visit.

Until the passing of the Street Improvement Act of 1876, Birmingham had but very few streets that were worthy of the size and importance of the town. New

Street is, however, a fine and picturesque thoroughfare, the slight rise and easy curve contributing very much to the general effect.

CORPORATION STREET, leading from New Street, opposite the entrance to the Railway Station, to the Aston Road, has been but lately formed; it is not yet entirely finished, but is already an unusually fine street. Many of the buildings are of great height and costliness. It promises to be one of the noblest thoroughfares to be found in any of our great towns.

ASTON HALL.—Sir Thomas Holte, whose family had long been resident at Duddeston, in the parish of Aston, began to build this magnificent house in 1618, and in 1631 he came to reside in it. In 1864 it was purchased by the Corporation of Birmingham, together with forty-three acres of the once extensive park, immediately surrounding it, and in the same year it was thrown open to the public. Dugdale, who wrote whilst the Hall was fresh from the hands of the builders, calls it "a noble fabric, which for beauty and state much exceedeth any in these parts," and the same may yet be said of it. It is well situated on high ground at a distance of about two miles from Stephenson Place, and retains about it some of the grand old chestnut and other trees for which the park was famous. Most of the outbuildings, including the stables, houses of the Chief Falconer and other officers, and the chief entrance lodge also remain, and add much to the interest and general effect. The principal front, approached by what remains of the Chestnut Tree Avenue, is symmetrically arranged, and consists of a central block with wings of considerable projection, enclosing a court of which one side is open to the East. The chief entrance door in the middle of the front is under a square tower

furnished with a lofty ogee curved roof, each of the wings has also a door from the court, under a similar tower. The towers, the curved gables, and the lofty bay windows which terminate the wings, combine in producing an extremely picturesque and imposing effect. The windows are all square headed and mullioned, the walling is of thin bricks, with windows, doors, and other important details of stone.

The entrance hall is fine and lofty, and the principal staircase with massive square newels and scroll work balustrade is extremely rich in effect. The great drawing room, the dining room, Lady Holte's room, and the great gallery, 136 feet long, are all grand apartments with elaborate ceilings in intricate geometrical patterns, rich cornices, and magnificent chimney pieces. Besides those mentioned, there are a great number of rooms of less importance. Many of the principal apartments contain collections of great interest.

Painting.—[By E. R. TAYLOR.]—For the opening of the Corporation Art Gallery in November, 1885, the large room was filled with a loan collection of pictures by Mr. G. F. Watts, R.A., and Mr. E. Burne Jones, A.R.A. These works, together with others of a decorative character, belonging to the town, have enabled the Birmingham public to view, for the first time, the highest phases of English Art.

The history of Art proves that, when the nobler walks of Painting and Sculpture reach a high standard of execution, decorative character, and poetic insight, Art, as applied to manufactures, makes corresponding progress. Decorative and poetic art in painting as seen in the works of Leighton, Watts, Burne Jones, Rossetti, Mason, Richmond, Albert Moore, Walter Crane, and others is, therefore,

of special interest to a manufacturing town like Birmingham. So long as these men exhibit the possibilities of decorative art, their work must be fraught with good to those engaged in applying similar principles to art manufactures, and (what is of equal importance) must educate those who are to be users of art productions.

BIRMINGHAM ARTISTS.—The names of at least two Birmingham men will ever hold a prominent place in the annals of English Art,—David Cox and E. Burne Jones; and as, from his residence here and his being a member of the Royal Society of Artists in this town, George Mason may also be fairly considered a local man, Birmingham may be said to have produced three great Masters—each perhaps the highest in his particular branch—in the three most characteristic phases and developments of English Art. Of this the town may be justly proud.

DAVID COX.—David Cox was born in Birmingham in 1783. His birth-place was near to "The Old Crown," a noted ancient timbered house in Deritend. He received his early art instruction from Joseph Barber, who conducted an academy close to the site of the present Municipal School of Art. In the mastership of that academy, Joseph Barber was succeeded by his son, J. Vincent Barber. A few doors away, Samuel Lines carried on a drawing school. These were the only means of art instruction in the town until the formation of the Society of Arts, whose work is now continued in the above-mentioned Municipal School. Cox was apprenticed for eighteen months to a miniature painter on lockets and snuff boxes. Owing to the bankruptcy of his master, his engagement was terminated at the end of that period. He afterwards became scene painter at

the Birmingham Theatre, then under the management of the elder Macready. John Varley, the famous water-colour painter, and Müller also gave him a few lessons in water-colours and oils, respectively. Thus Cox received what was for his day a fairly good education in art, if in this we include his initiation first into miniature painting and then into scene painting.

In 1813 he was elected a member of the Society of Painters in Water Colours. During his whole career, he seems to have possessed a strong affection for his native place; and, as soon as he was freed from the worries and anxieties of teaching, he came to Greenfield House, Harborne, where he spent the last eighteen years of his life, working at his beloved art, and paying visits, from time to time, to favourite Bettws-y-Coed. He died in 1859.

Cox was contemporary with Constable and Crowe. All three received but slight recognition of their merits while living; but since death their work has been highly praised and much sought after. Yet these men—and Cox particularly—were the first to carry out that direct study from nature which has become the characteristic of the English school, as distinct from the studio compositions and artificialities which flourished from the time of Claude to their own. There is every probability that the love for English scenery—scenery so full of colour and character; so varied and so changeful—has been greatly stimulated amongst the people by the fact that these artists have portrayed its beauties in their paintings, and have thus instilled a perception of, and love for, these beauties in nature.

Of the works of Cox, the Art Gallery contains thirty-three oil paintings (the Nettlefold Bequest),

and two or three water-colours. This is perhaps the finest collection of his oil colours extant, and among it may be specially mentioned: “Sheep Shearing” (27) and “Driving Cattle” (28), both full in colour, and simple and direct in execution; while “Changing Pasture” (9) may be cited as one of his best works. In the picture last mentioned, the sunset sky, the purplish blue distance, and the truth of the light in the middle distance and foreground should receive particular attention. “In the Hayfield” (26) is more in his water-colour manner; as is also his grand “Rhyl Sands” (10), in which the effect of the sea breeze is felt all over the picture. “Bettws Church” (11), “Tending Sheep, Bettws-y-Coed” (12), and “Evening” (24) are excellent examples of that quiet and unaffected, yet highly poetic treatment by which he ennobled the simplest materials; while “The Shrimpers” (31) is perhaps the best of his pictures of a sandy shore. “The Missing Lamb” (2) is interesting, in that it shows his method of commencing work. “Asking the Way” (40) is a fine example of his water-colours. In the midst of these beautiful specimens of Cox’s labour is placed “The Late David Cox” (17), by Sir John Watson Gordon—one of the most successful portraits of a great artist by a brother artist. Alike by its success and the evident sympathy between painter and subject, the work recalls the portrait of Hook by Sir J. E. Millais.

Whilst a careful study of Cox’s life and pictures, of his earnest and loving methods of work, and of the glorious harvest therefrom resulting, has had a highly beneficial effect on the world of Art, there is no doubt that from the sudden rise in value of his pictures, and the consequent magnifying of any scrap of paper his hand had touched, as well as from the fact that the work of his latest and broadest style was

most accessible, a certain servile imitation of his mannerisms, supplanted the earnest and loving study of nature, which characterised Cox to the end. These mannerisms, which by long study he had earned the right to use, and which in his work were always full of meaning, too often became in the productions of his imitators meaningless and pretentious. Time, however, is curing this evil; and the good alone will remain. As an example of the enormous increase in the monetary value of his pictures, it may be stated that "Lancaster sands," for which Cox received £10, was sold at the Gillott sale for 3,000 guineas.

GEORGE MASON.—The work of George Mason, A.R.A. (born 1818; died 1872), marks a further development of English Art. He, like Frederick Walker, opened up still deeper poetic sympathies for us. During the varied phases of humanity, its toil and its rest, were no longer treated as mere accessories to the landscape, but as a large and essential part of it; not inserted to give a point, or story, or bit of colour to the picture, but intended from the beginning to essentially form a part of its growth as a work of art. And even when there is no human incident poetically treated, as in his "Evening Hymn," or "Harvest Moon," there is something in his schemes of colour or other treatment of his landscape which occurs to awaken a human interest never reached even by Cox or Turner. This school has had the strongest and widest influence on the English Art of to-day. It is greatly to be regretted that the Birmingham Art Gallery contains no examples of the works of George Mason.

E. BURNE JONES.—The third phase is that represented by Mr. E. Burne Jones and Mr. Watts. This being the most recent development, its force

cannot yet be measured; but there is little doubt that it will be the greatest of the three. For six months after the opening of the gallery, one end of the large room aforesaid was filled with a magnificent collection of the works of Mr. Burne Jones; and at a recent exhibition of the Birmingham Society of Artists, was shewn his noblest work, "The Six Days of Creation."

The sale of the Graham collection has dispersed most of these. Perhaps no previous sale had evoked so much interest,—not even that of the Gillott collection. The enthusiasm then evinced, as well as the large prices obtained, shew that the work of the artist is already receiving just recognition. In addition to "The Six Days of Creation," there were (*e.g.*) exhibited at Birmingham "Le Chant d'Amour," "Venus's Mirror," "The Beguiling of Merlin," "Love in the Ruins," "Love Disguised as Reason," but as these are no longer here, it is unnecessary now to describe them. "The Feast of Peleus" has been lent by its fortunate possessor, Mr. Alderman Kenrick, M.P. This picture—at least from an artist's point of view—is one of the painter's most beautiful works. At the marriage of Peleus and Thetis, the Goddess of Discord throws down a golden apple, to be claimed by the most beautiful. Juno, Venus, and Minerva rise eagerly to claim it. In the foreground are three fates. The composition, drawing, scheme of colour, and marvellous realization even of the minutest details of form and colour render this work one of exceptionally high character, and, taken as a whole, the most enjoyable of all the artist's productions.

Attention may also be here directed to the fact that there have been placed in St. Martin's and St. Philip's Churches, Birmingham, two lovely stained glass

windows, both designed by Mr. Burne Jones. The artist's practice in stained glass, tempera, and mosaic has, no doubt, greatly influenced his style of composition and colour.

MUNICIPAL GALLERY.—Pictures by the following Birmingham artists, named alphabetically, belong to the Corporation:—

Baker, Alfred—(an artist of great promise, who died when young) —“Harvest Time.”

Baker, S. H.—“Nant Gwylt.”

Breakspeare, W. A.—“The Daughter of the House.”

Burt, C. T.—“The Edge Hills, from Burton Dassett.”

Feeney, P. M.—“Llyn Idwal.”

Hall, W.—(David Cox’s most intimate friend and biographer)—“A Peep out of Church, Bettws-y-Coed.” This picture is interesting as depicting a scene in the art-home of Cox.

Henshaw, F. H.—Three fine landscapes, of which the best is “A Distant View of Kenilworth Castle.”

Langley, Walter, R.I.—“Memories”—an excellent example of this artist, who has already by his work done much honour to Birmingham. It shows his deep sympathy with the humble life of English fisher folk, and is admirable in execution, lighting, and colour.

Lines, Samuel—“Llyn Idwal.”

Munns, H. T.—Portraits.

Phillips T., R.A.—Portrait of Sir John Franklin.

Pratt, Jonathan—Portraits.

Roden, W. T.—Portraits.

Taylor, Edward R.—"The Birmingham Reference Library, Destroyed by Fire, January, 1879."

Walton, Elijah—"Monte Tofana in Tyrol."

Wyatt, H.—"Juliet."

One other name should be included in any list of Birmingham artists. It is that of Mr. W. J. Wainwright, A.R.W.S., who has accepted a commission for the Art Gallery.

In the circular picture gallery will be found the admirable series of historical works by Sir James D. Sinton, P.R.I., representing scenes in the life of a soldier in the sixteenth century.

Among the portraits of special local interest are those by Mr. W. T. Roden, of Samuel Lines, the Birmingham artist; of Peter Hollins, the Birmingham sculptor; of his Eminence Cardinal Newman; and of John Henry Chamberlain, who has been justly described as the "second founder of the Birmingham and Midland Institute," and who, until his lamented death, was Chairman of the School of Art. Those of John Bright, by Frank Holt, R.A.; of George Dawson, by H. T. Munns; of William Murdock, by John Graham; of Arthur Ryland, the founder of the Birmingham and Midland Institute, and sometime Mayor of the town, by Sir J. W. Gordon; and of Sir John Franklin, by T. Phillips, R.A., also deserve note in this connexion.

WATTS AND PORTRAITS.—The large room of the Art Gallery is nearly filled with a collection of Mr.

Watt's pictures, kindly lent by the artist. Much interest now attaches to these works, as Mr. Watts has just offered them, with others, to the nation. We can somewhat measure this noble gift when we remember that the collection contains portraits of some of our ablest and most famous men, as well as large and important figure pictures, the work of a lifetime, and that these are the best works of an artist of world-wide reputation. The English School of portraiture has attained a high standard in the works of such artists as Millais, Holl, Ouless, and Richmond; but the portraits by Watts stand apart from even these in their nobility of treatment, scheme of colour, and rendering of the man, his very life and soul. The portraits of Mr. Burne Jones, the Marquis of Salisbury, and Lady Garvagh, recall to mind the best works of Reynolds and Gainsborough. Again, Dr. Joachim, a lamp-light study—is quite Rembrandt like. Those of Cardinal Manning, Carlyle, Mr. Browning, Mrs. Manners, in blue against a blue background; John Stuart Mill, Lord Lawrence, Lord Sherbrook and Philip Calderon, R.A., also merit careful observation. Mr. Watts's subject pictures are painted with the noblest motives, and the methods of execution and schemes of colour are all made subordinate to the idea. The subject "Love and Death," was suggested by the struggle of near friends to resist a fatal disease in a young man whom the artist was painting; and here the power of art, imagination, colour, conception, drawing of drapery and figure, all unite, not for technical display, but to realize in an intense degree the motive of the picture. The same may be said of "Mammon;" dedicated to his worshippers. In the previous picture the colour is blue-grey; in this it is gold and scarlet. "The Meeting of Jacob and Esau" is a striking instance of the

successful definition of opposite characters. “Orpheus and Eurydice” is descriptive of the moment when Orpheus looks back, and when, by reason of this act of impatience, Eurydice sinks back to Hades. “Fata Morgana,” turning on her followers through life, is also a splendid work.

This room further contains the large painting by Professor W. B. Richmond, M.A., entitled “An Audience in Athens during a Representation of the Agamemnon.” This, too, is a most valuable decorative work of Art in the attitudes, costumes and expressions of the audience, and in the rendering in colour and tone of the clear sunlight of Greece. Other decorative works in the Art Gallery are Mr. Albert Moore’s “Dreamers,” lovely figures most delicately painted in a scheme of yellow orange, grey and green; “Sapphires,” blue and orange; and “Canaries,” yellow orange and grey, with a little green. On a screen will also be found a small but very fine collection of works in water-colour by Mr. Walter Langley, R.I., including “Amongst the Missing,” “Time moveth not,” and many well known works by this artist.

The town possesses one of the strongest examples of Sir Frederick Leighton, P.R.A. “A Condottiere” is quite Titianesque in its painting of flesh, armour, and drapery. One example by Mr. Alfred W. Hunt is also the property of the town. It is called “A Norwegian Midnight,” and therein are displayed colour, mystery, sense of space, and moving cloud forms. Two of the finest paintings by Mr. Henry Moore, A.R.A., are also included—“Summer Time, off Cornwall,” and “The Newhaven Packet.” Other works in the Gallery of more than ordinary interest are: “Intellect and Instinct,” by H. Stacey Marks, R.A.;

"Detected Correspondence," by John Opie, R.A.; "A Martyr of the 16th Century," by W. Geets; "February Fill Dyke," by B. W. Leader, A.R.A.; "Ready for Work," by John S. Noble; "A North-West Gale," by John Brett, A.R.A.; "Homeward," by W. Napier Henry; and "The Poacher's Widow," by Breton Riviere, R.A.

It is a matter of real congratulation to Birmingham that her sons have taken a prominent place in the world of Art, and that, owing to an enlightened policy, the town now possesses a suitable gallery, wherein high-class works may be viewed by all. The works exhibited, whether purchased by the Committee or on loan, are generally of such a decorative character as to be of the greatest value to designers and other Art workmen. It is to be hoped that, stimulated by past example, as well as by present opportunities, the inhabitants will fully appreciate the importance of furthering that Art, which is at once a source of pleasure to the workers, and of illimitable enjoyment to the beholders.

Sculpture.—[By WHITWORTH WALLIS.]—The history of the birth and growth of sculpture, with no word for its decadence, death, and ultimate renaissance would alone be a subject difficult to compress into the space of a volume, but when there is to be added to that some account of the art in the time of the supremacy of its achievement, before it became tainted with decay, the task is vast indeed. Fortunately such a dissertation is not required in this place.

The art of sculpture is not restricted, as most people think, to the carving of mere marble and stone. In its strict meaning it is the art of *cutting* any material whatsoever into any required shape; but the

word is now generally accepted for the art of representing anything by form, no matter what the material may be, or what the method of its making; so that the word "sculpture" applies to Sculpture proper, and to castings in bronze, as well as to the carving of gems, ivories, and to modelling in wax and clay.

EGYPTIAN SCULPTURE.—In every part of the world, in modern as in ancient times, savage races have delighted to decorate their weapons with carving, and to make representations of men and animals, which they afterwards worshipped. But it was Egypt, that cradle-land of learning and of art, which seems to be the nation where first the rudeness of savage carving was brought under restraint and nurtured into Sculpture. What had previously been an amusement was changed by their priests into an art. But these very priests who first fostered the art were ultimately the means of stunting its growth and arresting its highest development. The reverence which long ages of worship caused the archaic statues to receive induced the priests, who were the representatives of learning and of wisdom, to make these old types symbolical of divine attributes, and it was considered sacrilegious to attempt to alter what had gradually come to be believed was the true likeness of the god. Thus religion, which was the kind foster-mother of the arts of sculpture and painting, came, later on, to be its most determined enemy.

Whilst in Egypt Sculpture was being strangled by Convention, all progress being arrested, and all originality starved out of it by the regulations which bound it to its archaic form, a new race of artists arose along the shores and amidst the islands of the

Mediterranean. In Greece Art found a new and happy home. Greek Sculpture, based on Egyptian precedent, and influenced greatly in its growth by Phœnician thought, gradually freed itself from all the trammels of the past, and formed a school of Sculpture, the results of which have never been equalled in all the after ages of art production.

GREEK SCULPTURE.—It was left to the beauty-loving Greeks to perceive that Sculpture was of all others the art by which they could best express and best immortalise the most perfect of all Nature's physical beauties. It was the Greeks who made Sculpture what it was, and with their school died out the highest development of the art.

The conquests of Alexander, and all that followed in their train—the treasures of the East unfolded, mighty monarchies founded, stately cities built—afforded opportunities for the spread of this art. Thus it became transplanted into strange lands, and was subjected to new influence and aspirations. After the Macedonian and Syrian wars the victorious Romans carried off with them the statues and other art objects from the conquered countries. Following in the train of their conquerors came the Greek artists themselves to Rome, but the art never became naturalised there, it soon lost all its ideality and became merely imitative in treatment. Under Antoninus it lost much of its grace and elegance, but the spirit of the Greek is mighty even in dying, and though it sank under Severus and his successors, its influence was still apparent until close upon the time of Constantine, when the great art of the ancients was entirely lost.

ITALIAN SCULPTURE.—Sculpture revived in Italy in the thirteenth century under Nicolo Pisano. All the

remains of art which had escaped destruction from barbarian violence, religious fanaticism, and natural causes, were now carefully collected, and the sentiment of reverence and admiration for the antique gradually developed into that great revival which we designate "The Renaissance." The wealthiest and most powerful Florentine families vied with each other in the encouragement of art in all its branches, and with the artists of the fifteenth and sixteenth centuries raised modern art to its loftiest pitch of splendour. Despite this fact it never attained the sublimity and tranquil grandeur of the antique. After the glorious epochs of Michael Angelo and Raphael a rapid decline set in. True feeling quickly disappeared, giving way to affected grace, extravagance, and excessive ornament. During the eighteenth century, Winckelmann was the first who influenced the revival of modern art, and opened the eyes of his contemporaries to the glories and elevated beauty of the arts of antiquity. Antonio Canova became the founder of the new period, his works being specially marked by pure simplicity and classical ideality, and by his side stands Thorwaldsen, whose artistic productions were as admirable as they were numerous.

ENGLISH SCULPTURE.—In England John Banks, who may be regarded as the father of English ideal sculpture, paved the way for his great successor John Flaxman, and the latter with his deep appreciation of severe simplicity and true form, his love and admiration for the Greek statues, brought into this country the classical spirit, and founded the schools of the nineteenth century. To judge by the progress which modern sculpture has made, and by the many noble works erected of late years, it is on a far safer road than during the end of the sixteenth century. In

England it is not likely that there will ever be such a great school of sculpture as of the sister art of painting. The greatest hope for ideal or poetic sculpture rests with the people themselves, who must be able to appreciate and love the beautiful, and this elevation of the taste of the public can only be accomplished by artists refusing to pander to a low ideal, but fearlessly and jealously devoting themselves to the execution of those works which will touch the tenderest feelings and arouse the noblest thoughts.

LOCAL SCULPTURE.—Birmingham, though possessing a fair number of sculptural monuments, can boast unfortunately but of few which show real artistic merit. In the Entrance Hall of the Free Libraries, Ratcliff Place, stands Mr. Foley's admirable statue of Prince Albert, which is considered to be one of his finest works. The Prince is attired in the robes of the Order of the Garter. By its side is placed the companion statue of her Majesty the Queen, which was also entrusted to Mr. Foley. That artist unfortunately dying, the work was carried out by Mr. Woolner, R.A., with far from a pleasing result. Both statues are intended for the Council House. The largest, and certainly one of the most prominent, monuments in Birmingham is the bronze statue erected by the inhabitants to the memory of Admiral Lord Nelson. It is situated in High Street, and was executed by Sir Richard Westmacott. It represents Nelson in a reposeful and dignified attitude, his left arm resting upon an anchor. The background is formed of the prow of a vessel and a sail. The statue is mounted on a pedestal of statuary marble, embellished with figures. The corner posts are said to be cannon formerly in use on board the "Victory." An auctioneer, who lived in High Street, left sixpence

per week to be paid in perpetuity, out of the rent of a house, to be devoted to the cleaning of the statue.

The bronze statue of Sir Robert Peel, at the top of New Street, is interesting as being the work of a talented Birmingham sculptor, Mr. Peter Hollins, and for the fact that it was the first bronze statue cast in one piece in Birmingham. The attitude of the Statesman is one of firmness; the face is very expressive, and shows strong intellectual power. Mr. Hollins likewise executed the statue erected to the memory of Sir Rowland Hill, which stands in the Post Office, Paradise Street. Of other works by this sculptor, I would draw attention to the busts of William Scholefield, Mathew Davenport Hill, Q.C., and David Cox, all of which are in the Museum and Art Gallery, and a fine bust of J. W. Whateley, in the General Hospital.

At the Five ways, Edgbaston, stands the statue erected to the memory of Joseph Sturge, an eminent member of the Society of Friends. The monument is pleasing in arrangement. The centre figure represents Joseph Sturge, his right hand resting on the Bible, his left extended towards a figure symbolical of Peace, whilst on the other side is a figure typical of Charity. This is reputed to be an excellent likeness of the philanthropist, and the expression is one of benevolence and tenderness. It is the work of the late John Thomas, a sculptor of some eminence, who unfortunately died before he could put the finishing touches to this memorial. Mr. Thomas was also the sculptor of the statue of Thomas Attwood “the father of Political Unions,” situated at the top of Stephenson Place. Thomas Attwood stands in the act of addressing a public meeting, the right hand outstretched, whilst his left grasps a scroll bearing

the word “Reform.” In the Art Gallery is a fine bronze group of Boadicea and her daughters, also the work of Mr. John Thomas.

In front of the Council House stands the statue of Dr. Joseph Priestley, the discoverer of oxygen, who was driven from the town by a Birmingham mob, and whose property was destroyed in the riots of 1791. The statue, a very pleasing one, is the work of Mr. F. J. Williamson, of Esher, who is also the sculptor of the adjacent statue of Mr. J. Skirrow Wright, and by the same hand is a striking bust of Mr. Sam: Timmins, F.S.A., which stands in the Reference Library, and an equally admirable bust of the late Dr. Heslop, now in the Mason Science College. This artist also executed the latest addition to Birmingham Sculpture, the statue of Sir Josiah Mason, and was also entrusted with the statue of the late George Dawson, opposite the Art Gallery, which stands under a highly ornate canopy, designed by the late John Henry Chamberlain. This statue, which is supposed to be an excellent likeness of Mr. Dawson, was executed on account of the dissatisfaction caused by the first figure, the work of Mr. Woolner, R.A. The effigy by the latter sculptor is still most unfortunately permitted to remain in the vestibule of the Free Library.

At the back of the Town Hall, stands a Memorial Fountain, erected to commemorate the municipal services of the Right Hon. Joseph Chamberlain, M.P. In the south side is a medallion portrait of Mr. Chamberlain, by Mr. Thomas Woolner, R.A. The memorial, which is architecturally treated and richly decorated with Venetian mosaics, was designed by the late John Henry Chamberlain.

In Ratcliff Place stands undoubtedly the finest

statue in the town, that of James Watt, by Alexander Munro. The calm dignity of the figure, the graceful pose of the same, the grand thoughtful face, and the very remarkable likeness of the great engineer, render it a work of the highest excellence. The original model of the head is in the Art Gallery.

The Art Gallery contains in addition to those already mentioned as located therein, the two original plaster models of Foley's great statues of Burke and Goldsmith; an interesting copy of the Venus di Medici by Raphael Monti, and some very admirable specimens of early Italian and renaissance sculpture. In the Vestibule stands a very dignified and impressive bronze statue of Buddha of Indian make, and of the greatest antiquity; and also a very remarkable piece of Hindoo sculpture in black marble.

In St. John's, Deritend, is a memorial bust of John Rogers, who edited the first English Bible, and was the first martyr of the reign of Queen Mary.

The Parish Church of Handsworth, some little distance from Birmingham, contains one of Sir Francis Chantrey's most remarkable and beautiful works, the statue of James Watt; and by the same sculptor is a fine monument erected to the memory of William Murdock. Here is also the excellent bust of Matthew Boulton, by John Flaxman.

Music.—[By W. BAYLEY MARSHALL.]—The most casual observer cannot fail to notice the rapid strides which Birmingham has taken in recent years in the cultivation of Music. We have now an orchestra of nearly one hundred performers composed of citizens of the town, numerous choral societies both public and private, well-qualified professors in all the branches of musical study, and an excellent musical

club. These combined agencies are rapidly removing the stigma which was formerly so truthfully applied —that Birmingham was like a boa-constrictor, making a huge meal of music once every three years, and doing little but sleep between times. In no branch of music is this progress more manifest than in the services of the church. Some sixteen years ago, it was quite the exception to hear even the psalms chanted; now choral services and well-rendered anthems may be heard in most of the churches. The limits of this article will only allow a brief reference to the principal societies and agencies engaged in the furtherance of music in Birmingham.

TRIENNIAL FESTIVALS.—The Birmingham Triennial Festivals are now universally acknowledged to be the most important Music meetings in the Kingdom. The first Festival was held in 1768. In 1799 the scale of the celebration was enlarged, and since then, with one exception, they have been held triennially. The management is in the hands of a small committee, appointed by the Governors of the General Hospital, and the whole of the proceeds go to the funds of that Institution; this has amounted to upwards of £120,000 since the foundation of the Festivals. During the period of more than a century over which the Festivals have now extended, they have attained European celebrity, and have been distinguished by the production of a large number of original works of the highest rank, among which may be mentioned: Mendelssohn's Lob-gesang (1840), and Elijah which was specially written for the 1846 Festival; Costa's Eli (1855), and Naaman (1864); Bennett's Woman of Samaria (1867); Sullivan's Kenilworth (1864), and Light of the World (1873); Smart's Bride of Dunkerron (1864); Barnett's Ancient Mariner (1867), and Paradise and the Peri (1870); Benedict's St. Peter

(1870); Macfarren's Resurrection (1876); Gade's Zion (1876) and Psyche (1882); Hiller's Nala and Damayanti (1871); Randegger's Fridolin (1873); Cowen's Corsair (1876) and Sleeping Beauty (1885); Gounod's Redemption (1882) and Mors et Vita (1885); Gaul's Holy City (1882); Stanford's Three Holy Children (1885); Dvorak's Spectre's Bride (1885). The next Festival will be held in 1888. Secretary, Mr. R. L. Impey, 26, Waterloo Street.

FESTIVAL CHORAL SOCIETY.—The date of the foundation of the Birmingham Festival Choral Society, the premier society of the town, is unknown; in 1834, Mr. G. Hollins, the first Organist of the Town Hall was appointed conductor; upon his death in 1841, Mr. Stimpson was appointed to both offices, and the society was reorganised and established with a permanent relief fund to be employed in case of sickness among its members. In consequence of ill-health, Mr. Stimpson resigned the conductorship in 1855, and Mr. Stockley (the present conductor), was appointed; Mr. Stimpson continuing as organist of the town, the duties of which office he still faithfully discharges. Since 1846, the choruses of the Musical Festivals have been mainly composed of members of the Festival Choral Society. The society gives annually a series of high-class subscription concerts. The management is in the hands of a Committee of fifteen members. Secretary, Mr. S. V. Cornish, 55, Varna Road, Edgbaston.

AMATEUR HARMONIC ASSOCIATION.—The Birmingham Amateur Harmonic Association was established in the year 1855, and, as its name implies, is a purely Amateur Association, more for the study and practice of choral music than for the public performance thereof.

The members have, however, done good service in placing before their friends at open rehearsals and private concerts, from time to time, a great number of works previously unknown to Birmingham, the most important of which are—Handel's oratorios, Jephtha (1871) and Joshua (1872); Haydn's First Mass (1859); Hummell's Mass in E flat, which was specially printed for the Association, and produced for the first time in England on December 13, 1865; Gounod's Messe Solennelle in G (1866), Gallia (1873), and Messe du Sacré Cœur (1878); Schubert's Mass in E flat, first performance in England (1868), Song of Miriam (1869), and Mass in F (1884); Benedict's Cœur de Lion (1869); Gade's Erl King's Daughter (1869); Sullivan's On Shore and Sea (1872); Macfarren's St. John Baptist (1874); Smart's Jacob (1875); Beethoven's Choral Fantasia (1875); Astorga's Stabat Mater (1881); Bridge's Boadicea (1881); Hodson's Golden Legend (1884); Lloyd's Hero and Leander (1884); and for the first time in England, Raff's Die Tageszeiten (1885). Mr. Alfred J. Sutton was appointed conductor at the commencement of the Association's existence, and continued in office until 1877, when, upon his resignation, Mr. Stockley, the present conductor was appointed; the members meet weekly for practice during the winter months. The management is in the hands of a Committee of fifteen members. Honorary Secretary, Mr. W. Bayley Marshall, 15, Augustus Road, Edgbaston.

AMATEUR MUSICAL UNION.—The Edgbaston Amateur Musical Union was established in 1863, for the cultivation and encouragement of the taste for orchestral music, and for the study and performance of orchestral works by the great composers. This society has by hard work and energetic management

slowly but surely made its way; at the first concert only fifteen amateur members assisted in the band, only two of whom were among the wind department; the band now consists of 47 members, is practically complete as to wind, and even includes drums. The library belonging to the society now contains a very fine and complete collection of standard works besides a large number of pieces of a lighter character.

Mr. C. J. Duchemin, who took a very active part in the formation of the society, for nineteen years acted as honorary conductor; upon his resignation in 1882, Mr. Alfred J. Sutton was appointed conductor. Honorary Secretary, Mr. R. B. Bandinelli, Pinson Villa, Fulham Road, Sparkhill.

PHILHARMONIC UNION.—The Birmingham Philharmonic Union was established in 1870, upon a somewhat similar basis to the Festival Choral Society, under the conductorship of Dr. C. Swinnerton Heap. The Society has given annually since its formation a series of concerts, with somewhat varying pecuniary success; and, like its companions, has introduced many important novelties, among which are:—Bach's St. Matthew Passion and the Christmas Oratorio, and Max Bruch's Odysseus. The Society meets weekly for practice. The management is in the hands of a committee of nine members. Secretary: Mr. C. H. Woodward, 71, Colmore Row.

MIDLAND MUSICAL SOCIETY.—The Midland Musical Society was established in 1880 by the members of the advanced singing class in connection with the Church of the Saviour. Unlike the other musical societies of the town, the Midland Musical Society is free, the members not paying any

subscription; the free use of a rehearsal room being granted by the Church Committee, and the conductor, Mr. H. M. Stevenson, being an honorary officer. The Society possesses a lending library of over 1,000 volumes of music for the use of its members, and now consists of a chorus of 240 and a well appointed amateur band. Several concerts for charitable purposes have been given by the members, and a series of ten concerts for the working classes, in the Town Hall, to which the admission was twopence and sixpence for floor and galleries respectively, at one of which Gounod's Redemption was performed. It is the intention of the committee to continue these concerts during the ensuing season. Honorary Secretary: Mr. H. M. Parker, East View, Robert Road, Handsworth.

SUNDAY SCHOOL UNION CHORAL SOCIETY.—The Birmingham Sunday School Union Choral Society was established in 1880. As its name implies, this society is connected with the Sunday School Union, and resulted from the very successful annual festivals which were given by a chorus of some 700, selected from the various schools in the union. The society meets weekly for practice under the conductorship of Mr. Alfred R. Gaul. Hon. Secretary: Mr. H. Parkes, 33, Brighton Road, Moseley.

MUSICAL SOCIETY.—The Birmingham Musical Society was established in 1842 upon the basis of a friendly sick and benefit society, and for the social intercourse of music lovers and especially for the practice of glee and madrigal singing. The members meet fortnightly, and so successfully have the affairs of the society been managed that the invested funds amount to upwards of £2,000. The excellent performances of the Birmingham Glee Union, Messrs.

Bickley, Woodall, Young, and Stilliard, all of whom are members of the society, are well-known throughout England. The onerous post of Musical director, which has been filled by many musicians of note, is now ably occupied by Mr. W. George Halliley.

MUSICAL ASSOCIATION.—The Birmingham Musical Association was founded in 1879 with the object of providing a series of high-class concerts at popular prices, establishing classes for musical instruction, vocal and instrumental, and the provision of a large Musical Library. Upon further consideration the establishment of classes and the formation of a library were abandoned. The weekly cheap concerts on Saturday nights have been continued with a few intermissions during successive winters and have now reached a total of 159, to which the admission is threepence and sixpence for the floor and galleries respectively. A band and chorus have also been organised and have rendered material assistance at the Saturday night concerts. Honorary Secretary, Mr. H. Hendriks, 25, Cannon Street.

MESSRS. HARRISON'S CONCERTS.—This admirable series of subscription concerts was established in 1870. Prior to this the present senior partner, Mr. T. Harrison, gave high class miscellaneous concerts at irregular intervals, commencing as far back as 3rd February, 1853, when the late Mr. Weiss and Mr. Sims Reeves (who was even then spoken of as the great English Tenor), took part in the programme. In 1870, Mr. Harrison took his nephew Mr. Percy Harrison into partnership, and the annual series of subscription concerts were inaugurated, the management of which for enterprise and skill in securing all the leading artistes, vocal and

instrumental, of the musical world, has made them well-known throughout the kingdom. Besides treating their subscribers to such stars as Patti, Nilsson, Albani, Titjens, Sims Reeves, Lloyd, Santley, Maas, Norman Neruda, Sophie Menter, Charles Hallé, Pachmann, Hans von Bülow, Joachim, Wilhelmi, Piatti, Bottesini, &c.; lovers of orchestral music have been provided for by the annual engagement of Mr. Charles Hallé's well-known band.

MR. STOCKLEY'S CONCERTS.—The Subscription Orchestral Concerts were instituted in 1873 by Mr. Stockley, the conductor of the Festival Choral Society. For the first few seasons these excellent concerts met with but scanty support, and were carried on under serious difficulties, and at a considerable loss; three concerts were given each season, and the band consisted of about 50 members. Mr. Stockley, however, steadily persevered with the good work, and met with increasing support; in 1881, the band was augmented to its present number of 80, of whom no less than 76 are *bona fide* residents in the district; in the following year the number of concerts were increased to four each season; and the support now accorded is most encouraging, the annual balance-sheet no longer showing a loss. The programmes have always included a complete symphony at each concert, one or two classical overtures and smaller orchestral pieces; two singers of eminence have been engaged for each concert, and the vocal items as far as possible arranged to correspond with the classical character of the instrumental. Mr. Stockley must now be congratulated upon the successful result of thirteen years' hard work, under very discouraging circumstances at first, to popularise good orchestral music.

CHAMBER CONCERTS.—Birmingham in the past has persistently refrained from adequately supporting chamber concerts, even when the quartette consisted of some of the greatest living instrumentalists. Dr. C. Swinnerton Heap, with praiseworthy zeal, gives an annual series of high class chamber concerts, for which the subscription list is much smaller than the excellence of the concerts should command. It is to be earnestly hoped that his labours will in the end be rewarded with the success they so richly deserve.

THE CLEF CLUB.—The Clef Club was founded in 1881, to provide a central resort for the study and practice of vocal and instrumental music, combined with the general accommodation of a Club. Monthly Smoking Concerts are held in the Club Rooms, the executants being selected from among the members, and the programmes confined to strictly "chamber music." It may safely be said that since its formation the Clef Club has done much to elevate the taste of its members, and promote the study and appreciation of chamber music. The success which attended the development of the Club was so great, that greatly enlarged premises soon became necessary; and the promises of support being so encouraging, it was determined to register the Club under the Companies Act, and very greatly enlarge the original scheme. Sir Arthur Sullivan kindly accepted the post of President of the Club, and showed warm interest in the details of the new scheme. The lease of the present club premises in Paradise Street, close to the Town Hall, having been secured, and the extensive alterations completed, the club entered upon its new life in July, 1885. In addition to the monthly concerts there is an impromptu smoking concert every Friday night. Honorary Secretary, Mr. F. E. Huxley, Clef Club,

Paradise Street.

FLUTE SOCIETY.—The Birmingham Flute Society, probably the only flute society in England, was established in 1856 to encourage and develop the performance of classical flute music; the Society possesses a very fine library, consisting of all the concertante duetts, trios, and quartettes of Berbiguier, Fürstenau, Kuhlau, Kuffner, Kummer, Gabrielsky, and Tulou. The members meet twice a month. Honorary Secretary, Mr. Arthur H. Hughes, 40, Chapman Road, Smallheath.

MUSICAL INSTRUCTION.—There is no more important step in the development of the study of music than a thorough system of elementary education; the Birmingham School Board, fully recognising this, in 1876 made provision for the systematic teaching of music in all the schools under their control. Mr. W. Dobson was appointed superintendent of musical instruction, and has formulated a very thorough system; the tonic sol-fa method is adopted and infants, if only seven years of age, are taught to sing from note correctly. One hour per week is allotted to this subject in two half-hour lessons; in addition to this two or more classes are occasionally grouped in divisions for united rehearsal and musical drill. In addition to instruction in singing, violin and brass band classes were commenced last winter, also on the tonic sol-fa method, and have been very successful. Many thousand children have thus been taught, by their voices being trained in connection with the ear and understanding, to sing correctly, and have been musically educated in such a way as to enable them in after years to listen intelligently and enjoy good music.

SCHOOL OF MUSIC.—The School of Music in its present form at the Birmingham and Midland Institute was commenced in 1885. Classes were established in the following branches—theory of music, elementary and advanced part singing and solo singing, (a separate class for each voice, soprano, contralto, tenor and bass). The pianoforte, violin (elementary, intermediate and advanced), clarionet, flute, violoncello, and brass instruments generally. During the first term there were 1,233 students in the school, the fees range from one penny per lesson to half-a-guinea for a term of 12 to 15 lessons. During the current season the following additional classes have been sanctioned by the Council—organ, bassoon, oboe, double bass, and viola; and it is probable that classes will be formed for ensemble orchestral playing and part singing.

Chapter VIII.
MANUFACTURING INDUSTRIES
(Birmingham and District.)

BY C. J. WOODWARD, B.Sc.

In the following pages an attempt is made to give to the reader some idea of the extent and variety of the manufactures of our town and neighbourhood. The method followed is to state at the outset the classes of material which come into the town, and to follow these in the mind's eye through smelting furnace, forge, or workshop, until they come out in a wonderful variety of articles, one or more of which will ultimately be found in the possession of every

nation of the earth. To carry out the proposed method with fulness and accuracy would require a strict blockade of the town, similar to that adopted for collecting town dues in continental towns with agents to report the quantities and qualities of the goods passing in and out. Failing this, we may, through the agencies of the railway and canal companies obtain at least some idea of the character and extent of our trade.

In preparing some statistics relating to goods brought into and taken out of the town, I am particularly indebted to the courtesy of Mr. Henry Wiggin, M.P., one of the directors of the Midland Railway, and also to Mr. John Noble, general manager of that railway; Mr. J. Grierson, general manager of the Great Western Railway; and Mr. G. Findlay, general manager of the London and North Western Railway. Mr. W. Pilcher, of the Birmingham Canal Navigations, and Mr. George, of the Birmingham and Worcester Canal, have also been good enough to supply information. In considering the traffic of our town we must remember that Birmingham is not only a manufacturing centre but a distributor of goods which arrive here in bulk. This, coupled with the circumstance that, from its inland position, there is a great deal of through traffic, renders it difficult to obtain such satisfactory figures as I hoped to have done when I commenced this work.

Statement of principal classes of goods coming into and going out of Birmingham by railway during the year 1885, with weight in tons of each class.

INWARDS.

Coal and Coke	897541

Lime	5327
Limestone, Bricks, &c.	14315
Glass	7689
Iron and Steel	115874
Tin Plates and Zinc	10382
Spelter or Zinc	22564
Hardware and Miscellaneous	134204
Stone	15621
Timber	63591
Paper Making Materials	5550
Drugs and Drysaltery	14867
Grain	126783
Grocery and Provisions	61888
Leather	3599

OUTWARDS.

Bedsteads	34976
Brass & Copper, Ingot and Wire	4697
Galvanised Wire and Ware	11705
Glass	6151
Hardware and Lamps	110597
Iron and Metal Tubes	13570
Iron Wire and Sheet	2999
Iron Castings	9166
Nails	18936
Rolled Metal	7619
Paper and Stationery	9490
Machinery Hides and Leather Miscellaneous	} 33754

From one wharf alone in Birmingham there were

delivered into the town by canal last year about 40,000 tons of various goods, of which the following will serve as examples—Timber, 3810 tons; salt, 443 tons; metals, 3948 tons; road stone, 10,821 tons; potatoes, matches, mill stones, glue and groceries, 1221 tons, whilst traffic over one of the canals in the course of the year was 7,327,269 tons, including merchandise, 972,749 tons; pig iron, 586,434 tons; coal, 3,333,865 tons; iron stone, 495,912 tons; sand, 115,791 tons; lime and limestone, 140,828 tons; road materials and manure, 525,249 tons; and bricks, 460,359 tons.

Nature of the Manufacturing Industries of Birmingham and the District.—It is difficult, if not impossible to classify satisfactorily the varied industries of Birmingham and the district. The one adopted has as its basis, the raw materials of different kinds as used up in the trades of the town. In order to obtain information as to progress of the trades, or change in their character, I have extracted from Kelly's Directory of 1864 the number of each trade as then given, and compared it with the number in the last Directory published, viz., 1884:—

Trades of Birmingham and the Counties of Staffordshire, Warwickshire, and Worcestershire.

I.—Production of Materials from Ores, including Chemicals.

A.—Non-metal.

	No. in Directory.	
	1864	1884
Black Lead		2

[41]Chemicals	33	54
Colour Grinders and Manufacturers	29	51
Glue, Isinglass	6	7
[42]Mungo	0	1
Optical Glass	1	1
Paper	31	21
Ice	0	1
Glass	41	62

B.—Metal and Alloy.

	No. in Directory.	
	1864	1884
Alloy Makers	0	1
Aluminium	0	1
Brass and Yellow Metal	0	6
Copper	7	10
German Silver	14	10
Iron	88	103
Nickel & Cobalt	2	2
Steel	18	21

II.—Finished Articles.

A.—NON-METAL.

	No. in Directory.	
	1864	1884

Barometer and Thermometer	2	4
Leather Articles	28	57
Bicycle Saddle	0	3
Wholesale Boot and Shoe	11	42
Clay—		
Pottery, Encaustic Tiles, Terra Cotta, Parian	43	43
Telegraph Insulator	0	1
Ivory, Pearl, and Bone Workers	59	54
Chocolate	2	6
Floor Cloth		2
India Rubber Goods	5	14
””Stamps	0	3
Bristle, Fibre, Hair, Feathers—		
Besom	1	1
Chimney Sweeping Machines	0	2
Hearse Plume		1
Whip	35	33
Brushes	88	106
Cotton	2	4
Measuring Tape	7	6
Wooden Articles—		
Boxes (and Paper)	27	77
Clock Case	11	7
Cork Cutters	9	12
Clog and Patten	85	127
Rules	37	23
Picture Frames	40	99
Tobacco Pipe	29	18
Railway Carriage	11	13
Bellows	10	14
Casting Mould Pattern Makers	30	27

Glass Articles—		
Lighthouse	1	1
Bottle, Plate and Window, Decanters, Tumblers, &c., Looking Glass, French Shade	50	65
Toys	13	3
Artificial Eyes	1	6
Horn—		
Lantern Leaf	5	0
Combs	6	4
Paper and Pulp—		
Paper	31	21
Papier Mâché	19	15
Black Ornament	0	24
Account Books	10	20
Bags	4	16
Gun Wads	6	4

B.—Metal.

	No. in Directory.	
	1864	1884
Gold—		
Chains	43	50
Brooches and Jewellery	346	472
Pencil Case	21	21
Ring	3	29
Leaf	20	14
Watch Case	10	43
Silver—		

Spoons, &c., Lockets, Bracelets, &c. (Silversmiths)	51	103
Leaf		
Reflectors (Plate)	1	6
Copper—		
Pans, Kettles, &c., Sugar Pans (Coppersmiths) Tubes	21	20
Plate Engraving	2	18
Wire		
Lightning Conductors	0	4
Percussion Cap	5	4
Lead—		
Pipes	0	1
Pumps		
Iron and Steel—		
Anchors	12	22
Bedsteads (Metal)	51	48
Bicycles		
Bird Cage & Wire Work	44	59
Bridle Bit	104	67
Boarding Pike	1	2
Boilers		
Buckles	25	25
Nuts and Bolts	19	81
Chain	45	131
Coach Furniture, &c.	60	48
Coffin Furniture	17	14
Corkscrew	17	16
Door Spring	4	6
Earth Boring App.	0	1
Forge (Portable)	3	2
Frying Pan	7	9

Fencing Foil	0	1
Fender	45	55
Fire Irons	57	55
Fish Hook	68	36
Gun (27 Branches)	553	424
Gas Holder	8	5
Gas Meters	1	1
Hair Pin	6	7
Hammer	18	12
Handcuff	3	4
Hyd'lic Machinery	1	2
Hinge (and Brass)	47	51
Hollow Ware	10	23
Hooks		
Hook and Eye	14	13
Ladle		
Roofing	8	15
Tanks	12	20
Boats	9	9
Bridge	9	12
Girder	7	9
Jews Harp	6	8
Keys	87	140
Lance and Javelin	1	1
Locks (13 Br'nch's)	164	252
Lasso Rings		
[43]Matchet	4	6
Mariner's Compass		
Needles (7 Br'nch.)	172	126
Nutcrackers	3	10
Nailmakers	207	235

Pens	18	19
Pen Holder	16	14
Quoit Makers		
Quicksilver Bottle Rings (Split, &c.)	13	16
Scale and Weight	25	25
Screws	71	42
Sewing Machines	10	30
Spectacle Frames	9	16
Safes	15	27
Spring Makers	8	14
Spring Mattress	0	2
Steel Toy	58	39
Sword	17	4
Toasting Fork		
Tack		
Umbrella & Parasol Furniture	12	11
Vice	49	32
Brass—		
Ammunition cases	1	2
Bedsteads		
Belt clasp	7	3
Coach beading	5	4
Candlestick	12	9
Coach handles	2	5
Cocks	29	35
Chandelier	40	51
Church Furniture	4	6
Clock movements		
Cornice pole	3	12
Curtain hook	0	10
Curtain ring	4	14

Door bolts		
Door handles		
Electrical bell & apparatus	2	7
Fog signal	1	1
Ferrule		
Gas burner	4	4
Gauge	6	13
Mathematical inst.	10	10
Military ornament	12	15
Paper fasteners		
Roasting jack	7	2
Stair rod (case)	6	7
Theatrical jewellery	0	1
Thimble	13	12
Watches (29 branches)	496	790
Tin Plate—		
Coffin Furniture	17	14
Dish Covers	1	7
Grocers' Canisters	2	2
Lamps		
Baths		
Cooking Utensils		
Candlesticks		
Tin Alloys, hard and soft—		
Beer Engine	19	10
Bells	10	17
Dram Flask		
Medals		
Measures, Tankards		
Composition Pipe		
Stencil Plates		

Tea Pots		
Cream Jugs, &c.		
Britannia Metal Ware Manufacturers	20	13
German Silver—		
Cruet Frames		
Tea Pots		
Spoons, &c.		
Electro-plated Ware & Electro-platers & Gilders	110	215
Dessert Knife & Fork		

Implements and Tools used in Manufactures.

Awl Blade, Auger, Anvil, Brace and Bit, Bookbinders' Tools, Bellows, Bullet Mould, Brushes, Coach Wrench, File Cutter, Glaziers' Diamond, Gun Implements, Hammer, Hoe, Iron Ladle, Last and Boot Tree, Nails, Rivet, Saw, Screw, Tack, Gimp Pin, &c., Vice, Press Tools, Punches.

Dependent Manufactures and Processes.

A.—Non-Metal.

Box Makers (Wood), Box Makers (Paper), Brick (Fire), Bookbinding, Casting Pot and Crucible, Emery and Glass Cloth Paper, Embossed Paper, Engravers (Block), Felt, Glass Mould, Jewellery Case, Lamp Wick, Lithography, Printing, Pitch Paper, Pearl Workers, Rouge, Rope and Twine, Sealing Wax, Tortoise Shell Workers.

Dependent Manufactures and Processes.

B.—Metal.

Assayers, Bronze Powder, and Gold and Silver Leaf, Die Sinkers, Iron and Steel Hoop, Letter Cutters, Music Smith, Rollers, Refiners, Sweep Smelters, Water Tuyere Iron Manufacturers, Weavers' Mail.

Processes carried on for the Trade.

Brass Polishers, Buckle Plater, Chasers, China Decorators, Coach Painters, Dippers and Silverers, Diamond Cutter, Engravers and Woodcutters, Enamellers, Electrotypers, Electro-platers, Engine Turners, Galvanisers, Glass Quicker, Glass Painters, Glass Grinders, Glass Benders, Glass Cutters, Harness Platers, Iron Planers, Iron Casters, Iron Braziers, Jewellers' Stampers, Jewellers' Glass Cutter, Lapidaries, Metal Spinners, Metal Perforators, Metal Fluters, Machine Rulers, Magic Lantern Slide Painter, Stereotypers.

Dealers and Merchants.

Asbestos, Carozo Nut, Cotton Waste, Copper and Metal, Grindstone, Iron, Salt.

Variety of Materials used in the Manufactures.

It may be expected that in a variety of manufactures, such as those just given, numerous materials would be required. In order to ascertain as far as possible what materials are used in the town, circulars were sent out to many firms, and from information supplied, in reply to these circulars and from other sources, the following list has been

prepared.

STATEMENT OF MATERIALS USED IN THE MANUFACTURES OF BIRMINGHAM AND THE DISTRICT.

NOTE.—After the name of the material, which is printed in small capitals, is given in ordinary type the trades, or a few typical ones, in which the material is used.

ORES.

ANTIMONY.—Nickel and cobalt refining.

BROWN IRON ORE.—Gas works.

COPPER PYRITES—(SPANISH ORE).—Copper extraction and refining, sulphuric acid works.

COBALT AND NICKEL.—Nickel and Cobalt refining.

HÆMATITE.—Iron smelting, nickel and cobalt refining, malleable iron casting, polishing works.

GALENA.—Refining lead slags and products.

IRON PYRITES.—Sulphuric acid manufacture.

MANGANESE OXIDE.—Weldon's process for chlorine.

TIN ORE.—Nickel and cobalt refining, bedstead manufacture, tin plate works.

METALS.

ANTIMONY.—Britannia metal works, pewter working, stereotyping, engineers' brassfounding.

ALUMINIUM.—Aluminium bronze, metal beating, pen and pencil case, gauge making, sewing machine.

BISMUTH.—Engineers' brassfoundry, solder making.

COPPER.—Alloy makers, coppersmiths, copper and brass tube works, gas fitting, railway carriage works, brass founding, stereotyping, nail making, gun making, roast jack, clocks, electro works, jewellers, mathematical instrument makers.

GOLD.—Jewellery, gilt toy, thimble making, brassfounding, chains, spectacles, watch chains and cases, electro-plate, gun making, swords, pens.

IRON and STEEL.—All trades.

LEAD.—Chemical manufactures, alloy makers, pewter and Britannia metal, nickel and cobalt refining, electro-plate, whip, pen, nail, stereotyping, india rubber stamps, railway carriage, gun, brassfounding, thimble, ship's log.

MAGNESIUM.—Mathematical instrument.

NICKEL.—Electro-plate, pen and pencil, stereotyping, whip button, needle, sword, photo-frames, fire-irons, tin plate, sewing machine, coach furniture and harness, bicycle, steam gauge.

PLATINUM.—Mathematical instrument, nickel and cobalt refining, photo-frames, electro-plate, wedding ring, thimble, brassfounding.

IRIDIUM and PALLADIUM.—Pen and pencil.

QUICKSILVER.—Optical instrument, nickel and cobalt refining, stereotyping, thimble and whip, gauge, electro-plate, art metal, clock.

SILVER.—Silversmith, jewellery, carriage furniture, whip mounts, sword, electro-plate, hook and eye, mathematical instrument, gun, silver plating, button, stereotyping, spectacles, chains, bedstead, thimbles.

TIN.—Cocoa, stereotyping, whip, rolled metals, toilet pin, nail, needle, railway carriage, mathematical instrument, tool making, gas meters, roasting jack, engineers' brassfounding, axle boxes, clock, bedstead, thimble, gauge, electro-plate, brassfounding, wholesale boot and shoe.

TIN PLATE.—Various branches of the tin plate trade, ship's log, steam gauge, art metal, nickel and cobalt refining, button, cocoa, printing, electro-plate, needle.

ZINC and SPELTER.—Brass and alloy makers, yellow and sheathing metal, thimble, whip, art metal, galvanising, copper extraction, button, stereotyping, alkali, electro-plate, nail, watch chain.

NOTE.—The applications of the compound metals or alloys, such as BRASS, BRITANNIA METAL, BELL METAL, GERMAN SILVER, GUN METAL, PHOSPHOR TIN, FERRO-MANGANESE, HARD AND SOFT SOLDERS, and others, are not given for want of space. The most important trades consuming metal in the form of leaf and powder—GOLD LEAF, SILVER LEAF and BRONZES—are bedstead manufacturing, picture frame making, japanning, lithography, art metal work (planishing.)

ACIDS.

ACETIC (VINEGAR).—Gelatine manufacture, button, lithography, whip, sword, art metal, gas fitting, bedsteads.

BORACIC.—German silver, electro-deposition.

CARBOLIC.—Gelatine, soap, ammunition works.

CITRIC.—Lithography, art metal.

HYDROFLUORIC.—Glass, gas fitting, nickel and cobalt works, button making, railway carriage.

HYDROCHLORIC (MURIATIC or SPIRITS of SALT).—Metal trades generally, gas manufacture, gelatine, printing, chemical trades, railway carriage.

HYDROCYANIC.—Button, pen and penholder, electro-plate.

NITRIC (AQUA FORTIS).—Metal trades generally, especially brass, gelatine, button, whip, sword, gun, hook and eye.

OXALIC.—Tin plate, art metal work, button, tool making, whip, pen and penholders, wholesale boot and shoe trade.

PYROGALLIC.—Gas manufacture, art metal.

SULPHURIC (OIL OF VITRIOL).—Iron wire, nails, bedsteads, button, pen, gelatine, chemical trades, soap, hook and eye, tin plate, brass trades, gun, whip, sword.

TARTARIC.—Gelatine, nickel and cobalt, art metal.

CHEMICALS.

AMMONIA and AMMONIUM SALTS.—Gas manufacture, brass trades generally, galvanising, buttons, tin plate, printing and lithography, nails, paper.

ARSENIOUS ANHYDRIDE or WHITE ARSENIC.—Brass founding, chandelier, electro-plate, buttons.

ALUM.—Gelatine, paper, rolled metal, buttons, wholesale boot and shoe.

BORAX.—Metal trades generally, jewellers, gelatine.

COPPER SULPHATE or BLUE STONE.—Iron wire, electro-plate, buttons, fibre dressing, printing.

GLYCERINE.—Gas fittings, soap, printing.

IODINE.—Copper extraction.

IRON SULPHATE or COPPERAS.—Buttons, fibre dressing, brass founding, emery paper, wholesale boot and shoe, rouge manufacture.

LEAD ACETATE (SUGAR OF LEAD).—Gelatine, buttons, tin plate works, oil and colour works.

MERCURIC CHLORIDE (CORROSIVE SUBLIMATE).—Buttons, jewellery, optical instruments, gold beating.

NICKEL SULPHATE.—Trades in which nickel plating is used, bicycles, sewing machines, bridle bit, &c.

POTASSIUM SALTS (CAUSTIC POTASH, CYANIDE, CARBONATE, SAL ENIXUM, FERROCYANIDE, FERRIDCYANIDE, PERMANGANATE, BICHROMATE, CHLORATE, ARGOL or TARTAR).—Brass founding, electro-plate, bedstead, jewellery, gelatine, glass, buttons, soap, whip, tin plate.

PLATINUM CHLORIDE.—Electro-plate, buttons, optical instruments.

SODIUM SALTS (CAUSTIC SODA, CARBONATE, BROWN ASH, ACETATE, SALT, SULPHATE).—Brass founding, jewellery, alloys, electro-plate, fibre dressing, tin plate, soap.

SULPHUR.—Chemical works, rolled metal works, sword, tin plate.

ZINC SALTS (CHLORIDE, SULPHATE).—Gelatine, buttons, printing.

PIGMENTS.

BRUNSWICK GREEN, CARMINE, CHROME YELLOW,

COBALT, GAMBOGE, INDIAN RED, INDIGO, IVORY BLACK, LAMP BLACK, OCHRE, ORANGE CHROME, ORPIMENT, PRUSSIAN BLUE, RED LEAD, SCHEELE'S GREEN, SMALTS, UMBER, ULTRAMARINE, VERDIGRIS, VERMILION, YELLOW OCHRE, ZAFFRE, ZINC WHITE, WHITE LEAD.—(Red and white lead are used for lutes as well as for pigments, red lead too is largely consumed in the manufacture of flint glass). Brass founding, tin plate works, japanning, bedsteads, lithography, brush works, coach and carriage works, buttons, ammunition works, cycles, art metal work.

STONES.

QUARRY STONES, LIMESTONE, BILSTON and DERBY (GRIND) STONES, LITHOGRAPHIC STONE, WHETSTONE, RAGSTONE, WATER OF AYR STONE, TURKEY STONE, ARKANSAS.—Iron smelting, chemical works, nickel and cobalt refining, sword, edge tool, and tool grinding generally, printing and lithography, tin plate, brass founding, gun, button, sword, art metal, electro-plate.

APATITE, SOMBRERITE, and NATIVE PHOSPHATES. —Phosphorus manufacture.

FLUR SPAR.—Alloys, engineers' brass foundry, roasting jack, hydrofluoric acid manufacture.

MICA.—Gas fitting, stove makers, brass founding, ship's log, optical instrument.

FELSPAR.—Pottery, art metal.

ROCK CRYSTAL.—Spectacle manufacture, art metal, electrical apparatus, optical instrument.

AGATE, BLOODSTONE, HÆMATITE.—As burnishers in many trades.

DIAMOND BORT.—Diamond cutting, lapidary work, spectacle manufacture, railway carriage.

DIAMOND.—Jewellery, glaziers' diamond manufacture.

AMBER, AMETHYST, CROCIDOLITE, GARNET, OPAL RUBY, SAPPHIRE, CARNELIAN, TOPAZ, &C.—Cut stones in jewellery, lapidary work, watch and clock manufacture, art metal work, electro-plate, whip, fine wire drawing.

GUMS.

ARABIC.—Brass founding, printing and lithography, optical instrument, electro-plate, pen, whip, light metal trades, wholesale boot and shoe.

BENZOIN.—Wire mattress, railway carriage.

COPAL.—Button, printing and lithography, electro-plate, needles, optical instruments.

DAMAR.—Button, optical instruments.

DEXTRINE.—Printing and lithography, pen and penholders, optical instrument, thimble.

GUTTA PERCHA.—Electro-plate, brass founding, railway carriage, printing and lithography, rolled light brass metal work, needle, thimble, wholesale boot and shoe.

INDIA RUBBER.—Vulcanised India rubber works.

MASTIC.—Buttons, printing and lithography, tin plate.

SANDARAC.—Buttons, printing.

SHELL-LAC.—Lacquer manufacture, brass founding, light metal work, railway carriage, pen and penholder, whip, button, printing and lithography,

sword, optical instrument, roasting jack, thimble, electro-plate.

TRAGACANTH.—Printing and lithography, wholesale boot and shoe trade.

OILS, VARNISHES, &c.

ANIMAL OILS (LARD, NEAT'S FOOT, SPERM, SEAL, WHALE, TALLOW, TRAIN).—Rolled metal, electro-plate, buttons, pen and penholder, nails, fire irons, bedstead, wedding ring, brass founding, gas manufacture, printing and lithography, optical instrument, alloy making, railway carriage, engineers' brass founding, soap, wholesale boot and shoe.

VEGETABLE OILS (COLZA, COCA NUT, LINSEED, RAPE, OLIVE, PALM, PINE).—Gas manufacture, fibre and brass dressing, printing and lithography, electro-plate, rolled metal, tin plate, carriage furniture, optical instrument, soap, paper, button, alkali works, iron wire, bedstead.

MINERAL OILS (PETROLEUM, PETROLINE, COAL SHALE).—Fibre dressing, brass founding, gas manufacture, spectacles, lapidaries' work, lithography and printing, railway carriage.

BENZOLINE, BISULPHIDE OF CARBON, COAL NAPHTHA, ETHER, METHYLATED SPIRIT, SPIRITS OF WINE, TAR SPIRITS, TURPENTINE, TEREBINE, WOOD NAPHTHA.—Papier mâché, japanning, lacquer, printing and lithography, electro-plate, button, thimble, cycle, whip, soap, brassfounding, railway carriage, bottle jack, optical instrument.

ASPHALTUM, BITUMEN, GOLD SIZE.—Printing and lithography, tin plate, papier mâché, bedstead,

picture frame, ornamental glass, brassfounding, art metal.

PITCH, RESIN.—Soap, electro-plate, tin-plate, bedstead, carriage furniture, printing and lithography, thimble, paper, brassfounding, wholesale boot and shoe trade.

VARNISHES (COPAL, MASTIC, JAPAN, PONTYPOOL).—30 or 40 varieties are known in the trade, the names often implying the purpose for which the varnish is used as coach-body varnish, oak varnish, undercoating, finishing, &c. Coach and carriage works, house decoration, furniture, tin-plate, papier mâché, bedstead, coffin furniture, fog signal cases, iron hollow-ware, enamel leather.

LEATHERS AND FABRICS.

BASIL or SHEEP SKIN, BUFFALO, BULL NECK, CALF, CROCODILE, COW HIDE, DOG FISH, DONKEY, GNU, HORSE HIDE, KANGAROO, PIG SKIN, RUSSIAN, SKIVERS, CHAMOIS, or WASH LEATHER, SEA HORSE, or WALRUS, VELLUM.—Wholesale saddlery and leather trades generally, wholesale boot and shoe trade, polishing in the metal trades, parts of articles in the electro-plate, tin plate, whip, and many other trades.

BUCKRAM, CLOTH, FLANNEL, PLUSH, SATIN, SILK, VELVET.—Railway carriage works, tin plate, brassfounding, button, needle, optical instrument, cocoa, leather trades.

FELT.—Corrugated iron, brassfounding, light brass rolled metal works, railway carriage works, printing and lithography, electro-plate, art metal, optical instrument, glass polishing.

PAPER.—Paper box trade, papier mâché, wrapping up in all trades.

WOODS.

ASH, BAYWOOD, BEECH, BIRCH, ELM, FIR, MAPLE, OAK, PINE, TEAK.—One or more of them used in most trades, railway carriage, cabinet, tin plate, brass founding, edge tools, clog, electro-plate.

BEEF WOOD.—Gun trade, ramrod.

BLACKTHORN.—Whip.

BOXWOOD.—Used in metal trades, generally for chocks.

CEDAR.—Railway carriage, cabinet, pen and penholder, needle, art metal, optical instrument.

COCUS WOOD.—Optical instrument.

EBONY.—Gun, gas fitting, brass founding, button, electro-plate, tool, art metal, railway carriage.

HICKORY.—Whip, rolled metal, needle, ferrule, railway carriage.

HOLLY.—Tool, whip.

HOLDER WOOD.—Clog.

LANCEWOOD, PARTRIDGE WOOD, SATIN WOOD, SNAKE WOOD.—Gun, clog, whip, needle, pen and penholder, brass founding, optical instrument.

LIGNUM VITÆ.—Button, whip, brass founding, art metal, rolled metal, tool, corkscrew.

MALACCA CANE.—Gold beating.

MAPLE.—Gun, railway carriage, cycle and sewing machine, brass founding.

PEACH.—Electro-plate.

PEAR.—Coal mining, glass, printing and lithography.

ROSEWOOD.—Gun, railway carriage, cabinet, printing and lithography, pen and penholder, electro-plate, tool.

SYCAMORE.—Railway carriage, electro-plate, printing and lithography, art metal.

TULIP.—Art metal.

WALNUT.—Gun, electro-plate, brass founding, railway carriage, cabinet, pen and penholder, art metal, matchet.

YEW.—Whip.

ZEBRA.—Button, electro-plate, pen and penholder, optical instrument.

DYE STUFFS.

ANILINE COLOURS, ALKANET, ARCHIL, BURWOOD, CUDBEAR, CATECHU, DIVI DIVI, DRAGON'S BLOOD, FUSTIC, INDIGO, GALL NUTS, LOGWOOD, MYRABOLANS, RED SANDERS, SHUMAC, TURMERIC. —Furniture and cabinet works, button, railway carriage, fibre and bass dressing, art metal, whip, paper, printing and lithography, matchet, wholesale boot and shoe trade.

NOT CLASSED.

ASBESTOS.—Gas fitting, paper, railway carriage, printing and lithography, electro-plate, tin plate.

BONES AND BONE WASTE.—Glue, buttons, electro-

plate, light brass rolled metal works, carriage furniture.

BEESWAX, PARAffiN WAX.—Brass founding, alloy, whip, bedstead, electro-plate, printing and lithography, light brass rolled metal works, optical instrument.

BURDOCK, KECK, ELDER PITH.—Watch Finishing.

BATH BRICK.—Gas fitting, whip, light brass rolled metal works, ships' log, optical instrument, railway carriage.

BLACK LEAD.—Black lead works, gas fitting, railway carriage, electro-plate, tin plate, nails, whip, buttons.

CHALK, WHITENING, FRENCH CHALK.—Gas fitting, brass founding, electro-plate, printing and lithography, sword, railway carriage, tin plate, fibre dressing, buttons, pen and penholder.

COAL TAR, CREOSOTE.—Tar distilling, railway carriage, soap, electro-plate, light brass rolled metal works.

CATGUT.—Bands for lathes in nearly all trades.

CAMEL HAIR, SABLE HAIR.—Railway carriage, electro-plate, watch chain, brass founding, art metal, optical instrument.

COTTON WASTE.—In nearly all the metal trades.

COTTON WOOL AND WADDING.—For storing and packing in jewellery and other trades.

COTTON, THREAD, TAPE.—Nearly all trades.

CUTTLE FISH.—Printing and lithography, jewellery.

CROCUS, COLCOTHAR, ROUGE.—Brassfounding, gas fitting, bedstead, electro-plate, tin plate, jewellery, glass grinding, and polishing.

CHARCOAL.—brassfounding, gas fitting, bedstead, electro-plate alloy, wedding ring, nails.

CHINA CLAY.—Porcelain (Worcester), paper, engineers' brassfounding.

COCOA (THEOBROMA CACAO).—Cocoa and chocolate manufacture.

EGGS.—Printing and lithography, photographic frame and cabinet work.

EMERY.—For grinding and polishing in all the metal trades, glass grinding, lapidary work, wholesale boot and shoe trade.

FLOUR.—Tin plate, brassfounding, alloys, railway carriage, printing and lithography, bedstead, nails, papier mâché, paper box, pocket book, wholesale boot and shoe trade.

FLAX.—Whip Manufacture.

FLOCK, FEATHERS.—Upholstery and bedding manufacture, artificial fly.

FIRE CLAY.—Furnaces in all manufactures.

FULLER'S EARTH.—Pin, cycle and sewing machine.

FLINTS.—African gun trade, nickel and cobalt, chemical works.

FOUNDERS' DUST.—For casting, metal trades generally.

GALL NUTS.—Ink, brassfounding.

[44]GYPSUM AND PLASTER OF PARIS.—Gold beating, paper, gas manufacture, railway carriage,

printing and lithography, whip, brassfounding, nails.

GAS CARBON.—Electrical apparatus makers, ship's log, thimble, whip, art metal, optical instruments.

GELATINE AND GLUE.—In nearly all trades.

GANNISTER.—Alloys, rolled metals, iron and steel works, brassfounding.

GOLD BEATERS' SKIN.—Gold beating, electro-plate.

HARES' FEET.—Gold beating, watch chain, whip, tool, thimble, printing and lithography.

HEMP, HURDS, TOW.—Rope and twine, alloy, electro-plate, carriage furniture, tin plate, brassfounding, gas fitting, railway carriage, anchor, sword, thimble.

HONEY.—Bronze powder, cocoa and chocolate.

HORSE HAIR.—Railway carriage, whip, fishing tackle, upholstery and bedding.

IVORY.—Bone and ivory and billiard ball turners, electro-plate, optical instrument.

IRISH MOSS, TANNATE OF SODA.—Used generally to prevent scaling in steam boilers.

JUTE, KITTOOL FIBRE.—Paper, glue, fibre, dressing, electro-plate.

LIVER OF SULPHUR.—For bronzing in various metal trades.

LIME.—Building, paper, glue, chemical works, iron wire, brassfounding, electro-plate, printing and lithography, railway carriage.

MARINE GLUE.—Alloys, railway carriage, rolled light metal, optical instrument.

NUTS (BETEL, COQUILLA, CAROZO).—Buttons.

OILSTONE DUST.—Gun, clock, watch finishing.

PARAFFIN WAX.—Railway carriage works, axle box, rolled light metal works.

POLISHING THREAD.—Watch chain, spectacle, cycle and sewing machine.

PUMICE STONE.—Grinding and polishing in most metal trades, printing and lithography, papier mâché.

PEARL SHELL.—Pearl workers, papier mâché, bedstead, electro-plate, optical instrument.

PUTTY POWDER.—Lapidary, electro-plate, diesinking, needles, whip, sword, thimble.

QUILLS.—Whip, fishing tackle.

ROTTENSTONE.—For polishing in the metal trades, papier mâché, pearl work.

SAND (FONTAINBLEAU, TRENT, SILVER, LOAM, CORE, &C).—Glass manufacture, glass grinding, moulding in the metal trades, for sand blast in the electro-plate trade.

SANDIFER or GLASS GALL.—Jewellery, electro-plate, watch chain.

SAWDUST.—Gas manufacture, brass founding and brass trades generally, railway carriage, printing and lithography.

SEALING WAX.—For parcelling in nearly all trades.

SILK.—Railway carriage, button, tin plate, printing and lithography, needles and fish hook.

SIZE.—Railway carriage, printing and lithography, tin plate, optical instrument, house decoration, electro-gilding.

SLATE AND SLATE PENCIL.—Jewellery, railway carriage, printing and lithography, electro-plate, tin plate.

SLAG WOOL.—Gas fittings, engineers' brass founding.

SOAP.—Nearly all trades.

SPONGE.—Tin plate, art metal, rolled light brass trade, whip, electro-plate, printing and lithography.

STALE BEER.—Electro-plating and gilding, wire working.

SUGAR.—Cocoa, electro-plate, tin plate, ships' log, printing and lithography.

STRAW or HAY.—Bedding, packing in nearly all trades.

SWAN'S DOWN.—Electro-plate, bridle bit, tin plate.

TORTOISE SHELL.—Tortoise shell workers, button.

VULCANITE.—Button, ammunition, railway carriage.

WHALEBONE.—Whip manufacture.

WOOL.—Railway carriage, felt, printing and lithography, bedding, needles, optical instrument.

In reference to some materials, Mr. Arthur Robottom, who has introduced a variety of new products for use in Birmingham sends me the following notes: *Cryolite* from Greenland, is used in making glass globes for the electric light. *Nitrate of soda*, from Chili.—Mr. W. R. Lloyd, merchant, Newhall Street, sold the first small lot to W. C. Alston, about 50 years ago; since then I have sold large quantities to the manufacturers of nitric acid. *Lard oil* was first used in Birmingham. *Carnubia wax*

(Brazil) was first used in Birmingham for wax tapers. *Mica.*—The first import of large plates from India was sold to Griffiths and Browett for lanterns to be used in powder magazines. *Istle or Mexican Fibre.*—The first bale was sold by me to Mrs. Grew, of Church street, and used for brush making. *Kourie Gum*, from New Zealand, first used in Birmingham by Barratt, Postans and others for varnish making. *Cow Hair* from River Plate used for circular brushes in glass cutting. *Carozo nuts* or *Vegetable Ivory*.—The first arrivals from Venezuela were sold to Mr. Burgiss, of Great Charles Street, for toys; afterwards some were obtained by Mr. Bricknall, button maker, who first made buttons from this material. Subsequently the late Mr. J. S. Wright, then a clerk with Smith and Kemp, took up the material, and it soon became generally used. Now some thousands of tons are consumed every year for this purpose. *Piassava.*—"I sold the first small lot to Richard Deen, and got him to retail it to Irishmen living in London Prentice street and neighbourhood, to make into bass brooms for hawking. At the present time some 200 tons per week of this material is made up into brooms. *Gum Animi*, largely used in Birmingham for varnish. *Button Lac* was first used in Birmingham by Joseph Shorthouse, Market Street, who had the first five cases from Calcutta, for the manufacture of lacquer. *Kiltool*, from Ceylon. The first shipment came to me, I put it aside in some stables at my house in the Coventry Road, intending to sell it for putting under ripe strawberries, but by accident I found out that by putting it into hot oil it took a beautiful black colour. Upon this Mr. Lovedee, of Bartholomew Street, at my suggestion, dressed and prepared the material for the brush trade. It is now used in great quantities." *Lemon*, *Orange*, and *Citron*

Peel.—Large quantities sent to Birmingham to be candied at Mr. Pattison's works, Spring Hill. They are imported from Sicily.

The reader having now some idea of the materials entering our district, let us see generally, though in mere outline, how these materials are worked up in the metal trades.

ORES.—The only ores smelted in our district on a large scale are iron and nickel and cobalt. Small quantities of galena and copper pyrites are used. Spanish ore, an iron pyrites containing two or three per cent. of copper, has the sulphur burnt off in the chemical works, and the copper is subsequently precipitated and refined.

METALS AND ALLOYS.—Iron and steel are now extensively produced from cast iron in our district by the modern methods as well as by the older ones of puddling in the case of iron, and cementing in the case of steel. The basic Bessemer process has been adopted on a large scale by Mr. A. Hickman, of the Spring Vale Furnaces, Bilston. Three converters are used, one lined in the ordinary manner (gannister), the other two with a paste made of dolomite (magnesian limestone) and tar, the process of conversion being commenced in the first named converter, and finished in the others. At the same works are modern type blast furnaces in which the waste gases are utilised for heating the blast on the regenerative principle, two stoves being those of Mr. Cowper's system, while there are three new ones invented by Ford and Moncan. Messrs. Hatton and Sons of Bilston, adopt a fixed Bessemer converter in which blast of low pressure can be used. At the same works the Wilson gas producer is used for re-heating furnaces, and an arrangement on the Ponsard

principle is adopted for raising the temperature of the air used in the combustion of the gas. Mr. Smith-Casson has in use at the Round Oak Works a novel gas furnace of his invention. At the Patent Shaft and Axle Tree Works a modification of the (Siemens) open hearth furnace (an improvement by Dick and Riley) is being used.[45] At Messrs. Cox Brothers and Holland, Alcester Street, crucible steel is made. The cementing process is carried on at the Brades Steel Works, Oldbury.

COPPER.—The crude copper known as Chili bars and precipitated copper from chemical works, where the sulphur of the ore has been previously utilized, are refined extensively in the neighbourhood of Birmingham.

LEAD.—Lead refuse of various kinds, together with galena, is treated at one small works in the town.

ALLOYS.—In most cases manufacturers mix their own metals. However, brass, German-silver, and other alloys are extensively manufactured for the trade.

The metal or alloy having been made, is subject to various general processes, either as preliminary to manufacture, or in the course of manufacture, of which the following are the principal:—

CASTING.—From a drawing the pattern is made in wood—⅛ of an inch to the foot longer in case of cast-iron, and $^{3}/_{16}$ do. in case of brass to allow for shrinking. The pattern is laid in sand, often contained in a casting frame, which, from its plasticity, non-fusibility, and other properties lends itself admirably for mould making. The mould is dusted over with charcoal, or with a mixture known as founders' dust, and the casting then made by

pouring metal in. With small articles in brass, metal patterns are used. For gold articles, such as wedding rings, an iron frame is used, filled with the finest red sand. For small gold work, the cuttle fish bone is used as a mould, the pattern being pressed in the same manner as in sand.[46] A special feature in the process of casting in our district is the production of "chilled" castings for rolls. The mould for the barrel part of the roll is a heavy cylindrical casting of iron truly bored out to a size sufficient to allow of the roll being turned to the required size. The molten iron is run into the mould sidelong, and from the bottom, so as to give the metal a rotatory motion. This rotatory motion causes the dust and slag to keep in the centre, leaving a pure metal in contact with the mould. This metal chilled by contact with the massive metal mould, produces the hard and close texture required.[47]

Keys, stirrups, hob nails, and many small articles are produced by casting, the casting being afterwards rendered malleable by the process of cementation, which consists in packing the articles in an iron box with powdered hæmatite, and heating from three to seven days. Iron castings are also annealed by packing with cinders in a box, which is then heated for some time, as with the malleable cast iron.

ROLLING, WIRE AND TUBE DRAWING.—Iron, brass, steel, and German silver are used up in the form of sheet, wire, and tube. With large firms producing finished articles, these processes are done on the premises, but there are several works devoted to the production of sheet metal, wire, or tube only, and rolling for the trade. In the jewellers' district, the cast ingots of the precious metals are taken to rolling mills in the neighbourhood to be rolled down to the

required degree of fineness. For some articles, such as spoons, where a blank is required of varying thickness, strips of metal are thinned in parts by what is known as “cross rolling,” the rolls being exposed at one end, so that a strip of metal may be passed through, which is thus thinned down at one end.

Tube drawing is effected by cutting a strip of metal which is then passed through rolls to give it a gutter form. One end of the gutter is now beaten up to form a tang that can be gripped by the tongs of the draw bench, and the gutter is pulled through a conical hole which roughly forms the tube. The open seam of the tube is now brazed, and after cleaning, this roughly formed tube is slipped over a steel rod or mandril. Both mandril and tube are drawn through a smooth circular hole when a smooth uniform tube is formed. Fluted taper tubes are made as described at (B. p. 324[48]) by means of “tins,” but a novel method is now adopted for smooth taper tubes. A wedge-shaped piece of metal is roughly made into a conical tube which is put on a taper mandril revolving in a lathe. A flat steel burnisher is pressed on to the tube as it revolves pressing the metal to take the shape of the mandril. Twisted tubes are produced by drawing the tube through a revolving nut (B. p. 325[48]), embossed or ornamented tubes by drawing a plain tube through a die, composed of a series, four say, of small wheels or pulleys on the edge of each wheel being impressed the desired pattern. As the tube is drawn through the die, the wheels turn and impress on the tube the pattern they carry on their surface. As stated (B. p. 326[48]), the invention is due to Mr. Fearn. It should, however, be mentioned that the process failed in his hands, but was subsequently taken up by Messrs. Winfield and

Co., who, with the help of their engineer, Mr. Thomas Preston, brought the process to perfection.

PRESS TOOL WORK.—The next general process in the manufacture of many metallic articles is cutting out a blank into the requisite shape. This is done by what is called a press tool consisting of two parts; one a firm block of steel, in which is an aperture, circular, oval, or whatever shape may be desired, and the other a punch of corresponding shape, a piece of metal being placed over the aperture, the punch is forced down by a screw of high pitch on to the metal, when a blank is cut out at one blow, and falls into a pan placed to receive it.[49]

STAMPING.—Used for hollowing blanks in a number of trades. The blank cut by hand or tool is placed on a mould or die, and a heavy weight, carrying on its lower surface the counterpart of the mould, working in guides so as to fall true, can be lifted up and allowed to fall on the blank until the metal is forced into the shape of the mould. As the metal hardens by successive blows, the blanks are annealed (that is heated and allowed to cool) as often as may be found necessary.

The weight which gives the blow is supported by a strap passing over a wheel in constant motion. So long as the strap hangs loosely over the wheel, the friction of the moving wheel is insufficient to lift the weight, but immediately the workman makes the strap taut, the weight is carried up and is let fall by the workman releasing his hold on the strap.

SHAPING.—Thin metal is shaped by pressure applied by means of a screw press, the metal being placed between a die or mould and its counterpart.

AUTOMATIC MACHINERY.—A number of articles

produced from wire, such as pins, nails, hooks and eyes, hair pins, etc., are made completely by automatic machinery, the wire being wound off a reel at one end of the machine and transformed into the various articles as it passes along until it comes out at the other end of the machine, a finished or nearly finished article.

AUTOMATIC TURNING AND SHAPING.—Gun stocks, boot lasts, tool handles and other similar articles are automatically turned. With a gun stock for example, the rough form cut from a plank is put in a lathe, above is placed a steel model or dummy of the form required to be turned, the model and the wooden blank are made to revolve at precisely the same speed, and a rotating cutter travels slowly along from one end of the blank to the other, the movement of the cutter inwards or outwards being regulated by the dummy. The wooden blank having been put in the lathes, the cutting is started, and it then goes on until finished, when the lathe stops automatically. The shaping of gun locks and many other parts of the gun is effected by causing a revolving cutter to be moved over a fixed steel model or dummy, the cutter thus shapes the blank to a fac-simile of the pattern or dummy.[50]

SPINNING.—Tea pot bodies and a variety of articles in Britannia metal are “spun.” A piece of wood 4 or 5 inches in diameter is attached to the lathe head, and in this a hollow corresponding to the bottom of the tea pot is turned. A sheet of metal of a foot or so diameter is now put against the wood and pressed into the hollow by a wooden cylindrical mould with a round base which corresponds to the concavity. The disc is rotated very rapidly and the workman presses the soft metal over the mould so as

to form a vessel in shape somewhat resembling a coffee cup with upright sides, the cylindrical mould is taken out and replaced by a disc of wood in two halves, held in place by a spindle from the back centre of the lathe. The metal cylinder is now gradually closed in until the opening is reduced to the required size, when the body is complete. The spindle is withdrawn and the divided disc of wood easily shakes out.

DRAWING THROUGH.—Umbrella ferrules, pencil cases, cartridge cases, and a variety of articles are made by "drawing through." The finest example of this process is seen in the manufacture of a metallic cartridge case, such as is used in the new Enfield-Martini rifle. I am indebted to Mr. T. R. Bayliss, Managing Director of the Birmingham Small Arms and Metal Company, for the following particulars. The brass is rolled to the required thickness.[51] It is then passed into a machine which forms it into a shallow cup. This machine consists of a tubular punch which cuts out a disc of 1.25 inch diameter, immediately upon which a solid plug passing through the tubular punch, presses the disc through a steel ring, so that it falls to the ground as a shallow brass cup. Three of these are produced by one blow of the press. The cups are heated in a muffle to a red heat, then dipped in dilute sulphuric acid to remove scale, washed, coated with soap and oil, and then passed through a second machine in which a slightly narrower punch forces the cup through a slightly narrower ring, and thus the cup, while retaining the same thickness at the bottom, is made slightly narrower and much deeper. Repetitions of the process (six altogether) produce a case rather more than half-an-inch wide and three inches long, which, when cut off to proper length, indented at the

bottom for reception of the cap, and some other finishing processes gone through, is ready for the charge of powder. The process is applied to small articles like pencil cases, and at the Small Arms and Metal Company to cases as large as 5·20 inch diameter and 15 inch long.

SOLDERING.—Hard soldering or brazing consists in fusing an alloy of high melting point between two junctions of the metal to be soldered so as firmly to connect them. The solder in fine powder is mixed with powdered borax, and made into a puddle with water, and then spread about the parts to be soldered together. The article is now heated by fire or gas, and the moment when the solder runs, is carefully watched. Gold and silver soldering used in the jewellery trades is on a small scale similar to brazing, the solder used is a gold or silver alloy of slightly lower melting point than the article to be soldered: the borax is commonly applied by previously rubbing down a crystal on a piece of slate and the white puddle thus obtained applied by means of a camel hair pencil to the junction on which the solder is placed. The article is supported on a piece of pumice stone and the necessary heat produced by the flame from a mouth blowpipe. In soft soldering an alloy of tin and lead is used, the melted alloy being spread by means of a "bit" or "doctor," consisting of a piece of copper attached to an iron rod set in a wooden handle. A flux called "monkey" or "spirit," consisting of muriatic acid with dissolved zinc, having previously been applied. Formerly resin was used as a flux, but this is now to a great extent superseded by the mixture just spoken of.

SCRATCH BRUSHING is used to produce a rich rough surface previous to gilding. Revolving brushes

of brass wire scratch the surface of the article which is kept well moistened with stale beer or with water to which size has been added.

Of late years the SAND BLAST has been introduced for roughing surfaces. Sand is fed into a powerful blast of air, and a fine frosted surface produced. If the article is protected in places by a mask of paper or soft metal cut out in any desired pattern, an ornamental pattern is produced requiring only a little chasing to finish it. The sand blast is used too in the production of an imitation of engraved glass, in embossing glass as a substitute for hydrofluoric acid, and for re-cutting old files.

DIPPING.—In order to clean brass articles, they are dipped into a mixture of nitric and sulphuric acids, the temperature and strength of acid determining whether the dipping is bright or dead. The bright articles are now finished by burnishing or polishing, and are then ready for

LACQUERING.—The articles are laid on an iron table heated to a temperature of about 230° F. by super-heated steam. When warm, the lacquer, which is a solution of shell-lac in spirits of wine, is brushed over, the spirit evaporates and leaves a protecting coating of gum.

GOLD CUTTING or LAPPING in jewellery consists in pressing articles against a rapidly revolving disc or "lap," composed of lead and tin, to the surface of which fine emery has been applied. The faces of the article which have thus been "cut" are subsequently polished on a "bob," that is on a wheel covered with leather on its edge or circumference.[52]

COLOURING in jewellery refers to a rich gold colour obtained on gold articles. The process at first

could be applied only to jewellery of high quality, but now 15 and 18 carat gold is coloured. The articles are heated to dull redness to destroy grease and dirt, then hung on platinum wires and immersed in a boiling mixture of salt, saltpetre, and muriatic acid and water. After drying out in sawdust they are scratch-brushed.[52]

There are many extremely interesting processes in the trades of our town besides those which apply exclusively to the metal trades, but for these I have no space. Those who wish for full information respecting the history, position, and general character of the Birmingham industries, must consult "Birmingham and the Midland Hardware District," edited by Mr. Sam. Timmins. This volume, which was published on the occasion of the visit of the British Association to the town in 1865, is exhaustive, describing the trades as they then existed. In order, however, to supplement Mr. Timmins' book, application has been made to various gentlemen who have been good enough to provide the following short notices (or the substance of them) of the various trades referred to at length in the volume. In addition there are some notices of industries which have been introduced since the year 1865.

SUPPLEMENTARY DETAILS OF BIRMINGHAM TRADE SINCE 1865.

Introductory Note.—The references to "Birmingham and the Midland Hardware District" volume are quoted as "B.," followed by a number indicating the page. Thus (B. 77) means, *See "Birmingham and the Midland Hardware District", page*

77. The trades are arranged alphabetically.

Assay Office of Birmingham.—[H. WESTWOOD]. —(B. 499). The assay marks continue to be so highly valued by the public that all goods are now sent to be assayed and marked except those of the commonest quality, and a few richly wrought articles that would be injured in the process.[53]

The statistics of the Assay Office form an index to the condition of the gold and silver trades of the town. The following tables are a continuation of those given by Mr. Ryland (B. 507).

WEIGHT OF GOLD AND SILVER WARES ASSAYED AND MARKED IN BIRMINGHAM.

Year ends June 24th	Gold. oz.	Silver. oz.
1865	30,733	99,688
1866	35,705	90,736
1867	34,114	83,501
1868	36,170	79,642
1869	47,694	87,027
1870	48,123	84,323
1871	58,323	81,248
1872	75,933	91,988
1873	98,134	106,415
1874	116,325	134,949
1875	113,642	141,123
1876	120,019	142,148
1877	114,772	163,047
1878	104,202	159,847
1879	87,042	166,469
1880	81,606	239,835

1881	70,466	331,209
1882	86,837	511,743
1883	91,053	851,957
1884	99,799	926,968
1885	97,618	888,391

Amount of Plate Duty Collected.

Year ends July 24th. Date.	Amount.
1865	£11,114
1866	11,493
1867	9,941
1868	9,761
1869	10,505
1870	10,767
1871	11,270
1872	12,603
1873	14,889
1874	17,898
1875	18,202
Year ends June 24th.	
1876	18,689
1877	19,053
1878	18,406
1879	15,752
1880	13,898
1881	15,141
1882	18,649
1883	19,663
1884	20,943

1885	20,221

NUMBER OF ASSAYS MADE IN BIRMINGHAM.

Date.	Number.
1843	1,685
1853	2,477
1863	6,823
1873	38,138
1883	101,012

Bedsteads, Iron and Brass.—[L. BRIERLEY.]—(B. 624.) In 1849 there were only about eight manufacturers of metallic bedsteads in Birmingham and the neighbourhood, whose united production probably reached 400 finished articles per week. In 1865 the number had increased to twenty, with a weekly output of about 5,000; the number of makers within a radius of fifteen miles is about forty, and the weekly production not far short of 20,000. As the number of manufacturers increased, and competition necessarily became keener, so improvements were continually being effected. The old imitation bamboo cane gave way to more artistic effects of colour. The pillars and rails were decorated with flowers and Dutch metal, or with gold—accomplished partly by hand, and partly by the process (long known in the potteries for ornamenting china ware) called transferring. This somewhat pronounced, if not "loud" style of decoration, though still in demand for foreign countries, has in its turn been replaced by plain polished surfaces, relieved at intervals with brass, nickel, or silver plated joints, and mountings. Prices range now (1886) from 5/- or 6/- for a plain

stump bedstead to £100 for electro-silver plated canopy or fore part constructed to suit Oriental taste. The United States now buys and also makes metallic bedsteads. Australia, New Zealand, the Cape, Mauritius, Canada, East and West Indies, the States of South America, Egypt, China, and to some extent, Japan, purchase.

About 500 persons are now employed in Birmingham and neighbourhood in the bedstead trade; the average earnings of men are about 23/- per week, and of women about 14/- per week.

Within the last ten years wire mattresses have been introduced. The price was formerly £4 to £5 for a mattress, according to width. Now a good one may be obtained at a price varying from 20/- to 40/-.

While Birmingham and the district is the principal seat of the bedstead trade there are extensive manufactories in London, Manchester, Glasgow, and Bristol. Metallic bedsteads are also made extensively in France, Spain, Italy, Germany, and of late years in the United States also. A great number are, however, still exported to Spain and America in spite of the native competition, and protective duties amounting to 45 per cent. Our trade with Spain is very much reduced of late years in consequence of England being denied the advantage of "the favoured nation" clause.

Block Paper and its Uses.—[J. B. GAUSBY.]—(B. 574.) Since the previous paper on this subject was written, there has been no alteration in the process of manufacture, nor has there been any marked development of the trade as a whole. The manufacture of panels of various thickness has increased in consequence of their adoption in the place of wood, where bending or exposure to varying

conditions of moisture are required. The great quantities of trays imported from Japan for some time checked the demand for moulded paper tray blanks, but the demand is now returning. Fashion has however dealt less kindly with the manufacture of slabs in blocks for the purpose of manufacturing artificial jet ornaments. This branch of the trade is entirely destroyed.

Boiler Plate and Gas Holders.—[W. S. SUTHERLAND.]—(B. 93.) In spite of heavy duties, boiler and gas apparatus are still exported. Within the last twenty years many types of tubular boilers have been introduced, but the one fluted or Cornish boiler, the simple egg-end, and the Lancashire and double boiler with cross tubes are most generally used. Mild steel has been introduced into boiler making and plate making during the last few years, though it is still a contested point whether it is superior to iron when all things are taken into consideration. It requires to have all rivet holes drilled, and it must be carefully annealed, though the writer is informed by Mr. Edwin Danks, of Oldbury, that steel makers often prefer to have their plates either worked cold or at a red heat, and not in the intermediate condition. Drilling machines especially designed are now used. Hydraulic machines of greatly improved construction have come into use for facilitating the operations in the boiler yard. These machines are portable, the water being supplied through a flexible tube. Improvements in the construction of the internal boiler flues have been made to enable them to resist increased pressure, and further to allow the expansion and contraction of the flue without injury. Of these improvements, the most noted are Fox's corrugated flues, the bowling ring, the flanged flue, and Arnold's flue.

An improvement introduced by the writer into boiler plate working, is the system of welding by gas, adopted in Birmingham by Messrs. Piggott, and by Messrs. Lloyd and Lloyd, for tubular and other work and applied by Mr. Puplett for welding plate sheets of steel only, 12 and 13 w.g. thick into ice moulds. It is found that the strength of the weld equals that of the solid plate, and the process is a cleanly and convenient one. Hemispherical sugar pans of 8 and 9 feet diameter without a joint are made by Messrs. Piggott, who use this process. *Gas Holders.*—Since 1865 much larger gas holders have been made. The two designed by Mr. Hunt, and recently erected at the Windsor Street Works, Birmingham, have each a capacity of 6,000,000 cubic feet, and are at the present time the largest in the world.

Brassfoundry.—(B. 225). No important changes have taken place in this trade since the last report was written. At Messrs. Winfield's and other makers, light and elegant "electroliers," for electric lighting, have been added to the usual run of work. A general cheapening of brass articles has resulted among other causes from the reduction in price of copper. In the table (B. 259) it will be seen that in 1855 copper was £126 a ton, the prices since 1865, when it was £92, have been—

	£
1866	88
1867	78
1868	76
1869	75
1870	70
1871	75

1872	96
1873	92
1874	87
1875	88
1876	82
1877	75
1878	67
1879	63
1880	67
1881	66
1882	72
1883	67
1884	59
1885	48

The increased imports from America account for the fall in price, the increase in Lake Superior copper alone being from 25,439 tons in 1882, to 35,000 in 1885.[54]

Button Trade.—[J. P. TURNER.]—(B. 432.) A fashion for covered buttons in various qualities of mohair or its imitations, in diagonal patterns, has prevailed at home and abroad for some years. These are largely made in Birmingham, but as many or more are imported from Germany, where the covering is *wholly* produced, and, further, a better finish to the buttons is obtained. *Vegetable Ivory or Carozo Nut Buttons.*—The Germans produce more beautiful designs and superior finish at the same prices, and the Birmingham markets are now almost annihilated. The foreign trade Birmingham once had is extinguished. *Pearl Buttons.*—Since 1865 a new supply of pearl shell has been obtained from various

parts of the coast round Australia, and this locality is our chief source of supply. It is worth £200 per ton for picked parcels, and about £150 per ton when delivered here. The best of this shell is equal or nearly so to the best Macassar shells. Panama shells are now found in but small quantities, and instead of only fetching £20 to £30 per ton, as quoted in 1865, they are now worth £50 to £70. *Glass Buttons.*—Some fancy glass buttons made in Birmingham are still unsurpassed in style, but the sale is a limited one. More than ever come from Bohemia, where they are better made than formerly, and equally low in price.

The button trade in Paris has had to yield to German competition equally with that in England. [55]

Cast Iron and Hollow Ware.—[W. KENRICK, M.P.]—(B. 103.) Since 1866 the increase in the trade is remarkable, and some important improvements have been introduced by which the public has obtained a very superior article, at a price quite as low, if not lower than before. Roughly speaking, the trade has doubled in twenty years. Enamelled iron ware has become better known and more appreciated. Ten firms are now engaged in this manufacture. Messrs. Baldwin, of Stourport, have introduced and patented a new process, whereby they claim the production of a better enamel at a lower price, owing to the use of a single coat. This variety is called mottled enamel ware.

Messrs. Kenrick were the first in the trade to introduce a cover stamped out of a single piece of metal without rivet or seam, and this was manufactured under a patent taken out by Mr. Ryland in 1868. Since then the adoption of a solid cover has extended generally throughout the trade.

By another patent, the firm fixed the tubular handle to the saucepan by means of a socket in which the tube was securely locked without a rivet.

The process of annealing has been improved by a saving of time occupied in the process. Machinery has been introduced into the moulding of hollow-ware, the stamping and finishing of covers, and the dressing of hinges and sash pulleys.

The odd work which comprises most small articles of cast iron used by builders' furnishers, &c., has undergone a great change in appearance, owing to the introduction of a new style of finish from America. A coat of transparent varnish is now applied, the iron being previously polished on those parts in relief, and the result is an appearance somewhat resembling antique bronze. This, together with greater lightness and elegance of design, has given an impetus to the trade, and has led to the introduction of iron where brass was previously used.

The favourable conditions of labour described in 1866 still prevail, though it may be added that progress in this direction has at least kept pace with the advance in progress of manufacture, and the greater excellence in the ware produced.

The provisions of the Factory Acts have long applied to this industry with beneficial results. The hours of labour have been reduced, and thanks to the Education Act of 1870, the intelligence and docility of the younger operatives are their notable characteristics. What is now wanted is the establishment of Science and Art classes where the principles which underlie processes may be learnt, and the power to add beauty of form to articles of utility may be acquired. When these branches of

technical training are added to the course of elementary instruction in our public Schools, all that is needed to secure the prosperity of British industry will have been done.

The best relations as a rule now exist between employers and employed; the former are less exacting and more sympathetic, the latter take juster views of the relation of capital and labour, and are more ready to co-operate with their employers to a common end. The wider introduction of machinery has been attended with the larger employment of female labour, and this seems to be an inevitable tendency of modern processes of manufacture. On the other hand many more skilled workmen are required in the fitting and machine shops, which now form an important department in large works of the class here described.

Clocks.—Within the last year or two a new industry has been imported into the town by Mr. Edward Davies, formerly of the Ansonia Clock Company, Brooklyn. A company has been formed under the name of the British United Clock Company, of 34, Farringdon Road, London. The works are in Great Hampton Street, Birmingham. The company make the round or drum-like time pieces, the works of which are machine-made, the parts being interchangeable, and are supplied retail at a few shillings each.

Coinage.—[RALPH HEATON].—(B. 552). Coining presses devised by a German named Uhlhorn, but manufactured and improved by Messrs. Heaton, have been supplied to the Royal Mint. The great advantage of the new presses is that they require no foundation, and are silent and automatic in action. The blanks are dropped into a tube, and the machine

carries them forward one by one to the dies, where they are finished and fall into a box in front of the workman.

With regard to the manufacture of blanks, Birmingham has from time to time furnished these to a number of States, and is doing so now. Nickel coinage (an alloy of 20 per cent. nickel, and 80 per cent. copper) has been supplied to Jamaica in pence, half pence, and farthings. In 1884, seventy-five tons nickel alloy were coined for Servia, and an entirely new coinage of both silver and nickel for the Republic of Ecuador. At the present time (1886) Messrs. Heaton are supplying Columbia and Egypt with nickel coinage. The nickel alloy is an excellent material for coinage.

In 1872 the Birmingham Mint delivered silver blanks to the Royal Mint, for a coinage of the nominal value of £1,000,000. This was completed in six months.

The letter H below the date will be found on many of the bronze coins in circulation; this implies that the coins were struck at the Birmingham Mint. At the time of their introduction in 1875, it was supposed that an extensive gang of forgers were at work, and the mint authorities were communicated with by an anonymous writer, who stated that the counterfeit coins could be distinguished by the small letter H below the date.

Messrs. Heaton have supplied coins to no less than 39 states or authorities. In 1868, the Italian Government ordered five million lire in pieces of 10 centimes; and in consideration of the satisfactory manner in which this and other coinages had been carried out, his majesty, King Victor Emmanuel, conferred the honour of knighthood on the firm.

Electric Lighting.—[HENRY LEA, M.I.M.E.]—The period of fifteen years following the last Meeting of the British Association in Birmingham, in the year 1865, was devoid of any undertakings in electric lighting, other than in the direction of the application of powerful arc lights for lighthouse purposes, as practised by Messrs. Chance Bros., of Spon Lane, near Birmingham, who, beginning in 1862 with apparatus having optical adjustments for electric arc lights of small power, proceeded to introduce more and more powerful lights, of which the Souter Point revolving light of the 2nd and 3rd order built in 1870, the South Forelands fixed lights, two in number, and of the 3rd order, built in the same year; the Sydney Heads light of the 1st order and of 11,000 candle power, built in 1880; and the flashing light at Tino, near Spezia, a lamp of the 2nd order, finished in 1885, are examples shewing the great progress made during the period referred to. The Sydney Heads light is said to be the leading light of the world. The motive power employed for it is the Otto silent gas engine. The carbons are 23 millimetres, or upwards of ⅞″ in dia. Particulars of these undertakings will be found in a special paper upon Lighthouse Work in another part of this volume. The first application of arc lighting for ordinary business purposes in this district is believed to be that of the Birmingham Household Supply Association Limited, which was fixed in the year 1880-1 under the superintendence of the writer, who employed a pair of 8″ × 12″ Horizontal Tangye Engines to drive a Brush Dynamo working sixteen arc lamps. Amongst other examples of arc lighting subsequently put down may be named those at Messrs. Brown Marshalls & Co.'s Carriage Works at Saltley, Messrs. John Wilkes and Sons' Rolling Mills

in Liverpool Street, Messrs. Elkington & Co.'s Show Rooms, in Newhall Street, the New British Iron Co.'s Works at Corngreaves, the Lower Grounds at Aston Park, and Messrs. Cadbury Bros.' Cocoa Manufactory, near Birmingham, the latter being only very recently started upon the Gulcher system.

The incandescent or glow electric lamp, first made its appearance upon a large scale in Birmingham, in the year 1882, when the Birmingham Town Hall was successfully illuminated for the Triennial Musical Festival, by Messrs. R. W. Winfield and Co., who had allied themselves with Messrs. R. E. Crompton and Co., of Chelmsford, for electric lighting undertakings. This installation was established under the writer's superintendence, and consisted of 440 Swan glow lamps, suspended from ornamental pendants placed around the walls of the Hall, a chamber having very nearly the proportions of a double cube, and measuring 165ft. × 65ft. × 65ft. high. Various lamps in other rooms raised the number to 500. Cables were laid underneath the streets, for a distance of about a quarter of a mile, to the works of Messrs. Winfield and Co., in Cambridge street, where nine Bürgin Dynamos, separately excited by two similar machines, were employed to generate the electricity, the motive power being the old rolling mill engine, from the flywheel of which a belt conveyed the motion to the electric machinery. This wheel, being 25ft. diameter, weighing about 25 tons, and revolving 50 times per minute, afforded a source of motion, the steadiness of which left nothing to be desired. The marked difference of temperature in the Town Hall during the evening performances, as compared with the previous use of gas—70° at the ceiling instead of 110°—was fully appreciated by the large audiences of that festival. Subsequently the

number of lamps was increased to upwards of 600, by the addition of two pendants. The same means of illumination were used for the 1885 Triennial Festival, as well as on many occasions of concerts, etc. The whole plant still remains the property of Messrs. Winfield and Co. Upon somewhat similar lines the same firm fitted up the Leeds Town Hall, for the Festival of 1883, where, however, the whole of the light was derived from pendants suspended from the ceiling by steel wire ropes. The machinery in this case was also situated about a quarter of a mile from the Town Hall.

In the year 1882, Messrs. Elwell, Parker, and Co., commenced electrical business in Wolverhampton, with secondary or storage batteries constructed upon a modification of the Planté method of manufacture. Shortly afterwards, the same firm began to make dynamos for charging their batteries, since which time the output has increased, and now amounts to a total of about 500 dynamos, besides several thousands of storage cells, the latter being now made under the joint Patents of the Wolverhampton Firm, and the Electrical Power Storage Co., Limited, of London. The London Stock Exchange, Lloyd's Shipping Offices, the Manchester Art Gallery, Lord Shrewsbury's seat at Ingestre Hall, the Lancashire and Yorkshire Railway Co., the Blackpool Electric Tramway, the Giants' Causeway Electric Tramway, the Cannock Chase Colliery, the Grosvenor Gallery and many other establishments are lighted or worked by means of dynamos manufactured by the Wolverhampton firm.

Amongst installations set up in Birmingham under the writer's superintendence may be mentioned the Theatre Royal, in New Street, and the Prince of

Wales Theatre, in Broad Street, in each of which the plant consists of a 16-H.P. Otto silent gas engine, driving a 300 light Ferranti alternate current dynamo with a Siemen's exciter, and with appliances at the prompt side for lowering or turning out the light at will. 200 lights are run very brightly with an expenditure of about 800 cubic feet of gas per hour. A similar number of ordinary gas burners would require from 1,000 to 1,200 cubic feet of gas per hour. The Birmingham Liberal Club, in Congreve Street, another example, has 160 lamps which are worked from a 10-unit compound dynamo, made by Messrs. Crompton and Co., of Chelmsford, the motive power being a 12-H.P. compound steam engine, by Messrs. Marshall, Sons, and Co., Limited, of Gainsborough. This machine is an excellent specimen of a self-regulating dynamo, the commutator not having been touched with anything coarser than well-worn emery cloth since February last, its surface presenting a highly-polished appearance. No storage cells are used, the lighting being derived directly from the machine.

In the suburbs, the house of Mr. Mitchell, Hagley Road, Edgbaston, has about 40 lights, and is worked from a 2-H.P. Otto silent gas engine, and a 2-unit Crompton shunt-wound dynamo, charging 24 storage cells of the E.P.S. (Electrical Power Storage Co.'s) type.

The writer's house, 7, Clarendon Road, Edgbaston, is also electrically lighted by 24 E.P.S. cells, charged by a 30-light Chamberlain & Hookham dynamo, worked from a ½-H.P. Otto gas engine.

Messrs. Chamberlain & Hookham began, a few years ago, the manufacture of dynamos having permanent steel magnets, but they subsequently

adopted the more usual type of electro-magnetic machines. Particulars are not to hand of this firm's work, but the residences of Messrs. Walter Chamberlain and Herbert Chamberlain are amongst the examples of domestic electric lighting carried out by the firm, whose attention, however, has been directed principally to the manufacture of dynamos for electro-depositing purposes, where very heavy currents of low electro-motive force are required.

The public supply of electricity was in 1882-3 the subject of much attention on the part of Messrs. Winfield & Crompton, under whose auspices the Incandescent Electric Lighting Co. Ld. was registered. An Act of Parliament was obtained, and plans and estimates were made by the writer for lighting a large district in Birmingham from central stations. Carefully collected statistics of the gas consumption in the proposed district afforded some interesting information, such as, for instance, that the average cost of gas per burner per annum, called the burner earnings, varied from 2d. to 43/6 per burner per annum, and showed a mean earning for the whole district of 10/2 per burner per annum, the average price of gas being about 2/3 per 1,000 cubic feet. From various causes, chief amongst them being the adverse restrictions of the Electric Lighting Act of 1882, the operations of the Company have remained in abeyance. The Birmingham Act is, however, still in force, and should the efforts which are now being made for the removal or substantial modification of the obnoxious clauses of the Act meet with the desired success, Birmingham may yet enjoy the advantages of a public supply of electric light, the luxury of which only those who have lived in an electrically lighted house can fully appreciate.

Flint Glass Manufacture of Birmingham.—[A. C. OSLER.]—(B. 526.) Further inventions have been made with regard to furnaces. Frisby's patent, the fuel inserted from below, instead of being thrown on the top of the fire, has met with some amount of favour, having been adopted by several Stourbridge houses. Bœtius's patent, by which the earlier stages of combustion take place below the floor of the furnace, and a current of heated air is supplied to complete the combustion as the inflammable gases pass through an opening in its floor into the furnace itself, has now been in use at Messrs. Osler's for many years.

The process of etching by hydrofluoric acid, has been largely developed as a means of ornamenting glass, and has to a large extent superseded engraving. Highly artistic designs are produced by a combination of etching and engraving. Mechanical methods are adopted in producing many effective borders.

Among new inventions for the ornamentation of glass, should be mentioned the process of "threading," that is, the surrounding and partial covering of a body of glass of one colour with a continuous thread of glass of another colour, by which many beautiful effects of varying and toned colour are produced.

Recent years have also seen the revival of what is termed cameo cutting on glass. A body of glass being formed of layers of different colours, the outer layer or layers are partially removed by eating away by hydrofluoric acid, and the remaining portions are then wrought into designs with the chisel or graver. A reproduction of the Portland Vase is one of the most remarkable specimens of this revived art, which

offers excellent opportunity for the combination of lustrous colours of varied hue with delicate and exquisite ornamentation.

Marked progress has been made in the production of coloured glass, formerly almost a monopoly of the Bohemian makers.

Hinges of Wrought Iron.—[F. E. MARTINEAU.]—(B. 610.) Material consumed at time of British Association Meeting, in 1849, was about 700 tons; in 1865, about 2,500 tons, and this year, 1886, about 3,500 tons per annum. In 1865, about 300 people were employed in the trade, there are now about 380. Strip steel has to a certain extent replaced strip iron in the manufacture.

Hydraulic Machinery.—[MESSRS. TANGYE.]—(B. 647.) The Cornwall Works have rapidly extended, now occupying six times the area covered in 1865. 2,000 men are employed. In addition to hydraulic machinery, steam engines, machine tools, machinery for gas works, patent retort lids, gas stoking and charging machines, gas engines of a novel and economical type, steam boilers of all kinds, and fixed and portable steam cranes are manufactured. These works will now turn out per month 200 steam pumping engines, 40 steam boilers, 100 steam engines used for other purposes than pumping, 800 cranes, crabs, and lifting apparatus. 300 hydraulic presses, lifts, and jacks. 5,000 complete sets of pulley blocks, and 1,000 gas retort mouth-pieces and lids.

Jewellery.—[JOHN BRAGG.] (B. 452).—EXTENT OF THE TRADE.—This general title includes a number of so called "Trades" which appear in the Directory under separate heads. It covers not only gold and silver "Jewellers," but gold and silver chain makers, gilt, plated, and black ornament jewellers, as well as

all those subsidiary branches which exist solely for the general trade, such for instance as lapidaries, stone dealers, gold cutters, chasers, engravers, jewellers' die sinkers, tool makers and stampers, enamellers, case makers, and also jewellery factors. In several large establishments, many of these separate departments are carried on within the walls and under one central management. The Post Office Directory for 1885 gives 1,123 master-men thus engaged in Birmingham. To these however must be added a large number of "garret" masters or "out workers" whose names do not so appear, and who employ perhaps only one, two, or three persons each. It is estimated that 14,000 to 16,000 persons are actively employed in this trade in Birmingham, while probably 40,000 to 50,000 are locally dependent upon it. The amount of capital here engaged in it is enormous, and, without doubt, larger than any other distinct and separate trade of the town. The manufacture is still, as at last report, aggregated in one locality, though it is extending its area. The central point is near to where Warstone Lane is crossed by Northampton Street or Vyse Street.

LABOUR AND WAGES.—The increase of female labour, particularly in silver jewellery and in warehouse duties, is very considerable, and has tended to keep down the wages of men. Still, these have risen to very high points in seasons of prosperity, and even in the present time of depressed prices, a skilled journeyman jeweller earns with his own hands 30s. to 45s. per week of about 54 hours. A trade society exists, but nothing approaching to a "strike" is possible, because of the infinite variety of departments, the constant change of patterns, and the habit of each workman agreeing personally with his employer or foreman as to prices of piece work.

Most of the manufactories are well ventilated, the newly built ones being large and commodious in every respect.

BULLION USED.—An estimate has been made by those most competent to judge as to the value of gold and silver used by this trade in Birmingham per annum. Taking the last three or four years as a basis, it seems probable that the annual consumption of gold here is about £750,000, and of silver (at the present low price) from £300,000 to £350,000. One large manufacturer of silver jewellery has, within the last three years, used upwards of 3,000 oz. of fine silver per week. Sovereigns are still extensively used to melt instead of grain gold.

It may be asked, "Why melt sovereigns when gold, commercially pure, can be had from the dealers without paying costs of minting?" The answer is: the cost of minting is so small that against the other advantages attaching to the practice, it is of no account. These advantages are—1st, the grain gold of commerce cannot be relied upon for absolute freedom from accidental or superfluous alloy; and 2nd, that other qualities, such as uniform hardness, tenacity, and ductility—of the utmost importance to some branches of the trade—are ensured by using them. The metallurgical science and technical skill of our national assayers and melters at the mint, are therefore freely used by our manufacturers to enable them to alloy to the utmost nicety, and yet with a certainty of their goods, when made, passing the "Hall." This, therefore, is a question of economy.

CHANGES IN THE TRADE.—The immensely increased production of silver jewellery has tended to almost obliterate two departments which twenty-five years ago were of large proportions—viz., the

gilt and the plated jewellery trades. The workmen in these branches have mostly turned their hands to silver working. Notice must be taken of some new developments, which have become practically new trades to the town. The manufacture of costly official insignia, such as mayoral chains, municipal badges, presentation caskets, gold and silver ceremonial keys, &c., is new since last report. More than seventy such mayoral chains have been made here since then. The manufacture of watch cases in gold and silver, but particularly in silver, is also a new and very considerable trade, employing hundreds of people. Not fewer than 60,000 to 80,000 silver watch cases per annum are now turned out from Birmingham manufactories. Another new trade, though at present not a large one, is diamond cutting, but there is no reason why it should not become an important business here.

ARTISTIC PROGRESS.—How far the trade has led or has followed public taste it is impossible to say, but that a general improvement has taken place is undeniable. In place of the huge bracelets, brooches, earrings, and lockets of twenty years ago, we now have small and elegant articles of the most tasteful designs. Even such jewellery as is produced greatly by the aid of machinery, for the sake of cheapness, is often characterised by perfect style. Silver brooches may be bought wholesale for one shilling each which would not disgrace any wearer of the most refined taste. In the gold trade also, the productions for the great middle classes are equally neat and commendable, both as to form and detail of decoration. The greater use of gems, both in gold and silver jewellery, is a distinct feature of present requirements. A most remarkable evidence of the above statements is afforded by one branch of the

trade, which now exports to France, Germany, and Switzerland goods in large and increasing quantities, winning its way by style as well as price against the best makers of the Continent. Compared with the like classes and prices of goods twenty years ago, there is no doubt but that beauty of design is greatly improved; nor can there be a doubt either but that our National Art Teaching has chiefly contributed to the improvement.

CHEMISTRY.—Chemistry has considerably improved the various processes in which its aid can be applied. Alloying is more skilfully and exactly performed. The art of melting is better understood. "Coloring" (which must not be confounded with "gilding") is now carried to a pitch of remarkable excellence. At date of last report, this, which is a purely chemical process, was done without much intelligence, and nothing lower than 15 carat gold could be with certainty so finished. But now those who devote themselves specially to this branch of work, can produce a beautiful "color" on 12 carat gold. It must, however, be stated, that upon the lower quality, such bloom and rich colour is fugitive, while upon the higher qualities it is permanent. Gilding by electric processes is done with increased economy and skill. Parcel gilding, oxydising, and gilding with various colored alloys in solution, are carried to a high pitch of excellence. The chemical treatment of waste, such as shop sweepings, and the water used for washing of hands is much improved. In the business of refining, scarcely anything is lost.

MECHANICAL CONDITIONS.—So much depends, and will always depend upon skilled handicraft in the Jewellery trades, that there is not much to record in the way of mechanical progress. Still, in some

tools there are notable improvements. The ingenuity manifested in the mechanical production of gold and silver "parts," to be afterwards put together into great varieties of patterns, is remarkable. "Sand blast" is a new mechanical means used for producing the rich dead surface so much admired on gold and silver. The lathe, draw bench, die stamp, and press, effect much more than they did for the trade 20 years ago. Gas engines are now commonly used, even in small shops.

PRECIOUS STONES.—The gem and precious stone business together with that of the lapidary form a most important element of the jewellery trade. We have some 35 local stone dealers and lapidaries. Besides these, Birmingham is visited constantly by dealers from London, Paris, Hamburg, and elsewhere, who do large trades here. Diamonds and other gems in the rough are also sold here increasingly. Compared with date of last report, the sales of diamonds and other gems to the trade in this town is probably twenty times larger. Single firms will each buy and mount up £20,000 or £25,000 worth of gems in a year. It is now a recognised and distinct name of this branch of the trade, "Diamond and Gem Mounter," and the Directory gives about 25 of those who do not ordinarily interfere with other jewellery. Many Birmingham factors now carry magnificent stocks of diamond goods manufactured here, which was not the case twenty years ago.

PRICES AND CHEAPNESS.—Any comparative notes which did not recognise the cheapness of modern jewellery would be incomplete. This cheapness is a real thing and not a delusion. Genuine gold and silver brooches, rings, bracelets, &c. set with gems, are now offered throughout the country, at prices

which often cause doubts of their quality. Gold, it is true, remains at the same standard value; but silver is one-fifth lower in price. Several causes have acted together, resulting in this considerable reduction in retail selling prices of both gold and silver goods. First, workmen's prices are much lower, although their total weekly earnings are not materially altered. This is effected by mechanical improvements; by the larger quantities of one pattern made at once; and by the employment of girls and youths under men. Secondly, the rates of profit realised by manufacturer, factor, and shopkeeper are lower. Lastly, diamonds and some other gems extensively used are much lower in price, especially their second and third qualities, than at date of last report.

DISTRIBUTION.—as a rule, manufacturing jewellers neither cultivate trade with shopkeepers nor with the private purchaser, but sell to the factors, or middle men. A factor sees all their stocks, selecting from each to compose his own, and so offers a better variety to the shopkeepers throughout the kingdom than could otherwise be done. There are in Birmingham about fifty of such factors. But the line of demarcation is somewhat indefinite, because many of them manufacture certain specialities for themselves. Still the system is the best under present circumstances, and works on the whole to the mutual good of all parties. The factors in London, and merchants generally, are also large purchasers from Birmingham manufacturers. The Post Office is the chief engine of distribution for small parcels, and all little orders and repairs. Two private firms, however, do a considerable business by collecting, through agents, in London, Coventry, and Birmingham, small jewellery parcels, conveying them by rail, and then delivering them very quickly and cheaply in those

towns. The losses are practically nil, although perfect shoals of such little packages are despatched and delivered daily by these means, together with the railways.

Lighthouse Apparatus.—[J. KENWARD].—(B. 153). The Lighthouse Works of Chance Brothers and Co., Spon Lane, near Birmingham, are the only works of the kind in the kingdom. The improvements since 1865 may be noted under: (1) the optical agents, (2) the lamps and burners with the illuminant or fuel used in them, (3) the mechanical appliances. The six original orders of optical apparatus distinguished by their radii and height are no longer the only types. There is the hyper-radial first order lens, whose focal distance is 1,330 millimetres, and diameter about 104¾ inches, the usual first order being about 72½ inches diameter, and there are several varieties below the 6th order whose radius is 150 mm. Of these the Ship Light introduced by Messrs. Chance with a focal distance of 125 mm., is the most important. Various new arrangements of condensing lights where from one flame, certain sea sectors are strongly illuminated by means of vertical prisms, while other sectors are less intensely lighted, have been adopted with signal success, as have also several special designs where a coloured and a white beam of equal intensity are concerned. The new lenses for port and harbour lights, and those used with the electric arc on board vessels of war for search purposes, introduced by Messrs. Chance, may be named. The present two most powerful lights in the world are the Macquarie at Sydney Heads (a revolving electric light of the first order) and the Tino near Spezia, a revolving electric light of the second order. In both a single optical agent is employed, and carbons from 15 to 25 mm. diameter.

Another improvement is the ship light lens designed to give adequate intensity and penetrating power in a vessel's signal lights, especially her side lights, whereby an increased luminous range can be secured and the risk of collision greatly lessened. The vertical angle subtended by lenticular refracting apparatus has been increased from 45° and 47° to 80°, and even by the use of dense flint glass to 92°. In this way the normal power of the central or lens portion of a light, always two-thirds of the whole power, has been so augmented that it is found advisable to dispense with the prisms both upper and lower, and to depend on the refractors alone. When higher degrees of intensity are needed, a second tier of lenses can be superposed on the first, and a third and fourth added, a separate flame being in the focus of each tier. This has been done by Mr. Wigham, of Dublin, with gas flames, and by Sir James Douglas with oil flames. The two great divisions of lighthouse apparatus into fixed sections and revolving sections have been extended. Thus the old fixed light, the revolving light with equally recurring single flashes, the composite fixed and flashing light, always objectionable from its unequal power, have been supplemented by the occulting light, and the group flashing light which last was designed by Dr. John Hopkinson, and first constructed by Messrs. Chance. In this arrangement the beams are sent out in groups, each beam of the group being separated from one another by a short interval of time, and each group by a longer interval. The lights on a coast can thus be distinguished by their single flash, double flash, or triple flash.[56]

ILLUMINANTS AND BURNERS.—Mineral oil has been introduced, and special burners designed in order to burn it. The largest of the old colza oil

burners (known as Fresnel burners) has an intensity of 230 candle units, or 23·6 candle units per square inch, while a similar burner for paraffin has been reported as affording 415 candle units, or 44·3 units. The latest developed Trimley burner of Sir James Douglas, with nine concentric wicks, gives 49·8 units. The oil used has a flashing point of 154° F. The average cost of mineral oil is one-fourth that of vegetable oil. Gas is also freely employed, and in the 108-jet burner of Mr. Wigham it has attained a power of 2,433 candles, and in the 10-ring burner of Sir James Douglas, a power of 2,619 candles. Beyond the highest reach of oil or gas burners, say 2,500 or 2,600 candles, is the electric arc giving an intensity of beam of ten millions of candles. At the other end of the scale is the duplex burner, which, with the new Chance lenses, is available in the smallest apparatus for a horizon of from seven to ten miles.

The Spon Lane Lighthouse Works have been extended greatly since the last visit of the Association. The unique methods of grinding and polishing the optical glass have not been materially changed, but the number and variety of machines have been largely increased. In the mechanical shops there is now a complete *outillage* for turning, drilling, shaping, screwing, &c., applicable to all the old designs and processes, and also the newer branches introduced since 1865. There are about 200 workpeople employed, many with consummate skill and intelligence, as may be assumed from the precise and highly finished work in which they are engaged.

At this date about 260 complete sea lights and about 300 complete harbour lights have been sent out, together with about 200 smaller port lights and about 370 of the recently designed ship lights.

Very striking specimens of optical science have been contributed by Messrs. Chance, as exemplified in the list of dioptric lights they have supplied around our own coasts, of which The Longships, the Wolf Rock, the Flamborough Head, the Hartland Point, the Start Point, the South Stack Rock, The Casquets, Bull Point, Anvil Point, the Eddystone, and many others are examples.

Mr. Kenward will be glad to give further information to any member of the Association who may take an interest in the subject.

Locks and Lock Making.—[J. C. TILDESLEY.]—(B. 77.) The price of cheap padlocks is still lower. Iron padlocks of the cheapest class are now being made in this district (Willenhall) and delivered free in Bombay and Calcutta, at *fivepence halfpenny per dozen*!

In reference to the table (B. 89), the number of employers may be set down as 100 less (that is 350) and at least 1,000 must be deducted from the total number of workpeople, bringing it to about 3,950.

The production of locks in the district may now be computed at 25,000 dozens per week, as against 31,500 dozens per week, as estimated in 1865. The reductions being chiefly in the pad, cabinet, chest, and till departments, which are being driven hard by America and continental competition. On the other hand, door locks (rim, dead, mortice, and drawback) are being made in larger quantities than ever, and are being sold at prices which would have been regarded as fabulous twenty years ago.

The average earnings of locksmiths are 15 to 20 per cent. less than the figures given at (B. 89.) American competition in castings has, so far as the

lock trade is concerned, considerably diminished since 1865. By grinding English sand to the fineness of flour, and by the adoption of Plaster of Paris moulds and improved methods of casting, transatlantic supremacy over England no longer prevails. While in the matter of cheap and clear castings they have maintained for their productions the reputation for practical qualities which has so long distinguished them. Artistic design and ornamentation have improved. Germany is now the most formidable rival to the English lockmaker, owing to the low wages and long hours endured by the German locksmiths. The remedy for this state of affairs ought, in the interests both of commerce and humanity to be found not in a retrograde movement on the part of England to Germany, but in the uprising of the German workman, to secure the same *status* as that enjoyed by his English confrere.

Magic Lantern Slide Painting.—[H. H. STANTON.]—The old fashioned method of tracing from a drawing or engraving though still used, has given way to a great extent to the introduction of photography. Special drawings are made, photographed on to glass, and subsequently painted. Girls and also artists are employed in the work. Photographic slides from various parts of the world come to Birmingham to be finished.

Measuring Rules and Tapes.—[JOHN RABONE.] (B. 628.) It is noteworthy that in the "garret" at Heathfield Hall, near Birmingham, where Watt amused himself during the latter years of his life with his copying machines—the prototypes of those afterwards known as the American and Enfield—is still to be seen an example of Watt's early work in London before he entered upon his remodelling of

the steam engine in connection with Matthew Boulton.

In one of the drawers there are preserved several of the old fashioned tools, formerly, and still used in rule making by hand, and also carefully wrapped up in paper by Watt himself, is a "brass sector with a French joint," which, unlike his compasses and other mathematical instruments, has undergone no wear, and is as faultlessly clear and perfect as it was on the day it left the maker's hands. The only assumption that can be made respecting it is that it is the identical "brass sector with a French joint," of which young Watt so glowingly wrote to his father, now a hundred and thirty years ago; and if that be so, it is the only known specimen of the great engineer's work as a rule maker.

Prior to the last meeting of the British Association in Birmingham, in 1865, machinery had been brought into the trade to but a small extent compared with what has since been the case in the making and marking of all kinds of rules. Accurately engine-divided, 2-feet folding steel rules, retailed at a shilling each, are a new feature of the trade, which is a boon to mechanics they never before had. The employment of automatic machinery has quite revolutionised the trade, by bringing larger capital into it, and increasing the number of workpeople sixfold, at the same time enabling employers to pay higher wages than they could possibly do when all depended upon unaided hand labour. The trade has always been in comparatively few hands, three-fourths of the names appearing in one directory as makers, being merely dealers, or journeymen; in one case fifteen of the men so described being merely journeymen of one employer. The bulk of the trade is

now in the hands of as few makers as might be counted on the fingers of one hand, but competition is not rendered thereby less severe, but is rather more excessive. During the past twenty years a great change has taken place in many countries by the adoption of the metre as a standard measure. Since 1870 all the numberless measures of little German towns, many with both decimal and duo-decimal divisions, have been abolished, and the use of the metre alone legalised. Other nations have followed the example of Germany. Many of the rules made for export to such countries as Russia, which have not legalised the metre, are marked with it in addition to the local measures, thus preparing the way for its future adoption. Its use has been legalised in Great Britain, though not made compulsory, and many of the measures made for export to foreign countries where English customs prevail are marked with both English and metrical divisions.

Military Arms Trade.—[J. D. GOODMAN.]—(B. 381.) At the date of the notice of the gun trade, published in the transactions of the meeting of the British Association held in Birmingham in 1865, the British forces were armed with muzzle-loading guns. The arm of the service was that known as the "Enfield Rifle." It was adopted by a committee of military officers, appointed by Lord Hardinge, Master General of the Ordnance, in 1853.

In 1865 the breech-loading system was receiving much attention. The Wesley Richards' Breech-loader had been for some time in use in the service on an experimental scale, and had been tested in the field, both in China and New Zealand. So far back as 1861, a thousand breech-loaders, on Terry's principle, had been issued to the troops, but did not prove

successful. Trial was also made of Sharp's American Breech-loading Rifle. The successful use of the Needlegun Breech-loader, by the Prussians, in the Danish war of 1864, gave great urgency to the enquiry.

In August, 1864, the English Government invited proposals for the conversion of the Enfield rifle into a breechloader. Fifty different systems were sent in, of which five only were ultimately selected for trial. Four of these were capping and one was a non-capping arm—that is, one in which the cartridge carries its own ignition. On 14th March, 1865, the Woolwich Committee issued their Report on the various systems which had been submitted, in which after speaking of the obvious disadvantages which a breechloader requiring a cap presents, when contrasted with one adapted for a cartridge carrying its own ignition, proceeds to say:—

> "The Committee have now respectfully to submit their observations on the whole question.
>
> "The ultimate armament of the infantry with breech-loading weapons is determined upon. It would be done at a comparatively small cost by conversion, but it is now well known that the calibre, twist, and form of rifling of the 'Enfield' is not the most favourable for fine shooting, and it is quite certain that no converted arms can possess the precision which will be easily attained in a new breechloader of smaller gauge and quicker twist. Nor will the soldier be able to carry that increased quantity of ammunition, which is so desirable, without a reduction of calibre.
>
> "There are certain circumstances in which, notwithstanding all the inconveniences which will attend the co-existence of unaltered arms, converted arms, and new arms, with their different ammunitions, it may still be desirable to proceed with the conversion on the ground of its small cost, and of the less time in which the arms can be turned out; but the Committee do not feel in a position at present to recommend such a measure."

In the end, the economical view prevailed, and it was determined to convert the Enfield rifles to the Snider system. The effect of this decision was to postpone to 1871, when the Martini rifle was

adopted, the advantages recognised in the Woolwich Report, which would be obtained by a smaller bore, quicker twist, and a different form of rifling.

In July, 1866, the Birmingham Small Arms Company was instructed to proceed with the conversion of the Enfield rifles to breech-loaders to the full extent of their power. The London Small Arms Company was very shortly afterwards established. They received similar instructions. The result was that the whole of the Enfield rifles available were converted, as follows:—

Enfield (Government Factory)	296,352
Birmingham Small Arms Company	156,000
London Small Arms Company	85,200
	537,552

As this number was insufficient for the requirements of the service, and as it was indispensable that there should be but one description of arm in use, it became necessary that new Sniders should be made. In 1869, and subsequently, orders were issued to the trade, and the following supplies were made:—

Enfield	200,523
Birmingham Small Arms Company	92,837
London Small Arms Company	42,525
National Arms Company	2,000
	337,885

Making a total of 875,437 Snider arms.

The adoption of the Martini-Henry rifle resulted

from an invitation to inventors, issued by the War Department first in 1866. More than 100 different arms and 49 descriptions of ammunition were sent in, but the committee appointed to make the selection reported that none came up to the requirements. The invitation was repeated in December, 1867, resulting in 45 additional arms being submitted. In February, 1869, the Committee reported recommending a combination of the Martini Breech Action and the Henry rifling, and for the ammunition, the Boxer coiled case. During the following year, trials of this arm were made in the service, and finally, in 1871, it was definitely adopted. Orders were afterwards issued to the trade, and the following statement shows the numbers which have been manufactured at the Government Factory, and by the trade, up to March, 1885:—

Enfield	583,798
Birmingham Small Arms Company	107,219
London Small Arms Company	74,131
National Arms Company	12,456
	777,604

It has now (July, 1886) been decided to adopt a new arm, embodying the improvements suggested by the experience gained in the use of the Martini, during the service it has undergone. It has been found that the calibre of the barrel if still further reduced would much improve the shooting, an increase being made at the same time in the twist of the rifling. A Committee has for some time past had the matter under consideration, and finally have recommended an arm which is to be known as the Enfield-Martini.

In the new arm, the Martini action is retained, the outside dimensions of the barrel are the same, but the bore is reduced from ·45 inch to ·4 inch. While the twist of the rifling is increased from 1 turn in 22 inches to 1 turn in 15 inches. The weight of the bullet is reduced from 480 grains to 384, the powder charge being the same as in the former rifle, 85 grains. A wooden hand guard is fixed over the breech end of the barrel to protect the hand of the soldier when the barrel becomes heated by rapid firing. The barrel is no longer imbedded in the fore-end of the stock; it was found that the exterior of the barrel was liable to rust from contact with the wood. The fore-end is now so shaped that the barrel simply lies upon it, held in place by the bands which surround both stock and barrel. The back sight is provided with a wind gauge, and a locking bolt secures the trigger when the arm is at full cock. A sword bayonet is substituted for the former triangular-shaped bayonet. A "quick loader" will be used with this arm. It hangs on the side of the body of the action, and holds six cartridges. The cartridges are acted upon by a spring which forces the head of the cartridge through an aperture in the lid, ready for the soldier's hand. With this "quick loader," six rounds can be fired in about 25 seconds, whereas, in loading from the pouch, 40 seconds are required. This description, of the new arm may be subsequently modified, as the recommendation of the Committee has not yet been confirmed.

DIMENSIONS, &C., OF THE BREECH-LOADING ARMS OF THE BRITISH SERVICE.

	MARTINI ENFIELD-
SNIDER.	HENRY. MARTINI.

RIFLE.			
Length of Barrel	39in.	$33\frac{3}{16}$in.	$33\frac{3}{16}$in.
Length over all	4ft. 7in.	4ft. 1½in.	4ft. 1½in.
Length with Bayonet	6ft. ½in.	5ft. 11½in.	5ft. 11½in.
Weight with Bayonet	9lb. 14oz.	9lb. 14oz.	10lb. 4oz.
Weight without Bayonet	9lb.	9lb.	9lb. 6oz.
No. of Grooves in Barrel	3	7	7
Calibre	.577	.45	.4
Twist of Rifling 1 turn in	78in.	22in.	15in.
Velocity of Muzzle per second	1240ft.	1315ft.	1570ft.
Trajectory at 500 yards	11.35ft.	8.594ft.	6.704ft.
Figure of Merit at 500 yards	0.89ft.	0.55ft.	0.30ft.
AMMUNITION.			
Weight of Loaded Cartridge, grains	715	758	718
Powder ”	70	85	85

Bullet	”	480	480	384

DESCRIPTION OF ARMS USED BY OTHER COUNTRIES.

COUNTRY.	DESCRIPTION.	CALIBRE.
America, U.S.	Springfield	·450
Austria	Werndl	·433
Belgium	Albini Braendlin	
Denmark	Remington	·433
Egypt	Remington	·433
France	Gras	·433
France	Kropatschek Magazine Gun in Navy	·433
Germany	Mauser	·433
Greece	Gras	·433
Holland	Beaumont	·433
Italy	Vetterli	·408
Norway and Sweden	Jarman	·397
Portugal	Martini Henry	·450
Roumania	Peabody Martini	·450
Russia	Berdan	·420
Servia	Berdan	·420
Spain	Remington	·433
Switzerland	Vetterli Magazine	·409
Turkey	Peabody Martini	·450

As it is essential that all arms made for the service should be interchangeable, the orders to the trade have been confined to the factories where the work is done exclusively by machinery, viz., to the Small

Arms Company and National Arms Company in Birmingham, and to the London Small Arms Company, whose works are at Bow. The National Arms Company, which was incorporated in January, 1872, is no longer in existence, having gone into liquidation in December, 1882. With a paid up capital of £330,000 they erected gun works at Sparkbrook, and ammunition works at Holdford. The gun works have now been purchased by the Government, and the Holdford Works are on the market for sale. The same irregularity in the Government employment, which proved fatal to the National Arms Company, acted very prejudicially for both the other Companies. The Birmingham Company paid no dividend during the five years 1879-83, and a nominal one only in 1884.

To this uncertainty of Government employment may be attributed the difficulty of obtaining swords and bayonets, to which, a short time since, attention was called in Parliament. When military arms were supplied by the ordinary hand-made trade, there were four bayonet-makers in Birmingham and West Bromwich, where, now, there is not one; and in Birmingham there is only one manufacturer of swords, when formerly there were several. The manufacture of triangular bayonets has been, with trifling exceptions, confined of late to Enfield, while sword bayonets, not made at Enfield, have been procured from Solingen. The future Enfield-Martini is to be provided with a sword bayonet. The plainly expressed wish of the House of Commons is that in future, all swords and sword bayonets shall be made in England, of English material. There will not be the slightest difficulty in carrying out this wish. Birmingham will be able to produce any number that may be wanted, but to keep together the required

staff of workmen it is necessary that the demand should be continuous.

In the manufacture of rifles, as well as bayonets, there is every reason to hope that the future employment of the trade will be more regular and continuous. The past bitter experience has shown that the trade cannot live without steady employment, and it is now fully recognised that it is not desirable that this country should remain dependent for its supply of arms on one Government manufactory at Enfield.

AMMUNITION.—Up to the present time the English Government have adhered to the use of the Boxer cartridge, the case of which is made up of thin coiled brass, attached to an iron base, which carries the ignition. For some years past all other European nations have used a solid metal cartridge case, *i.e.*, a case in one piece stamped out of a flat disc. The English Government have now decided that the solid case shall be used, with the new Enfield-Martini rifle. A plant for the manufacture of these cartridges is being prepared at Woolwich. It is fully intended also to employ the trade. Orders have already been issued to the Birmingham Small Arms Company and Messrs. Kynoch and Company, Birmingham, and Messrs. Eley Brothers, of London, who have all had long experience in the manufacture of this description of cartridge.

Nails (cut).—[R. F. MARTINEAU.]—(B. 613). The machines for cutting tacks and small nails up to 1½ inch are now fed automatically. One unskilled workman can keep five or six machines going. The machines do not work so fast as the hand fed, but there are fewer stoppages, and the quantity turned out is greater. This improvement has reduced the

price 30 per cent. The present machines turn out the work so that it need not be looked over and sorted as was formerly the case. The cut nail trade has developed in the North and at the present time, there are as many nails made at Leeds as at Birmingham. The better class of nail is, however, supplied from Birmingham. London brewers send coasting vessels up the east coast with cargoes of stout, and they return from Hull with cut nails at very low freight. The quantity of nails made in Birmingham is about the same as in 1865. The French and Belgians have given up making cut nails, but they make tacks. No French tacks or *tingles* (the smallest sort of tacks used in the shoe trade) are now imported into England, on the contrary, some are being exported into France.

Mild steel has been introduced since 1865. Steel nails are now being made at only a shilling per cwt. above the price of iron nails. These steel nails will clench, and hence are replacing wrought nails.

The manufacture of wire nails has been introduced into Birmingham since 1865. On its introduction, wire was imported from Germany and Belgium, owing to its cheapness and low freight, but now, as English wire has fallen in price, it is used in preference to the foreign.

Wire nails are suited for hard wood, hence a large trade is done in them in Australia. The Cape, India, and South America, are markets for Birmingham nails. Women get about ten shillings a week. Youths as feeders about 15 to 20 shillings, skilled mechanics from 30 to 50 shillings, and labourers 15 to 20 shillings per week.

Needles and Fish Hooks.—[J. M. WOODWARD.] —(B. 197). The pointing of needles is now done

exclusively by machinery. The new machines introduced into the trade within the last 25 years, are the machines for cutting, *pointing, *skimming, stamping, eyeing, *point handing, *tempering, scouring, *handing, *counting, heading and tailing, blueing, *burnishing, *finishing, assorting, and sticking. The machines marked with * produce not only cheaper, but better quality of work. Electro-gilding has taken the place of the old ether gilding. As regards machinery used in the production of sewing machine needles, the chief novelty is the "grooving" machine, which is taking the place of the old stamping process. From special enquiries made I conclude that in the needle district the weekly productions of all kinds of needles and goods akin to needles, cannot be less than 50,000,000 in number. *Pins.* In addition to pins in ordinary use, steel and glass headed pins are made at Redditch, the weekly production of all kinds of pins being about two tons. An attempt is being made to adapt the machines for the production of two pins at a time instead of one. *Fish hooks and fishing tackle* are now made almost entirely by machinery. Artificial fly making is altogether done by hand; feathers of various birds are used for "sea flies." Spinning baits are shaped much like the bowl of a spoon, and are electro-plated so as to cause a glittering appearance when in motion. Swivels in connection with these baits form a branch industry, and machinery for the dressing and turning of these has of late been introduced.

The manufacture of fishing rods is now an important branch. Among the new aids to production are the turning machine and the machine for splitting bamboo canes for the manufacture of "split cane" rods. These curious and costly articles first came from America, and the making of them by hand

requires the greatest patience as well as the highest skill in joining, every part of the rod, from the butt to the thinnest member, having to be split lengthwise into six pieces, each wedge-like in section, and then glued together again with the greatest care and exactness. Reel making has been introduced of late years. One manufactory turns out about 50 dozen rods, 7,000 floats, 13,000 flies, 4,000,000 fish-hooks, and 5,000 swivels per week. Electro-tinning is now used for small sea-hooks. The weekly production of fish-hooks is approximately 20,000,000.

Nickel, Cobalt and German Silver.—[ALFRED S. JOHNSTONE.]—(B. 673.) Many of the original sources of nickel have become exhausted. It is now found plentifully in Norway (in magnetic pyrites, containing about 4 or 5 per cent.) Hungary still supplies ore. The South African supply of ore, (an arsenide of over 25 per cent cobalt) has fallen off. South America and her desert of Atacama was a great source of nickel or cobalt, some of its hydrated arseniates reaching as much as 25% in the ores of nickel, and 17% in the ores of cobalt. The sole mine in Connecticut has been worked for many years. Sweden has yielded nickel from the Klefra and other mines. Germany supplies nickel from the Mansfeld mines. About 1874 nickel was discovered in the Island of New Caledonia, and large quantities of the ore were shipped to this country and to France. There appears now to be a constant supply from this source. The ore is a double silicate of nickel and magnesia, averaging 7 to 10% nickel. Later still nickel and cobalt have been discovered in Nevada. Passing over the history[57] of the production of nickel, which is already, to some extent, described in "Birmingham and Midland Hardware District," it

should be mentioned that nickel, though brittle under the hammer, has been successfully rendered malleable by treatment in which manganese is employed. The process of rendering nickel malleable is due to Messrs. Wiggin & Co., who patented the process in 1880. About the same time Dr. Fleitman, in Germany, succeeded also in rendering nickel malleable by using magnesium instead of manganese. The nickel thus produced may be rolled into plates and drawn into wire, or be stamped, beaten or raised into any article of common use, and it may be welded to itself or to iron. It is less malleable when it contains carbon than when pure. Besides its application for the production of German silver, nickel is largely used as anodes for nickel plating, and for coinage in many countries. Its oxide is used in the Potteries for giving a soft brown tint to china and earthenware, and it is also employed for the production of nickel salts for plating. The German Government in 1873 adopted nickel alloy for coinage, and the exceptional demand advanced the price from 4/- to 16/- per lb. At the present time, owing to the extensive supplies from all parts of the world, and the keen competition in the trade, nickel is reduced to 2/- per lb.

Cobalt has scarcely any application; it is used as an anode in plating, and for some parts of scientific instruments. It does not whiten copper to the same extent that nickel does. The oxides of cobalt are of great value in the arts, not only for the production of the beautiful blue colours given to china, earthenware, and glass, but also as a basis of the blue pigment known as cobalt blue. The oxide of cobalt was in 1841 40/- per lb.; to-day it is about 8/- per lb. Latterly there is a tendency to replace brass and electro-plate by white alloys which have nickel for

their basis. Spoons, forks, fittings for railway and ship fittings, bar fittings, and harness furniture have been largely manufactured from these metals. These alloys are known under various names, such as silveroid, argentoid, navoline, nickeline, aluminium metal, &c., but they are all varieties of German silver, containing in some cases small proportions of tin, lead, cadmium, and other metals.

Papier Mâché Trade.—[E. H. HODSON].—(B. 566). Within the last few years wood pulp imported from Sweden has been introduced as a substitute for paper pulp, and is used for small desks, work boxes, jewel cases, and many other articles, thus enabling Birmingham manufacturers to compete with Chinese and Japanese lacquered goods. A change too has taken place in the mode of ornamentation. Instead of employing artists at a high rate of wage, transfers are used which can be applied to the articles by boys and girls. German papier mâché is imported into this country duty free, but on the other hand, English papier mâché is subjected to heavy duties before it reaches the German and Continental Markets. It should be mentioned that there still continues a steady demand for small quantities of expensive articles made of papier mâché, though for the supply of the Million, the old papier mâché is replaced by the Swedish pulp above referred to.

Pewter & Britannia Metal Trade.—[W. PERKS.] —(B. 617). The two trades are distinct. Pewter consists of 95 parts tin, 4 parts copper, and 1 part antimony. The metal is cast in iron or brass moulds. Britannia metal is not cast, but rolled, stamped, swaged, or spun. Its composition is similar to pewter, but a little more antimony and copper and less tin. The staple articles in pewter are still ale and wine

measures, tankard and drinking cups, the most saleable shapes are identical with those which Hogarth painted in the early part of the last century. There has been a revival of pewter for ink pots for Board School use and home use. In foreign markets a tea-pot known as the Dutch pattern is still sold of the same shape, style, and strength as it has been for the last 70 years. Makers have tried to introduce wrought metal pots instead of cast pewter, but the foreign traders do not care for them. The trade in beer engines and bar fittings has much increased within the last 20 years.

Plate, Crown, and Sheet Glass.—[HENRY CHANCE.]—(B. 147.) In the 1864 report it was mentioned that cast plate glass is manufactured at Smethwick (Plate Glass Company) crown, sheet, and rolled or rough plate glass at Smethwick (Messrs. Chance Brothers and Co.) and at Stourbridge (Stourbridge Glass Company.) Of these three manufacturing establishments, that of Messrs. Chance Brothers and Co. is the only one now in operation. Antique glass for decorative purposes and glass shades are manufactured at Oldbury by Messrs. W. E. Chance and Co. Crown glass is now almost extinct; Messrs. Chance however still make the very limited quantity required. The price of ordinary sheet glass has fallen from one shilling and twopence per foot in 1884 prior to the repeal of the duty, to three halfpence in 1886. Rolled plate glass is now made by most of the manufacturers of sheet glass, and by several firms who confine themselves to this branch of trade. The Siemens' regenerative furnace has not only been successfully applied to furnaces containing pots, but by its aid Messrs. Siemens have been able to dispense with pots and employ large tanks made of clay, for the melting of glass. By this means the

process of melting and working becomes continuous. The raw materials are introduced at one end of the tank furnace and arrive, after gradual transformation, at the other end, in the shape of melted glass.

Plated Wares.—[ELKINGTON AND CO.]—(B. 477.) A great impetus has been given to the trade owing to the development of hotel life in London and all large towns, together with the equipments required for ocean-going steamers, in many cases special designs having reference to the building being required. On the other hand the taste of the public is now for simple and useful designs. The old form of stamping, in which the stamp was lifted by one or more workmen, has been superseded by the method described on page 172. A dish cover which formerly required hundreds of blows now requires only six, and instead of the old process of smoothing the surface with hammer and stake a "wheeling" machine is used, and the swage or shape lapped over instead of mounting with a wire, the time consumed being about one twentieth part of that required by the old process. Improvements in metals used enables the hollow bodies of coffee and tea services to be "spun" (see page 174) instead of being slowly raised into form by wooden mallets and steel hammers. Spinning oval bodies is now extensively practised, though at one time it was considered impossible to treat German silver in this way. This process (oval spinning) is used only when one or two articles of a particular shape are required. When great numbers are required stamping is the process adopted. Press work in shaping articles has considerably improved, and has replaced, to some considerable extent, the tedious process of chasing and embossing. Enamelling has been introduced, but

owing to Japanese competition the trade is gradually falling off. The enamelling, known as cloisonné is performed as follows: The decoration, birds, flowers, &c., is traced on the surface of the object to be enamelled, very thin wire of any metal, but generally silver or copper, is then bent by hand to the various forms traced on the metal. This process requires the utmost care. The wire thus bent is then soldered down to the surface of the object, the different colours put in in the form of paste into the different divisions formed by the bent wire, and the whole is subjected to intense heat until the colours are completely fused. When cold the surface is rubbed down flat, and finally polished. In the champlevé process the spaces for the colours are cut out with a graver. The process of damascening largely carried on by Messrs. Elkington is described at (B. 545.) Soldering arrangements are much improved, the introduction of the patent blowpipe saves time, and the workman is able to solder, cleaner and produce a firmer jointing than with the old process. The sand blast is a new feature in the finishing department.

Refrigeration.—[S. PUPLETT.]—Mechanical refrigeration owes its development to the enterprise of Birmingham men. The imports of ice into the United Kingdom were in 1884 nearly 300,000 tons. Refrigerating machinery is supplying ice in competition with these importations. In addition, refrigerating machinery is used in brewing for the purpose of cooling wort quickly, in bacon curing, in working of butter and butterine, cocoa, and candles, in oil refining and tar distilling, and in telegraphic works for securing a low temperature when testing cables. Freezing machines have too been used in sinking and tunnelling, the water being prevented from running into the shaft owing to the hardening

of the earth by freezing. The cost of imported ice may be taken as 20/- per ton, while machine ice can be made for 5/- per ton. The first commercial machine, patented by James Harrison, of Geelong, in 1856, was an ether machine, and made in London. Afterwards machines of this kind were made by Mr. Philips, of the Atlas Works, in Oozells Street, Birmingham. In 1861 Carré showed the advantages of ammonia over ether as a refrigerant, and since then Mort and Dicholle, of Sydney, and Stanley, of London, have patented various modifications of the Carré system. Pictet has devoted many years to the subject, and has identified himself with sulphurous acid as a refrigerant, and recently claims to have discovered a fluid termed *liquide Pictet*, SCO_4; in addition to these refrigerants, air, water, chloride of methyl, bisulphide of carbon, carbonic acid, and nitrous oxide have been used. The machines made in Birmingham by the Birmingham Refrigerating Company are ammonia machines. This form of machine consists of (1) a multitubular vessel called the refrigerator, containing liquid (anhydrous) ammonia—in this vessel vaporization takes place; (2) a vapour pump, by which the ammonia formed by evaporation is exhausted from the refrigerator, compressed, liquefied, and forced into (3) the condenser, consisting of a multitubular vessel surrounded by water; (4) a circulating pump for supplying the condenser with water; (5) ice tanks surrounded by a bath of a liquid of a low freezing point, such as a solution of chloride of calcium or of common salt; (6) a circulating pump for circulating the brine through the refrigerator and around the ice tanks; (7) the steam engine or other motor for driving the vapour and circulating pumps.

Rope Making.—[J. T. WRIGHT.]—(B. 578).

Within the last few years a machine has been introduced by Mr. Good, an American, for treating fibres as imported, more particularly Manilla. By means of fluted rollers, and a system of bars fitted with strong steel pins which press upwards into the hemp, the fibres are dressed and straightened out, the operation is aided by a patented machine known as Wright and Laider's Patent Sun and Planet Hacklebus. Finally, the hemp fibres are drawn off the pins and delivered in a compact and continuous sliver into a can placed in front to receive it. These slivers being in one length, are now passed on to the drawing frames to be accumulated together.

Steel Pen Trade.—[MAURICE POLLACK.]—(B. 634.)—There has been little improvement since 1865. Muffles heated by gas on the plan of Dr. Siemens, have been introduced for tempering and colouring, and ordinary gas is also used in connection with these processes, but these improvements are only used by one or two firms, and more as a matter of convenience than as a means of making pens of a better quality or lower price.

Many patents have been taken out since 1865 for new styles of pens, the most successful have been those which deal with the points; these have been turned up or turned down, thickened, or planished, all for the purpose of producing smooth points to glide freely over paper even with a rough surface. The fashion in paper and ink materially influences the style of pens. The J pens (so called because that letter was embossed upon one of the first and best known broad points) have been extensively used, and have influenced hand writing, especially that of ladies. Calligraphy as an art has fallen off in this country, and this has influenced pen manufacture.

The most delicately made pens are manufactured for foreign use. There are, perhaps, not so many pen works now as there were in 1865, but the productive power has vastly increased. The present *weekly* average of pens manufactured is about 160,000 grosses, requiring from 16 to 18 tons of steel, of which only 8 tons appears in the article, the rest being loss or waste. Pen steel is still produced in Sheffield, the best being made from Swedish iron. The number of girls and women employed is from 3,200 to 3,600, whilst the number of men employed as tool makers, rollers, engineers, stokers, &c., hardly exceeds 500. The increase in make since 1865, of quite 60 per cent. is mainly due to the export trade. No new pen manufactories have been established since 1865, except in the United States, where there are now four pen works, but of these, only one is of importance. In France, there are now only three pen manufactories, and the production is less than it was three years ago. In Germany there is only one, and its make though improved in quality is very inconsiderable in comparison with the large consumption of steel pens in Germany. An attempt has been made to establish works in Russia, where the duty on steel pens is high, but after existing one or two years, the manufactory was burnt down, and no attempt has been made to re-build it. The Customs duty on steel pens with the exception of Russia, are the United States, where it is 6d. per gross, is very moderate, and prevents the importation of low and middle class pens. The price obtained for steel pens depends more upon the reputation of the maker or of the mark than upon their intrinsic value, hence the difficulty of giving an average value of each gross of pens produced.[58]

Stourbridge Fire Clay.—[GEORGE KING

HARRISON.]—(B. 133.) The district suffers from high railway rates. The quantity of clay raised per week now is about 3,500 tons, say 160,000 tons per annum. About 40 million bricks are made per annum.

Salt.—[J. H. HOLLYER.]—(B. 138.) At the Stoke Prior Works from 500 to 700 hands are employed. The salt manufactured is from 3,000 to 4,000 tons per week. The entire produce of salt in Worcestershire is about 250,000 tons per annum. The Brine pits are about 1,000 feet deep. "Butter salt" is largely exported from Droitwich to India and Australia. Round pans have been introduced since 1865. The aggregate traffic, that is, coal received and salt forwarded, of the Stoke Prior works is about 1,000 tons per day.

Swords and Matchets.—[F. M. MOLE, JUN.]—(B. 649.) The conventional ideas as to the extent of the sword trade are very erroneous. Our army is small and only horse soldiers and officers carry swords. When once equipped one single sword forger will produce what is required. Hence the matchet trade is combined with sword manufacture. (The matchet is a large knife used in sugar cultivation in the West Indies and Central South America.) The extraordinary demand for swords at the time of the Crimean war, and the inability of English firms to supply it, gave the start to foreign competition. It is not generally known that the larger proportion of the officers' swords sold in this country are either German swords imported complete or foreign blades mounted in London. There have been several spurts in the trade, but these died out, and at the present time Messrs. Robert Mole and Son, of Birmingham, are the only manufacturers who take Government

contracts. An outline of the method of manufacture is given in (B. 649) and is similar to that of edge tools generally—(see p. 208). In ornamenting the hilts of swords fire or mercury gilding[59] is used. The "gripe" is of wood (walnut or beech), and covered with dog fish skin.

Tin Plate Ware.—[A. N. HOPKINS.]—(B. 638.) Fifty years ago workmen made a variety of articles with several pieces of tin plate soldered together. The introduction of machinery in the trade is reducing the number of skilled workmen. In 1835-6 Mr. Thomas Griffiths took out a patent for stamping and burnishing; shortly afterwards Mr. J. H. Hopkins commenced the manufacture of "Patent tea-pots." Candlesticks and other articles made in the same way quickly followed, and stamping and burnishing opened up possibilities which till then had not been dreamed of in the trade. In 1840 what was thought a monster stamp was put down to stamp the top of an 18-inch imperial dish cover. Further improvements in stamping led to the trade being speedily one of the most important, both in this town and the neighbouring one of Wolverhampton. A little time later, tin plate workers turned their attention to the stamping of a few culinary articles, such as colanders, gravy strainers, &c., and of wash-hand basins. In the making of these sheet iron was used, and the articles when finished were tinned by the same process as that used by tin plate makers, and were then sold as "tinned wrought iron hollow ware," and once more an increasing impetus was given to the trade. Milk pans and "prospecting" pans were made in this way, and the advance made just at this time by the Australian Colonies on the great discoveries of gold opened out a large field, where the goods have been bought in ever-increasing

quantities, while shortly after, the Cape and South America as well as Canada became large customers for a similar class of goods. India too came into the market for brass and copper articles, while Egypt, especially about the time of the American Civil War, began to be a most important customer for the copper utensils hitherto manufactured only by the natives, but which the superior machinery the English manufacturer possessed, enabled him to produce much better and cheaper. Meanwhile the French Exhibition of 1855 had shown to our manufacturers specimens of stamping superior to anything they could produce, and one or two unsuccessful attempts were made by them to obtain a nearer inspection of the French method of stamping or more properly pressing. In one way and another it leaked out that the French makers employed a pressure plate and a gradual forcing process, instead of the sharp blow by which the English stamper pounded his material into the required shape. The late Mr. Clutton Salt purchased the patent right for this country, and in 1867 a machine was in operation at the works of the Birmingham Enamel Co., with which Mr. Salt was at that time connected, and Messrs. Griffiths and Browett took out a licence to use the patent. Improvements in stamping followed, keeping well abreast of the new process, and ultimately outstripping it, especially as regards size of vessel produced.

The French system of pressing was taken up in the United States, and as early as 1865 the works of Lalance and Geoschein, at Woodhaven, New York, were in active operation on this principle. In 1866 a Birmingham man, named W. Page, son of an old Birmingham worthy, travelled to New York, and

erected improved machines on the French system in the factory of Messrs. Ketcham and Co. These machines economised material, and at the same time quickened production.

In 1872 Mr. Satchell Hopkins, of Birmingham, after communication with Mr. Page, put down a number of machines on Mr. Page's principle, including one which is even now the largest and most powerful of its kind. A similar form of machine was adopted by other firms, and there soon followed an extraordinary development of the trade hitherto known as the "Stamped Tin Hollow-ware," but now as the "Pressed Bright Tinned Hollow-ware" Trade.

In another important branch of the trade, though there has not been so much scope for improvement, advance has not been wanting. The common and ugly japanned ware, in which stencil plates were largely used, has been superseded by "transfers," and by an invention of Mr. Alfred Hopkins, the japanning of articles with backgrounds highly polished has been superseded by a dead, morocco-like surface, in low tones of pleasing appearance.

In iron plate working the only new mechanical appliance introduced since 1867 is a machine or series of machines for making buckets, by which the article is practically made in one operation. The low wages of workmen who make buckets, coupled with the low prices to which manufacturers have been driven by excessive competition, render the employment of these machines of doubtful advantage. Besides Birmingham, manufactories are established in Wolverhampton, London, Reading, Sheffield, and other towns.

Treatment of Waste.—The following facts are

supplied by Mr. T. J. Baker:—Sheet iron scrap and lathe turnings are worked up again into sheet iron. Copper clippings and turnings are remelted. Copper scale is resmelted, as also brass clippings and brass dust. Gold scrap of the japanning department is sent to the gold refiners, and the leaf metal scrap to the bronze powder manufacturers. Tin plate scrap, after the larger pieces have been sold to the button makers, are "stripped"—that is, the tin is removed by immersion in hydrochloric acid. The resulting tin salt is used by calico printers. The iron scrap, after removal of the tin, is used for precipitating copper by the wet process. Tin oxide, known as "drop tin," formed on the surface of the metal in the tinning pot, is, after recovery of as much of the tin as possible, sent to the tin smelter. Galvanizing dross, an alloy of zinc and iron, which sinks to the bottom of the galvanizing bath, is removed by a perforated ladle, and refined by distilling off the zinc. Zinc ashes, that is cinders which have fallen on the molten metal and absorbed zinc, is also refined by distillation. Flux skimmings, or that which is skimmed off from the galvanizing bath, is an oxide and chloride of zinc. This is put in a vat; stirred with hot water, the oxide falls to the bottom of the vat, but the chloride dissolves. The clear solution is heated with gas liquor, when zinc precipitates as carbonate, and the chloride of ammonium, now in solution, is recovered by evaporation. The solid residues are worked up in paint mills into zinc white.

Tools (Heavy Edge).—[A. WINKLER WILLS.]—(B. 656.) In addition to edge tools proper, such as axes, adzes, hatchets, and other articles, the trade includes pickaxes, spades, shovels, forks, hoes, augers, trowels, shipscrapers, &c. The number of patterns regularly supplied by the manufacturers of

Birmingham and the neighbourhood is estimated at several thousands, each nation and almost each district requiring special patterns of its own. The character of the soil, habit of people and other circumstances affect the form of tool though used for the same purpose. The enormous hoe, with a blade nearly a foot wide and of the same depth, which is in universal use in Guatemala, would be useless in Valparaiso, because the soil is light in one country and heavy in the other.

A Brazilian axe is made thus:—A piece of bar iron is taken and the middle part thinned out under a light steam hammer to the thickness required to form the edge of the tool. The blank is then doubled over upon itself and the bottom part welded together. A bar of hard cast steel is welded on to the bottom of the blank; the steel being then cut off from the bar to a width corresponding to that of the blank. The embryo axe, by means of a steam hammer, is forged under tools of suitable shape fixed in the head of the hammer, the final shape being given by hand tools. The tool is now ready for hardening and tempering—the steeled end of the axe is heated to a blood red in a slow furnace and is then plunged into cold water. It is now tempered by slowly heating till it assumes the required tint. The tool is now ready to be ground, polished on a succession of wooden wheels or bobs, dressed with emery of gradually increasing fineness, and then to have its upper part japanned black, blue, scarlet, or bronze-coloured, according to the taste of the consumer.

The principal machinery employed consists of shears, “squeezers,” tilt and trip hammers, striking from 200 to 400 blows per minute, steam hammers, shearing and punching machines, stamps, rolls, and

lastly, massive machines or presses of various construction, used for shaping the eyes of hoes, pickaxes, &c. The wood handles required for spades, shovels, &c., form a distinct branch of the trade. Hickory handles are almost exclusively used in the wedge axes so largely employed in India and the colonies; these handles are necessarily imported from the United States. Self-acting machines have during late years been introduced for the turning of ash handles for axes, hatchets, &c. The handles of spades, shovels, and forks are of ash sawn from planks, subsequently turned in lathes. To bend them, they are steamed and pressed into shape by powerful screws.

The only waste products are the scale or dross which falls from the heated iron, and the shearings or scraps cut off the tools. Both are sold to the ironmaster—the former for fettling his furnace, the latter to be worked up again into bar iron.

The number of persons employed in the trade in Birmingham and the district is probably 3,000 to 4,000.

The conditions of the manufacture have been greatly altered during the last seven years by the extensive introduction of machinery to replace manual labour; at the present time a much larger number of boys and youths are employed than was formerly the case. Their wages range from 8s. to 15s. per week according to age. Forgemen earn on an average £2. 10s. or £3. per week; foremen smiths about £2., and their strikers or underhands about £1. to £1. 5s, when in full work. Women are only employed in japanning, wrapping up and similar light work. The revolution which has taken place in the method of manufacture during recent years was

largely accelerated by the tyrannical operations of the formerly powerful trades union of edge-tool makers, which, during the period of large demand which prevailed from 1872 to 1874, used every available means to limit production, and to make it impossible for the manufacturers to execute orders in reasonable time. As a consequence, the productive power of the trade has been so enormously increased that at present it is altogether disproportionate to the demand, and hence, in this as in almost every other branch of manufacture, unremunerative prices and reckless competition are unfortunately the order of the day.

Umbrellas and Parasols.—[WILLIAM HOLLAND.] —(B. 666). Since the previous article was written machinery has been extensively introduced, an umbrella rib being now made by automatic machinery in one operation instead of several. The square or round iron wire for the stretcher is also similarly converted into form nearly ready for japanning. In some cases, even the riveting or attaching the rib to the stretcher is done by machinery, but as yet the experiment remains to be proved good and economical. The number of hands employed has increased. Some hundreds of men, women, girls, and boys are employed. The materials have undergone a change, zinc and iron have displaced to a large extent brass and copper, and great competition has caused everything to be lightened and cheapened; but a reaction is taking place in this respect, and better and stronger goods are coming into use. The various parts of umbrellas and parasols are now gilt, bronzed, enamelled, silver and nickel-plated, instead of being simply japanned as was the case formerly. The patents which have been taken out in connection with umbrellas and

parasols are numerous, and in many cases trivial. Over 800 patents were granted between 1867 and 1876, and since then the inventive ball has been rolling still more rapidly. It has been proposed to use a transparent material to enable one to see ahead when protecting the face with the umbrella. Another arranges for spinning the umbrella so as to drive off the rain, other proposals are to fold the umbrella so as to go inside a stick, to convert it when necessary into a railway carriage key, a corkscrew, or a pike, writing materials have been inserted in the handles, and a variety of contrivances proposed. One of the most curious of all these patents is one for fixing the umbrella to the hat somewhat after the fashion of the thatched Indians of whom one reads in books of travel.

Watch Manufacture.—[R. L. BRAGGE.]—The "watchmakers" of Birmingham of forty or fifty years ago were rather repairers than makers, though there was scarcely a part of the mechanism of a watch which they were not at times obliged to make. Of these watchmakers, S. Allport, of Bull Street, was considered to take the lead. There were also T. Warwick, in Colmore Row; Birley, in High Street, and others. At this time the highest class watches were made in London. Liverpool also had a reputation for goods of high quality. Coventry, however, enjoyed a larger industry than either of the other centres named. The first earnest and persistent effort to include watch manufacture as a Birmingham industry was made by Messrs. Hodgkins and Booth, who commenced about 1843, and continued till 1850, when Messrs. Betts and Fairfax succeeded to the business. Messrs. Charles Wood and Sons, of Bath Street and of St. Paul's Square, not long afterward gained a reputation as manufacturers of high quality

watches. Mr. W. Ehrhardt, in 1873, erected a large manufactory for production of watches according to modern ideas, and the English Watch Company (Limited) have also erected extensive ranges of shopping in Villa Street. Exclusive of "jobbers," there are probably about 600 to 700 artisan watchmakers employed in the town, about 30 per cent. of whom are females; some 500 of these are employed at the two large manufactories just mentioned. It is probable that nearly 700 watches per week are turned out in Birmingham. Birmingham watches have a good reputation, and there is not a "duffer" watch turned out from one year's end to another.

One singular feature of the trade is that the name of the maker rarely appears on a watch—manufacturers generally put on the names of their customers. Many large export houses have adopted fictitious names, under which a certain pattern watch has attained a reputation that makes the name a valuable property. A large Colonial trade is done on these lines.

Messrs. Dennison, Wigley, and Co., manufacture watch cases, employing about 100 hands, making the cases for American companies. These cases as well as many Swiss ones pass through the Birmingham Assay Office, and are afterwards sent abroad for the movements to be fitted in. Since this practice prevailed, it is obvious that the Assay Office returns are no index of the number of watches made in this town. Almost the only branch of this trade which is not localised is the enamelling and painting of the dials. Watch glass making is scarcely practised in this country, nearly the whole supply of the watchmaking world coming from the Continent.

Wire Working.—[J. B. GAUSBY.]—(B. 596.) No

marked departure from processes previously described has taken place. More attention is now paid to decoration, and there is an endeavour to introduce more artistic designs. The large demand for wire netting made by machinery as described (B. 597) has led to a wide extension of locality for its manufacture. Large wire drawing firms and galvanizers in different parts of the country have taken up the manufacture, so that although Birmingham still turns out a large quantity of the article, she has not been able to retain the manufacture within her bounds.

Wire (Steel).—[CHARLES LEAN.]—(B. 591.) One hundred years ago a horse was employed for drawing wire by a firm in the town. New applications of wire within recent years have been telephones, deep sea sounding, road and aerial tramways, and cycles. The scrap wire is utilised for nails; it is also bought by hawkers for the purpose of making riddles and a number of wire articles. No women or girls are employed in the trade of the district, and perhaps about 700 men and boys, the bulk of whom draw iron wire only.

[Other articles on Manufacturing Industries will be found in Appendix.—ED.]

PART III.

GEOLOGY AND PHYSIOGRAPHY. (BIRMINGHAM DISTRICT.)

EDITED BY PROFESSOR CHAS. LAPWORTH, LL.D., F.G.S.

PHYSIOGRAPHY.

The town of Birmingham lies almost in the exact geographical centre of England and Wales, midway between sea and sea. Its distance in a straight line from the three nearest sea-ports on the opposite sides of the island, Liverpool, Boston, and Bristol, is about 85 miles in each case, while its distance from London and Southampton is only a few miles more.

The main watershed of Southern Britain, which commences to the northward in the Pennine Range and divides the rivers which flow eastward into the German Ocean from those which drain westward into the Irish Sea and the Bristol Channel, enters upon the Birmingham District from the northward by way of Cannock Chase, crosses the "Black Country" about six miles to the west of Birmingham, and passes out of the district to the southward through the Lickey Hills, round the headwaters of the Avon to the Edge Hills and the Cotswolds.

The town of Birmingham and its immediate neighbourhood, is drained by the brooklets which unite to form the river Tame, the first of the southern tributaries of the Trent. Thus, physiographically speaking, Birmingham lies well within the basin of the Humber. To the west of the watershed of Dudley and the Lickey, the rivers of the district have a short

and rapid descent to the main stream of the Severn; to the south eastward, they glide gently across the Midland Plain to its tributary—the soft-flowing Avon.

The physical centre of the district is the locality of Barnt Green, a point on the Midland Railway, about eight miles to the south of the town. From this point radiate the several low hill ranges which give to the neighbourhood of Birmingham its distinctive character. The first of these ranges (forming the main watershed, and constituting the natural backbone of the area) is composed of the Lower Lickey Hills and their northerly extensions—the rolling heights of Halesowen, the conspicuous mound of Rowley Regis (820 feet), and the beautifully wooded heights of Dudley Castle (730 feet), the Wren's Nest, and Sedgley Hill. To the west of this axial ridge, a second range bearing points of a somewhat greater elevation, stretches from the same locality of Barnt Green through the Upper or Bromsgrove Lickey Hills (900 feet) to Hagley, where it is known as the Clent Hills (1,028 feet). These look out far and wide over the beautifully fertile valley of the Severn, and are continued to the north-westward in the heights of Stourbridge and Abbots Castle. To the east of the main Lickey and Dudley axis, the country is less conspicuously diversified. The hill-ranges are broader, and rise almost imperceptibly from the surrounding plains. The most important of these less elevated areas forms what may be termed the Birmingham plateau. This is an irregular strip of broken ground, about twenty miles in length by four or five miles in breadth, which takes origin from the north-eastern slopes of the Lickeys between Northfield and Halesowen, and sweeps northwards through Harborne, Birmingham, Barr and Sutton

Park, into the wild district of Cannock Chase. On this irregular plateau stand the town of Birmingham and its suburban villages of Harborne, Edgbaston, Moseley, Aston, Handsworth, and Sutton Coldfield. The western side of the plateau overlooks the "Black Country." It is marked out by the terrace of Smethwick, Sandwell, and Great Barr, and culminates in the conspicuous fir-topped hill of Barr Beacon (800 feet). The eastward margin of the plateau is much less pronounced, and subsides gently into the great Midland plain of Warwick and Tamworth, along a line drawn from Northfield, through King's Heath, Moseley, Camp Hill, and Sutton Coldfield.

The ground forming the Birmingham plateau rises and falls into an endless succession of heights and hollows; here sinking down into broad tree-sheltered, stream-cut valleys, there rising into long low mounds and hills. The subsoil throughout is mainly gravel or sandy clay, and the underground drainage is, as a rule, excellent. The north-western half of the plateau still retains its original forest character, and the primeval aspect of the district is recalled by the wild area of Sutton Park—a picturesque admixture of long, dry, pebbly mounds, covered with thick woods of oak, ash and holly, and divided from each other by open glades of gorse patches, with long, flat, treeless expanses, shrouded in dark heather and picked out here and there with deep, clear water-pools. The central half of the plateau is now covered by the great town of Birmingham and its immediate dependencies. The town stands upon a series of broad rounded knolls, divided from each other by intervening open valleys. The more elevated points are marked by the church of St. Philip's, Newhall

Hill, Soho Hill, and the Monument; while the great maze of streets, manufactories and commercial buildings fill up all the space between. Strictly speaking, the town proper lies in the angle included between the river Tame and its little tributary the Rea. The Tame runs in a broad valley round the north-eastern side of the town to the low-lying district of Saltley, and thence takes its course north-eastward across the Midland plain towards the Trent at Burton. The little river Rea, which is the Birmingham river par excellence, runs from the Lickey Hills through the south-eastern corner of the town, across the low-lying district of Digbeth, and joins the Tame at Saltley.

The south-western portion of the Birmingham plateau is occupied by the fashionable district of Edgbaston and the neighbouring suburbs of Harborne and Moseley. While the original upland character of the plateau is still distinctly apparent, the dwellers in this southern area have in all other respects utterly changed its former aspect. The land has been reclaimed and enclosed. In place of the wild oak and ash, we have masses of the Elizabethan elm, the fir and the beech; and in place of the wild heather, cultivated lawns and grassy fields. Every advantage has been taken of the natural resources of site and soil; and the result is that Edgbaston and its surroundings form one broad expanse of mansions, woods and fields, well worthy of the town and neighbourhood.

To the westward of the Birmingham plateau lies the district of the "*Black Country*," of which the town of Dudley is the natural centre. Compared with the Birmingham plateau, it is a lowland district of wild confusion—a maze of mines, chimneys, factories, and

straggling villages and towns, shrouded in a canopy of smoke and steam. The natural soil is generally hidden from sight by heaps of mining spoil, and mounds of rubbish, cut through in all directions by lines of railway and broad canals. The beautiful wooded hill of Dudley, crowned with its grey keep, and the neighbouring oak-clad ridges of the Wren's Nest and Sedgley, rise like islands of verdure out of the dark sea of mining ground around, and look strangely out of place amid their gloomy surroundings.

To the east of the Birmingham plateau lies the broad plain of Tamworth and Nuneaton, watered by the sluggish stream of the Tame. The plain is continued far to the southward through the richly wooded district of Warwick, Alcester, and the old Forest of Arden, and thence down the valley of Shakespeare's Avon, to the terrace of the Edge Hills and the northern slopes of the Cotswolds.

GEOLOGY. (BIRMINGHAM DISTRICT).

Paleozoic Rocks.

BY PROF. C. LAPWORTH, LL.D., F.G.S.

Introduction.

The Birmingham district, or that area of which Birmingham constitutes the natural capital and commercial centre, extends from Stafford on the north to Tewkesbury on the south, and from Wellington on the west to Leicester on the east,

forming an area about 60 miles in length by 50 in breadth.

In no single district in Britain is the relation of the physiography of the country seen to be more strikingly dependent upon its geological structure than within the limits of the Birmingham district. Every hill, ridge, plain, and valley of any importance is a mere reflex of the underground geology. The local distribution and physical peculiarities of its rock formations afford a natural and complete explanation of all its special scenic peculiarities.

The dominant geological formation of this Midland area is the great Mesozoic formation of the *Triassic* or New Red Sandstone, which stretches through Southern Britain in a continuous band from Hartlepool to Exeter, and divides the broken and contorted Paleozoic rocks of the west from the flat-lying Neozoics of the east. This great band of New Red Sandstone attains its widest extension in the north of the Birmingham district, between Eccleshall and Charnwood Forest, where its transverse diameter is about 50 miles. Within the limits of the Birmingham district, however, its diameter rapidly decreases, until in the extreme south, in the neighbourhood of Worcester and the Malverns, its breadth is reduced to about 10 miles.

The red rocks of this *Triassic* formation not only form by far the most predominant and most conspicuous geological feature of the district at the present time, but not long since, geologically speaking, they must have extended over the entire area in one unbroken expanse. They now constitute a sheet of red sandstones and marls, through which protrude, in numerous bands and patches, the older Paleozoic rocks. Although nowhere very steeply

inclined, these red beds of the *Triassic* have been bent into several long low arches, or broad domes, whose longer axes range approximately north and south. The summits of many of these arches have been denuded, and the underlying older rocks have again been bared to-day. Four of these arches are especially conspicuous, those of the Wrekin, Malvern, Dudley, and Nuneaton. In each of these the underlying *Coal Measures* are laid bare, forming the four coalfields of Coalbrookdale, Forest of Wyre, South Stafford, and Eastern Warwick, all of which shew round their outer margins a narrow band of the intermediate formation of the *Permian*. In each of these anticlinals, too, the denudation of the core of the arch has been sufficient to wear away the *Carboniferous* from its centre, and to expose to view yet older formations—the *Old Red Sandstone* in the Forest of Wyre, the *Silurian* in South Staffordshire, the Malverns, and Coalbrookdale, and even the *Upper Cambrian* and its underlying igneous rocks in the Wrekin, the Lickey, and near Nuneaton. With the exception of the *Silurian* of Abberley and Dudley, and the recently discovered *Cambrian* of Nuneaton, however, these *pre-Carboniferous* rocks are comparatively inconspicuous, rising up merely in narrow bands in the cores of long wedge-shaped hills.

From the economical as well as from the structural point of view, by far the most important of these geological arches is that of South Staffordshire, which is the southward continuation of the Pennine chain, and part of the true backbone of Southern Britain. The central axis of this arch runs, as we have seen, through the Dudley Hills, and dies away in the complex of faults to the south of the Lickeys. On the natural consequences of the rise of this arch, all the

physical, scenic, and economic peculiarities of the central parts of the district are essentially dependent. The hills and plains around Birmingham are all more or less related to this grand anticlinal—the hills marking the uplifted edges of the harder rocks, the limestones, sandstones, and pebble beds; and the plains, the position of the gently inclined soft shales and marls. It has brought within workable distance of the surface the coals and ironstones of South Staffordshire, and the valuable limestones of the Dudley Hills, and it has had its final effect in bringing together the overflowing population of the town and district.

The original simplicity of the geological structure of the floor of the Birmingham District is much complicated by fractures, faults, and unconformities. The Wrekin and the Malverns are both affected by profound dislocations. The South Staffordshire Coldfield is bounded both on the eastward and the westward by faults of more than ordinary magnitude, while a long straight fault more than 20 miles in length runs through the south-eastern part of Birmingham itself, and flings down the *Keuper marls* of the Warwick plain against the older sandstones of the Birmingham plateau.

In the Birmingham District as everywhere in Britain, the *Triassic* formation rests unconformably upon everything below. At the same time, its members overlap each other more or less irregularly, and shew a rapid diminution in thickness when followed from west to east. Thus it happens that not only do the *pre-Triassic* rocks make their appearance in their expected positions along the main anticlinal lines, but many of the old ridges of Palæozoic rocks, which rose out of the Triassic waters, have had their

enveloping pall of red sandstone removed from their flanks and summits, which have thus been bared once more to the light of day. Such are, in part, the ridges of the Wrekin, the Malverns, the Lickeys, and the Forest of Charnwood.

In the valley of the Severn, to the west of Birmingham, the strata run in narrow bands. The central portion of this valley lying between Coalbrookdale and Bridgnorth, to the west of the main anticlinal of the Birmingham district, owes all its striking beauty and variety to the rapid alternations of hard and soft strata which occur within its limits.

In the great Midland plain to the east of Birmingham, the strata are spread out in broad sheets. The plain is underlain in great part by the comparatively homogeneous flat lying Keuper marls, with their intercalated bands of harder sandstones. Its scenery is consequently less varied than that of the Severn valley, but it is rich in that sweet sylvan beauty which is almost peculiar to the English landscape, and it forms one broad expanse of gently rolling farmland and woodland, whose green crested waves sweep onward to the east and south, mile beyond mile, till they break against the long shore-like scarp of the harder Jurassics.

The Local Rock Formations.

As will be apparent upon a study of the accompanying geological map, the geological formations exposed within thirty miles of Birmingham, include the entire stratigraphical succession between the *Cambrian* and the middle portion of the *Jurassic*, with two notable exceptions.

The two formations locally wanting are the *Ordovician* and the *Old Red Sandstone*. The nearest known *Ordovician* rocks occur in central Shropshire, to the east of Church Stretton; the nearest *Old Red Sandstone* beds are met with to the south of the Forest of Wyre. The natural sequence of formations, and the localities where the several formations are most conspicuously displayed, are given in the following table:—

TABLE OF THE GEOLOGICAL FORMATIONS OF THE BIRMINGHAM DISTRICT.

MESOZOIC, OR SECONDARY ROCKS.

LIASSIC.	*Middle Lias* (*Marlstone*)— Edge Hill, Fenny Compton.
	Lower Lias Clays— Harbury, Rugby.
RHŒTIC.	*Marls and White Lias*— Harbury, Knowle, Wooten Wawen.
TRIASSIC.	*Upper Trias or Keuper*: (*a*) *New Red Marl*— Moseley, King's Norton, &c., &c.
	(*b*) *Lower Keuper or Waterstones*— Birmingham, Warwick.

Lower Trias or Bunter:

(*a*) *Upper Mottled Sandstone*—Harborne, Edgbaston, Hockley.

(*b*) *Pebble Beds and Conglomerate*—Sutton Park, Smethwick.

(*c*) *Lower Mottled Sandstone*—Clent Hills, Stourbridge.

PALÆOZOIC, OR PRIMARY ROCKS.

PERMIAN, OR DYASSIC.

(*a*) *Permian Breccia*—Clent Hills, Northfield.

(*b*) *Red Sandstones and Marls*—Halesowen, Enville, Rubery.

CARBONIFEROUS.

(*a*) *Upper Coal Measures with Spirarks Limestone, &c.*—Sandwell, Arley.

(*b*) *Lower Coal Measures*—Oldbury, Bilston, Hawkesbury.

	(*c*) *Millstone Grit*—Absent near Birmingham, present near Colebrookdale.
	(*d*) *Carboniferous Limestone*—Absent.
Old Red Sandstone or Devonian	Absent near Birmingham, present in Forest of Wyre.
Silurian.	(*a*) *Ludlow Shales and Limestones*—Sedgley Hill.
	(*b*) *Wenlock Shales and Limestone*—Dudley Hill, Wren's Nest, Walsall.
	(*c*) *Woolhope Beds*—Barr and Rubery.
	(*d*) *Llandovery or Mayhill*—Rubery.
Ordovician.	Absent.
Cambrian.	*Upper Cambrian:*
	(*a*) *Tremadoc Beds and Lingula Flags.*—Shineton, Nuneaton, Lower Lickey, and Malverns.

FUNDAMENTAL, CRYSTALLINE AND IGNEOUS ROCKS.

(*a*) *Charnwood Volcanic Rocks*—Charnwood Forest, Caldecote Hill, The Wrekin.

(*b*) *Malvern Crystalline Rocks*—North Hill, Hereford Beacon, &c.

The Fundamental Crystalline and Volcanic Rocks of the Malverns, the Wrekin, And Charnwood Forest.

The rocks which undoubtedly occupy the lowest place in the geological formations of the Birmingham district are those crystalline and partly schistose masses which form the core of the Malvern Hills; and certain well-marked volcanic rocks which occur at the Wrekin and Nuneaton, and which appear to have their equivalents in the great igneous series of Charnwood Forest. That all these more or less crystalline rocks are of higher antiquity than the Upper Cambrian of Wales is demonstrated by the fact that fossiliferous rocks containing Cambrian fossils of this age overlie them, while the lowest recognisable zones of these overlying fossiliferous rocks (the Hollybush sandstone of the Malverns, the quartzite of the Wrekin, and the Hartshill quartzite of the neighbourhood of Nuneaton) are in part composed of their fragments. Whether, however, they belong in part to the Middle or Lower Cambrian, or wholly appertain to the earlier formations of the Archean, must as yet remain an open question.

(*a.*) MALVERN HILLS.—The core of the Malvern Hills is composed of a coarse syenitic, and more or less gneissose rock, pierced by veins of quartzo-felspathic rock of igneous origin (Hereford Beacon, &c). The main mass which is coarsely crystalline, becomes occasionally distinctly gneissose and even

schistose, and its mineral bands strike from north-west to south-east, *i.e.*, transverse to the general trend of the Malvern Ridge. The basement beds of the Hollybush sandstones (Cambrian) and the Llandovery rest unconformably upon this rock, which has consequently been claimed by some geologists as distinctly of Archean age, representing in part the Laurentian of Logan.

The best localities for studying the essential characters of the Malvern rocks are the quarries of the North Hill and the Wych, and the eastern slopes of the hills between Malvern Wells and Herefordshire Beacon.

(*b.*) THE WREKIN.—The core of the beautiful hill of the Wrekin is formed by a magnificent series of highly acidic volcanic rocks—rhyolitic lavas and ashes. As first pointed out by Dr. Callaway, they rise out unconformably from below fossiliferous rocks of Upper Cambrian age. (Hollybush Sandstone and Shineton Shales) and are believed by him to be of Archean age. The finest exhibitions of the volcanic ashes of the group are met with in quarries on the flanks of the Wrekin itself, while the rhyolitic lavas occur in scattered localities along the hill. A broad mound of the same igneous series rises out from below the Triassic to the south of Walcot Station, and a most beautiful and instructive section of banded and spherulitic rhyolites is shewn in the quarry at the locality known as the Lee Rock.

The truly volcanic nature of these remarkable rocks was first pointed out by Mr. S. Allport, F.G.S., and their original characteristics, and the changes they have undergone since their formation, have been described by him in a well-known series of memoirs. Their geological position, and their relation

to the associated fossiliferous strata, and to the similar rhyolitic rocks of Caer Caradoc and Pontesbury have been fully discussed by Dr. C. Callaway, F.G.S.

(*c.*) NUNEATON (CALDECOTE HILL).—A thin group of volcanic breccias and tuffs, with associated quartz-felsites, and diabase, rises out from below the Upper Cambrians of Nuneaton, in the Park of Caldecote Hill. The lowest zone of the overlying Cambrian Hartshill quartzite is in part composed of their fragments. The ashes are shewn in old cuttings to the north-west of Caldecote Lodge, the quartz-porphyries and diabase in an old quarry about a quarter of a mile to the southward, while the breccia composed of the fragments of these old rocks, in the base of the Cambrian quartzite is best shewn on the tramway still farther to the southward, leading down to the Coventry Canal.

(*d.*) CHARNWOOD FOREST.—This district is formed of an island of ancient igneous and stratified rocks rising out from below the Upper Trias. The stratified rocks are almost wholly composed of materials of volcanic origin, and shade off on the one hand into coarse volcanic agglomerates, and on the other into fine green slates like those of the Borrowdale series in the Lake District, to which indeed the whole of the bedded Charnwood rocks bear a striking resemblance.

The stratified volcanic rocks are pierced by numerous igneous intrusions. The most conspicuous are those classed by Professor Bonney, F.R.S., as syenite. These are most conspicuous near Groby, Bradgate, and generally in the south eastern parts of the Charnwood area. A mass of beautiful hornblendic granite rises through the Trias immediately to the

east of Charnwood Forest at Mount Sorrel, near Barrow on Soar. A few later dykes of altered andesite occur within the forest itself, and diorite in the outlier of Brazil Wood.

To the south of Charnwood Forest, several remarkable points of syenitic rock protrude through the flat-lying Trias. The most conspicuous of these are the hills of Sapcote, Croft, and Enderby.

There is no direct evidence of the Cambrian or pre-Cambrian age of the Charnwood rocks, but strata identical with the fossiliferous Stockingford shales (Upper Cambrian) of Nuneaton, have been pierced in several borings through the Trias near Leicester, Market Bosworth, etc., and appear to rest at once upon the Charnwood rocks, as do the Nuneaton beds upon the Caldecote volcanic group.

Cambrian Rocks.

No fossiliferous strata unequivocally of Lower Cambrian age occur within the limits of the Birmingham District; but strata of Upper Cambrian age are met with in several localities. They were first recognised by Professor Phillips in the area of the Malvern Hills, and have been subsequently detected within the last few years at the Wrekin, at Nuneaton, and in the Lower Lickey Hills.

MALVERN HILLS.—The Upper Cambrian beds of the Malverns rest upon the crystalline rocks of the axis of the hills to the south of Herefordshire Beacon, along the slopes of Midsummer Hill and Keys Hill. The lowest zone is the *Hollybush Sandstone*, a light green micaceous rock, containing tubes of sea worms and *Kutorgina cingulata*.

The Hollybush Sandstone is succeeded by shivery shales, somewhat sandy below, and becoming darker and more carbonaceous above.

In their lower beds they yield:—*Obolella Salteri*, *Obolella sagittalis*, *Lingula pygmea*, *etc.* In their middle beds they afford *Pellura scarabeoides*, *Spheropthalmus alatus*, *Agnostis pisiformis*, *Agnostus trisectus*, etc., well-known fossils of the Upper Lingula Flags (Dolgelly) of North Wales.

Their highest beds contain *Dictyonema sociale*, a fossil which passes up into the succeeding Tremadoc Slates.

The rest of the local succession of the Cambrian rocks is hidden by the unconformable overlap of Silurian.

The Hollybush Sandstone and the overlying sandy shales contain numerous intercalated volcanic rocks, some of which are of the age of the surrounding strata, while others are intrusive.

NUNEATON DISTRICT.—In the neighbourhood of the town of Nuneaton in eastern Warwickshire, a strip of Cambrian rocks, about eight miles in length by one in breadth, has been detected within the last few years. The rocks consist of volcanic ashes, quartzites and thin-bedded shales, pierced by dioritic dykes. These strata were formerly mapped as altered Millstone Grit and Carboniferous shale, and their Cambrian age has only been recently demonstrated by the discoveries of Birmingham geologists. The complete succession is as follows:—

(1.) CALDECOTE VOLCANIC GROUP.—Well-bedded tuffs and volcanic ashes (see *ante*) with masses of Quartz-felsites and diabase.

(2.) HARTSHILL QUARTZITE.—Thick-bedded quartzites, with occasional layers of sandy shale.

(3.) STOCKINGFORD SHALES.—

(*a.*) *Lower Division.*—(*Obolella Beds*) Purple and green shales with *Obolella Salteri*, *Lingulella pygmea*, *Lingulella lepis*, *Acrotreta*, *Protospongia*, &c.

(*b.*) *Upper Division.*—(*Agnosias Beds*) Grey and black shales with *Agnostus pisiformis*. *Beyrichia Angelini* and *Lingulella Nicholsoni*, in the lower zones, and *Spheropthalmus alatus* and *Dictyonema* in the upper zones.

These Cambrian rocks are overlain unconformably by the Coal measures to the west, and by the Keuper beds to the east; the boundary of the area is, however, locally defined by lines of fault.

The basement beds of the Hartshill Quartzite are locally composed of fragments of the underlying volcanic rocks (Caldecote Beds). The Quartzite itself, which forms the chief road metal of the neighbourhood, is laid bare in a long series of quarries between Nuneaton and Hartshill.

The overlying purple and green shales of the Stockingford Beds range from Marston Jabet, south of Chilvers Coton to Atherstone Outwoods. The best section is seen in Parley Park Lane near Atherstone, and the fossils have been obtained from this section, from Atherstone Oakwoods, Camp Hill, and Marston Jabet.

The best section of the succeeding grey and black Shales occurs in the cutting of the Midland Railway near Stockingford, which gives its name to the formation. Their fossils have been procured from the rocks of this section; from the cutting at Chilvers

Coton, the banks of the Coventry Canal, from Oldbury reservoir, Mawbornes and Merevale Park.

The numerous intrusive dykes of volcanic rock form a conspicuous feature in the geology of these Cambrian strata. They are formed of coarse-grained diorites, much quarried for road metal, kerbs, and setts. Good sections occur in the quarries near Tuttle Hill, in the railway cuttings near Stockingford and Chilvers Coton, and in quarries near Oldbury Reservoir.

A small patch of these Nuneaton Cambrians is met with on the north-western margin of the East Warwickshire coalfield, at Dost Hill, to the south of Tamworth. It consists of the usual annelide-bearing Stockingford Shales, pierced by an intrusive mass of diorite.

LOWER LICKEY HILLS.—The core of the Lower Lickey Hills between Barnt Green and Rubery, about eight miles south of Birmingham, is formed of a mass of quartzite identical in all its main features with that of Hartshill, near Nuneaton.

At the village of Rubery, in an exposure on the roadside, it is seen to be unconformably overlain by fossiliferous Llandovery sandstone, the basement beds of which contain fragments of the underlying quartzite in abundance. At the south-western extremity of the Lower Lickey Range the quartzites contain fragments of igneous rocks, and appear to pass down into a series of felspathic grits, pierced by dioritic dykes similar to those of the Nuneaton District. Good sections of the quartzites are laid bare at Rubery Station, at the village of Rubery, and in a large quarry near the roadside, a mile northward from Kendall End. In the last-named locality the quartzites are seen greatly folded and faulted.

WREKIN DISTRICT.—In the Wrekin area the great volcanic series of the hills is immediately overlain by a quartzite similar to that of the Hartshill and the Lickey, the basement bed similarly containing fragments of the underlying volcanic rocks. The quartzite is succeeded by the Hollybush sandstone, with its characteristic fossil, *Kutorgina cingulata*.

A broad area, lying between the Hollybush sandstone and the unconformably overlying Silurian rocks of Buildwas, is occupied by a series of Upper Cambrian rocks, denominated by Dr. Callaway the Shineton Shales, and characterised by the forms:—*Olenus Salteri*, *Sphæropthalmus*, *Asaphellus Homfrayi*, *&c.*, *Bryograptus Callavei*, *&c.*, allying them with the Tremadoc Beds of North Wales.

Silurian Rocks.

The rocks of the Silurian System are fully developed within the limits of the Birmingham District, under their most typical aspect. The well known localities of Dudley and Barr have been famous in the geological world since the publication of Murchison's great work, the Silurian System; and the abundance and beauty of the fossils of the limestone rocks of the district place it next to the typical area of Central Shropshire as the representative country of the Silurian rocks.

The Silurian strata are all of the well-known Salopian type, shewing several thick-bedded limestones, occurring on distinct horizons in a great thickness of dark blue or grey nodular shales and mudstones. They make their appearance in sharp anticlinal arches in the South Staffordshire coalfield, and along its faulted margins. Four of these

exposures occur along the crest of the Lickey-Dudley anticlinal—at Rubery, Dudley Castle Hill, the Wren's Nest, and Sedgley. The largest continuous exposure is that near the town of Walsall, on the eastern margin of the coalfield.

All the Silurian formations from the Mayhill Sandstone to the Ludlow (Aymestry) Limestone are recognisable, but the terminal Downton sandstone is lost below the unconformably overlying Carboniferous. None of the localities, however, shew the complete consecutive series, which is made out by piecing together the sections occurring in the several areas.

(1.) LOWER LICKEY HILLS.—

(*a.*) *Landovery or Mayhill Rocks.*—The usual red and grey *Pentamerus* sandstone of the Mayhill formation is exposed along the north-west flank of the Lower Lickey Hills. It may be seen resting unconformably upon the Cambrian quartzite in the village of Rubery, and at Leach Heath. Casts of fossils are abundant in some of the sandstones a few feet above the base of the formation, and include the well known forms:—*Pentamerus oblongus*, *Pentamerus lens*, *Strophomena expansa*, *Attrypa reticularis*, *etc.*—These may be collected from the rocks at the village of Rubery, and from the fragments of sandstone scattered over the fields between the Asylum and Leach Heath.

(*b.*) *Woolhope or Barr Limestone.*—The Llandovery sandstone is followed (in a stream section below the Asylum) by pale blue shales and mudstones containing a bed of hard calcareous rock, affording examples of *Illenus Barriensis*, *Atrypa reticularis*, *Encrinurus punctatus*, *Rhynchonella Lewisii*; but the section is a poor one, and is covered up almost

immediately by the overlying Carboniferous.

(2.) WALSALL AND BARR.—This is the typical area for the well known Barr Trilobite *Illenus Barriensis*. The quarries of the Woolhope Limestone which afford it are now disused, but a good section of the fossiliferous shales above is displayed in the railway cutting between Aldridge and Walsall. The overlying Wenlock or Dudley Limestones are mined at the town of Walsall itself, but good fossils are now comparatively rare.

(3.) DUDLEY AND THE WREN'S NEST.—By far the most notable and interesting of the Silurian exposures are those of the neighbourhood of Dudley. In the three exposures of Dudley Castle, the Wren's Nest, and Sedgley Hill, the Silurian limestone rises up in steep dome-like forms. This limestone, which is that of the Wenlock of Siluria, is here composed of two calcareous bands—the higher about 28 feet in thickness, and the lower about 42 feet—separated from each other by an intermediate zone of about 90 feet of gray shales. The limestone has been worked for centuries as a flux for the ironstones of the coalfield. The hills have been mined to a great depth, and all the best limestone rock extracted. The intervening and enveloping shales have been allowed to remain, and the present structure of the hills is that of a central dome surrounded by two enveloping shells, separated from each other by two more or less empty spaces. Where the dip of the rock is high, and these excavated parts are exposed, they form deep moat-like hollows, bounded by walls of shale. Where the dip is low, and the overhanging rocks are supported by the vast pillars left by the workmen, these excavations form magnificent caverns of peculiar weirdness and beauty. In the heart of the

hill at greater depths they form damp gloomy chasms of enormous extent, which can only be seen to perfection when lit up by artificial light.

The Dudley limestone bands and the surrounding calcareous shales have long been famous for the abundance and beauty of their included fossils. Many of the type species of Murchison's Silurian System came from this locality; but since the superficial limestones have been worked out, good specimens are exceedingly rare. An excellent collection of the fossils of these beds is laid out in the Dudley Museum, and another in the Geological Museum of the Mason College. Many good collections are in the possession of private individuals in Dudley and elsewhere.

The best localities for fossils at present are the shaly slopes on the flanks of the Wren's Nest, where the usual Wenlock Brachiopods and Corals are abundant, but the beautiful Trilobites of the formation are but rarely met with.

The Wenlock limestone occurs both in the Dudley Castle Hill and in the Wren's Nest. The Aymestry limestone is only met with in a single locality on the flanks of Sedgley Hill, where it yields occasional specimens of its characteristic fossil, the *Pentamerus Knightii*.

Carboniferous Rocks.

Rocks of Carboniferous age make their appearance at four distinct localities within the limits of the Birmingham District, viz., in the coal fields of Coalbrookdale, the Forest of Wyre, South Staffordshire, and East Warwickshire. The strata

exposed on the last three of these coalfields are those of the upper Carboniferous or Coal measures; neither the Carboniferous limestone nor the Millstone grit being met with outside the limits of the coalfield of Coalbrookdale.

In the Forest of Wyre the Coal measures rest upon the Old Red Sandstone, in the South Staffordshire Coalfield upon the various members of the Silurian, and in the East Warwickshire upon the Upper Cambrian rocks. In these three coalfields a two-fold division of the Carboniferous is recognisable:—

(*a.*) *The Lower Coal Measures* proper, consisting of grey sandstones and shales with occasional coal seams, some of which are of remarkable thickness.

(*b.*) *Upper Coal Measures*, or Halesowen grey and red sandstones, brick clays and marls, with occasional coal-seams, none, however, of commercial value.

In the South Staffordshire and East Warwickshire coalfields, the well known "*Spirorbis Limestone*" of the Upper Coal Measures occurs in its normal place near the summit of the Carboniferous series.

SOUTH STAFFORDSHIRE COALFIELD.—The Carboniferous rocks of South Staffordshire are arranged in a broad dome about 23 miles in length by 6 in breadth. Their basement beds rest unconformably upon the Silurian around the flanks of the Dudley Hills, and in the neighbourhood of Walsall. Their highest beds dip conformably below the Permian rocks at the southern extremity of the coalfield south of Halesowen, and are overlapped unconformably by the Triassic pebble beds at its northern extremity, in the district of Cannock Chase. The eastern and western boundaries of the coalfield

are formed by lines of fault, which have flung down against the Coal Measures the various members of the Permian and the Triassic. The total thickness of the Carboniferous beds is about 1,300 feet, and the normal succession in the central and highest part of the coalfield is as follows:—

Upper Coal Measures.—

2a. Halesowen Sandstone Group, 600 to 800 feet.

2b. Red Coal Measure Clays.

Lower Coal Measures, 500 to 600 feet, containing several excellent coal seams, of which the following are the most important:—

(*a.*) Brooch Coal, 4 feet.

(*b.*) Thick Coal, 30 feet.

(*c.*) Heathen Coal, 3 feet.

(*d.*) New Mine Coal, 2 to 11 feet.

(*e.*) Fire Clay Coal, 1 to 14 feet.

(*f.*) Bottom Coal, five feet and above.

These measures include several zones of workable ironstone, of which the most important are:—

(1.) The Pins and Pennyearth ironstones, below the Brooch coal.

(2.) The Whittery and Gubbin ironstones, below the Thick coal.

(3.) The Blue Flats, Silver Threads and Diamond Ironstones, below the Bottom coal.

For its size the South Staffordshire coalfield has proved itself the richest mineral area in Britain.

Thick coal seams, rich bands of ironstone, and great thicknesses of Silurian limestone, all occur within a short distance of each other, and all within easy reach of the miner. The natural result has been that the South Staffordshire coalfield and its immediate neighbourhood has been the great coal and iron mart of Central Britain, and the abundance and cheapness of its material it has afforded, have rendered Birmingham and the "Black Country" the hardware workshop of the world.

Almost all the available coal seams and ironstone beds within easy reach have been long since practically worked out, but there is still much excellent coal and iron to be obtained at greater depths, especially in the northern part of the coalfield. Of late years the Triassic rocks which surround the coalfield have been pierced in order to reach the Coal measures beneath. An entirely new coalfield has been developed in this manner in the district of Cannock Chase; and two most remarkable collieries, those of Sandwell Park, and Hamstead, have been opened in the neighbourhood of Birmingham itself.

The area immediately underlain by the Coal measures constitutes the district of the "Black Country," which extends from the western margin of Birmingham to the fringe of Cannock Chase. It includes within its limits, the large towns of Dudley, Walsall, Wolverhampton, Bilston, and others of scarcely less note.

The most remarkable seam of the South Staffordshire coalfield is that known as the Ten yard or Thick coal, a continuous bed of workable coal from 25 to 30 feet in thickness. This underlies all the south central part of the field in the area enclosed by

Smethwick, Oldbury, Dudley, Walsall and Bilston. To the southward near Halesowen it thins out and becomes mixed with shaly material. It is in reality composed of 13 or 14 superimposed coal seams, which form an apparently unbroken mass, but are easily distinguished individually by the practised Thick coal miner. As we pass northward from the typical Thick coal area towards Walsall and Cannock Chase, the component seams become separated by intercalated sandstones and shales, so that eventually in the district of Essington and Pelsall the Thick coal is represented by 14 distinct coals occurring at intervals in a mass of sandy rock, between 500 and 600 feet in total thickness. The Thick coal is known to extend far to the eastward, beyond the present margin of the South Staffordshire coalfield. The first attempt to reach it through the red ground (Permian) was made under the bold and skilful guidance of the late Mr. Henry Johnson, C.E., of Dudley, at the locality of Sandwell Park. The coal was reached in 1873 at a depth of 1,250 feet and found to be of its original thickness, and of excellent quality. The next attempt which was made at Hamstead Hall, about three miles outside the limit of the coalfield, was even bolder and more hazardous, but it was eventually crowned with equal success; the Thick coal being reached at a depth of 1,800 feet. As the demand for coal increases, other collieries will doubtless be started at fresh localities outside the limits of the coalfield, for there can be no question that the Thick coal extends far to the eastward, under and beyond the town of Birmingham itself.

The strata of the South Staffordshire Coalfield afford the usual fossils of the British Coal Measures. The roofs of the coal seams, and the layers of carbonaceous shale, locally furnish well preserved

examples of *Lepidodendron*, *Sigillaria*, *Calamites*, *Annularia*, *Pecopteris*, *Neuropteris*, etc., often associated with abundant specimens of the peculiar *Unio*-like shell, *Anthracosia*: while the ironstone nodules occasionally yield fragmentary *Crustaceans* and *Insects*. Marine fossils are principally confined to the lower beds of the series, below the Thick coal. Owing to the absence of true limestone beds in the coalfield, the characteristic corals, &c., of the Carboniferous are absent, but the following marine forms are not uncommon in the lower ironstones:—

Lingula elliptica, *Discina nitida*, *Producta scrabicula*, *Conularia quadrisulcata*, *Aviculopecten scalaris*, *Gyracanthus farmosus*, *Megalichthys Hibberti*, *Pœcilodus angustus*.

These have been met with at several localities near Walsall, Oldbury, Old Hill, Kingswinford, and Oldswinford, etc.

The rocks of the South Staffordshire coalfield are pierced locally by sheets of igneous rock. The most important of these is a mass of dolerite about two miles and a half in length, which caps the long ridge of Rowley Regis. It is traversed by several mining shafts, which pass through the dolerite into the workable coals below. Other igneous masses occur near Dudley, and at Pouk Hill, near Walsall.

THE EAST WARWICKSHIRE COALFIELD.—The rocks of this coalfield form a narrow strip about 15 miles in length, ranging from Tamworth on the north to Bedworth on the South. The coalbearing strata rest unconformably upon the Cambrian below, and pass up conformably into the Permian above. The sequence of the beds is practically identical with that of South Staffordshire—the richer coal measures being all confined to the lower part of the

Carboniferous series, and passing up through a group of coloured clays into a final group of barren sandstones. In the north of the coalfield five workable seams of coal occur, separated by many feet of barren measures. As they pass to the southward the intermediate strata thin out, and the coal-beds practically come together at Hawkesbury to form one Main coal seam, as do the corresponding members of the Thick coal of South Staffordshire. It is probable that the two coalfields were formed in the same general area of deposition, and except for the possibility of its destruction by erosion prior to the deposition of the Triassic, it might be suggested with safety that the Thick coal of South Staffordshire extends in a continuous sheet under the red rocks of Northern Warwickshire from Smethwick to Hawkesbury.

FOREST OF WYRE.—Unlike the strata of the other coalfields, the Carboniferous rocks of the coalfield of the Forest of Wyre are comparatively barren of good coal seams. The best, which is locally known as the *Main* coal, is about seven-and a-half feet in thickness, and occurs at an average depth of 300 feet.

COALBROOKDALE.—This coalfield, which lies to the east of the Wrekin, covers an area of about 28 square miles. It originally contained about 28 coal seams, but the majority of these are now practically worked out. The succession includes the Carboniferous limestone, the Millstone grit, and the Lower coal-measures in conformable sequence. The Upper coal-measures rest in a hollow eroded out of the Lower coal-measures beneath, forming what is locally known as the “Symon Fault.”

Permian or Dyassic.

The Permian rocks of the Birmingham District are totally distinct in their petrological characters from those of the typical area of Yorkshire and Durham. No true limestones are present, and the formation is wholly made up of red sandstones, marls and beds of angular breccia.

The lowest zones of the Permian repose conformably upon the Upper Coal Measures of the South Staffordshire Coalfield in the slopes of the hills to the south of Halesowen, and its strata are seen in corresponding relation to the Carboniferous on the east of the Coalfields of the Forest of Wyre and Coalbrookdale, and to the west of the Coalfield of Eastern Warwickshire.

The Permian is everywhere covered up unconformably, or locally overlapped, by the various members of the Triassic formation; all the subdivisions of the Triassic series being found resting immediately upon it in turns as they are followed from the valley of the Severn to the neighbourhood of Charnwood Forest.

In the neighbourhood of Enville and the Forest of Wyre, three divisions are recognisable in the Permian, viz.:—

(1.) *Lower Red Sandstones and Marls*, with bands of calcareous conglomerate.

(2.) *Coarse Breccia.*

(3.) *Upper Red Sandstones and Marls.*

Round the South Staffordshire Coalfield the Breccia is the highest division exposed, and this only occurs in force to the south of the coalfield.

Between Tamworth and Kenilworth, to the east of Birmingham, the Permian strata floor a wide tract of

country, and lie almost horizontal. Red sandstones, marls and beds of breccia occur in association, but the divisions named above are not individually recognisable.

By far the most striking local member of the Permian formation is the so-called *Volcanic or Permian Breccia*. It is found in scattered patches over an area of about 500 square miles, extending from the Malverns to Enville, Stourbridge, and the Lickey Hills. It is made up of angular fragments of volcanic rocks, tuffs, altered shales, grits, and slabs of fossiliferous sandstone and limestones, all embedded in paste of bright red marl or pebbly sandstone. It is usually both underlain and overlain by red sandstones and marls, but sometimes, as at Stagbury and Woodbury Hills, &c., in the Valley of the Severn, it reposes at once upon pre-Permian rock.

This peculiar Breccia is well displayed in the Clent Hills, between Hagley and Halesowen. It there reposes upon the Lower Permian Sandstones with calcareous grit bands—(which may be seen above the little Church of St. Kenelm)—and forms all the highest points of the Clent Hills, passing unconformably to the southward under the pebble beds of the New Red Sandstone. In this locality the angular fragments composing the Breccia are mainly volcanic:—rhyolites, porphyrites, ashes, and volcanic grits, embedded in a coarse matrix formed of similar materials. Other sections are seen in the Bromsgrove Lickey Hills, and in the neighbourhood of Northfield. In the last-named locality an excellent section is exposed in a lane leading from the Bell Inn to Bangham Pit. In this exposure the breccia, which shows the usual preponderance of volcanic materials, contains in addition fragments of Silurian limestone

(crowded with characteristic fossils), and pieces of Landovery grit and shale.

According to Sir Andrew Ramsay,[60] this Permian breccia is probably of glacial origin, its materials having been brought down by ice in Permian times from the neighbourhood of the Longmynd in central Shropshire, where all the formations represented in its derived rock fragments occur at present in natural juxtaposition. According to Professor Jukes,[61] the fragments of the Northfield breccia, at any rate, "may have been derived from adjacent rocks, now concealed under the Permian and New Red Sandstone."

The Triassic Rocks.

BY W. JEROME HARRISON, F.G.S.

A considerable portion of the Midland Counties of England is composed of red sandstones and marls. The town of Birmingham stands upon, and is surrounded by rocks of this character. They form the Triassic System of geologists, the first of the four grand members of the Mesozoic series.

Strictly speaking, the title *Trias* is a misnomer as applied to the English development of the rocks of this system. The central member of the typical German succession, the *Muschelkalk*, is wanting in Britain; and only the upper and lower divisions, the so-called Keuper and Bunter, are represented. The *Bunter* or lower Trias, consists in the Midland areas of a mass of pebble beds or conglomerate, usually underlain and overlain by variegated sandstones. The *Keuper* is formed of a great thickness of red marly strata, with a thick sandstone (*Waterstones*) at the base.

The following table shews the subdivisions of the Trias which have been recognised in England, together with (*a*) their maximum thickness, and (*b*) their thickness in the neighbourhood of Birmingham.

CLASSIFICATION OF THE TRIASSIC STRATA—

	Thickness in Cheshire. Feet.	Thickness near Birmingham. Feet.
KEUPER RED MARLS (with the Upper Keuper Sandstone) f. 6.	3,000	700
LOWER KEUPER SANDSTONE, f. 5.	450	200
Muschelkalk	(wanting in England).	
UPPER MOTTLED SANDSTONE, f. 3.	500	200
PEBBLE BEDS, *or Bunter Conglomerate*, f. 2.	600	400
LOWER MOTTLED SANDSTONE, f. 1.	400	(wanting.)

The Trias enters England on the south coast, between Torbay and Exmouth. At the little watering-place of Budleigh Salterton there is a bed of quartzite pebbles in the Trias 100 feet thick which is worthy of

study in connection with the great numbers of similar pebbles that occur in the same strata round Birmingham. In West Somerset and Devon, the Triassic strata are 3,500 feet in thickness. Their subdivisions cannot be correlated with those of the Midlands, for they appear to have been deposited in a separate basin, of which the Mendips, &c., still mark the northern boundary.

Crossing into Gloucestershire, we find the vale of the Severn composed of Triassic marls, and thence northwards the “red rocks” broaden till they form the plains of Cheshire and South Lancashire on the west, and extend eastward to Warwick, Leicester, and Derby. From this great central plain of our island a long strip of Triassic sandstones and marls runs northwards, forming the Vale of Trent and the Vale of York, until finally it reaches the coast between Redcar and Hartlepool. Along the main line of outcrop—from the Malvern Hills to the mouth of the Tees—the Triassic strata incline gently, or dip, to the south-east, at from two to five degrees.

Of the two great divisions of the Trias, the lower (Bunter) is mainly sandy; while the upper (Keuper) is chiefly a stiff marl or clay. One result of this is that while the outcrop of the former is usually barren, forming much heath or waste land, as Sherwood Forest, the Keuper marls produce a rich soil, well fitted for the plough.

Owing to the soft nature of the strata, valleys are usually hollowed out in the Lower and Upper Mottled Sandstones, while the Keuper marls form an undulating plain. On the other hand the harder nature of the Bunter pebble bed, and the Lower Keuper Sandstone, causes these two rocks to form escarpments or lines of hills, parallel to each other;

the abrupt face generally looking west or north-west, while the gentle slope is to the east or south-east, agreeing with the average dip.

THE LOWER RED AND MOTTLED SANDSTONE.—Round Bridgenorth this division rests unconformably on Permian strata, and is about 650 feet thick. It is a homogeneous sandstone, of reddish-brown, yellow, and bright red colours, entirely devoid of pebbles. As we follow this stratum to the east it decreases in thickness, being only 200 feet near Stourbridge. East of the South Staffordshire field, the Lower Mottled Sandstone is entirely absent, and the Bunter pebble beds repose directly upon the Permian rocks. Geologists desirous of examining the "Lower Mottled" should visit Kinver Edge, west of Stourbridge, where this rock is well seen underlying the Bunter conglomerate. Its upper portion has here been hardened by calcareous matter, and projects beyond the pebble beds above. Caves, or "rock-houses," have been excavated in the Edge, and in a detached mass of sandstone called the Holy Austen Rock. The Lower Mottled Sandstone is again visible on Whittington Common, between Kinver and Stourbridge. It is everywhere quite unfossiliferous. "False bedding" is especially characteristic of this division, but it is common in all the Midland Triassic sandstones.

THE BUNTER CONGLOMERATE OR PEBBLE-BED occupies the surface of the Birmingham area, along a line running from south-west to north-east. It extends from Worcester, by Bridgnorth, Stourbridge, Cannock Chase, and Sutton Park to Lichfield. At all these places it is seen as a remarkable mass of rounded pebbles—mostly yellow, brown, or liver-coloured quartzites—and attains a thickness of 300 feet at

Cannock Chase. West of Stourbridge the Conglomerate forms the "Ridge," and caps Kinver Edge, dipping east or south-east at from five to eight degrees. Thence it is traceable northward by Upper Penn and Bushbury to Cannock Chase, where it forms a wide undulating heathy moorland, six miles in breadth from Bednall on the west to Rugeley on the east, and is exposed in many gravel pits and other excavations. The Staffordshire Coalfield lies like a great wedge between the Trias on its western and eastern sides. Crossing over from Stourbridge, we again find the Bunter Conglomerate or Pebble-beds extending between Harborne and Smethwick, and thence it runs northward in a broad band across the western suburbs of Birmingham, by Winson Green, Handsworth, Perry Barr, and Perry, to Sutton Park (where its outcrop is 3½ miles wide), and on to Aldridge, Wreford, Hopwas Wood, and Lichfield Racecourse. All along this line the Pebble-beds rest on Permian marls, and their thickness at Barr Beacon is about 400 feet. Good sections of the pebble-beds are rare on the south-west or west of Birmingham, but in the north-west they are well seen in a quarry south of Great Barr Station, and in one or two sections near the Beacon. At Sutton, exposures along the new railway lines to Lichfield and to Walsall have been numerous and good, and the Quarry in the Park, close to Blackroot Pool, gives a vertical section of thirty feet. Each section shows a mass of well-rounded hard pebbles, which have been so pressed together during the earth-movements that have taken place since their deposition that many are cracked, while all bear white indentations. The Bunter Conglomerate contains no fossils of contemporaneous age, but many species of shells have been obtained from the hard, rounded lumps of

rock of which it is composed. These fossils being of necessity of the age of the rock-fragments in which they are included, they furnish a clue to the sources from which the pebble-beds were derived. The following list of these derivative fossils will give some idea of the results which have already been obtained:—

ORDOVICIAN (in quartzite pebbles).—(*Arenig Beds.*) *Lingula Lesueurii.* (This interesting brachiopod shell has not yet been found in its parent rock in England, though it is not uncommon in the *Gres Armoricain* of Brittany, a quartzite on the same horizon as the Stiper stones); various lamellibranchs such as *Modiolopsis*, *Palaearca*, and *Lyrodesma* occur.

(*Caradoc and Bala Beds.*)—Seven or eight species of brachiopods, of which the commonest is *Orthis Budleighensis*; a crinoid (*Glyptocrinus basalis*), &c.

(*May Hill Sandstone.*)—Lumps of coarse sandstone, identical lithologically with the rock which flanks the Lickey Hills, occur commonly; they contain numerous casts of *Stricklandinia lirata*, &c.

DEVONIAN.—Nine or ten species of brachiopods (especially *Spirifera Verneuilii*). Remains of trilobites, such as *Phacops* and *Homalonotus* are not unfrequent.

MOUNTAIN LIMESTONE.—Mr. Molyneux enumerates twenty-two species of mountain limestone fossils—brachiopods, corals, crinoids, &c.—which he obtained

from the Bunter pebble-beds of Trentham. Near Birmingham, fragments of partly decomposed chert, in which the stems of crinoids are beautifully shown, are common in the same strata.

THE UPPER RED AND MOTTLED SANDSTONE.—Stourbridge stands on the bright red sands of this division, which extend northward through Kingswinford to Trysall and Tettenhall. South of Birmingham we find the same strata at Harborne Heath and Mill—there is a good exposure underneath the drift in Flavel's brick pit at "California"—from which point we can trace the "Upper Mottled" across the western part of Birmingham, by Rotton Park Reservoir and the Botanical Gardens; the beautiful soft red sandstone forming a strip about a mile in width between Spring Hill, Hockley Brook, Aston Villa, and Birchfields on the west, to the foot of Snow Hill, and Aston Park on the east. In the cemetery adjoining the Great Western Station at Hockley, there is a grand section, forty feet in height, where the incoherent sand is largely worked for moulding and foundry purposes. It is also exposed in and round Aston Park.

THE LOWER KEUPER SANDSTONE.—The lower member of the Keuper is the most consolidated part of the Triassic formation, being best known as a tolerably hard sandstone, white or pink in colour, which often yields good building stone.

The "basement beds" of the Keuper are certain coarse sandstones and chocolate coloured marls seen in a pit at "California," near Harborne. Above these come massively-bedded sandstones, of which there is a good exposure in the now disused quarry at Weoley Castle.

Commencing at Edgbaston, we can trace the Lower Keuper Sandstone by the Five Ways, and across the central highest part of Birmingham to Nechells, Gravelly Hill, and Erdington. Its lower boundary line, where it reposes on the Bunter, may be indicated by a line drawn from the junction of Monument Road with Hagley Road to the bottom of Snow Hill, and thence to Aston Station. From this point it extends eastward, for from one mile (Edgbaston) to half-a-mile (Aston). The ridge on which stands the Town Hall, St. Philip's Church, &c., (475 feet above sea-level) is formed by the Lower Keuper Sandstone, and deep excavations for foundations in the centre of the town, frequently disclose the thin-bedded, dull-coloured, pinkish sandstones (known to workmen as "skerry") which constitute the upper portion of this rock. Its thickness under Birmingham may be estimated at 200 feet. The average dip is from three to five degrees south-east. Similar beds are exposed in the cutting at Bromsgrove Railway Station, and it was from a quarry here (now closed) that the remarkable fossil fish was obtained, which was described by Sir Philip Egerton as *Dipteronotus cyphus*. From quarries at Coton End, Guy's Cliff, Cubbington and Blakedown Hill, near Warwick, bones and teeth of four species of the *Labyrinthodon* have been obtained, and foot-prints of the same creature have been found in the Lower Keuper Sandstone in many localities.

THE KEUPER RED MARL is the uppermost member of the Trias. Near Birmingham it is abruptly separated from the Lower Keuper Sandstone by a line of *fault*, which can be traced from Selly Oak northwards to the junction of the Rea with the Tame. East of this line of fault, the red marls extend for ten or twelve miles forming an undulating fertile plain,

on which stand Moseley, Smallheath, and Castle Bromwich, Coleshill and Whitacre. The thickness of the Keuper Marls is considerable. A boring in Smallheath Park was made to a depth of 440 feet entirely in such strata; but quite lately another boring at King's Heath has been continued to a depth of 700 feet. Gypsum is plentiful in the red marls, occurring in white fibrous layers, but not of sufficient thickness to be of any value in this district. At Droitwich (eighteen miles south-west of Birmingham) the Keuper Marls contain a thick bed of rock salt, which yields an inexhaustible supply of *brine*.

The Upper Keuper Sandstone is a thin band of sandstone, not exceeding thirty feet in thickness, which occurs irregularly in the upper part of the Keuper Marls. It is well exposed at the entrance to the canal tunnel at Shrewley Common, and in a small quarry at Rowington (thirteen miles south-east of Birmingham), and also crops out on the hill sides at many points in South Warwickshire. From this thin stratum, the Rev. P. B. Brodie, F.G.S., has obtained a fossil fish (*Palœoniscus superstes*), and the crustacean (*Estheria minuta*). Specimens of these may be seen in the Warwick Museum, which contains the finest collection of Triassic fossils possessed by any provincial museum.

HOW THE TRIASSIC ROCKS WERE FORMED.—According to the writer's views, the area now occupied by central England, alternated in condition during the Carboniferous epoch, between a low plain and a shallow sea. In the Permian period, land conditions prevailed, except in the North and North Midland Counties, where a brackish sea somewhat like the Baltic, it may be—occupied a shallow

depression. In Triassic times this central sea appears to have been completely cut off from the open ocean, and to have formed a large inland lake, comparable to the Caspian or the Dead Sea of our own day. The southern boundary of this inland sea was formed by a ridge of old rocks which extended from Charnwood by Hartshill and the Lickey to the Wrekin and Malvern Hills. In the basin north of this axial ridge, all the subdivisions of the Bunter and the Keuper were in turn deposited; and the cliffs and reefs of the Palæozoic rocks of which this coastline was composed, yielded large contributions to the pebble-beds, sands and marls, which constitute the Trias. According to a theory originally advanced by Professor Hull, and ably supported by Professor Bonney, the pebbles of the Bunter were mainly derived from the Paleozoic Rocks of the N.W. and N.E., some being possibly furnished by the ancient strata of N.W. Scotland.

The waters of the Triassic sea were so overcharged with salts of iron, that every grain of sand was encrusted, before its deposition, with a pellicle of peroxide of iron: of chloride of sodium (common salt) and sulphate of sodium (gypsum), there was also an excess, so that much was deposited on the sea-floor, producing beds of rock-salt and of gypsum, of considerable thickness. The presence of these mineral substances in the water was prejudicial to life, so that—as in the Dead Sea, and in Lake Utah to-day—few living creatures could inhabit the Triassic sea, and fossils are consequently of extreme rarity in strata of this age.

The Trias as a source of Water Supply.—The Triassic strata are so porous, that they absorb a large proportion of the rain which falls upon them, and

they consequently form an underground reservoir which, when tapped by wells or boreholes, is capable of yielding an almost inexhaustible supply of good, though somewhat hard water. In this way Birmingham receives three-fourths of its water from three deep wells—two on the north-east of the town, at Aston and at Perry respectively, and one on the south-west, near Selly Oak. These wells extend to depths of 400 feet, passing through the Upper Mottled Sandstone, and piercing the pebble beds, and the average supply of water from each is three million gallons per day. The hardness varies from nine to fifteen degrees. There are many other deep wells in and round the West of Birmingham, and at Stourbridge, Wolverhampton, etc., which derive their water from the same source.

Liassic and Rhætic.

BY REV. P. B. BRODIE, M.A., F.G.S.

The Lias occupies a large area in the south and east of the Birmingham District, and consists for the most part of the middle and lower divisions. The highest position of the Lias is seen on the south and south-eastern division of Warwickshire, the middle Lias forms the hills projecting in spurs to the north-west, and the lower division extending in the same direction, at a lower level, up to the southern edge of the Trias.

UPPER LIAS.—The Upper Lias is chiefly represented by a thin bed of clay, with some characteristic fossils. It occurs on the hills of Fenny Compton and elsewhere, and there is evidence to show that it formerly capped the range of the Edge Hills adjacent, occupying its natural position above

the marlstone, or Middle Lias, of which they are mainly composed. From Fenny Compton to Harbury, a good descending section may be obtained from the marlstone (rock bed), through the underlying clays and marly beds, through the "Lima Beds" and White Lias, to the New Red Marls at Harbury.

MARLSTONE OR MIDDLE LIAS.—The Marlstone (rock bed) is largely quarried on the Avon and Burton Dassett Hills. It forms a good building stone, more or less indurated, of a green or yellow brown colour, sometimes ferruginous. It forms a conspicuous range of hills of moderate height of which Edge Hill is the highest, from which it strikes southward towards Oxfordshire. The plain below is occupied by the underlying division of the Lower Lias. In this county the marlstone contains very few fossils, and those chiefly brachiopodous shells belonging to the genus *Terebratula*. In most cases elsewhere the Marlstone proper, or highest zone, is very fossiliferous, and abounds in marine shells, which are usually well preserved. The sandy beds immediately below are rarely exposed, but crop out in a lane near Bitham House, where as usual they contain many fossils. The inferior clays and marls are not visible except in some brick pits near Fenny Compton and along the line of railway. These are very full of fossils in the zone of *Ammonites Jamiesoni* and *Ibex*, here nearly one hundred feet thick, and especially at one horizon in a coarse, hard, stony band which contains numerous corals towards the upper part of the cutting, near the station.

LOWER LIAS.—For the most part this formation spreads over the portion of the country on the north-east, east, south-east, south and south-west of Warwick. A remarkably fine section is exposed in the

railway cutting near Harbury Station. This portion of the series is also largely quarried at Rugby, and in other places south and south-east of Stratford. The strata consist of beds of blue clay or shale interstratified with beds of blue rubbly and argillaceous limestone, much quarried for hydraulic lime. One good section of the lime-yielding beds occurs at Messrs. Greaves and Lakin's Quarries at Stockton and Harbury. The lowest zones of the Lias are largely quarried at Wilmcote, and may be seen at the remarkable outlier of Brown's Wood, near Henley-in-Arden, and at another (Copt Heath), near Knowle. These two last are of special interest, because they shew the lowest beds of the Lias (in connection with and passing into the Rhætics,) resting immediately upon the New Red Marls. The thickness of the Lower Lias in the county is above 600 feet; but only the inferior zones of *Ammonites angulatus* and *A. planorbis* are laid open to any great extent. The best sections of the *Lima* beds (*A. angulatus* zone) occur in the railway cutting at Harbury, Stockton lime quarries, and the extensive quarries at Newbold near Rugby. Fossils are not very numerous, but the following occur:—*Gryphea incurva*, *Rhynchonella variabilis*, *Ammonites angulatus*, *Pecten*, various species, *Lima gigantea*, and bones and teeth of *Plesiosaurus* and *Ichthyosaurus*. Fish are comparatively rare, two or three only were found at Harbury and a very few near Rugby.

The higher ground round Wilmcote and Binton is also capped by these Lima beds; but the district is more or less affected by small faults, so that certain beds in one contiguous quarry are absent in another. The lower limestones (insect beds) are largely worked in this locality, and are of much economical value. With the exception of remains of insects and

fragments of plants, the fossils are entirely marine, *Ammonites planorbis* and *A. Johnstoni*, being abundant and characteristic. Crustacea belonging to the genera *Astacus* and *Eryon*, the latter of great size are not unfrequently met with. Small fishes, *Pholidophorus Stricklandi*, and the larger *Dapedium* and *Tetragonolepis* more rarely occur. A fine example of the latter is preserved in the Warwick Museum. The large *Enaliosaurians* are well represented by some fine specimens of *Ichthyosaurus* and *Plesiosaurus*; the *P. megacephalus* in the Museum at Warwick being nearly entire, measuring 14 feet 4 inches in length. Large masses of driftwood and a few fronds of ferns are sometimes met with. But perhaps the most interesting and remarkable fossils are the insects. Twenty-four families and genera were determined more than twenty years ago, since which time many important additions have been made. The *Coleoptera* and *Neuroptera* are most numerous. Small beetles are not unfrequently found entire. Among these may be noted the families *Buprestidæ*, *Elateridæ*, *Carabidæ*, and others.

There are also remains of *Orthoptera*, *Homoptera*, *Libellulidæ*, and some *Diptera*. Many of the *Neuroptera* were evidently of gigantic proportions, but most of the insects were of small size, and like the associated plants, are indicative of a temperate climate. They are most nearly allied to forms which now inhabit North America. There are few extinct or unknown genera among them.

RHÆTIC SERIES.—The highest beds referred to this series consist of certain hard, fine grained limestones, which, from their ordinary white colour, have been termed *White Lias*. They occupy a considerable area south and south-east of Warwick.

They constitute a purely local deposit, and are confined for the most part to this county and Somersetshire. They are often close-grained and hard limestones, and make a useful building material and a good lime. Their colour is mostly white, with a yellow tinge, and occasionally pink and grey. Some geologists consider these beds to belong to the "Rhætic Series," others to the passage beds between the Lias and the latter, while others still class them with the Lias.

The undisputed Rhætic rocks lie between the White Lias and the Triassic Marls. In Warwickshire they are rarely exposed, and then much reduced in bulk, compared with their development in Gloucester and Glamorgan. They may be seen to a limited extent below the White Lias in the railway cutting at Harbury, where a band of yellowish sandstone contains the small bivalved crustacean, *Estheria minuta*; and also at the small outlier of Brown's Wood, and at Stooper's Wood, near Wooton Wawen, where this sandstone occurs with inferior shelly limestones and sandy bands, containing the usual Rhætic fossils, *e.g.*, *Cardium Rhæticum*, *Avicula contorta*, *Pleurophorus elongatus*, *Pecten valoniensis*, and *Schizodus cloacinus*. The nearest exposure of the Rhætic to Birmingham occurs round the fringe of an outlier of Lower Lias resting on the Upper Red Marl near the village of Knowle. This outlier is about a mile and a half long, by half a mile broad. Its highest beds at Copt Heath contain *Ammonites planorbis*. The beds referred to the Rhætic include a stratum of yellow micaceous sandstone full of *Schizodus cloacinus*, which, though usually in the form of casts, is sharp and well defined. The bone bed, though no where exposed, is probably present in its normal position. A fine section, with numerous characteristic

Rhætic fossils was exposed on the railway cutting at Summer Hill, between Stratford and Alcester. Rhætic black shales were passed through at Snitterfield, in making a tunnel in connection with the new reservoir for Stratford.

Glacial and Post Tertiary Deposits.

BY H. W. CROSSKEY, LL.D., F.G.S.

Post Tertiary Deposits are scattered profusely over the district of which Birmingham is the centre, and present many problems of too complicated a character to be discussed in the pages of this guide. It must suffice to indicate a few of their chief exposures and characteristics. The term "*Boulder Clay*" is used in this note to denote a clay shown to be connected with the Glacial epoch, by containing a greater or less number of erratic blocks; and in the employment of the term, no theory regarding the method of formation of the deposit will be implied.

The Post Tertiary deposits of the district may be arranged in the following general order:—

I.—Lower boulder clays.

II.—Middle glacial clays, sands, and gravels.

III.—Upper boulder clays.

IV.—Post glacial clay, sands, and gravels.

The most complete section that has been found is at “California,” near Harborne.

Resting upon the Bunter Sandstone, about 480 feet above the sea level, is a *Lower boulder clay*, containing erratic boulders of slate, felsite, quartzite, intermixed with blocks and stones of local origin. Many of the erratics are angular, and some (especially the slates) are finely striated. The whole deposit is unstratified and compact, and the boulders are roughly pressed together, in every variety of position, without any orderly arrangement. This boulder clay is succeeded by the *Middle Sands and Gravels* which are irregularly stratified and show false bedding. Fragments of coal occur among the pebbles. The sands and gravels dip rapidly to the S.W., and pass under an Upper boulder clay. *The Upper Boulder Clay* consists of a compact mass of clay with erratics scattered through it; but the erratics are neither so abundant nor so confusedly pressed together as in the lower bed. Granite has been found, although rarely, associated with the travelled felsites and quartzites, together with a few flints; and local stones and blocks are also mixed up with the clay—the clay itself however largely preponderating and being available for brick making.

The series is capped by a mixture of clay, sand, and gravel in varying proportions, which fills many

hollows that have been washed out of the upper clay; and must be regarded as Post Glacial. Taking the general divisions indicated by the California section, attention may be directed to the following illustrative facts and sections. Glacial striæ upon the surface of the rock have been noticed at Weoley Hill Quarry close to California. The removal of a mass of clay, sand, and gravel exposed a distinctly striated surface of hardened Bunter Sandstone. The polished surface dips towards the south west, in which direction the principal striæ run, although there are several cross striæ. The complete section shews (*a*) striated and polished Bunter (altitude 520 feet above sea level); (*b*) thin bed of marl; (*c*) sands and gravels (Middle Glacial); (*d*) clay (Upper Boulder Clay).

A very large number of well-marked and finely smoothed and polished grooves occur upon the blocks of native rock which are strewn over the irregularly shaped mass of basalt constituting Rowley Hill, Worcestershire. Isolated grooved blocks rest upon the surface of the hill, having been carried by external force into their present position; but there is also, at Rowley Hall Quarry, a kind of platform, capping the solid mass of basalt, which is almost entirely composed of blocks with smoothed and grooved surfaces, stiffly imbedded in clay.

The question has been raised whether, since the basalt readily develops joints, these grooves may not be rudimentary joints, or whether disintegration may not have taken place along certain lines which have gradually become grooves. I entertain no doubt, however, of their glacial origin. No other explanation than that the grooves were the work of moving ice can account, I think, for their excellent polish, their frequent parallelism, their adaptation to the hollows

and protuberances of the blocks they cross, and their predominant trend from north-east to south-west. The absence of erratics from the boulder clay in which the grooved basaltic blocks are embedded is evidence of local ice action at Rowley Hill. It is notable also that angular blocks of basalt from Rowley Hill have been found in Birmingham, blocks which must have travelled at least six miles.

It is often difficult to decide the precise age of the boulder clays of the district; and whether any individual bed is referred to the upper or the lower series is more dependent upon the glacial theories that may be adopted than upon any observations that can be made in the field. A *Boulder Clay*, of a typical kind, has been exposed at a brickyard, at the bottom of Oak Street, Wolverhampton. This clay contains an extraordinary number and variety of erratic blocks, without question from the Lake District and south of Scotland, a few flints, together with pebbles from the Bunter beds. One of the sides of a boulder of felsite, measuring 11 × 3 × 3ft., is flat and smooth, and covered with parallel striæ. The sands and gravels rising in small hillocks near the Cemetery, and slightly covering the clay of the pit, are probably Middle glacial. A boulder clay, formerly exposed at Icknield Street, Birmingham, while presenting the same physical characteristics as the Wolverhampton clay, differed from it widely in the nature of the embedded erratic blocks. Instead of having travelled from the Lake District or Scotland, a large proportion were derived from rocks that occur *in situ* at the Berwyn and Arenig Hills. The condition of the New Red Sandstone ridge, against which this boulder clay rested, was remarkable. The sandstone rock was broken up, and large fragments of it were lifted out of their position and thrust into the middle of the

drift.

The changes of level which occurred during the glacial epoch are shown by the deposits at Frankley Hill. In the clays and sands cut through by the Halesowen Railway only a few erratics (felsites) were found; but on the summit of the section they are abundant and of large size (*e.g.*, 4 × 4 × 2ft.) Professor Bonney, who has examined them, feels certain they must have come from Wales, having seen nothing like them in the Lake District. Their height is nearly 800ft. above the sea level. Were these erratics brought by land ice, the alteration in the physical geography of the country must have been enormous to have enabled a glacier to have moved downwards over this point; were they dropped from icebergs, the land must have been depressed to the extent of at least 900ft., to form a sea in which the bergs could have floated.

Turning to the *Middle Glacial Clays, Sands, and Gravels*, these may be seen more or less developed in almost every section cut through undulating ground; and they are occasionally twisted and contorted. In the immediate neighbourhood of Birmingham they are not fossiliferous.

At Ketley, near Wellington (Shropshire) however, fossiliferous sands and gravels occur, which I am inclined (provisionally) to assign to this period. They rest upon a bed containing erratic blocks of granite, and other rocks of northern origin; and I collected from them 13 species of mollusca. Only one species was peculiarly northern (*astarte borealis*) but all in the group have an arctic range of habitat. The elevation of these beds is about 357 feet above the sea.

At Fox Hall Field, New Lodge, Lilleshall

(Shropshire) in a pit worked for sand, 463 feet above the sea, Mr. Woodward discovered 21 species of mollusca, three—viz., *Dentalium abyssorum*, *Natica affinis*, and *Astarte borealis*—being characteristically arctic and extinct in British waters.

The Upper Boulder Clay is worked for bricks in many localities. It is distinguished from the Lower Boulder Clay, by having erractic blocks sparsely scattered through it. It is often very compact and tenacious. No fossils have as yet been found in it; unless indeed a clay derived from a drain in a street at Wolverhampton, in which I detected fragments of *Tellina balthica*, the spine of an *Echinus*, *Polymorphina lactea*, and *Polystomella crispa*, may be assigned to this division of the epoch.

The extraordinary *dispersion of erratic blocks* over the surface of the ground remains to be noticed, and constitutes one of the most remarkable phenomena in local glacial geology. I distinguish the boulders resting on the surface of the ground from those embedded in the clay beds, although it is of course possible and probable that the clay has been largely denuded, and the boulders have thus been left exposed. Many of these erratic blocks may therefore belong to the Lower Boulder Clay; while others may have fallen from the icebergs which during the proved subsidence of the land must have floated over the "Midland" sea, and have been deposited in the Upper boulder clay, while it was in process of accumulation.

How far the dispersion of erratics over the Midlands may be referred to the ice sheet of some geologists, or to the icebergs of the Archipelago period in the history of Great Britain, must, at present, be regarded as an open question.

The Midland erratics have undoubtedly travelled from three distinct regions, viz., (1) from Wales, (2) the western part of the Lake district, and (3) Kirkcudbrightshire. Boulders from the more easterly part of the Lake district, such as the Snap granite boulders, so abundantly spread over Yorkshire, have not been found in this neighbourhood.

The peculiar distribution of the Midland erratics is noteworthy. Commencing at Bushbury Hill (a little to the north of Wolverhampton, on the table land facing towards the N.W.) the Lake rocks and the Scotch rocks—Criffell granites and Eskdale granites—are largely intermingled. Journeying westwards, a stream of boulders from Wales crosses the northern streams. On and around the Clent Hills (1023 feet) south west of Birmingham, Welsh felsites are the only boulders to be found. Birmingham itself being in the rear of the higher part of the table land on which it stands, is in a kind of protected district, so far as the northern stream of boulders is concerned, and the erratics in its immediate vicinity are chiefly Welsh felsites; a few fragments however of granite are occasionally found.

POST GLACIAL BEDS.—The most complete section of post glacial beds in this locality was obtained during excavations made at Shustoke, near Birmingham; when a bed of black peat, containing the remains of *Elephas antiquus*, *Cervus elephas*, and *Bos primigenius*, with hazel nuts and fragments of wood, was discovered 7ft. 6in. beneath the surface. The section was as follows:—

Soil	1ft.	0in.
Sandy marl	1ft.	8in.
Yellow clay (stiff)	3ft.	8in.

Blue clay (stiff)	1ft. 2in.
Black peat	1ft. 10in.
"Ballast" gravel and sand	3ft. 0in.
Sandstone and marl.	

The fossils found in the peat have been placed in the Geological Museum of the Mason College.

PETROGRAPHY.
Notes on the Igneous and Metamorphic Rocks of the Birmingham District.

BY S. ALLPORT, F.G.S.

The space available for some account of the crystalline rocks being strictly limited, it would be useless to attempt anything more than a brief general description of the most important and interesting varieties. Fortunately there is abundance of material, for Birmingham, as a central point, affords unusual facilities for the study of this branch of petrology. Although the rocks here described appear to be scattered over a rather wide area, it will be found that every locality mentioned may not only be easily reached from one of the railway stations, but that a good series of specimens may be collected and the return journey made within the same day.

THE MALVERN HILLS.—It was clearly shown by Dr. Holl, in 1865, (Quar. Jour. Geol. Soc., Vol. xxi.) that the central portion or axis of this chain of hills consists of a great series of true crystalline schists,

among which the prevailing types are hornblendic and micaceous gneiss, hornblende-schist, mica-schist, and a quartzo-felspathic rock, all of which are more or less distinctly foliated. There is, however, great variety in the relative proportions of the constituents; in many places either the hornblende or the mica are nearly, or even quite absent; the felspar and quartz then form the mass of the rock. In the quarries on the east side of the North Hill, beautiful examples of hornblende and felspar rock are abundant; they contain more or less quartz, with a little mica, and occasionally pass by insensible gradations from a well-marked gneissic structure into a coarsely crystalline mass in which foliation is no longer apparent. These latter are, however, exceptional cases, and there can, I think, be no doubt that we have here, in the Midlands, a considerable exposure of the oldest type of foliated crystalline schists, or as they are now frequently called Pre-Cambrian or Archæan rocks. The rocks of the North Hill are probably the oldest; they have been much disturbed, and are generally the most coarsely crystalline of the series. The more basic portions have suffered a considerable amount of alteration; the secondary constituents, chlorite and epidote, become abundant, and occasionally the hornblende has been completely replaced by the latter mineral; the rock then becomes an epidote schist of a pale-yellowish colour. In Swinyards Hill there is a micaceous gneiss with garnets, and in Raggedstone Hill there are interesting varieties of contorted mica-schist containing a large proportion of quartz. Dykes of intrusive rocks occur in nearly all the hills, but become far more numerous towards the north; they are very uniform in appearance, and are probably altered dolerites or diorites; very few specimens have been examined,

and they belong to the former group. In the North Hill there are some masses of true diorite, but their relation to the hornblendic gneisses with which they are associated has not been clearly established.

MOUNT SORREL GRANITE.—The granite is of two varieties, red and grey, the difference being due to the fact, that in the red masses, the partially decomposed felspar has been coloured by ferric oxide. The rock is a hornblendic granite, the constituents being quartz, felspar, biotite, hornblende and titanite, with magnetite and a little apatite. The felspars are orthoclase and plagioclase; the former is much decomposed, while the plagioclase frequently remains clear, and exhibits well its twin striation. Biotite was originally abundant, but is very frequently replaced by a clear green substance, which is strongly dichroic, the two colours being grass-green, and clear yellow. The hornblende has been greatly decomposed; clear crystals are, however, not uncommon, and exhibit the usual optical characters of the mineral. The products of alteration are chlorite and epidote. The titanite appears in reddish-brown grains, but is not very abundant. In 1879, the writer discovered the junction of the granite with the sedimentary rocks, and proved that the former was intrusive (Geol. Mag. dec. ii., Vol. vi., p. 181). The junction occurs in Brazil Wood, where there is a small quarry, in which granite veins may be seen to penetrate the strata in various directions; a large mass of granite is also within a few yards. Some of the phenomena of *contact metamorphism* may here be readily studied, the granite having converted the slate into a crystalline micaceous schist, quite similar in character to those produced under like conditions round the granite in Cornwall and elsewhere. Small

garnets occur in the altered slates, and also in the granite close to the junction.

THE CHARNWOOD SYENITES.—The Syenites and other igneous rocks of Charnwood, have been described by Messrs. Hill and Bonney (Quar. Jour. Geol. Soc. Vol. xxxiv., p. 199.) The original constituents are felspar, hornblende, quartz, apatite, ilmenite, magnetite and titanite. The felspar is of two kinds, orthoclase and plagioclase, the former is very turbid and decomposed, while the plagioclase is clear, and retains its usual optical characters. The curious intercrystallization of quartz and felspar, known as *micropegmatite,* is common in the masses of syenite near Groby; the best examples, however, have been found by the writer in the Markfield rock, where it appears to form a ground-mass in which the larger crystals of orthoclase and plagioclase are enclosed. A small portion of the hornblende is still characteristic, but the greater portion appears in various stages of decomposition; the alteration products being chlorite and epidote. Titanite is by no means rare, and occurs in well formed twin crystals.

DIORITES OF ATHERSTONE AND NUNEATON.—A careful examination of many specimens collected by the writer from the various masses marked in the map 63 S.W. of the Geological Survey shows clearly that they are diorites, the characteristic constituents being hornblende and a triclinic felspar; these minerals, together with magnetite and apatite are invariably present, and in addition, a little orthoclase is seldom absent. The best specimen examined is from a quarry near Marston Jabet; it is a fine-grained rock, similar to a basalt in external appearance, but contains numerous crystals of hornblende and plagioclase which are generally quite unaltered. The

clear brown crystals of hornblende are unusually well developed, and afford excellent opportunities of examining their crystallographic and optical characters. There are also present many grains of magnetite, and a few needles of apatite. The only product of alteration is a little calcite in the spaces between the crystals. Other specimens from the same quarry will perhaps give a better idea of the general character of the rocks of the district, and they possess a special interest, as they afford unusually good examples of successive stages of alteration. In one specimen the constituents are well preserved, the plagioclase is clear and exhibits its characteristic twin striation; the hornblende is, for the most part, unaltered, but is much fissured, and occasionally contains so many cavities that the crystals are little more than skeletons. A ground-mass in which the constituents were set has been highly altered, and now consists of a fine granular substance, partly serpentinous, with here and there a little calcite. A second example is quite similar in texture to the last; the felspar, still recognisable as triclinic, has been partially converted into a grey turbid substance. The hornblende occurs in various stages of alteration; some crystals are but slightly attacked, while others are to a considerable extent replaced by a pale green serpentinous substance. The alteration has followed the cleavage-lines and fractures, while the numerous cavities just mentioned are also filled by the same substance. In a single slice there may be seen almost every degree of change from a slight marginal erosion to a mere skeleton of the original. Of the latter, however, some little is always left; and whether the alteration be little or great, the crystalline forms are perfectly preserved. In a third specimen the alteration has proceeded still further,

the whole of the hornblende crystals having been completely converted into pale green pseudomorphs; they were originally large and well developed, and their forms are still perfectly sharp and distinct. The felspar is here quite turbid and opaque, and the interstitial ground-mass is represented by calcite.

Purley Park, near Atherstone.—The rock here contains, in addition to the usual brown hornblende, many crystals and grains of clear yellowish augite, and several pseudomorphs after olivine. The augite crystals exhibit the usual forms, some being twins. The pseudomorphs after olivine are quite similar to others observed in certain highly altered dolerites, they consist of calcite or calcite and viridite; they are numerous, and are generally larger than the crystals of augite or hornblende.

Quarry close to Atherstone.—This rock also contains both augite and hornblende; and lastly, in the railway cutting at Chilvers Coton, several interesting varieties of diorite may be found.

THE RHYOLITES OF THE WREKIN NEAR WELLINGTON, SHROPSHIRE.—In the large quarry in Lawrence Hill, at the north end of the Wrekin, and at Lea Rock on the Shrewsbury Road, are to be found some of the most beautiful varieties of ancient volcanic glassy rocks hitherto discovered in Britain. The rocks in their present condition do not look like glass, owing to a process of devitrification, which they have evidently undergone. There can, however, be no room for doubt as to their original vitreous condition, for they exhibit, under the microscope, certain peculiar perlitic and spherulitic varieties of structure, associated with characteristic forms of microliths, which are found only in the pitchstone and obsidian varieties of volcanic glass. In the quarry

in Lawrence Hill, thick beds of volcanic ashes and agglomerates are to be seen dipping towards the north at a high angle, and an examination of this hill and the Wrekin shows that they both consist of a series of stratified ashes alternating with several flows of rhyolite. One of the ash beds contains numerous spheroidal blocks of thoroughly characteristic varieties of glassy rocks; they have not yet been described, but it may here be stated that, in addition to many typical varieties of known rhyolites, there are also included among them some of the rarer glassy kinds described by Zirkel in his Petrography of the 40th Parallel. Beautiful examples of the spherulitic and perlitic varieties may be found at Lea Rock, and have been described by the writer in the Quar. Jour. Geol. Soc. Vol. xxxiii., p. 449. It has been shown by Dr. Callaway, that all these rhyolites are of Pre-Cambrian age; we have here, therefore, the clearest proof that, during very early geological periods volcanic action was of the same kind, and produced the same results, as in more recent times.

SOUTH STAFFORDSHIRE.—The igneous rocks of the South Staffordshire coalfield belong to the basic series, and are, without exception, dolerites or basalts, the latter being merely a fine grained variety of the former. They have been intruded among the coal measures and shales, and are frequently found in an excellent state of preservation. The original mineral constituents are crystals, or crystalline grains of triclinic felspar, augite, olivine, magnetite, ilmenite, and apatite. These minerals are very frequently quite unaltered, with the exception of the olivine, which is often partly converted into serpentine; this is the pale green substance seen along the cracks, and around the sides of the grains;

generally, however, the decomposition has been continued until the formation of complete serpentinous pseudomorphs after olivine has been the result. The Hailstone Hill, near Rowley Church, is the best locality for varieties in texture and composition, as also for contemporaneous veins. In the large quarry there is a very coarsely crystalline variety containing large flat plates of ilmenite, and here also may be found some light-coloured veins in which orthoclase is the predominant felspar. The writer has also found in the same quarry vessicular and amygdaloidal varieties of the rock. It need scarcely be mentioned that, minute details of structure and composition can only be studied in thin slices under the microscope. Rocks of similar character to the above occur in the following localities:—Pouk Hill, near Walsall; Titterston Clee Hill (sheet 55, N.W.), Knowl Hill, near Kinlet (sheet 55, N.E.), and Swinnerton Park, eight miles N.E. of Stafford. For fuller descriptions of these rocks, see Allport, Quart. Jour. Geol. Soc., Vol. xxx., p. 529.

Mining Statistics of the South Staffordshire Coalfield.

By PROFESSOR W. E. BENTON, A.R.S.M., F.G.S.

MINERALS WORKED.—The principal minerals worked within the limits of the South Staffordshire Coalfield are coal, ironstone, and fireclay from the Carboniferous formations, and limestone from the underlying Silurian rocks.

THE COAL is bituminous, non-caking, and much of

it contains a high percentage of water and oxygen. Some of the seams produce excellent house-coal, others manufacturing and steam coal.

THE IRONSTONE is an argillaceous carbonate of iron, occurring as nodules in the roofs of the coal seams, or as thin beds within them.

THE FIRECLAY, particularly in the neighbourhood of Stourbridge, has a high refractory power.

QUANTITY OF MINERALS RAISED.—The annual produce of minerals during the last twenty years has remained without any considerable alteration. The Government Mineral Statistics for 1885 are not yet published, but in 1884 the quantities of minerals raised in South Staffordshire Coalfield were:—Coal, 9,688,047 tons; ironstone, 116,951 tons; fireclay, 205,320 tons; limestone (no statistics given). The respective values of these minerals at the mines were estimated at:—coal, £2,785,313; ironstone, £62,974; fireclay, £42,781.

The total number of persons employed at the mines during the same period was 23,782.

DESTINATION OF THE MINERALS.—The greater part of the coal is consumed in the district for house purposes, for steam raising, for the manufacture of bricks, pottery, glass, salt, &c. The remainder is carried out of the coalfield into the south and south-western districts of England by the London and North Western, Great Western, and Midland Railway Companies, for house and steam purposes. The gas coals and coke used in the Birmingham district are not the product of the South Staffordshire Coalmeasures, but are brought principally from North Staffordshire, Derbyshire, and Yorkshire.

The whole of the ironstone raised is smelted within

the district, in addition to large quantities of iron ore (hydrated oxide) brought from the Northampton and North Staffordshire mines. The manufacture of pig iron has within the last decade decreased to such an extent that less than one-third of the existing furnaces of South Staffordshire are at present in blast.

The quantity of pig produced in the coalfield in 1884, was 356,873 tons; in the reduction of which 810,936 tons of coal (including coal converted into coke) were used, or about 45½ cwts. of coal to one ton of pig iron. The whole of the pig iron is retained in the district. The finished iron trade retains its importance, more than one-third of the existing puddling furnaces and rolling mills in Great Britain occur within the limits of the South Staffordshire Coalfield.

The finished iron is produced from local pig iron, and from pig iron brought from Derbyshire, Yorkshire, and North Staffordshire. The steel production in South Staffordshire is gradually increasing. The processes adopted are those known as the Bessemer, Gilchrist and open hearth.

The South Staffordshire fireclay is worked principally in the neighbourhood of Brettle Lane and Stourbridge, and is employed in the production of firebricks, gas retorts, pottery, etc. Much also is conveyed into other districts in a raw condition for pottery purposes.

The Silurian limestone is worked partly in open work in the neighbourhood of Dudley, and partly by ordinary underground mining operations at the Wren's Nest, Sedgley, and at Walsall.

Characteristic Features of the Mining of

SOUTH STAFFORDSHIRE.—There are several noteworthy features in the mining of South Staffordshire. A stranger is especially impressed with the large number of separate collieries in working (about 600) in proportion to the quantity of mineral raised. This peculiarity is due essentially to the insignificant depth at which the minerals occur below the surface (indeed, at Foxyard, near Tipton, coal has long been quarried in an outcrop of the 10 yard seam). This "Shallow Mining" has passed its meridian. The future mining of the district is forecast by those remarkable operations on the "red ground," forming the eastern side of the coalfield. The most recently opened seam in the red ground is at Hampstead, three miles north of Birmingham, where coal mining is carried on below the Permian and Triassic, at a depth of more than 600 yards.

Another feature of the mining is the unique South Staffordshire mode of getting coal in the ten yard seam, called "Square Work." This method has met with much condemnation from strangers, but after trial of other methods, it still dominates. A further and most strongly marked peculiarity of the South Staffordshire area is the tendency of some of the Black Country coals to spontaneous ignition. Much coal has thus in times past been sacrificed; but a better acquaintance with the causes of this phenomenon has led to measures which have reduced and which must still further reduce this sacrifice of wealth.

MINES' DRAINAGE.—In the Tipton and Old Hill districts many of the coal mines are water-logged. In 1873 a Parliamentary Commission however was appointed to drain this area, and was empowered to levy rates to defray the drainage expenses. The

drainage area under the direction of this Mines' Drainage Commission is 50 square miles. The principal pumping stations are the Moat, the Stoneheath Station, and the Bradley Station. The Bradley pumping engines (a quarter of a mile from Moxley on the Great Western Railway) are of the compound type having 52-inch and 90-inch steam cylinders. These engines, with a 10 feet stroke, and six strokes per minute, work two 27-inch plunger pumps, and raise from a depth of 126 yards more than 4,000,000 gallons of water per 24 hours. As a result of this gallant effort to recover these water-logged minerals, the number of pumping stations has been gradually reduced in the Tipton district from 77 in 1873 to 10 in 1885, and the quantity of water from 23,000,000 to 10,000,000 of gallons daily. To meet the inevitable expenses, a rate of 9d. per statute ton is levied on all coals, slack, and ironstone; 3d. per statute ton on all fireclay and limestone, and 1d. per statute ton for surface drainage on all minerals, raised in the Tipton district. In the Old Hill district a much lower mines'-drainage rate is collected.

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62—S.E. Birmingham.

62—N.W. Penkridge.

63—N.W. Market Bosworth.

53—N.W. Coventry.

54—N.W. Droitwich.

62—S.W. Dudley.

62—N.E. Lichfield.

63—S.W. Nuneaton.

54—N.E. Henley-in-Arden.

NOTE.—The main outlines and colors of the formations &c., in the accompanying Geological Sketch-Map correspond with those of the above mentioned one inch Survey Maps of the District.

PART IV.
ZOOLOGY.

UNDER THE GENERAL EDITORSHIP OF W. R. HUGHES, F.L.S.

Introduction.

It is believed that this is the first attempt to give a connected account of the Zoology of the neighbourhood of Birmingham, although the Botany of the District has long attracted diligent and enthusiastic workers. The subject, however, has not been neglected, and past and present members of the Birmingham Natural History and Microscopical Society, and other naturalists, have from time to time made public, in the *Midland Naturalist* and elsewhere, their observations on the more important classes of the animal kingdom. Some of the classes in the sub-kingdoms, PROTOZOA, CŒLENTERATA, VERMES, and ARTHROPODA (it is to be regretted) have been almost entirely neglected.

The limited amount of space allotted to Zoology in the present volume and the limited amount of time at the disposal of the contributors have prevented the presentation of complete lists in all the divisions selected, although the Editor believes that the various papers now submitted furnish—so far as they go—a very fair, if not an exhaustive account of our local fauna. It would have been desirable to have discussed, more fully than is done by the various contributors, the question of the Geographical distribution of animals in the district, but this question, for the reasons above stated, must be left until another occasion. The division of the

MICROSCOPIC FAUNA has been made somewhat arbitrarily, in order to meet local circumstances. It is hoped that at some future time these papers may be extended, and become the foundation for a complete record of the Zoology of the district.

Without any invidious comparison, the Editor may say that, in the domain of local zoology, by far the most systematic study has been that devoted during many years by Mr. Thomas Bolton, F.R.M.S., to the microscopic fauna of the neighbourhood. The number of new species which this able and industrious naturalist has added to science, probably equals if not exceeds that of the discoveries recorded in any other part of England during the time Mr. Bolton has been an observer. Moreover, his novel and successful method of disseminating these organisms among microscopists, has contributed largely to scientific knowledge, not only in England, but on the Continent, and even in America.

Although not coming within the category of the local fauna, very fine collections of the classes ECHINODERMATA and CRUSTACEA have been made by Mr. G. Sherriff Tye, of Richmond Road, Handsworth, who will be happy to show the same to members of the British Association. His excellent collection of MOLLUSCA, many of which are noticed in this volume, will also be on view.

The Entomological collection made by Mr. W. G. Blatch—the work of a lifetime—many specimens of which are referred to in this volume, will similarly be on view, on application to Mr. Blatch, at Green Lane, Small Heath. It is right to state that this naturalist has added very many new species to the fauna of the district. The Coleoptera occurring in the Midlands will be exhibited by Mr. Blatch in Bingley

Hall.

The collection of local fishes taken by members of the Birmingham and Midland Piscatorial Association (established in 1879) of which Mr. James Gregory is Honorary Secretary, contains some very handsome and well-mounted specimens which may ordinarily be seen in the Society's Room, at the Grand Hotel, on application to Mr. Field, the proprietor. The collection for the present forms part of the Exhibition in Bingley Hall. It should be mentioned that this Association has done good work in stocking the River Trent with about 35,000 Trout fry (*Salmo fario*) during the last few years.

The Editor offers no apology for mentioning the exceptionally fine Ornithological collection of Mr. R. W. Chase, President of the Birmingham Natural History and Microscopical Society. The collection comprises, in sequence, the eggs, and the birds in various stages of growth towards maturity. The specimens are mounted so as to show instructively the surroundings of the various birds as seen in their natural habitats. Mr. Chase will be happy to show his collection to members of the British Association, on application at his residence, Southfield, 7, Edgbaston Road, Edgbaston.

Although Birmingham is nearly the central part of England, and thus farthest removed from the sea, it may not be uninteresting to state that some attention has been given to Marine Zoology, the Birmingham Natural History and Microscopical Society having several times made excursions to parts of the coast for the purpose of dredging specimens. The PENNATULIDA, dredged by the Society, at Oban, in 1881, were described by Professor A. Milnes Marshall, M.D., D.Sc., F.R.S., and Mr. W. P. Marshall,

M.I.C.E., in a Report, with illustrations by the authors, published in the "Midland Naturalist" for 1882, which gained the Darwin Gold Medal, awarded by the Midland Union of Natural History Societies, at the sixth annual meeting, held at Tamworth, in 1883. The specimens may be seen in the annexe of the Exhibition, at Bingley Hall.

The limit of radius of about twenty miles round Birmingham, including parts of the counties of Warwick, Worcester, and Stafford, chosen by the botanists who have contributed to the present work, has been generally accepted by the zoologists except in the division of the MOLLUSCA, which is mainly confined to a radius of twelve miles, as fixed by local Conchologists several years ago. Some latitude has however been allowed, to meet exceptional cases, necessitated by the wider range of animals as compared with that of plants.

The thanks of the Editor are due to the various local contributors, and especially to Mr. E. de Hamel, late President of the Tamworth Natural History Society, for his kind co-operation in furnishing the chapter on Mammals and Reptiles. In strict order of classification, the division of Reptiles should have followed that of Birds, but for convenience in the present arrangement it has not been thought desirable to separate this chapter.

Chapter I.
Mammals and Reptiles.

BY E. DE HAMEL.

I.—MAMMALS.

The district around Birmingham is admirably suited for our native animals, abounding as it does with fertile and well-watered valleys, wild moorlands, and extensive woods; on the other hand, its large population renders the prolonged existence of individual and striking rarities well-nigh impossible.

The value of the matter contained in this chapter has been much enhanced by the personal observations of many of the best Midland naturalists.

Cheiroptera.

Adopting the late Professor Bell's classification of British quadrupeds and reptiles, the Bats come first under consideration; and out of the fourteen species described by him, no fewer than nine are to be found in this district. The Noctule or Great Bat, *Scotophilus noctula*, is the largest of our British species, and is characterised by its lofty flight. There is a colony of these Bats in the roof of Cliff Hall, near Kingsbury, and another in a hollow of a lime tree in the Moat House Avenue, Tamworth. The Hairy-armed Bat, *S. Leisleri*, which has a zig-zag flight, occurs on the Warwickshire Avon. The Common Bat, or Flittermouse, *S. pipistrellus*, is often seen flying near buildings in broad daylight, and secretes itself in crevices. The Reddish-grey Bat, *Vespertilio nattereri*, is found in roofs of churches and similar buildings. Daubenton's Bat, *V. Daubentonii*, flies close to the surface of water, and has been seen flying both at mid-day and dusk over the River Anker at Tamworth, and is abundant at Stratford-on-Avon; it hides in trees and buildings. The Whiskered Bat, *V.*

mystacinus, frequents the sheltered side of high hedges, and secretes itself in any convenient chink. The Long-eared Bat, *Plecotus auritus*, possesses ears nearly as long as its head and body combined, and is generally distributed; it collects in clusters under tiled roofs and in church towers. The Barbastelle Bat, *Barbastellus Daubentonii*, is not uncommon in Warwickshire; it flutters lazily round moving objects, and hides in crevices. The last local species is the Lesser Horse-shoe Bat, *Rhinolophus hipposideros*, which is gregarious, and haunts roofs of houses; it is easily distinguished by its curious nasal appendage.

Insectivora.

The Hedgehog, *Erinaceus Europæus*, common everywhere, hibernates in a nest of leaves. The Mole, *Talpa Europæa*; abundant, pied and light coloured varieties plentiful. The Common Shrew, *Sorex vulgaris*, often, found dead on pathways. The Water Shrew, *S. fodiens*, is more rare, but has been found near Tamworth, at Great Barr, and in the Birmingham Botanical Gardens. The Lesser Shrew, *S. pygmæus*, is omitted, as it is now generally considered to be but a variety of *S. fodiens*.

Carnivora.

The Badger or Brock, *Meles taxus*, whilst rare, is very equally distributed over the district. On April 14th, 1877, one was obtained in the Foxhole Hill, in Bentley Big wood, near Atherstone; a female and three young ones were taken alive in the spring of 1884, in a wood, near Croxall; there are some more badgers in the same wood this year, 1886. In March, 1885, a single one was captured at Bentley, near

Redditch; the keeper at Beaudesert reports that they are still plentiful on Cannock Chase. The Otter, *Lutra vulgaris*, like the Badger, though rare, still frequently occurs in the Midlands, especially on the rivers Anker, Tame, and Trent, and their tributaries; as well as the Warwickshire Avon. On the Tame, a few years since, a female Otter and brood of young ones was seen several times swimming near an osier bed in the Cliff meadows; another was shot when crossing the river at the back of Broad Island, near Tamworth; two young ones were killed in a hay field, close by Hopwas Wood; and a large Otter was found in a brook at Wigginton, a mile from the river, and destroyed after a desperate encounter; still another was seen trotting along the banks of the Tame, close by the town of Tamworth; while the largest Otter known to have been taken in the river Avon was captured on the first of June, 1886, at its junction with the river Arrow; it weighed 28lbs. The Weasel, *Mustela vulgaris*, and the Stoat, *M. erminea*, are both plentiful. The Polecat or Fitchet, *M. putorius*, is becoming decidedly rare, only three having been recorded in the district during the last few years; the first of these occurred at Alvecote Wood, the second at Hints, in the neighbourhood of Tamworth, and the third at Merivale, near Atherstone. The Pine Marten, *Martes abietum*, although believed now to be absolutely extinct in the Midlands, used to be found in Needwood Forest, and a specimen taken many years ago near Rugeley is now in the possession of Mr. R. W. Chase. The Fox, *Vulpes vulgaris*, being strictly preserved, is sufficiently abundant.

Rodentia.

The Squirrel, *Sciurus vulgaris*, is thinly distributed,

and may occasionally be seen in most of the large woods, as for instance, those in Sutton, Hagley, and Arbury Parks, where the dreys are built on the forked branches of the trees. The Dormouse, *Myoxus avellanarius*, is also rare, but is occasionally met with by hedgers, when dressing fences. As it is semi-gregarious, when one is found more may be expected. The nest is built of grass, compact, globular, about five inches in diameter, with the entrance near the base. A nest was taken at Cofton Reservoir, near Barnt Green, in April, 1885. The Harvest Mouse, *Mus minutus*, is the smallest of our quadrupeds, building a small round and firm nest among the ears of corn, or stems of reeds. It is generally distributed, and has been taken near Stratford-on-Avon, Merivale and Atherstone. The long-tailed Field Mouse, *M. sylvaticus*, is plentiful, and often turned up by the spade or plough. The Common Mouse, *M. musculus*, abundant in buildings. The Black Rat, *M. rattus*, although rare, is still to be found in small colonies, generally in the cellars of large towns, where it is comparatively secure from the attacks of its greatest enemy and destroyer, the Brown Rat. A single recent example has been taken within the last six months at New Parks, near Leicester, and is now in the possession of Mr. F. T. Mott. The rarity of the occurrence justifies this record, although the locality is outside the radius agreed upon. The Brown Rat, *M. decumanus* is abundant in both buildings and hedgerows. The Water Vole, *Arvicola amphibius*, better known as the Water Rat, is common on all the streams of the Midlands. The common Field-Vole, *A. agrestis*, is plentiful in the meadows, where their nests are frequently exposed by the mowers. The Red Field or Bank-Vole, *A. glareolus*, is much more rare and

distinguished from the last species, by its rich chestnut fur; several of these were taken at Belvoir Castle, in July, 1885. The Hare, *Lepus timidus*, and the Rabbit, *L. cuniculus*, have been greatly reduced in numbers since the passing of the Hares and Rabbits Bill in 1881.

Ruminantia.

The Red Deer, *Cervus elaphus*, as recently as 1800, roamed wild over Cannock Chase and Needwood Forest, but is now confined to the areas of the large parks, such as Gopsall and Beaudesert. The Fallow Deer, *C. dama*, formerly existed in thousands on Cannock Chase, and is now the chief ornament of the parks. The Roe Deer, *Capreolus caprea*, was also common, but has become extinct. The Wild Cattle, *Bos taurus*, under the fostering care of the Lords Ferrars, at Chartley, near Stafford, still constitute the greatest curiosity among the Midland mammals. Garner, in his history of Staffordshire, relates that these animals at one time roamed free over Needwood Forest, and how, in the thirteenth century, William de Ferrariis enclosed a thousand acres of high-lying moorland, the turf of which is in the same condition now as then, and within this enclosure the animals are maintained in their pristine purity. At the present time this herd consists of about thirty head, comprising three bulls, the oldest aged nine years, a magnificent beast, with deep chest, black muzzle and ears, black-tipped, wide-spreading horns, and forefeet also flecked with black, the prevailing colour being a rich creamy white. So sensitive are these cattle, as the result of their high breeding, that calves unduly handled are forsaken by their mothers; and older beasts, if

subjected to forcible restraint, will often, as the keeper put it to the writer, “just wag their tails and die.” When the calves are with them the cows are dangerous to approach.

Pachydermata.

Before leaving the local mammals, the celebrated red breed of Tamworth Pigs, *Sus scrofa*, deserves mention as one of the best, most useful, and healthy of the many well-known kinds; but there is no reason to suppose that it, any more than the others, can claim descent from the reputed Wild Pigs of Needwood.

II.—REPTILES.

Sauria.

The Sand Lizard, *Lacerta agilis*, occurs in Leicestershire and Worcestershire, and is to be met with on Cannock Chase and similar localities. The Viviparous Lizard, *Zootoca vivipara*, is found in Sutton Park, is smaller and more active than the Sand Lizard, and differs from that species inasmuch as the young are born alive.

Saurophidia.

The Blindworm, *Anguis fragilis*, is not infrequent, specimens have been obtained at Sutton Park, Merivale, Baddesley Ensor, Beaudesert, the Forest of Wyre and Habberley Valley, near Kidderminster.

Ophidia.

The Ringed Snake, *Natrix torquata*, is seldom seen in the neighbourhood of Tamworth—although on one occasion the occupants of a boat on the river Anker saw one of these snakes glide down the bank and swim towards them—it is common in Merivale Park, occasionally found in Sutton Park, and near Dudley. The Viper or Adder, *Pelias berus*, our only poisonous reptile, is locally common, but generally rare; a large number were killed in Sutton Park during the summer of 1884; it is plentiful on Chartley Moss, Cannock Chase, and in the Forest of Wyre. The Viper is shorter and thicker than the Common Snake, and easily distinguished by the V shaped marking on the head.

Anoura.

The Common Frog, *Rana temporaria*, is very abundant, and may be seen in hundreds in the ditches during March. The Common Toad, *Bufo vulgaris*, is also generally distributed.

Urodela.

The Common Warty-Newt, *Triton cristatus*, may be found in ponds throughout the district. The Smooth-Newt, *Lissotriton punctatus*, is a habitant of every clear horsepond, where it can be seen either basking on the bottom, or rising to the surface for air; this species often leaves the water, and hides under stones.

Chapter II.
Birds.

BY R. W. CHASE.

The district surrounding Birmingham does not present any striking or special feature to the ornithologist; but owing to its varied character, comprising as it does hill and dale, with considerable stretches of moorland and a plentiful supply of water, in rivers, reservoirs and pools, it forms haunts particularly attractive to birds.

The number of local species recorded is large, consisting of about sixty residents, forty-two migrants, and eighty occasional and rare visitors; making a total of one hundred and eighty-two species.

The large number of marine or littoral species occurring so far inland is an interesting fact to be noted, and from the records of such species as the Curlew Sandpiper, Turnstone, Ring Dotterel, Common and Arctic Terns, much valuable information might be brought to bear upon some of the knotty problems of migration. It is principally during autumn that such species are noticed, and invariably the examples obtained are immature, or birds of the year.

The classification and synonymy used in this brief summary is in accordance with the fourth edition of "Yarrell's British Birds."

Accipitres.

FALCONIDÆ.—Golden Eagle, *Aquila chrysaetus*, has occurred at Needwood. White-tailed Eagle,

Haliætus albicilla, has occurred at Cannock Chase. Osprey, *Pandion haliætus*, very rare; has occurred at Witton, and near Lichfield. Peregrine Falcon, *Falco peregrinus*, rare visitor; one shot at Olton, near Solihull, in December 1880; it has also occurred at Packington, Water Orton, and Polesworth, near Tamworth. Hobby, *F. subbuteo*, frequently taken by the birdcatchers in their nets. It has bred in Warwickshire. Merlin, *F. æsalon*, not common; more frequently observed in the autumn. Kestrel, *F. tinnunculus*, common and generally distributed. Sparrow Hawk, *Accipiter nisus*, common. Kite, *Milvus ictinus*, has occurred at Polesworth, near Tamworth. Common Buzzard, *Buteo vulgaris*, an occasional visitor; has occurred at Alcester and Sutton Coldfield. Rough-legged Buzzard, *B. lagopus*, very rare; twice obtained in the neighbourhood of Coleshill. Honey Buzzard, *Pernis apivorus*, very rare; has occurred at Stoneleigh. Hen Harrier, *Circus cyaneus*, a rare visitor; has occurred at Alcester. Marsh Harrier, *C. æruginosus*, very rare; has been obtained at Elford, near Tamworth.

STRIGIDÆ.—Tawny Owl, *Strix aluco*, fairly common in wooded districts. Long-eared Owl, *Asio otus*, fairly abundant and breeds here. Short-eared Owl, *A. accipitrinus*, an autumn migrant. Barn Owl, *Aluco flammeus*, abundant.

Passeres.

LANIIDÆ.—Great Grey Shrike, *Lanius excubitor*, frequently occurs during autumn and winter; it has been taken at Wylde Green, November 14th, 1871, and at Rubery Hill, October 31st, 1881. Red-backed Shrike, *L. collurio*, generally distributed and breeds here.

MUSCICAPIDÆ.—Spotted Flycatcher, *Muscicapa grisola*, a common summer visitor. Pied Flycatcher, *M. atricapilla*, rare.

ORIOLIDÆ.—Golden Oriole, *Oriolus galbula*, one was obtained at Barton, near Tamworth. —"Zoologist," 1871, p. 2639.

CINCLIDÆ.—Dipper, *Cinclus aquaticus*, very rare in the district; one was shot at Handsworth, January 12th, 1882.

TURDIDÆ.—Missel Thrush, *Turdus viscivorus*, common and breeds here. Song Thrush, *T. musicus*, common. Redwing, *T. iliacus*, winter visitor. Fieldfare, *T. pilaris*, winter visitor. Blackbird, *T. merula*, abundant everywhere and increasing. Ring Ouzel, *T. torquatus*, not common, has occurred at Wylde Green and Gravelly Hill.

SYLVIIDÆ.—Hedge sparrow, *Accentor modularis*, abundant. Redbreast, *Erithacus rubecula*, common and resident. Nightingale, *Daulias luscinia*, not very plentiful throughout the district, but to be found fairly numerous in favoured localities, and breeds here. Bluethroat, *Ruticilla suecica*, very rare; once occurred near Birmingham, ("Yarrell's British Birds," Vol. i., p. 322). Redstart, *R. phœnicurus*, common summer visitor. Stonechat, *Saxicola rubicola*, and Whinchat, *S. rubetra*, are to be met with in suitable localities. Wheatear, *S. œnanthe*, common in spring; generally arrives about the middle of March, Reed Warbler, *Acrocephalus streperus*, a summer visitor and breeds here. Sedge Warbler, *A. schœnobœnus*, plentiful throughout the district. Grasshopper Warbler, *A. nœvius*, far from common; has occurred at Barnt Green, Alcester, Sutton, Tamworth; breeds here sparingly. Whitethroat, *Sylvia rufa*, abundant in summer. Lesser Whitethroat, *S. curruca*, not so

abundant as the previous species. Garden Warbler, *S. salicaria*, common summer migrant. Blackcap, *S. atricapilla*, locally distributed. Wood Wren, *Phylloscopus sibilatrix*, common during summer, especially in the neighbourhood of Selly Oak. Willow Wren, *P. trochilus*, abundant. Chiffchaff, *P. collybita*, one of the earliest summer migrants. Golden-crested Wren, *Regulus cristatus*, frequently breeds here.

TROGLODYTIDÆ.—Wren, *Troglodytes parvulus*, abundant.

CERTHIIDÆ.—Tree Creeper, *Certhia familiaris*, common; especially in Sutton Park.

SITTIDÆ.—Nuthatch, *Sittia cæsia*, generally to be met with where old trees abound. Aston, Edgbaston, and Sutton Coldfield are localities where it has been observed.

PARIDÆ.—Titmouse, *Parus*. This genus is well represented, those species which occur being plentiful.

AMPELIDÆ.—Waxwing, *Ampelis garrulus*, rare; has occurred at irregular intervals; one shot in the grounds of Aston Hall, by a gamekeeper of James Watt, Esq., about the year 1845, and another at Rednal, Jan. 30, 1882.

MOTACILLIDÆ.—Pied Wagtail, *Motacilla lugubris*, common. Grey Wagtail, *M. sulphurea*, has been observed several times in full summer plumage, and probably breeds in the district. Yellow Wagtail, *M. raii*, regular summer migrant. Tree Pipit, *Anthus trivialis*, not rare, but local. Meadow Pipit, *A. pratensis*, common.

ALAUDIDÆ.—Sky Lark, *Alauda arvensis*, resident and common. Wood Lark, *A. arborea*, rare.

EMBERIZIDÆ.—Snow bunting, *Plectrophanes nivalis*, rare; has occurred at Harborne. Reed Bunting, *Emberiza schœniclus*, generally to be met with in suitable localities. Yellow Bunting, *E. citrinella*, abundant. Bunting, *E. miliaria*, frequent.

FRINGILLIDÆ.—Chaffinch, *Fringilla cœlebs*, common. Brambling, *F. montifringilla*, occasionally occurs in the winter. Tree sparrow, *Passer montanus*, very local in distribution. House Sparrow, *P. domesticus*, abundant everywhere. Hawfinch, *Coccothraustes vulgaris*, more plentiful than formerly; now breeds regularly in the district. Greenfinch, *C. chloris*, common. Goldfinch, *Carduelis elegans*, scarce. Siskin, *C. spinus*, occasionally occurs in the winter. Lesser Redpoll, *Linota rufescens*, common and resident. Linnet, *L. cannabina*, common and resident. Bullfinch, *Pyrrhula europœa*, generally distributed throughout the district. Crossbill, *Loxia curvirostra*, rare; a pair were shot in Aston Park about 1845; it has also occurred at Solihull and Wylde Green.

STURNIDÆ.—Starling, *Sturnus vulgaris*, abundant and resident.

CORVIDÆ.—Crow, *Corvus corone*, not rare. Grey crow, *C. cornix*, mostly noticed during winter; the nest of this species was taken in Sutton Park, May, 1883. Rook, *C. frugilegus*, abundant and increasing. Jackdaw, *C. monedula*, common. Magpie, *Pica rustica*, common in localities not strictly preserved. Jay, *Garrulus glandarius*, common in large woods.

HIRUNDINIDÆ.—Swallow, *Hirundo rustica*. Martin, *Chelidon urbica*, and the Sand Martin, *Cotyle riparia*, are all common summer visitors.

Picariæ.

CYPSELIDÆ.—Swift, *Cypselus apus*, summer visitor, rather local.

CAPRIMULGIDÆ.—Night-jar, *Caprimulgus europæus*, generally distributed; frequenting woods adjoining heaths; especially plentiful in Sutton Park.

CUCULIDÆ.—Cuckoo, *Cuculus canorus*, summer migrant.

UPUPIDÆ.—Hoopoe, *Upupa epops*, an accidental visitor; has been shot at Witton, Quinton, Oscott, and Baddesley near Tamworth.

ALCEDINIDÆ.—Kingfisher, *Alcedo ispida*, fairly numerous; to be met with on most of the rivers and brooks.

PICIDÆ.—Green Woodpecker, *Gecinus viridis*, not common, but breeds. Greater spotted Woodpecker, *Dendrocopus major*, scarce. Lesser spotted Woodpecker, *D. minor*, often obtained, but by no means common. Wryneck, *Jynx torquilla*, summer migrant, rather local in distribution.

Columbæ.

COLUMBIDÆ.—Ring Dove, *Columba palumbus*, common. Stock Dove, *C. œnas*, not numerous, but often met with. Turtle Dove, *Turtur communis*, occurs in considerable numbers and breeds here.

Pterocletes.

PTEROCLIDÆ.—Pallas' Sand Grouse, *Syrrhaptes paradoxus*, very rare; has occurred in Staffordshire; also at Swinfen near Tamworth. ("Zoologist," 1873, p. 3,801).

Gallinæ.

TETRAONIDÆ.—Black grouse, *Tetrao urogallus*, formerly common, now nearly extinct; a brace shot in Sutton Park, October, 1871. Red grouse, *Lagopus scoticus*, very rare.

PHASIANIDÆ.—Pheasant, *Phasianus colchicus*, common in preserves. Partridge, *Perdix cinerea*, common. Red-legged partridge, *Caccabis rufa*, occasionally met with; has been shot at Ladbrook, and Great Barr. Quail, *Coturnix communis*, rare; has been obtained near Tamworth.

Fulicariæ.

RALLIDÆ.—Land Rail, *Crex pratensis*, common summer migrant. Spotted Crake, *Porzana maruetta*, occurs more frequently in autumn; the nest has been taken in Sutton Park. Water rail, *Rallus aquaticus*, more rare than formerly. Moor Hen, *Gallinula chloropus*, common. Common Coot, *Fulica atra* not rare.

Alectorides.

OTIDIDÆ.—Little Bustard, *Otis tetrax*, once at Thickthorn, near Tamworth.

Limicolæ.

CHARADRIIDÆ.—Cream-coloured Courser, *Cursorius gallicus*, has been obtained at Yoxall. Dotterel, *Eudromias morinellus*, very rare; has occurred at Cannock Chase 1875, and at Perry Barr, 1882. Ringed Plover, *Ægialitis hiaticula*, rare;

occasionally met with in autumn. Golden Plover, *Charadrius pluvialis*, rare. Lapwing, *Vanellus vulgaris*, common and resident. Turnstone, *Strepsilas interpres*, very rare. Oyster-catcher, *Hæmatopus ostralegus*, has been obtained at Yoxall.

SCOLOPACIDÆ.—Red-necked Phalarope, *Phalaropus hyperboreus*, has occurred once at Tamworth. Woodcock, *Scolopax rusticula*, rare. Great Snipe, *Gallinago major*, one obtained at Polesworth and another is said to have been seen in Sutton Park(?). Common Snipe, *G. cœlestis*, winter visitor; breeds here in small numbers. Jack Snipe, *G. gallinula*, winter visitor; not numerous. Dunlin, *Tringa alpina*, very rare; has occurred at Small Heath. Curlew Sandpiper, *T. subarquata*, rare; a small flock seen in the neighbourhood of Barnt Green in September, 1885. Ruff, *Machetes pugnax*, very rare; once occurred at Sutton Coldfield. Bartram's Sandpiper, *Bartramia longicauda*, once near Warwick, on October 31st, 1851 (Zool. pp. 3,330, 3,388, 4,254). Common Sandpiper, *Totanus hypoleucus*, summer visitor; it is probable this species breeds in the district. Wood Sandpiper, *T. glareola*, very rare, once occurred at the Sewage Farm. Green Sandpiper, *T. ochropus*, has occurred at Packington, near Tamworth. Redshank, *T. calidris*, rare; has occurred at the Sewage Farms; also at Sutton Coldfield and near Tamworth. Greenshank, *T. canescens*, occasional visitor in autumn; has occurred at Castle Bromwich. Curlew, *Numenius arquata*, rare; has occurred at Great Barr and Polesworth.

Gaviæ.

LARIDÆ.—Black Tern, *Hydrochelidon nigra*, often occurs in spring and autumn. Sandwich Tern, *Sterna*

cantiaca, occasional visitor; more frequently observed towards autumn. Common Tern, *Sterna fluviatilis*, often observed during spring and autumn migration; chiefly birds of the year during the latter period. Arctic Tern, *S. macrura*, the same remarks apply to this species as to *S. fluviatilis*. Sabine's Gull, *Xema sabinii*, once occurred near Coleshill, in October, 1883. Black-headed Gull, *Larus ridibundus*, not rare; frequently met with during spring on some of the large reservoirs. Lesser Black-backed Gull, *Larus fuscus*, rare; has been shot at Bromsgrove and Handsworth. Great Black-backed Gull, *L. marinus*, once occurred at Shustoke, September 20th, 1874. Large Gulls are often observed passing over, which probably belong to this species. Common Gull, *L. canus*, rare, has been shot near Alcester. Kittiwake Gull, *Rissa tridactyla*, rare; occasionally seen during winter. Pomatorhine Skua, *Stercorarius pomatorhinus*, very rare; considering the unusual number of Skuas that appeared during the autumn of 1879, it is rather surprising that more examples were not noticed in this district, very few being shot. Buffon's Skua, *S. parasiticus*; an immature bird was shot on Lichfield Racecourse in October 1874.

Tubinares.

PROCELLARIIDÆ.—Manx Shearwater, *Puffinus anglorum*; an immature bird was picked up exhausted in the Chandos road in this town, September 5th, 1880. Forked-tailed Petrel, *Cymochorea leucorrhoa*, very rare. One picked up September 4th, 1883, dead in a yard, in Guildford street in this town, and subsequently recorded in the local papers as *Procellaria pelagica*. Stormy Petrel, *P. pelagica*, has occurred too many times to particularize each

instance.

Pygopodes.

ALCIDÆ.—Little Auk, *Mergulus alle*, very rare; several instances are on record of its occurrence in the district, one was obtained in November, 1863. Puffin, *Fratercula arctica*; one picked up in Broad street in this town, in an exhausted condition, 1884.

COLYMBIDÆ.—Great Northern Diver, *Colymbus glacialis*, very rare; one was obtained at Tipton, January 8th, 1877.

PODICIPEDIDÆ.—Great crested Grebe, *Podiceps cristatus*, generally distributed throughout the district, and far from rare; breeds regularly at Sutton Coldfield, Little Aston, and Barnt Green. Sclavonian Grebe, *P. auritus*; one shot at Sutton Coldfield, in December, 1868. Little Grebe, *P. fluviatilis*, not rare; breeds sparingly in suitable localities; small flocks or families are often observed during the autumn and winter, especially on the river Tame.

Steganopodes.

PELECANIDÆ.—Common Cormorant, *Phalacrocorax carbo*, a rare occasional visitor. Shag, *P. graculus*, very rare; has occurred twice in the neighbourhood of King's Norton, also near Tamworth. The Gannet, *Sula bassana*, one taken exhausted in a field of potatoes near Tamworth.

Herodiones.

ARDEIDÆ.—Common Heron, *Ardea cinerea*, generally to be met with. There are several Heronries

in the county of Warwick. Little Egret, *Ardea garzetta*, said to have been obtained at Sutton Coldfield, many years ago. Night heron, *Nycticorax griseus*, one obtained near Alcester. Common Bittern, *Botaurus stellaris*, more rare than formerly; a great many examples have been obtained from time to time, especially in the neighbourhood of Sutton Coldfield.

Odontoglossæ.

PHŒNICOPTERIDÆ.—Flamingo, *Phœnicopterus roseus*; one stated to have been shot in the neighbourhood of Wolverhampton, but probably an escaped bird.

Anseres.

ANATIDÆ.—Brent Goose, *Bernicla brenta*, scarce; two shot at King's Norton, October 24th, 1882, during stormy weather; has also been obtained near Tamworth. Flocks of geese are often observed passing overhead, but of course it is impossible to determine to what species they belong. Canada Goose, *B. canadensis*, has been shot several times in the district, whether escaped specimens or not, it is difficult to say, as this species is often kept in a semi-wild state. Mute Swan, *Cygnus olor*, is to be found upon many large pools and ornamental waters; breeds here plentifully. Polish Swan, *C. immutabilis*, once occurred at Earlswood reservoir. Ruddy Sheld-Duck, *Tadorna casarca*, has been shot at Nechells, also at Yardley Wood; probably escaped birds. Common Sheld-Duck, *T. cornuta*, rare visitor. A magnificent male was shot at Hawkesbury, near Coventry, in 1881. Mallard, *Anas boscas*, plentiful on some pools; breeds throughout the district. Gadwall,

A. strepera, very rare; one shot near Lichfield in December, 1873. Shoveller, *Spatula clypeata*, formerly bred in Staffordshire, but very scarce of late years; one shot at Sutton Coldfield, in 1867. Teal, *Querquedula crecca*, sparingly met with, a few pairs breed in the district; the nest has several times been taken in Sutton Park. Widgeon, *Mareca penelope*, winter visitor; often seen in large flocks upon the reservoirs and pools during severe weather. Scaup, *Fuligula marila*, has occurred once at Wichnor near Tamworth. Pochard, *F. ferina*, rare; has been shot near Tamworth. Tufted Duck, *F. cristata*, very rare; a male was shot in Aston Park many years ago, by a gamekeeper of James Watt, Esq. Golden Eye, *Clangula glaucion*, one shot near Tamworth. Goosander, *Mergus merganser*, an accidental visitor in winter; specimens obtained are generally either immature birds or females. Red-breasted Merganser, *M. serrator*, very scarce; only young birds have been obtained. Smew, *M. albellus*, very rare. A female was shot on the canal at Selly Oak, about fifteen years ago. Another example of this species was obtained at Elford, near Tamworth.

Chapter III.
Fishes and Mollusca.

BY G. SHERRIFF TYE.

I.—FISHES.

The waters within easy reach of Birmingham

afford to those interested in the Natural History of Fishes excellent opportunities for study, and are much resorted to by anglers. To those who do not incline to the study of fish or fishing, it will probably be a matter of surprise to know the abundance and excellence of the individuals, and the variety of species occurring within an hour's walk of the centre of our town. Of the river Tame, a well-known angler states: "In my opinion this is a remarkable little river; in three and a half miles it contains in abundance at least ten species of fish, viz., trout, pike, chub, tench, perch, roach, rudd, dace, gudgeon, minnow, all of which, except the pike, attain to a size equal to any in rivers or pools within a hundred miles of Birmingham." Large fish are not so common now as formerly, but probably this river will recover, and attain its wonted excellence, when the "Black Country" sewerage works are completed.

The river Cole is a fine trout stream. The river Blythe, Coleshill, is an excellent stream, especially for eels. The river Trent with its tributaries, the Anker, Tame, and Mease, is celebrated for many species of fish, and is a great resort of anglers. Earlswood and the Corporation reservoirs, the pools at Sutton Coldfield, Great Barr Park, King's Norton, Barnt Green, and many others are all well stocked with fish, and will render fine examples to all who seek them.

The writer's thanks are cordially rendered to members of the Birmingham Piscatorial Association and to other gentlemen for valuable information, kindly given, respecting the localities and habitats of Fishes. The weights of the largest specimens recorded, have all been verified by the anglers who have taken them.

The classification adopted in this paper is that of "Yarrell's British Fishes," second edition, 1841.

The number of local species recorded is thirty-three.

Acanthopterygii.

Perch, *Perca fluviatilis*, accommodates itself to either river or pool, the former producing the cleanest and handsomest fish. It has been taken of fine size, 4½ lbs., Rotton Park Reservoir; 3½ lbs., Tardebigg; 3 lbs., Rotton Park Reservoir; 2 lbs. to 3 lbs. from Old Soho Pool, now the site of a Railway Wharf.

Ruffe, *Acerina vulgaris*, not uncommon, river Trent, Alrewas. The writer has taken a number from a pool near Wednesbury.

Miller's Thumb, *Cottus gobio*, is to be met with in most of our little rivulets, lurking under stones.

The Rough-tailed three-spined Stickleback, *Gasterosteus trachurus*; ubiquitous. The males in the breeding season are resplendent in scarlet and green, and fight for supremacy. It is remarkable with what ease individuals accommodate themselves to sea water. The Smooth-tailed Stickleback, *G. leiurus*; the Short-spined Stickleback, *G. brachycentus*; the Four-spined Stickleback, *G. spinulosus* and the Ten-spined Stickleback, *G. pungitius*; although not so common as *G. trachurus*, are all found in ditches communicating with the river Anker, at Tamworth.

Abdominal Malacopterygii.

Carp, *Cyprinus carpio*. The writer has had one of

large size from Plants Brook Reservoir, 7½ lbs., and has seen a larger one in the pool. The largest recorded was from Sandwell Pool, 12 lbs.

Crucian Carp, *C. carassius*, is not uncommon; the writer has seen numbers of them taken from small cattle pits on a farm in Warwickshire. It is a pretty and hardy species in an aquarium.

Gold Carp, *C. auratus*, the well known "gold-fish," used to breed in a pool at West Bromwich, into which warm water from an engine flowed, but it is not found there now.

Barbel, *Barbus vulgaris*, is found in abundance in the River Trent, but in general size not to be compared with those taken in the Thames. River Trent, 7½ lbs. and 8 lbs.

Gudgeon, *Gobio fluviatilis*, in streams fairly common, also in canals, but rare in pools. Earlswood Reservoir.

Tench, *Tinca vulgaris*, not uncommon; of large size at Handsworth, Sutton Coldfield, and near Barnt Green, in pools; plentiful at the latter place, rivers Tame, Anker, &c.; 3 lbs. Edgbaston Pool. It is one of the easiest fishes to keep in confinement. A golden variety of this species is bred in the private pools of gentlemen in this country, it is said to have been introduced from Germany. Fine specimens were to be seen at the recent Fisheries Exhibition in London.

Bream, *Abramis brama*, in the larger rivers. When this species assembles, after an overnight's baiting, it may often be taken in great numbers. 5 lbs. River Trent. The writer has known a few hours' fishing in a Warwickshire stream to yield sufficient fine fishes of this species to fill a hamper as much as a couple of

men could carry.

Roach, *Leuciscus rutilus*, occurs very commonly and of large size; old Soho Pool, 3 lbs. weight, a truly noble fish; Sharpley Reservoir, 2 lbs.

Dace, *Leuciscus vulgaris*, River Trent, 14 ozs.

Chub, *Leuciscus cephalus*, River Tame, 5½ lbs. 5 lbs. and many approaching that weight.

Rudd or Red-eye, *Leuciscus erythropthalmus*. In the River Tame.

Bleak, *Leuciscus alburnus*. In streams and in Earlswood Reservoir. A friend remarks, "I have taken this species in Earlswood Reservoir, and Gudgeon also, the only instance I have met with where these two river fish have occurred in a pool." They were probably bred from escaped bait.

Minnow, *Leuciscus phoxinus*, common in many streams.

Loach, *Cobitis barbatula*, is found in streamlets in many places. The writer has taken it at Handsworth. It is said to be delicate food.

The Spined-Loach, *Botia tænia*, is rarer than the preceding. It has been taken in the Rivers Anker and Tame at Tamworth.

Pike, *Esox lucius*, is found in large pools and rivers. 26 lbs.; 25 lbs. 6 oz., Earlswood Reservoir; 23 lbs., Middleton Pool; 22 lbs. 6 oz., Pebble Mill Pool; 12 and 13 lbs., Sutton Park. The writer could relate many instances of the voracity of the Pike, and incidents of sport,—one must suffice. A Pike was hooked near some floodgates in the Tame, and on taking out the hook he found that it had gone through a Water-Shrew, which the fish had just

taken, and still held in its mouth.

Salmon, the king of British fishes, *Salmo salar*, comes legitimately within our radius of twenty miles. It has been taken from the Eel traps in the River Tame at Tamworth; in the River Trent at Yoxall; and in the River Severn at Bewdley. At the last mentioned place a specimen weighing 40 lbs. has been captured.

Common Trout, *S. fario*, Bourne Brook, Fazeley, 7 lbs.; River Tame, 5½ lbs., 4 lbs. several, and many below that weight; River Trent, 4 lbs. 2 ozs.; River Cole, Packington.

Lochleven Trout, *S. Levenensis*. In April, 1884, the Water Department of the Corporation of Birmingham stocked their new reservoir (90 acres) at Shustoke with 3,000 of this fish. The reservoir at Witton was stocked with 2,000 fish at the same time. They were yearlings, about 3 inches long, and are now (August, 1886) from 2 lbs. to 3¼ lbs. in weight. These reservoirs will therefore in a few years be good places for this species of Trout.

Grayling, *Thymallus vulgaris*, River Trent, Shenstone, 2 lbs.; Alrewas, 17 ozs.; Bourne Brook, Fazeley.

Subbrachial Malacopterygii.

The Burbot, *Lota vulgaris*, the only British species of the family of the Gadidæ that lives permanently in fresh water, is found in the River Anker at Tamworth, the largest fish recorded being 5 lbs.; 3 lbs. 2 ozs.

Apodal Malacopterygii.

The Sharp-nosed Eel, *Anguilla acutirostris*, and the Broad-nosed Eel, *Anguilla latirostris*. In rivers and pools generally. Fine specimens of *A. acutirostris* are taken in the River Blythe, some weighing 4 lbs. each. The third species of Eel mentioned by Yarrell, the Snig, *A. mediorostris*, occurs with the two others in the Worcestershire Avon, and doubtless finds its way into the Arrow and other tributary streams. It differs from the two preceding species, being much smaller, individuals rarely exceeding half a pound each; and in its habit of roving and feeding by day. It is of superior flavour to its congeners. The Snig may easily be distinguished by the first five cervical vertebræ, which are smooth and free from spinous processes, always present in the sharp-nosed and broad-nosed Eels.

Chondropterygii.

Lampern or river Lamprey, *Petromyzon fluviatilis*. In the River Trent, and also the Tame and in streamlets, Sutton Park, &c.

II.—MOLLUSCA.

The district around Birmingham is an excellent field for terrestrial and fluviatile Mollusca. Within a circle of twelve miles radius, which includes a portion of the Counties of Warwick, Stafford, and Worcester, can be found fifty per cent. of the species and varieties enumerated in Dr. J. Gwyn Jeffreys' "British Conchology." No special quality of soil or geological condition is required for the existence of Molluscs; whatever the nature of the ground may be, some species or other will reward the searcher. The number of terrestrial species is usually the greatest

where limestone is present; indeed some species do not seem able to maintain their existence away from it, *e.g.*, *Helix ericetorum*, *H. virgata*, *H. arbustorum*, and *Cyclostoma elegans*. The still beautiful grounds of Dudley Castle were once "happy hunting grounds" for the collectors of Mollusca, but the smoke of a thousand fires has cast a baleful influence over the locality. The dead shells of species, once abundant, are conclusive evidence that the Molluscan fauna do not now enjoy a congenial atmosphere in that neighbourhood. *Helix arbustorum*, may, notwithstanding, still be found there, its nearest proximity to Birmingham.

Among the noticeable species of the district may be mentioned *Testacella Haliotidea*, found in the garden of a florist at Redditch; *Succinea virescens*, (Morelet) = *S. putris* var. *vitrea* (Jeffreys), which the writer has taken near Plants Brook Reservoir; *Zonites glaber*, found near Solihull; *Helix Cantiana*,[62] Henley-in-Arden; *H. virgata*, Grafton, near Alcester; *Balia perversa*, Fenny Compton, Northamptonshire. The three last named species are outside the twelve miles radius.

Conchifera.

The Midlands are rich in fluviatile forms, nearly all the known British species occur. Those worth noting among the Sphæriidæ are—*Sphærium corneum*, var. *Scaldiana*, Acock's Green; *S. corneum*, var. *flavescens*, Plants Brook; *S. rivicola* and *S. ovale*, Acock's Green and Rushall Canal. *S. lacustre* is not uncommon, and is found abundantly in a pond at Handsworth.

The Pisidia are well represented, four out of our five species occurring. It is curious that the large

form *Pisidium amnicum* has not hitherto been taken in the district. The writer took *P. roseum*[63] from several ponds at Meriden in 1885-6.

The Unionidæ are extremely plentiful, and the two species *Unio tumidus* and *U. pictorum* attain to an immense size. In the writer's cabinet are examples of *U. pictorum* of the following dimensions—$2^{1}/_{16}$ in. × $5^{1}/_{16}$, $2^{1}/_{16}$ in. × 5¼, $2^{3}/_{16}$ in. × 5¼, some of them weighing nearly 4 ounces avoirdupois; and of *U. tumidus*, $2^{5}/_{16}$ in. × 4¾, 2⅜ in. × 4⅞, 2¾ in. × 5, the weight of some examples reaching nearly 6 ounces avoirdupois. These are probably the finest shells of their kind ever taken anywhere. *Anodonta cygnea* is common, and its varieties *incrassata*, *Zellensis*, *pallida*, and *rostrata* occur. *A. anatina*, and the varieties *radiata* and *ventricosa* are found; handsome shells of the latter occur at Barr Park and in the river Blythe at Coleshill. *Dreissena polymorpha* is commonly distributed.

Gasteropoda.

In the order Pectinibranchiata, *Neritina fluviatilis*, the only representative in England of a genus of world-wide distribution, has occurred in the river Tame at Aston, but the writer believes is not now to be found there. One of our two species of Paludinidæ, *Paludina vivipara*,[64] *Bythinia tentaculata*, *B. Leachii*, and *Valvata piscinalis* make up the list of operculate water snails.

Among the Limnæidæ examples of the following genera occur. In the genus Planorbis we find all the species except *Planorbis lineatus*, excluding of course *P. dilatatus* (Gould), which only occurs at Manchester, having been introduced on cotton from

America. The epiphragm formed by *P. spirorbis*, in summer, when the solar heat has dried up its habitat, is a singular item of its economy. It is supposed that this habit enabled *P. dilatatus* to reach our shores. *Physa hypnorum* and *P. fontinalis* are both represented; they are charming inhabitants of an aquarium, their habit of thread spinning,[65] especially in the young state, makes them lively creatures; the lobed mantle of *P. fontinalis*, nearly enclosing the shell, gives a peculiar character to the animal.

Of the six species of Limnæa[66] which occur, it will not be needful to mention more than one, which is the rarest with us, viz.: *Limnæa glabra*. Both species of Ancylus are moderately common.

Of terrestrial Mollusca we enumerate the following Limacidæ—*Arion ater*, *A. hortensis*, *Limax marginatus*, *L. flavus*, *L. agrestis*, *L. arborum*, *L. maximus*, and as before said one of the Testacellidæ viz., *T. Haliotidea*. Among the Helicidæ of course the common kinds are all present. Of the genus Zonites we have the following species: *Zonites cellarius*, *Z. glaber*, *Z. alliarius*, and its var. *viridula*, *Z. nitidulus*, *Z. purus*, and its var. *margaritacea*, *Z. radiatulus*, *Z. nitidus*, *Z. excavatus* (one only, at Knowle), *Z. crystallinus*. Among the smaller species of Helix, attention may be called to the following: *H. aculeata*, a minute spiny coronet; *H. pygmæa*, the smallest of known Helices; *Helix fusca*, taken in two localities only, at Knowle and Selly Oak. Of the four species of Pupa found in Britain, two only occur, *Pupa umbilicata* and *P. marginata*. Of the latter species a colony of the white variety has been found inhabiting a wall at Cleeve Prior, Worcestershire. Only two out of our eleven species of Vertigo have occurred, viz.: *Vertigo*

edentula and its variety *columella*, and *V. pygmæa*. Two Clausiliæ are found, *Clausilia laminata* and *C. rugosa*. It is somewhat singular that of the four species inhabiting this country the last named is ubiquitous, while *C. Rolphii* and *C. biplicata* are local. The writer has taken the rare albino form of *C. rugosa*, at Selly Oak. That exquisite shell, *Cochlicopa tridens*, var. *crystallina*, has been taken in three places; the type is largely distributed in our neighbourhood, whereas in others it is rare, while *C. lubrica* is widespread in England. *Achatina acicula*, dead shells only, Dudley Castle. *Carychium minimum* is commonly distributed.

In giving this outline of the Molluscan Fauna of our neighbourhood, the writer has called attention to the valuable papers on Embryology by Professor E. Ray Lankester, as shedding great light on the affinities of the Mollusca with other groups.

Chapter IV.
Insects.

BY W. G. BLATCH.

The neighbourhood of Birmingham, and in fact the Midland district generally, has never been considered particularly rich in either the number or variety of its insect productions, and it is a fact that a collection of Midland species, of whatever order, shows very wide gaps, both in genera and species, when compared with one formed in the east or south of England. Nevertheless, the Midland Counties are not entirely

barren in this respect, and a catalogue of the insects known to occur within a radius of twenty miles of Birmingham would be a very respectable one. During the last few years a large number of very interesting species have been discovered, and there can be no doubt that with more workers and greater enthusiasm considerable additions would continue to be made. By extending the radius somewhat our list would embrace a good array of species which seem to be peculiar to the Midlands, such as *Bembidium adustum*, *Eutheia clavata*, *Euplectus nubigena*, *Teredus nitidus*, *Macronychus quadrituberculatus*, *Hylecœtus dermestoides*, *Tropideres sepicola*, *Bagöus diglyptus*, *Notodonta bicolor*, &c., &c. At any rate these insects have not hitherto been detected in any other British localities. It is much to be regretted that local entomology suffers greatly from two untoward circumstances, viz., the lack of students and the want of a carefully compiled list of species of the several orders. The publication of a catalogue of local insects as far as our present knowledge extends, would undoubtedly tend to stimulate the intelligent pursuit of this study, and it seems surprising that such an important work has not long ago been undertaken by the Natural History Societies of the district.

Having regard to the limited space allowed for this paper its object will, perhaps, best be secured by giving as full a list as possible, of the rarer and more interesting species belonging to the two most popular orders, viz., the Coleoptera and the Lepidoptera, together with some of the localities in which they occur. With few exceptions the references will be to insects which inhabit the twenty miles radius, a wider range being taken only in specially interesting cases, but even then it will be impossible to give anything like an adequate idea of the beetles,

butterflies, and moths of the district.

To prevent the possibility of error it should be stated that the nomenclature adopted is (for the beetles) that of the "Catalogue of British Coleoptera, by Matthews and Fowler, 1883," and (for the butterflies and moths) "Synonymic List of British Lepidoptera, by Richard South, 1884."

Coleoptera.

This order is well represented; certain localities in the district are favourable to their existence and economy, and many rarities occur. Only one Cicindela (*Cicindela campestris*) inhabits our district and that is generally distributed and plentiful, especially in sandy places. The curious and elegant *Cychrus rostratus* is often found under stones and loose bark at Dudley and Bewdley, and the handsome *Carabus nitens* and its congener *C. arvensis*, may be taken on Cannock Chase, both species being now very scarce. *Elaphrus riparius* and *E. cupreus* occur not uncommonly in wet and boggy places. *Notiophilus substriatus* (generally a sea-side species) may be found occasionally on Cannock Chase, and so also may the curious *Nebria livida*. This latter beetle was first discovered on the Chase by Mr. J. T. Harris, and the writer has verified its occurrence there many times. It is a remarkable fact that this is the only known instance of this species inhabiting an inland locality—its head quarters being at Bridlington Quay and two or three other parts of the north-east coast—it lives in the argillaceous cliffs, and on Cannock Chase it is met with in a similar formation.

Of the curious genus Dyschirius two species only appear to have settled in our neighbourhood, viz., *D.*

æneus and *D. globosus*, both occur at Bewdley and on Cannock Chase—the latter also at Coleshill and Sutton Park.

The genus Bembidium is well represented, 33 of the 50 British species and varieties being taken in the Birmingham district. A few may be named: *B. rufescens*, under bark and in damp places; *B. quinquestriatum*, on walls at Smallheath and Olton; *B. Mannerheimii*, Knowle, Bewdley, Cannock Chase; *B. articulatum*, Knowle, Bewdley; *B. nigricorne*, Cannock Chase; *B. monticola*, Bewdley; *B. Stephensi*, Sutton Park; *B. prasinum*, Bewdley. In this connection the writer may perhaps be allowed to refer to the finding by himself of *B. adustum* in large numbers at Tewkesbury. This species was previously represented only by a very few old specimens, and had not been found for more than 40 years, until he had the pleasure of re-establishing it.

Patrobus assimilis is found sparingly on Cannock Chase; *Trechus discus*, *T. micros* and *T. secalis*, are plentiful in the river banks at Bewdley; *T. micros* occasionally turns up at Smallheath amongst bones placed in the garden as a trap for Homalotæ; *T. obtusus* has occurred at Bewdley and Cannock Chase, and in the latter locality the writer once found a few examples of the rare *T. rubens*.

The important genus Pterostichus has many representatives: *P. versicolor*, at Solihull, Sutton Park, and Cannock Chase; *P. lepidus*, Cannock Chase; *P. picimanus* and *P. anthracinus*, Bewdley; *P. minor*, Coleshill and Cannock Chase; *Platyderus ruficollis* seems to be generally distributed, but scarce. *Amara fulva* may frequently be taken under stones in sandy places at Sutton Park, Cannock Chase, and Bewdley; *A. consularis* at Sutton Park and Hopwas Wood; *A.*

spinipes, at Dudley and Bewdley; *A. patricia*, Cannock Chase; *A. acuminata*, Sutton Park; *A. lunicollis*, Small Heath, Sutton, Cannock Chase, and Bewdley; *A. continua*, *A. communis*, and *A. ovata*, at Knowle, Coleshill, and Bewdley.

Badister sodalis is to be had at Dudley and Bewdley. All the species of Calathus occur, and *Taphria nivalis*, a closely allied beetle, turns up now and again, singly, at Small Heath, Knowle, Bewdley, and Trench Woods. The Anchomeni are fairly well represented, and it seems very likely that additional species may yet be added to our local list. The following may be selected as most worthy of notice: *Anchomenus oblongus*, Bewdley; *A. atratus*, Coleshill, Cannock Chase, and Bewdley. A single *Lebia chlorocephala* was captured in hedge rubbish near Acock's Green. *Dromius quadrisignatus* is a Sutton Park species, being found rarely under bark of Oak trees. *Blechrus maurus*, which seems decidedly out of its reckoning in a Midland locality, has been taken at Bewdley and Leamington. All the species of Metabletus occur, and are pretty generally distributed. *Cymindis vaporariorum* inhabits Cannock Chase, where it may be found lurking under the heather and loose stones, but is not abundant. In the same locality the curious *Miscodera arctica* may, in some seasons, be met with in plenty. Two species of Chlænius occur, viz.: *C. vestitus* at Bewdley, and *C. nigricornis* at Cannock Chase. Of the extensive genus Harpalus, the following species may be cited, it being understood that several of the commoner forms exist here in great abundance. *H. puncticollis*, Dudley and Bewdley; *H. griseus*, Cannock Chase; *H. tardus*, Sutton Park and Bewdley. The pretty little *Acupalpus exiguus* and v. *luridus* may be obtained by searching the Sphagnum on the margin of Coleshill Pool. All the

Bradycelli, except *B. placidus* and *B. collaris*, are plentiful in the district, and in certain spots, such as Cannock Chase, they are extremely abundant. *Anisodactylus binotatus* occurs on Cannock Chase, but is not often to be found.

The water beetles are pretty numerously represented in the district generally, the best localities for them being Coleshill, Sutton Park, Cannock Chase, and Bewdley. It must suffice to mention a few of the rarer or more striking kinds, *e.g.*, *Brychius elevatus*, at Yardley and Knowle; *Haliplus cinereus*, at Knowle; *Hydroporus septentrionalis*, Bewdley; *H. marginatus*, Knowle; *H. picipes*, Cannock Chase; *H. lepidus*, Knowle, Bewdley, Cannock Chase; *H. duodecimpustulatus*, Bewdley; *H. assimilis*, Sutton Park, Knowle, Cannock Chase; *H. dorsalis*, Yardley, Knowle; *H. marginatus*, Knowle; *H. nigrita*, Knowle, Bewdley; *H. monticola*, Cannock Chase; *H. neglectus*, Cannock Chase; *H. umbrosus*, Knowle; *H. augustatus*, Knowle; *Ilybius ater*, Knowle, Cannock Chase; *I. guttiger*, Coleshill; *Agabus Solieri*, Knowle; *A. affinis*, Sutton Park; *Gyrinus caspius*, Hopwas; *Hydrobius picicrus*, Knowle; *Laccobius sinuatus*, Knowle; *L. alutaceus*, Knowle; *L. minutus*, Cannock Chase; *L. bipunctatus*, Cannock Chase; *Limnebius nitidus*, Knowle, Bewdley; *L. picinus*, Knowle; *Chætarthria seminulum*, Cannock Chase; *Helophorus æqualis*, Bewdley; *H. Mulsanti*, Bewdley; *Hydrochus augustatus*, Knowle; *Hydræna palustris*, Bewdley; *H. nigrita*, Knowle, Bewdley; *H. atricapilla*, Knowle; the rare *Leptinus testaceus* has been taken at Needwood in the nests of wild bees. *Agathidium nigripenne* Sutton Park; *A. lævigatum*, Knowle, Dudley; *A. atrum*, Yardley, Sutton Park, Cannock Chase; *A. seminulum*, Coleshill, Knowle, Cannock Chase; *A. varians*, Knowle; *A. rotundatum*, Cannock

Chase; *A. convexum*, Hopwas Wood; *Amphicyllis globus*, Bewdley; *Leoides orbicularis*, Cannock Chase; *Anisotoma picea*, Cannock Chase; *A. litura*, Knowle.

Several of the Burying Beetles—Necrophorus and Silpha—occur generally in the district, as also do many of the Cholevæ. Colons are conspicuous by their absence—only two species having put in an appearance, viz: *Colon dentipes*, Knowle; and *C. brunneum*, Knowle. The interesting groups of Scydmænidæ and Pselaphidæ are remarkably well represented, but room can be found for only a few of the rarer species: *e.g.*, *Scydmænus exilis*, Sutton Park, Hopwas Wood, Cannock Chase, Bewdley; *S. angulatus*, Cannock Chase; *S. hirticollis*, Sutton Park; *Eutheia plicata*, Budden Wood, *E. Schaumii*, Smallheath, Knowle; *E. Scydmænoides*, Knowle (abundantly); *E. clavata*, new to Britain, discovered by the writer in Sherwood Forest; *Bryaxis impressa*, Coleshill; *Euplectus punctatus*, Knowle, Bewdley, Cannock Chase; *E. nigricans*, throughout the district; *E. nanus*, Edgbaston, Bewdley, Cannock Chase; *E. bicolor*, Sutton Park, Hopwas Wood, Cannock Chase, Bewdley; *E. nubigena*, a very distinct species, new to Britain, discovered by the writer in Sherwood Forest in 1885.

The Brachelytra have not had much attention paid to them in the Midlands, the group being a very large one, and the species mostly difficult to determine. These insects are plentiful in the district and many rare forms occur. A few only, comparatively, can be here specified:—*Ischnoglossa corticina*, Olton, Sutton Park, Old Hill; *Thiasophila angulata*, Hopwas Wood, Bewdley (Ants' Nests); *Dinarda Markelii*, Bewdley (in Ants' Nests); *Atemeles emarginatus*, Bewdley (in Ants' Nests); *Ilyobates*

nigricollis, *Callicerus obscurus*, *C. rigidicornis*, Knowle; *Tachyusa scitula*, Bewdley; *Ocyusa maura*, Coleshill; *O. picina*, Sutton Park, Bewdley; *Oxypoda exoleta*, Smallheath, *O. recondita*, Budden Wood (Ants' Nests, *Formica rufa*); *O. sericea*, new to Britain, Smallheath, Edgbaston, Knowle.

In the genus Homalota there are 160 British species, of which the writer has, up to the present, found 93 in the Birmingham district. The following may be noted: *H. currax* and *H. insecta*, Bewdley; *H. pavens*, Smallheath; *H. eximia*, Bewdley (previously only found on banks of Scotch rivers); *H. luteipes*, Bewdley; *H. sylvicola*, Coleshill, Cannock Chase, Bewdley; *H. monticola*, Smallheath; *H. curtipennis*, Sutton Park; *H. autumnalis*, Knowle, Old Hill, Bewdley, Middleton, near Tamworth; *Gymnusa brevicollis* and *G. variegata* occur on Cannock Chase, the latter also at Sutton Park; *Megacronus inclinans* may be found at Bewdley, and *M. cingulatus* at Sutton Park and Cannock Chase; *Staphylinus latebricola* (in Ants' Nests), at Sutton Park and Bewdley; *Philonthus fulvipes*, Sutton Park; *Ancyrophorus homalinus*, Bewdley; *Trogophlœus halophilus*, Hopwas Wood(!); *Deleaster dichrous* and var. *adustus*, Bewdley; *Geodromicus nigrita*, Bewdley; *Deliphrum tectum*, Knowle; *Acidota crenata*, Coleshill; *A. cruentata*, Sutton Park; *Coryphium augusticolle*, Sutton Park, Knowle, Hopwas; *Homalium Allardi*, Smallheath; *H. punctipenne*, Edgbaston, Sutton Park, Knowle, Bewdley; *H. deplanatum*, Knowle, Cannock Chase; *H. brevicorne*, Knowle; *H. gracilicorne*, Sutton Park, Hopwas Wood; *H. salicis*, Sherwood Forest; *Phlœocharis subtilissima* and *Prognatha quadricornis*, Sutton Park, Needwood.

Many of the Trichopterygidæ are found in

profusion, including a good number of rare species. *Ptinella testacea*, *P. denticollis*, *P. aptera*, and *P. angustula*, are all plentiful in various parts of the district, from Smallheath and Knowle to Cannock Chase and Bewdley Forest. *Pteryx suturalis* is also generally distributed and fairly abundant. Several good species of Trichopteryx occur in hot-beds at Knowle and Edgbaston, and also on the river banks at Bewdley. *Millidium trisulcatum* sometimes swarms in one spot at Knowle. *Ptenidium Gressneri*, a new British species, may be mentioned as having been captured in 1885 at Sherwood Forest. *Triplax russica* abounds on Cannock Chase, and *T. ænea* may be taken sparingly at Needwood. The very rare *Teredus nitidus*, after being lost sight of for nearly 50 years, was again found in Sherwood Forest by the writer in 1884 and 1885. *Myrmetes piceus*, Hopwas Wood, Bewdley; *Gnathoncus rotundatus*, Cannock Chase; var. *punctulatus*, Knowle; *Abrœus granulum*, Salford Priors; *Plegaderus dissectus*, Cannock Chase, Salford Priors; *Epuræa augustula*, Sutton Park; *Cryptarcha strigata* and *C. imperialis*, Knowle; Rhizophagus: nine of the species occur in the neighbourhood of Birmingham, and the tenth, *R. cœruleipennis* has been taken at Matlock; *Thymalus limbatus*, Cannock Chase; *Psammœchus bipunctatus*, Coleshill, Sutton Park; *Antherophagus nigricornis*, Bewdley; *A. silaceus*, Marston Green, Bewdley; *A. pallens*, Solihull, Bewdley; *Myrmecoxenus, vaporariorum*, Edgbaston, Knowle; *Scaphidium quadrimaculatum* may be taken at Cannock Chase and Bewdley; *Diphyllus lunatus*, in the same localities and also near Knowle; *Byrrhus fasciatus* and *B. dorsalis*, at Cannock Chase; *Georyssus pygmœus*, Bewdley. The remarkable beetle, *Macronychus quadrituberculatus*, should be included in this list, its only British habitat being the river

Dove, near Burton-on-Trent.

Coming now to the Lamellicornia, the following species may be noted: *Lucanus cervus*, Bewdley; *Dorcus parallelopipedus*, Bewdley, Cannock Chase, Salford Priors; *Aphodius tesselatus* and *A. porcus*, Sutton Park; *Ammœcius brevis*, Bewdley (banks of Severn); *Trox sabulosus* and *T. scaber*, Bewdley and Cannock Chase; *Hoplia philanthus*, Bewdley, Knowle, &c. Of the Serricornia, a few examples may be given: *e.g.*, *Agrilus augustatus* and *A. laticornis*, Bewdley; the brilliant *Trachys troglodytes*, quite a Southern species, which the writer has on several occasions captured in an old pasture at Knowle; *Elater coccinatus*, Sherwood; *E. pomorum*, Cannock Chase; *E. balteatus*, Coleshill, Sutton Park, Bewdley, Cannock Chase; *Athöus rhombeus*, Sherwood; *Corymbites pectinicornis*, *C. cupreus*, and var. *æruginosus*, *C. æneus*, Knowle, Bewdley, Cannock Chase; *Sericosomus brunneus* and v. *fugax*, Cannock Chase; *Hydrocyphon deflexicollis*, Bewdley; *Scirtes hemisphæricus*, Cannock Chase; *Lampyris noctiluca* is spread over the whole district, but is most abundant in Bewdley Forest; *Malachius æneus* is found at Knowle, and *Haplocnemus impressus* at Sutton Park; *Clerus formicarius* occurs at Salford Priors; *Hylecœtus dermestoides* and *Sphindus dubius* at Cannock Chase and Sherwood Forest; *Niptus crenatus* and *Hedobia imperialis* occur at Knowle.

Of the Longicornia, it must suffice to mention the following:—*Prionus coriarius*, Aston and Cannock Chase; *Callidium alni*, Knowle; *Clytus mysticus*, Bewdley; *Pachyta collaris* and *P. octomaculata*, Bewdley; *Strangalia quadrifasciata*, Bewdley and Cannock Chase; *S. nigra*, Bewdley.

Many of the Donaciæ are plentiful, perhaps the most interesting local species being *D. affinis*, which

is found at Knowle.

Clythra tridentata and *C. quadripunctata* inhabit Bewdley Forest, but *C. tridentata* is very rarely met with. *Cryptocephalus coryli*, *C. punctiger*, and *C. fulcratus* may be beaten out of birches on Cannock Chase, and at Chartley the Scotch species, *C. decempunctatus*, has been taken.

Salpingus ater is at Knowle, and *S. castaneus* at Coleshill and Cannock Chase. The curious *Notoxus monoceros* is abundant at Kidderminster and Bewdley.

Among the Rhynchophora the following may be noted: *Platyrhinus latirostris* and *Anthribus albinus*, Salford Priors; *Tropideres sepicola*, Budden Wood (unique); *Choragus Sheppardi*, Salford Priors; *Apion Hookeri*, Knowle and Trench Woods; *A. filirostre*, Trench Woods; *Cœnopsis fissirostris* and *C. Waltoni*, Cannock Chase, also on Hartlebury Common; *Cleonus sulcirostris*, Erdington; *Cœliodes geranii* and *C. exiguus*, Bewdley; *Amalus scortillum*, Bewdley, Salford Priors; *Magdalinus barbicornis*, Bewdley; *Rhyncolus gracilis*, Sherwood Forest is noteworthy; *Phiœophthorus rhododactylus*, Bewdley; *Scolytus destructor*, Yardley; *S. intricatus* and *S. rugulosus*, Bewdley; *Xylocleptes bispinus*, Sutton Park and Malvern.

Lepidoptera.

This order has received the lion's share of attention from local collectors, with the result that a very fair proportion of the British Micro-Lepidoptera has been discovered in the district. The Micro-Lepidoptera have, however, not been looked up with any enthusiasm, and consequently our knowledge of the extent to which these interesting little moths

occur about us is extremely limited.

The Rhopalocera include all the common species, and also a few which are always considered desirable by every collector. At Bewdley, *Aporia cratægi* used to be found, and doubtless could yet be obtained if carefully sought for. *Leucophasia sinapis* flies more or less abundantly at Bewdley Forest and Trench Woods; it has also been occasionally taken in woods near Knowle. *Colias edusa* always an erratic species, sometimes visits the Midlands, and has been captured at Yardley, Coleshill, Knowle, and other places. *C. hyale* also turned up once or twice in the district. *Gonopteryx rhamni* is generally distributed and plentiful. *Argynnis selene*, *A. euphrosyne*, *A. aglaia*, *A. adippe*, and *A. paphia* occur near Knowle, and at Bewdley they are all found in great abundance; the variety *valesina* has likewise been captured in the Forest. *Melitæa aurinia* is not rare in certain spots near Knowle and Bewdley. *Vanessa C. album* may occasionally be seen flying in the streets of Birmingham, especially in the region of Sparkbrook and Moseley. *V. polychloros* flies at Knowle. *V. antiopa* has several times been captured at Bewdley; and *V. io*, *V. atalanta*, and *V. cardui* are met with throughout the district.

The occurrence of *Limenitis sibylla* has not been heard of nearer than Church Stretton, but *Apatura iris* has been taken in woods not far from Coventry and Leamington. *Melanargia galatea* is a common butterfly at Salford Priors and Trench Woods. *Epinephele hyperanthes* is abundant at Bewdley. The southern limit of *Cœnonympha typhon* appears to be Chartley Moss, where the butterfly (both light and dark forms) is anything but rare. *Thecla betulæ*, *T. W. album*, *T. pruni*, and *T. quercus* fly at Trench Woods;

T. quercus also near Knowle, at Bewdley, &c.; and *T. rubi* is extremely plentiful at Sutton Park and Cannock Chase. *Lycæna argiolus* is found in several localities near Birmingham, but abounds in the Holly Woods at Sutton Park. *L. semiargus* used to be taken many years since, close to Birmingham, but seems to have become quite extinct.

In the division Heterocera the following list of selected species with localities must suffice to represent the moths of the district:—*Acherontia atropos*, Knowle, Dudley, Bewdley; *Sphinx convolvuli*, Birmingham (frequent); *S. ligustri*, Knowle, Sutton, Bewdley; *Deilephila galii* and *D. livornica*, Birmingham (occasional); *Chærocampa celerio*, Birmingham (1868); *C. nerii*, Birmingham (1869); *C. porcellus*, Sutton Park; *C. elpenor*, Solihull, Hockley Heath; *Smerinthus ocellatus*, *S. populi* and *S. tiliæ* are found throughout the district. *Macroglossa stellatarum* affects all our localities; *M. fuciformis* and *M. bombyliformis* may be found near Knowle.

Ino statices at Olton, Marston Green, Knowle; *Zygœna filipendulæ* var. *chrysanthemi*, Bewdley Forest; *Lithosia mesomella*, Knowle, Bewdley, Cannock Chase; *Euchelia jacobææ* used to be found at Saltley; *Nemeophila russula* and *N. plantaginis*, Sutton Park, Chartley Moss; *Spilosoma fuliginosa*, Knowle; *S. mendica*, Smallheath; *Cossus ligniperda*, throughout the district; *Zeuzera pyrina*, Knowle; *Heterogenea limacodes*, Trench Woods; *Leucoma salicis*, Knowle; *Psilura monacha*, Sutton Park; *Orgyia gnostigma*, Bewdley, Coventry, Cannock Chase; *Saturnia pavonia*, Sutton Park, Cannock Chase; *Drepana sicula*, Trench Woods (one larva 1885); *D. binaria*, near Knowle; *Dicranura furcula* and *D. bifida*, near Knowle; *Pterostoma palpina*, Knowle; *Notodonta bicolor*,

Burntwood, Staffordshire; *N. dictæa*, *N. dictæoides*, *N. dromedarius*, *N. zizac*, *N. trimacula*, Knowle, Bewdley; *Thyatira derasa* and *T. batis*, Knowle, Sutton Park; *Asphalia flavicornis*, Knowle, Hopwas Wood, Cannock Chase; *A. ridens*, Hopwas Wood; *Acronycta tridens*, Knowle (larvæ on Elm Trees); *A. leporina*, Knowle; *A. aceris*, Smallheath; *A. alni*, Smallheath, Edgbaston, Sutton Park; *Nonagria arundinis*, Knowle, &c.; *Gortyna ochracea*, Knowle, Bewdley; *Agrotis suffusa*, Knowle; *A. ripæ*, Bewdley; *Triphæna ianthina*, *T. fimbria*, *T. interjecta*, Yardley, Knowle, Bewdley, Trench Woods; *Amphipyra pyramidea*, Knowle; *Panolus piniperda*, Sutton Park; *Tæniocampa gracilis*, Yardley, Knowle; *Anchocelis lunosa*, Kidderminster; *Xanthia citrago*, *X. fulvago*, *X. circellaris*, Knowle; *Eremobia ochroleuca*, Acock's Green, Yardley; *Dianthæcia cucubali*, Sparkbrook, Knowle; *Hecatera serena*, Bewdley Road, Kidderminster; *Polia chi*, throughout the district; *Aplecta tincta*, Knowle, Bewdley; *Hadena glauca*, Sutton Park, Cannock Chase; *Xylocampa areola*, Knowle; *Calocampa vetusta*, *C. exoleta*, Knowle, Sutton Park; *Xylina ornithopus*, Knowle; *Cucullia verbasci*, Knowle, Bewdley; *C. chamomillæ* and *C. umbratica*, Coleshill, Knowle, Dudley; *Habrostola tripartita* and *H. triplasia*, Knowle; *Plusia interrogationis*, Cannock Chase; *Anarta myrtilli*, Sutton Park, Cannock Chase, Bewdley Forest; *Heliaca tenebrata*, Sparkbrook, Knowle, Bewdley; *Chariclea umbra*, Coleshill; *Erastria fasciana*, Trench Woods; *Phytometra viridaria*, Knowle, Coleshill, Sutton, Cannock Chase, &c.; *Euclidia mi* and *E. glyphica*, Knowle, Bewdley, Trench Woods; *Catocala nupta*, Knowle, Bewdley, Bromsgrove; *Brephos parthenias*, Bewdley, Cannock Chase; *Epione apiciaria*, Knowle; *Venilia macularia*, *Angerona prunaria* and *Eurymene dolobraria*, Bewdley Forest; *Pericallia syringaria*,

Smallheath, Hall Green, Knowle, Bewdley; *Selenia lunaria*, near Birmingham, *Nyssia hispidaria*, Sutton Park; *Biston hirtaria*, Cannock Chase; *Amphidasys strataria*, Knowle, Sutton Park; *Hemerophila abruptaria*, Edgbaston, Knowle; *Boarmia roboraria*, Bewdley, Cannock Chase; *B. consortaria*, Knowle, Bewdley, Trench Woods; *Tephrosia punctularia*, Cannock Chase, Trench Woods; *Gnophos obscuraria*, Bewdley; *Pseudoterpna pruniate*, Knowle; *Geometra papilionaria*, Knowle, Bewdley; *Phorodesma pustulata*, Solihull; *Zonosoma porata*, *Z. pendularia*; Erdington, Knowle, Bewdley, Trench Woods; *Asthena luteata*, *A. candidata*, *A. sylvata*, Knowle; *A. blomeri*, Hoar Cross; *Acidalia fumata*, Chartley; *A. inornata*, Chartley, Cannock Chase; *Timandra amataria*, Knowle; *Bapta temerata*, Trench Woods; *Macaria liturata*, Hopwas Wood, Cannock Chase; *Bupalis piniaria*, Knowle, Sutton Park, Hopwas Wood, Cannock Chase; *Minoa murinata*, Bewdley Forest; *Aspilates strigillaria*, Bewdley, Cannock Chase, Chartley; *Abraxas sylvata*, Hopwas Wood; *Eupithecia venosata*, Sutton Park, Cannock Chase; *Lobophora halterata*, Trench Woods; *L. viretata*, Sutton Park (some seasons very abundant); *L. carpinata*, Hopwas Wood; *Thera variata*, Sutton Park, Hopwas Wood, Cannock Chase; *Hypsipetes ruberata*, *H. trifasciata*, Solihull, Sutton Park, Bewdley; *Melanippe hastata*, Knowle, Bewdley; *Anticlea sinuata*, *A. rubidata*, *A. badiata*, *A. derivata*, Knowle; *Camptogramma fluviata*, Knowle; *Cidaria miata*, Knowle; *Carsia paludata*, var. *imbutata*, near Birmingham.

Chapter V.

Microscopic Fauna.

BY THOMAS BOLTON, F.R.M.S.

The writer in drawing up the following summary of the local Microscopic Fauna, knowing how limited a space is allowed, has in several of the families given only the more rare and remarkable species which have come under his own observation. The organisms included in this division are abundant all round Birmingham; in the canals, reservoirs, and rivers, in the swags and catchpits, amongst the spoil heaps of the "Black Country," and in the numerous clay-pits on the farm lands.

INSECTA.

It is desirable to call attention to the identification of the larvæ of the Trichopterous insects *Agraylea multipunctata* and *Oxyethira costalis*, by Messrs. Kenneth J. Morton and Robert McLachlan. The perfect insects were bred from larvæ collected in this district, as referred to in the "Entomologists' Monthly Magazine," May and June, 1886. So many problems in the life history of insects, having aquatic larvæ, remain unsolved, that it is desirable that microscopists should pay more attention to this subject.

ARACHNIDA.

The curious Diving-bell Spider, *Argyroneta aquatica*, is found in the pools at Sutton Park; and a great variety of species of the Water-Mites is generally distributed. Mr W. Saville Kent reports that several specimens received from this district are new

to science.

Tardigrada, viz., *Macrobiotus Hufelandii*, and other species, may be found almost everywhere, if carefully looked for amongst damp moss and decaying algæ.

CRUSTACEA.

In this class should be mentioned the freshwater Crayfish, *Astacus fluviatilis*, not of course a microscopic organism; but if it were omitted here it would not appear in any of the other reports. This species is fairly distributed in most of the smaller brooks, in the canals, and larger reservoirs, but is not so abundant or so large as it is on the lime formations round Oxford. Two other large microscopic species of this class, the freshwater Shrimp, *Gammarus pulex*, and the water Wood-louse, *Asellus vulgaris*, are always present, the former busy in its office of scavenger in the sandy bottoms of the brooks and ditches, and the latter climbing about, like a monkey, amongst the water weeds, investigating the mass of living and decaying organisms with which the weeds are clothed.

Entomostraca.

The members of this sub-class are also to be found everywhere, but it is desirable to call special attention to the discovery for the first time in Great Britain of the wonderfully transparent *Leptodora hyalina*, at a visit of the Birmingham Natural History and Microscopical Society in 1879, to the Olton Reservoir, near Solihull. It has since been found in many localities, and is very abundant in the summer

and autumn in the Warwick Canal and several reservoirs. *Hyalodaphnia Kahlbergensis* is very generally found with it. *Argulus coregoni* is found in the Birmingham and Warwick Canal. It had only been discovered in Great Britain previously in the tanks of the Royal Aquarium at Westminster, which, of course, are not used for British fish exclusively. The Fairy-shrimp, *Chirocephalus diaphanus*, is found in only one locality in the district, near Knowle. A few specimens of the very rare *Lynceus acanthocercoides* were found near Bewdley, and amongst other local finds may be mentioned *Moina rectirostris*, *Macrothrix roseus*, and *Ilyocryptus sordidus*.

POLYZOA.

These are generally distributed; *Alcyonella fungosa*, *Plumatella repens*, *Fredericella sultana*, and *Paludicella Ehrenbergii* cover the root-fibres under the banks of the River Avon, at Evesham. *Lophopus crystallinus* is occasionally found in the brooks to the south west of Birmingham. *Cristatella mucedo* is often very abundant in the larger reservoirs at Sutton Park, Barnt Green, Olton, &c. Fredericella and Paludicella, have several times been seen in the town water supplied by the Corporation.

ROTIFERA.

The district appears to be very rich in these organisms, and a good number of new species from this locality are enumerated in the admirable Monograph on this family now being published by Dr. C. T. Hudson and Mr. P. H. Gosse. In the five parts already published (July 12th, 1886), they

record one hundred and ninety-two species, of which ninety-eight have been found in this district, twenty-two being new species. Of the fifteen Floscullariæ eight species have been found here, viz., *Floscullariæ regalis* (new), *F. coronetta*, *F. ornata*, *F. cornuta*, *F. campanulata*, *F. ambigua*, *F. calva*, and *F. mutabilis* (new). *Stephanoceros Eichhornii* may sometimes be seen quite clothing the water weeds in the canals and pools. The always attractive building Wheel-animalcule, *Melicerta ringens*, is occasionally present in abundance in the canals, rivers, and pools all over the district. The writer has taken *Melicerta conifera* several times. *Melicerta tubicolaria* was found by Dr. Hudson in Sutton Park, and has since been found in other localities in this district. *Limnias ceratophylli* is very generally abundant. *Limnias annulatus* has been found in two places. *Œcistes cystallinus* is common, and *Œ. intermedius* not uncommon. Although beyond the radius, it may be interesting to note that *Melicerta Janus*, new to England, was taken in one of the Shropshire meres, by the writer on the 23rd of June, 1886. It had only been found in Scotland before, by Mr. Hood, in 1880. The new rotifer, *Œcistes umbella*, was found by Mr. A. W. Wills, together with the rare *Œ. pilula* in a pool at Sutton Park. The charming clustered rotifer, *Lacinularia socialis*, only appears in the hot summer months, but was surprisingly abundant last year in the River Avon at Warwick, literally clothing the weeds with life. This rotifer was in fair abundance a few years back in the Barnt Green Reservoir, and last year in the neighbouring canal. The still more charming free-swimming clustered rotifer, *Conochilus volvox*, is more generally present, but is not always easy to detect, on account of its transparency and continuous quick movements. The writer has taken this rotifer in

the pools at Sutton Park with a muslin net in such abundance as to form quite a jelly at the bottom of the net. He also found a new species, *Conochilus dossuarius*, in 1884. Of the Philodinidæ, the following have been found—*Philodina roseola*, *P. citrina*, *P. megalotrocha*, *P. aculeata*; *Rotifer vulgaris*, *R. tardus*, *R. macroceros*, *R. macrurus*; *Actinurus Neptunius*, *Callidina elegans*, and *Adineta vaga*. The rare and pretty little *Microdon clavus* may be found swimming about in Coleshill pool. Asplanchna, Synchæta, Polyarthra, and Triarthra, may be netted in enormous numbers in the summer months, especially in all the canals and larger pools, and they occasionally abound in the smaller pools and even in ditches, together with a great variety of the creeping ones, such as Philodina, Rotifer, Notommata, Brachionus, Anuræa, &c. The wonderful variety of these living together in a small ditch in Sutton Park is reported upon in a short paper read by the writer before the Birmingham Natural History and Microscopical Society in February last, and published in the "Midland Naturalist," July, 1886. *Hydatina senta* and *Rhinops vitrea* may be looked for amongst the *Euglena viridis* often seen luxuriating in farm yard drainage. The abnormal species, *Pedalion mira*, was found at Knowle in 1884, in fair abundance. The spiny *Anuræa longispina* was found at Olton Reservoir very soon after it was first discovered in America, and it soon afterwards abounded in the town water, and may be found in most large reservoirs.

ANNELIDA, ETC.

Some interesting examples of the Oligochæta have been found in this locality, most of which have been identified by Professor E. Ray Lankester or Mr. E. C.

Bousfield, and of these the following are noteworthy —*Chætogaster limnæi*, and *C. diaphanus*, *Nais hamata*, *N. lurida*, *N. appendiculata*, and *N. barbata*; *Stylaria parasitica*, *Dero digitata*, *D. obtusa*, *D. Perrieri*, *D. limosa*, and *D. crassa*; *Salvina serpentina*, and *Ælosoma quaternarium*. The Cercaria (the larva of a fluke) which infests the common Water Snail, *Limnæa stagnatis*, is occasionally found; also *Mesostomum rostratum*, *Derostomum vorax*, *Planaria lactea*, and *Piscicola geometrica*.

HYDROZOA.

Both *Hydra vulgaris* and *H. viridis* are of course found everywhere. *Cordylophora lacustris*, which is usually more abundant in brackish water, was found last year in the canal at Hamstead, near Handsworth. The writer has found it in the Stourbridge canal, and in the River Stour. Some years back the writer heard of a canal boat being docked at Dudley Port which was found to be clothed with this Hydrozoon as with velvet.

SPONGIDA.

The freshwater sponges, *Spongilla fluviatilis* and *S. lacustris*, are abundant, but no one has taken up the subject in this district, to work out the different species into which this genus is now divided.

INFUSORIA.

When Mr. W. Saville Kent was preparing his manual on this subject, he was supplied with a great variety of specimens from this district, many of which proved to be new ones. The following are

worthy of mention: *Anthophysa vegetans*, *Rhipidodendron Huxleyi*, *Spongomonas intestinalis*; various *Codosigæ* and other Choano-flagellate monads, including *Salpingœca Boltoni*, Kent, (new); *Euglena acus*; *Dinobryon sertularia*; *Synura uvella*; *Uroglena volvox* (very general); *Distigma proteus*; *Hemidinium nasutum*; *Peridinium tabulatum*; *Ceratium longicorne*; *Nassula ornata*; *Trachelius ovum*; *Spirostomum teres*, and *S. ambiguum*; *Stentor polymorphus*, *S. Barretti*, *S. cœruleus*, and *S. niger*; *Folliculina Boltoni*, Kent (new.) The writer has found several free swimming Tintinnus, not corresponding with any that Mr. W. Saville Kent enumerates; *Didinium nasutum*; *Trichodina pediculus*; *Scyphidium Fromentellii*; *Spirochona gemmipara*; *Vorticella chlorostigma*, and *V. monilata*; *Carchesium polypinum*, and *C. epistylidis*; *Zoothamnium arbuscula*; *Vaginicola tincta*; *Thuricola folliculata*; *Cothurnia imberbis*; *Ophrydium versatile*, *O. Eichhornii*, and *O. sessile*; *Stichotricha remex*; *Atineta lemnarum*, *A. grandis*, and *A. mystacina*; *Dendrosoma radians*.

RHIZOPODA.

The following have been found: *Amœba proteus*, *A. verrucosa*, *A. radiosa*, and *A. villosa*; *Ouramœba vorax*; *Lithamœba vorax*, Lankester (new); *Difflugia pyriformis*, *D. spiralis*, and *D. corona*; *Cyphoderia umbella*; *Arcella vulgaris*; *Actinophrys sol*; *Raphidiophrys pallida*, and *R. elegans*; *Actinosphærium Eichhornii*; *Acanthocystis chætophora*; *Archerina Boltoni*, Lankester (new); *Clathrulina elegans*, and *Biomyxa vagans*.

PART V.
BOTANY.

Introductory Remarks.

BY WM. MATHEWS, M.A.

In attempting to describe the more interesting features of the indigenous Flora of the neighbourhood of Birmingham, it is necessary to define the limits of the district intended to be included. A circle of 20 miles radius, with the Town Hall as its centre, has been found convenient as an approximate boundary. This will enclose portions of the three counties of Warwick, Worcester, and Stafford, which meet at a point on the south-western edge of the Borough, and a small part of the County of Salop. The latter, with the exception shortly to be mentioned, will be excluded from consideration. On the other hand, the radius must be extended about two miles on the south-east to take in the town of Stratford-on-Avon, and about the same distance on the west to take in the woodlands west of the Severn from Shrawley Wood to Wyre Forest near Bewdley. A part of the Forest is in Salop, and to this extent only is the latter county admitted. The district thus defined contains an area of about 12,500 square miles. It includes the towns of Birmingham, Sutton Coldfield, Tamworth, Nuneaton, Coventry, Leamington, Warwick, Stratford, and Alcester, in the County of Warwick; of Bromsgrove, Droitwich, Stourport, Bewdley, Kidderminster, Stourbridge, Halesowen, and Dudley, in Worcester; of Wolverhampton, Walsall, Penkridge, Cannock, Rugeley, and Lichfield, in Stafford.

The vegetation of any district depends partly on the nature of the soil, as determined by its geological structure, partly on altitude and drainage areas, and partly on the character of the surface, whether water, bog, heath, arable, pasture or woodland. The geology has been treated of in a previous part of this volume. It will be sufficient to say here that the red rocks of the Trias occupy by far the largest portion of the area, and that calcareous soils are rare. An elevated line of country, commencing north of Wolverhampton, runs in a southerly direction, by Sedgley, Dudley, and the Rowley Hills, to Frankley Beeches and the Upper Lickey, where it attains an altitude of about 900 feet above the sea. This is the great water parting of central England which divides the drainage areas of the Trent and Severn. From the Lickey, a line of lower elevation runs in a westerly direction and divides the tributaries of the Trent from those of the Avon. The subordinate river basins and surface characteristics will be noticed in the special articles.

A brief outline of the history of the Botany of the Midland Counties may be useful to students, and is therefore included in these remarks. It commences with the honoured name of William Withering, one of the most eminent of British Botanists. Born at Wellington, in Shropshire, in 1741, he practised as a physician in Birmingham, where he died in 1799. The first edition of his well-known “Botanical arrangement of British Plants,” in two volumes, was published in 1776; the second, in three vols. in 1787; the third, in four vols. in 1796. It passed through five further editions, in four volumes, after his death. Numerous references to localities in the neighbourhood of Birmingham are contained in these volumes.

Scarcely less distinguished was Thomas Purton (1768-1833), surgeon, of Alcester, the author of "The Midland Flora." The first two volumes of the work appeared in 1817, the third in 1821. They contain copious descriptions of local habitats in the counties of Warwick, Worcester, and Stafford.

Nash's "History of Worcestershire," 1781, contains (Introduction p. lxxxix.) a list of forty-three rare plants, two only of which, *Vaccinium Oxycoccos* and *Comarum palustre*, recorded as growing at the Lickey, belong to the Birmingham district. The Supplement (1799) has a further list of forty-seven plants, four of which belong to the district.

The late W. G. Perry, bookseller, of Warwick, published at Warwick, in 1820, the first Flora of that county, under the title of "Plantæ Varvicenses Selectæ." He also contributed to the Magazine of Natural History, Vol. iv., p. 450, 1831, a list of some of the rarer plants of Worcestershire, chiefly from the neighbourhood of Kidderminster and Bewdley.

The "History of Stourbridge," by William Scott, Stourbridge, 1832, contains a list of plants from the neighbourhood of that town, in the counties of Worcester and Stafford.

For a knowledge of the plants of the immediate vicinity of Birmingham, and particularly of the once celebrated "Moseley Wake Green," Botanists are chiefly indebted to the late William Ick, Secretary of the old Philosophical Society of Birmingham. Mr. Ick published two lists; the first in "The Analyst," for 1837, Vol. vi., p. 20; the second in the "Midland Counties Herald," Aug. 1838.

The present Mrs. Avery, then Miss M. A. Beilby, was a frequent visitor to Moseley at about that date,

and has obliged the writer with a list of the rarities gathered by her at Moseley Bog and Common in 1835 and 1836.

A list of some of the rarer plants of the neighbourhood of Birmingham, by Saml. Freeman, appeared in the first series of the Phytologist, Vol. i., p. 261.

The Rev. W. T. Bree, Rector of Allesley, near Coventry, was a well-known Botanist. He contributed to Purton's Midland Flora, to the Magazine of Natural History, and to the first series of the Phytologist, many notices of the plants of the northern part of his county.

The first volume of the last named serial, 1844, pp. 508-514, contains an account of the ferns of Stafford, Warwick, and Worcester, from the pen of the Editor, the late Edward Newman.

The second series of the Phytologist, 1855 to 1863, was edited by the late Alexander Irvine of Chelsea. Several plants from the neighbourhood of Clent and Churchill are recorded by the Editor, in an article on the "Botany of the Clent Hills," Vol. ii., p. 385, April, 1858.

The Studies of Warwickshire Fungi, made by the late Mrs. F. Russell, of Kenilworth, will be noticed in the article on that group of plants.

The County Botany of Worcester has been associated for upwards of half a century, with the name of the veteran Worcester Botanist, Mr. Edwin Lees. His first observations, made in conjunction with the late Dr. Streeten, were published in Hastings's "Illustrations of the Natural History of Worcestershire," (1834). These, together with a

further list supplied by him to the late H. C. Watson, are incorporated in the Catalogue of Worcestershire plants in "The New Botanists' Guide," (1835). The same work contains lists of the plants of Warwick and Stafford. In 1867, Mr. Lees published his "Botany of Worcester," the only complete record of the flowering plants and ferns of the whole county, which has yet appeared. His "Botany of the Malvern Hills," which has passed through three editions, relates to a part of the county outside the limits of the Birmingham district.

The plants of the north-east of the county are enumerated in the "Flora of the Clent and Lickey Hills," by the present writer. First edition, 1868; Second Edition, 1881. He has been indebted for assistance to many friends, too numerous to mention in this notice.

"The Natural History of Stafford," by R. Garner, 1884, contains a list of the rarer plants of that county. Our more recent knowledge of its botany is due to Dr. Fraser, of Wolverhampton, whose discoveries are published in the Reports of the Botanical Record Club, 1873-1883. These reports contain also many district records communicated by the Editor, Dr. F. Arnold Lees, and by Mr. J. E. Bagnall.

The modern geographical botany of Warwick is the work of members of the Birmingham Natural History and Microscopal Society, and especially of Mr. J. E. Bagnall, Mr. A. W. Wills, and Mr. W. B. Grove. The volumes of "The Midland Naturalist" have been enriched by numerous papers from these Botanists, for one of which, the monograph on the Pilobolidæ, published in Vol. vii., 1884, the Darwin Gold Medal of the Midland Union of Natural History Societies

was awarded to Mr. Grove. Those relating to the Botany of the county are, by Mr. Bagnall, "The Distribution of the Roses," (Vol. i, 1878), "The Moss Flora," (Vols. ii. and iii., 1879-80), "The Hepaticæ," (Vol. iii., 1880), and "The Flora of Warwickshire," (Vols. iv.-ix., 1880-86); by Mr. Wills, "The Desmidiæ of Sutton Park," (Vol. iii., 1880); by Mr. Grove, "The Fungi of the neighbourhood of Birmingham," (Vols. v.-vii., 1882-84.)

The works of the late Hewett Cottrell Watson, the founder of the Science of the Geographical Botany of Great Britain, must not be passed over. Those containing provincial or comital records, besides the new Botanists' Guide already mentioned, are the Cybele Britannica, 1847-1872; Topographical Botany, 1st edit., 1873-4, 2nd edit., 1883.

It may be interesting to mention that a Students' Garden for economic and medicinal plants was laid out in 1882, in the Edgbaston Botanical Gardens, from the plans of Professor Hillhouse, of Mason College, and that a Students' garden of British plants has been laid out, in the present year, in Cannon Hill Park, from the plans of Mr. J. W. Oliver, teacher of Botany at the Midland Institute. For the establishment of the latter garden, students are indebted to Mr. Alderman White, chairman of the Baths and Parks Committee of the Town Council.

County boundaries have been so generally adopted as the limits of local Floras, that it has been thought desirable to adhere to them, and to tabulate the plants separately for Warwick, Worcester, and Stafford, whenever the materials at command have admitted of this division. The flowering plants and ferns present no difficulty, but with respect to the lower forms of vegetation it has not always been

found possible to determine their comital distribution. The plants indigenous to the district are described in the following articles:—

The Flowering Plants and Ferns by Mr. J. E. Bagnall, assisted, as to Worcester, by the editor of the section, and, as to Stafford, by Dr. Fraser. The Mosses, Hepatics, and Lichens, by Mr. J. E. Bagnall. The Algæ, by Mr. A. W. Wills. The Fungi, by Mr. W. B. Grove.

Chapter I.
The Flowering Plants, Ferns, &c.

BY J. E. BAGNALL, A.L.S.

The flowering plants, ferns, and fern allies of the Birmingham District will be described, as stated in the Introductory Remarks, under the heads of the three counties of Warwick, Worcester, and Stafford. The total flora of the district comprises upwards of 1,116 flowering plants and ferns; of these 844 are native, 143 are varieties, 14 aliens, 42 colonists, and 73 are denizens. The nomenclature adopted is that of the 7th edition of the "London Catalogue of British Plants."

WARWICK.

The Warwickshire portion of the district comprises the greater part of North Warwickshire, with a portion of South Warwickshire. It is watered by the Tame, with its affluents the Rea, Cole, Blythe,

Bourne, and Anker; and the Avon with its affluents the Leam, Sow, Alne, and Arrow. The greatest elevations occur at Hartshill, Dosthill, Corley, Alne Hills, and Arrow, none of which exceed 550 feet above the sea. As a whole it is well wooded, but the woods are usually small and not productive of the rarer woodland species. Heath lands are mostly reclaimed, and the more extensive marshes and bogs drained, hence ericetal and bog plants are rare. It has been divided into the following sub-districts, bounded by the water partings of the river basins:—I. TAME, II. BLYTHE, III. ANKER, IV. AVON, V. SOW, VI. ALNE, VII. ARROW.

In presenting an account of the rarer plants as full a list from each sub-district (as space permits) will be given, but many of the plants cited for one or other sub-district may also be found in one or more of the others.

The plants marked by an asterisk* before the name are probably extinct.

I. TAME.—This sub-district embraces all those portions of the Tame valley not drained by the Blythe or Anker, and includes Sutton, Middleton, Water Orton, Kingsbury, Shustoke, and Arley. The country is generally flat, but is slightly elevated on both right and left banks, near Arley, Middleton, Dosthill, and Shustoke. In this district about 750 flowering plants and ferns are recorded; among the more rare are—

Ranunculus fluitans, R. Lenormandi, R. Lingua; Nymphæa alba; Viola palustris; Moenchia erecta; Ornithopus perpusillus; Comarum palustre; Rubus Schlechtendalii, R. rosaceus; Rosa sphærica; Callitriche obtusangula; Parnassia palustris; Galium uliginosum; Valeriana dioica; Chrysosplenium alternifolium; Dipsacus pilosus; Carlina vulgaris; Carduus nutans; Leontodon hirtus; Jasione montana; Vaccinium Vitis-Idæa, V. Oxycoccos; Menyanthes trifoliata; Mentha rotundifolia; Calamintha Acinos; Scutellaria minor; Pinguicula vulgaris; Polygonum maculatum; Empetrum nigrum; Salix fusca; Juncus diffusus; Scirpus pauciflorus; Eriophorum vaginatum; Carex dioica, C. curta, C. Ehrhartiana, C. lævigata, C. fulva; Agrostis nigra; Botrychium Lunaria; Nephrodium Thelypteris; Chara opaca.

II. BLYTHE.—The Blythe, which rises on the borders of East Worcestershire near Earlswood, takes its course through Solihull, Knowle, Hampton-in-Arden, Packington, and Coleshill, to its confluence with the Tame, near Whitacre; with this is included the Cole, running through Marston Green and Coleshill. This sub-district is mostly flat, the soils are usually sand, marl, and clay. Heath lands occur near Earlswood and Coleshill; bogs and marshes near Coleshill and Barston. The recorded flora is about 820 flowering plants and ferns, the following being the more noteworthy:—

Thalictrum flavum; Aquilegia vulgaris; Drosera rotundifolia; Cerastium arvense; Sagina ciliata; *Elatine hexandra; Hypericum elodes; Geranium pyrenaicum; Genista tinctoria; Vicia tetrasperma; Rubus suberectus, R. adornatus; Rosa micrantha, R. surculosa, R. obtusifolia, R. Reuteri; Pyrus torminalis; Cotyledon Umbilicus; Œnanthe crocata; Chærophyllum Anthriscus; Sambucus Ebulus; Carduus pratensis; Anthemis arvensis; Bidens cernua, B. tripartita; Solidago virga-aurea; Lactuca muralis; Hieracium umbellatum; *Pyrola media; Linaria minor;

Limosella aquatica; Veronica Buxbaumii; *Orobanche major; Mentha piperita; Stachys ambigua; Myosotis repens, M. sylvatica, M. collina, M. versicolor; Lysimachia vulgaris; Littorella lacustris; Populus canescens; Lemna gibba; Potomogeton rufescens; Orchis Morio; *Gymnadenia conopsea; Narthecium ossifragum; Rhynchospora alba; Scirpus multicaulis, S. cæspitosus; Carex elongata; Agrostis canina; Calamagrostis lanceolata.

III. ANKER.—The Anker rises about 3 miles S.E. of Bedworth, drains the country about Bedworth, Nuneaton, Atherstone, Polesworth and Tamworth, and enters the Tame at Tamworth. The country it waters is usually flat, but on its left bank at Hartshill and Polesworth there is rising ground about 500 feet above sea level. In this sub-district the Warwickshire coalfields occur, and it is possibly due to the great prevalence of smoke that its flora is meagre and the plants often depauperated. The recorded flora is about 680 flowering plants and ferns, and among the more rare are:

*Myosurus minimus; Cardamine amara, C. impatiens; Viola Reichenbachiana; Stellaria aquatica; Tilia parvifolia; Rhamnus catharticus; Genista tinctoria; *Vicia sylvatica; Prunus insititia; Potentilla procumbens; Rubus calvatus, R. mucronulatus, R. Bloxamii, R. foliosus, R. Bellardi; Rosa andegavensis, R. bibracteata; Epilobium roseum; Œnanthe fluviatilis; Cornus sanguinea; Matricara Chamomilla; Wahlenbergia hederacea; Atropa Belladonna; Veronica polita; *Orobanche elatior; Rumex pratensis; Salix pentandra, S. rubra; Sparganium neglectum; Sagittaria sagittifolia; Butomus umbellatus; Potamogeton pusillus; Epipactis latifolia; Fritillaria Meleagris; Scirpus acicularis; Nardus stricta; Ceterach officinarum; Equisetum maximum; Chara Hedwigii.

IV. AVON.—This sub-district includes that portion of South Warwick within the area not drained by the Leam, Sow, Alne, and Arrow, including Milverton,

Stoneleigh, Warwick, Stratford-on-Avon, Bidford and Salford Priors. This valley is beautifully undulating and well-wooded, watered by many minor streams, with very varied soils and usually highly cultivated. Its flora is peculiar from the absence of bog and heath plants, the records comprising about 970 flowering plants and ferns, of which the following are the rarer:—

Ranunculus parviflorus; Papaver strigosum, P. Lecoqii; Sisymbrium Sophia; Erysimum cheiranthoides; Cheiranthus Cheiri; Diplotaxis muralis; Viola odorata; Dianthus Armeria; Hypericum dubium; Medicago maculata; Astragalus glycyphyllus; Trifolium subterraneum, T. scabrum, T. fragiferum, T. filiforme; Vicia lathyroides; Potentilla argentea; Rubus Guntheri, R. tuberculatus; Rosa stylosa; Poterium Sanguisorba; Geum intermedium; Epilobium tetragonum; Petroselinum segetum; Senecio erucifolius; Crepis biennis; Solanum nigrum; Mentha cardiaca; Myriophyllum alterniflorum, M. spicatum; Salix Hoffmanniana, S. Helix; Potamageton flabellatus; *Carex Bœninghauseniana; Carex acuta, C. pendula; Agrostis spica-venti; Bromus commutatus.

V. SOW.—The Sow, rises near Astley, and receives tributaries, draining Combe fields, Brinklow and Sow Waste on the east, and Allesley, Corley, and Kenilworth on the west. The high land about Corley divides the watersheds of the Tame and Avon. The flora of this sub-district is about 691 flowering plants and ferns, the more noteworthy being—

Ranunculus penicillatus, R. radians; *Arabis perfoliata; Geranium columbinum; Rubus humifusus, R. hirtus, R. Balfourianus, R. Guntheri; Rosa Doniana; Epilobium obscurum; Myriophyllum verticillatum; Callitriche hamulata; Saxifraga granulata; Pimpinella magna; Silaus pratensis; Arctium intermedium; Serratula tinctoria; Inula Conyza; Erigeron acris; *Lactuca virosa; Campanula patula; *Cuscuta Europæa; Verbena officinalis; *Mentha gentilis;

Nepeta Cataria; Lamium maculatum; Cynoglossum montanum, C. officinale; Chenopodium rubrum; Potamogeton obtusifolius, P. mucronatus; Acorus Calamus; Paris quadrifolia; Calamagrostis Epigeios; Lolium temulentum; Aspidium angulare; Chara contraria.

VI. ALNE.—The Alne, rises near Tanworth on the west border of Warwickshire, the high land there forming in part the watershed of the Avon and Tame. Its course is through Henley-in-Arden, near here it is joined by an important tributary draining the country between Henley, Lapworth, and Rowington. This sub-district is somewhat hilly, the Alne Hills being the highest elevations. It includes Tanworth, Henley-in-Arden, Bearley, Alne, Wilmcote, Claverdon, Hatton, Rowington. The Lias soils prevail in southern part of the district. The flora is about 745 flowering plants and ferns, the following being the more rare—

Clematis vitalba; Ranunculus Drouetii; Helianthemum vulgare; Viola hirta; Geranium pratense, G. pusillum; Melilotus officinalis; Lotus tenuis; *Lathyrus Aphaca, L. Nissolia; Spiræa Filipendula; Agrimonia odorata; Rubus thyrsoideus; Rosa rubiginosa; Sison Amomum; Caucalis daucoides; Galium tricorne; Valeriana Mikani; Scabiosa columbaria; Carduus acaulis; Centauria Scabiosa; Anthemis nobilis; Arctium majus; Picris hieracioides; Helminthia echioides; Gentiana amarella; Linaria spuria, *L. repens; Thymus Chamædrys; Ophrys apifera; Juncus obtusiflorus; Avena pratensis; Bromus erectus; B. secalinus; Chara longibracteata.

VII. ARROW.—The Arrow enters the county near Redditch, and takes its course through a narrow hilly valley to its confluence with the Avon at Salford Priors, passing on its way Studley, Alcester, Arrow, Wixford, and Broome. This sub-district is well wooded; the soils are mostly Keuper marls and sand, with Lias soils prevailing about Wixford. The flora

has not been fully worked out, but the record is now about 706 flowering plants and ferns; among the more noteworthy are:—

Ranunculus circinatus; Berberis vulgaris; Sinapis nigra; Silene noctiflora; Euonymus Europæus; Trifolium striatum; Rosa spinossisma; Pyrus communis; *Sedum Telephium; Ribes nigrum; Bupleurum rotundifolium; Torilis infesta; Adoxa Moschatellina; Viburnum Lantana; Carduus crispus, C. Eriophorus; Campanula glomerata, C. Trachelium; Specularia hybrida; Chlora perfoliata; *Hyoscyamus niger; Linaria Elatine; Calamintha menthifolia; *Marrubium vulgare; Galeopsis Ladanum, G. versicolor; Centunculus minimus; Chenopodium polyspermum, C. hybridum; Polygonum Bistorta; Daphne Laureola; Carpinus Betulus; Salix triandra; Orchis pyramidalis; Spiranthes autumnalis; *Epipactis palustris; Chephalanthera ensifolia; Iris fœtidissima; *Allium oleraceum; Juncus Gerardi; Carex divulsa, *C. distans; Kœhleria cristata; Schlerochloa rigida; Brachipodium pinnatum.

WORCESTER.

The Worcestershire portion of the district extends from Oldbury and Yardley in the north, to Abbot's Morton on the south. It is watered by the Cole and Rea, tributaries to the Tame, by the Stour and Salwarp, tributaries to the Severn, by the Severn itself, and by the Arrow and minor streams tributaries to the Avon. A range of hills about eight miles long runs across the country from north-west to south-east, and articulates with the central water parting at Bromsgrove Lickey. It includes Clent, Walton and Romsley Hills, Frankley Beeches, the Upper and the Lower Lickey, and rises in Walton Hill, to a maximum height of 1036 feet above the sea. The Worcestershire portion of the district has been divided into the following eight sub-districts,

distinguished by the Roman numerals I. to VIII. It has not been found convenient in every case to adopt water partings as sub-divisional boundaries.

I. REA. II. CLENT AND LICKEY. III. STOUR. IV. EAST SEVERN. V. WEST SEVERN. VI. SALWARP. VII. ARROW. VIII. AVON.

I. REA.—The north-east angle of the county, drained by the Rea and Cole. Surface strata, red marl, occasionally covered by modern drift.

The flora of this sub-district has, unhappily, mainly an historical interest. Moseley Wake Green and Bog, drained and enclosed in or about 1840, and now partly built upon, formerly produced the following rarities:—

Viola palustris; Drosera rotundifolia; Dianthus deltoides; Alsine tenuifolia; Radiola millegrana; Hypericum elodes; Comarum palustre; Parnassia palustris; Helosciadium inundatum; Hydrocotyle vulgaris; Carduus pratensis; Vaccinium Oxycoccus; Menyanthes trifoliata; Pedicularis palustris; Scutellaria minor; Anagallis tenella; Centunculus minimus; Narthecium ossifragum; Rhyncospora alba; Eriophorum vaginatum; Triodia decumbens; Molinia cærulea; Nephrodium Oreopteris; Osmunda regalis; Lycopodium Selago; Equisetum hyemale.

Most of the above plants are certainly, and all probably, extinct. The same may be said of—

Thalictrum flavum; Coronopus Ruellii; Lythrum Salicaria; Ribes alpinum; Œnanthe fistulosa; Veronica Anagallis; Triglochin palustre; Butomus umbellatus; recorded from other parts of this sub-district.

The rarer plants now existing within it are:—

Ranunculus pseudo-fluitans; Chelidonium majus; Cardamine amara; Nasturtium amphibium; Nasturtium palustre; Epilobium roseum; Sium augustifolium; Adoxa moschatellina; Galium uliginosum; Hieraceum

umbellatum; Campanula latifolia; Limosella aquatica; Stachys palustris; Rumex Hydrolapathum; Narcissus pseudo-narcissus; Lemna trisulca; Sagittaria sagittifolia; Scirpus setaceus; Carex vesicaria, C. pseudo-Cyperus; Alopecurus fulvus; Triticum caninum.

II. CLENT AND LICKEY.—The Clent and Lickey Hills, with the head waters of the Rea and Arrow, and upper valley of the Stour to Stourbridge. Surface strata; Water stones, Bunter soft red sandstone and Pebble bed, Permian breccia, Permian clays and sandstones, Coal measures, Silurian and Cambrian rocks of the lower Lickey. This sub-district is extensively wooded, especially in the basin of the upper Stour above Halesowen.

The rarer plants are—

Ranunculus circinatus, R. auricomus, R. parviflorus, R. arvensis; Corydalis claviculata; Lepidium Smithii; Cardamine amara, C. impatiens; Barbarea stricta; Nasturtium amphibium; Erysimum cheiranthoides; Cheiranthus Cheiri; Reseda luteola; Viola palustris; Polygala depressa; Moenchia erecta; Spergularia rubra; Hypericum Androsæmun, H. humifusum; Geranium sylvaticum, G. lucidum; Rhamnus Frangula; Ulex Gallii; Genista tinctoria; Ononis arvensis. O. campestris; Melilotus arvensis; Trifolium medium, T. hybridum; Ornithopus perpusillus; Orobus tuberosus; Prunus Avium; Geum rivale, G. intermedium; Rubus macrophyllus, R. Sprengelii, R. hystrix, R. rudis, R. Kœhleri, R. fusco-ater, R. rotundifolius, R. tenuiarmatus, R. diversifolius; Rosa mollissima, R. tomentosa, R. subglobosa, R. Watsoni; Agrimonia Eupatoria, A. odorata; Alchemilla vulgaris; Sanguisorba officinalis; Poterium muricatum; Pyrus Aucuparia; Epilobium angustifolium, E. obscurum; Callitriche stagnalis; Peplis Portula; Ribes rubrum, R. nigrum; Chrysosplenium alternifolium; Adoxa moschatellina; Hydrocotyle vulgaris; Sanicula Europæa; Pimpinella magna; Silaus pratensis; Pastinaca sativa; Torilis infesta;

Viscum album; Sambucus nigra; Viburnum Opulus; Asperula odorata; Valerianella dentata; Dipsacus pilosus; Inula Conyza, I. dysenterica; Matricaria Parthenium; M. Chamomilla; Doronicum Pardalianches; Senecio erucifolius; Carlina vulgaris; Serratula tinctoria; Centaurea Scabiosa; Lactuca muralis; Hieracium murorum; Campanula latifolia; Erica tetralix; Vaccinium Myrtillus; Erythræa Centaurium; Chlora perfoliata; Convolvulus sepium; Cuscuta Trifolii; Orobanche major; Lathræa squamaria; Linaria Cymbalaria, L. repens; Pedicularis sylvatica; Veronica montana, V. Buxbaumii; Calamintha Clinopodium; Scutellaria galericulata; Lamium Galeobdolon; Galeopsis versicolor; Stachys Betonica; Myosotis sylvatica; Cynoglossum officinale; Primula caulescens; Lysimachia vulgaris, L. Nummularia; Chenopodium Bonus-Henricus, C. olidum; Polygonum Bistorta; Euphorbia amygdaloides; Humulus Lupulus; Salix pentandra, S. aurita; Paris quadrifolia; Tamus communis; Orchis Morio; Gymnadenia conopsea; Neottia nidus-avis; Habenaria bifolia; Epipactis media; Narcissus pseudo-narcissus; Sagittaria sagittifolia; Butomus umbellatus; Allium ursinum; Colchicum autumnale; Juncus squarrosus; Luzula pilosa; Potamogeton rufescens, P. perfoliatus, P. crispus, P. pectinatus; Carex pulicaris, C. remota, C. pallescens. C. strigosa, C. pendula, C. pilulifera, C. fulva, C. lepidocarpa, C. sylvatica, C. pseudo-Cyperus, C. binervis; Triodia decumbens; Molinia cærulea; Festuca gigantea; Bromus erectus; Nardus stricta; Equisetum maximum, E. sylvaticum, E. hyemale; Nephrodium Oreopteris, N. spinulosum; Aspidium aculeatum, A. angulare: Asplenium Trichomanes; Blechnum boreale; Botrychium Lunaria; Ophioglossum vulgatum; Lycopodium clavatum.

Diplotaxis muralis; Buplerum rotundifolium; Hyoscyamus niger; Linaria Elatine; Borago orientalis have occurred as casuals.

Narthecium ossifragum and *Drosera rotundifolia* formerly grew at the Lower Lickey. The former was destroyed by drainage about 1854, the latter has been recently extirpated by collectors. *Ceterach*

officinarum, which grew in great abundance on the garden wall at the Leasows from 1850 to 1884, was destroyed soon after the latter date.

III. STOUR.—Country from the foot of the Clent Hills to the east bank of the Stour, near Kidderminster. Surface strata—Waterstones, soft red Bunter, Pebble bed. This sub-district is distinguished by the steep scarps of the waterstones, the sandy soils of the soft red sandstone, and the numerous pools on the brooks which flow from the Clent Hills into the river Stour. The rarer plants are—

Rananculus circinatus, R. fluitans, R. Lenormandi; Aquilegia vulgaris; Chelidonium majus; Nasturtium palustre; Cardamine amara; Barbarea præcox; Thlaspi arvense; Teesdalia nudicaulis; Viola palustris; Sagina ciliata; Arenaria leptoclados; Cerastium aquaticum, C. semidecandrum; Spergularia rubra; Malva moschata; Hypericum dubium, H. humifusum; Geranium columbinum; Erodium cicutarium; Trifolium arvense, T. filiforme; Ornithopus perpusillus; Potentilla argentea; Comarum palustre; Rubus suberectus, R. affinis, R. umbrosus, R. rhamnifolius, R. Lindleianus, R. diversifolius, R. ternuiarmatus; R. spinosissima, R. mollissima; Lythrum Salicaria; Epilobium angustifolium. E. obscurum; Myriophyllum spicatum; Ceratophyllum aquaticum; Bryonia dioica; Sedum Telephium, S. album; Ribes rubrum, R. nigrum; Saxifraga granulata; Chrysosplenium alternifolium; Parnassia palustris; Hydrocotyle vulgaris; Sium angustifolium; Conium maculatum; Galium uliginosum; Valerianella olitoria; Gnaphalium sylvaticum; Anthemis arvensis; Tanacetum vulgare; Bidens tripartita, B. cernua; Carduus nutans; Leontodon hirtus; Hieracium murorum, H. umbellatum; Jasione montana; Campanula patula; Menyanthes trifoliata; Echium vulgare; Myosotis versicolor; Solanum nigrum; Verbascum Thapsus, V. nigrum, V. virgatum; Veronica Anagallis, V. polita; Pedicularis palustris; Verbena officinalis; Salvia verbenaca; Mentha sylvestris; M. piperta; Calamintha menthifolia, C.

Acinos; Nepeta Cataria; Rumex Hydrolapathum, R. pratensis; Polygonum Bistorta, P. pseudo-dumetorum; Anacharis Alsinastrum; Orchis mascula, O. latifolia, O. incarnata; Alisma Plantago; Polygonatum multiflorum; Luzula sylvatica, L. pilosa; Typha augustifolia; Acorus Calamus; Sparganium ramosum, S. simplex; Potamogeton zosterifolius, P. flabellatus; P. lucens; Zanichellia palustris; Scirpus sylvaticus; Carex axillaris, C. disticha, C. muricata, C. paniculata, C. Boeninghauseniana, C. pilulifera, C. pseudo-Cyperus, C. ampullacea, C. paludosa; Nardus stricta; Aira caryophyllea, A. præcox; Avena pubescens; Festuca sciuroides, F. Myurus; Bromus erectus; Triticum caninum; Equisetum maximum; Asplenium Trichomanes; Ceterach officinarum.

Camelina sativa, *Silene anglica*, *Anthoxanthum Puelii*, have been found as field casuals. *Mimulus luteus* is established in the brooks at Churchill. *Medicago maculata*, *Xanthium spinosum*, *Polypogon monspeliensis* were growing in 1875 on wool waste at Hoo Mill.

Sium latifolium, which grew in Blakedown Pools, in Purton's time, has been long extinct in that locality. *Osmunda regalis*, which grew in this sub-district in 1852-3, has disappeared. *Asplenium Adiantum-nigrum* and *Scolpendrium vulgare* have been all but exterminated.

Elatine hexandra and *Hydropiper*, reported by the late Mr. Alexander Irvine in a "Mill Pond near Churchill station," in 1857, have not been seen by any other botanist.

IV. EAST SEVERN.—Country from the west bank of the Stour to the east bank of the Severn near Bewdley and Stourport, including Hartlebury Common east of Severn, below the junction of the Stour at Stourport. Surface strata: Waterstones, Bunter sandstone and Pebble bed, Permian breccia, Coal measures, Old red sandstone; covered at

Hartlebury Common and elsewhere with modern drift. The sand and bog plants of Hartlebury Common are the most interesting features of the flora of this sub-district. It contains—

Ranunculus fluitans; Teesdalia nudicaulis; Brassica Cheiranthus; Viola canina; Drosera rotundifolia; Cerastium arvense; Spergularia rubra; Radiola millegrana; Erodium maritimum; Geranium pratense, G. lucidum, G. pyrenaicum; Trifolium striatum, T. arvense; Ornithopus perpusillus; Vicia lathyroides; Potentilla argentea; Comarum palustre; Rubus suberectus, R. fusco-ater; Rosa spinosissima; Pyrus torminalis; Lythrum Salicaria; Sedum dasyphyllum; Cotyledon Umbilicus; Hydrocotyle vulgaris; Helosciadium inundatum; Œnanthe crocata; Chærophyllum Anthriscus; Lonicera Caprifolium, L. Xylosteum; Valerianella carinata; Carduus nutans; Hypochæris glabra; Inula Conyza; Erigeron acris; Campanula Trachelium; Erica tetralix; Monotropa hypopitys; Menyanthes trifoliata; Myosotis collina; Verbascum Lychnitis, V. virgatum; Nepeta Cataria; Veronica scutellata: Salvia verbenaca; Calamintha menthifolia, C. Acinos; Scutellaria minor; Marrubium vulgare; Rumex maritimus; Potamogeton polygonifolius, P. obtusifolius; Juncus squarrosus; Rhyncospora alba; Eriophorum augustifolium; Scirpus fluitans; Carex curta, C. pilulifera, C. divulsa; Agrostis canina; Triodia decumbens; Nardus stricta; Equisetum sylvaticum; Asplenium Adiantum-nigrum; Botrychium Lunaria; Lycopodium clavatum, L. inundatum.

Melilotus alba, *Carum Carui*, *Arnoseris pusilla*, *Crepis Nicœnsis*, *Linaria minor* have been found as casuals near the Railway Viaduct over the Stour, south of Kidderminster, and *Centaurea solstitialis* at Hartlebury; *Lycopodium complanatum* was gathered on Hartlebury Common in 1836, but has not been seen since.

V. WEST SEVERN.—Country west of the Severn, from Wyre Forest on the north, to Shrawley Wood on

the south. Surface strata: Waterstones, soft red Bunter, Permian breccia, Coal measures, Old red sandstone. This sub-district extends somewhat beyond the twenty miles radius. It is chiefly remarkable for the large area of woodland known as Wyre Forest, which produces a number of rarities not found elsewhere within the County. Part of the forest is in Salop. The following list includes plants from both counties:—

Thalictrum flavum; Ranunculus fluitans; Aquilegia vulgaris; Cardamine impatiens; Nasturtium sylvestre; Polygala vulgaris; Saponaria officinalis; Hypericum montanum; Tilia parvifolia, T. grandifolia; Geranium sylvaticum, G. sanguineum; Rhamnus catharticus, R. Frangula; Vicia sylvatica; Spiræa salicifolia; Pyrus torminalis; Rubus saxatilis, R. villicaulis, R. hirtus, R. pyramidalis, R. Guntheri; Rosa mollissima, R. micrantha; Sedium Telephium; Galium erectum; Hieracium murorum; Campanula latifolia, C. Trachelium; Pyrola media, P. minor; Gentiana campestris; Mentha Pulegium; Pedicularis palustris; Melampyrum pratense; Scutellaria minor; Myosotis repens; Lithospermum officinale; Centunculus minimus; Juniperus communis; Convallaria majalis; Orchis latifolia; Gymnadenia conopsea; Habenaria chlorantha, H. viridis; Epipactis latifolia, E. palustris; Cephalanthera ensifolia; Neottia nidus-avis; Spiranthes autumnalis; Scirpus pauciflorus, S. setaceus; Eriophorum latifolium; Carex pulicaris, C. divulsa, C. fulva, C. montana, C. strigosa; Melica nutans; Nephrodium Oreopteris; Equisetum maximum, E. hyemale.

A single tree of *Pyrus domestica*, once a celebrity of Wyre Forest, and reputed the only wild one in Britain, was destroyed by fire in 1862. *Spiranthes æstioalis* has once been gathered in the great bog in the Forest; *Coronilla varia* occurs as a casual on the right bank of the Severn, about a mile above Bewdley.

VI. ARROW.—Country between Barnt Green and Redditch, surrounding the village of Alvechurch. With the exception of a small patch of Waterstone, this sub-district is entirely on the Red marl. Several large reservoirs belonging to the Worcester canal are situated within it.

The following are its characteristic plants—

Ranunculus Drouetii; Lepidum ruderale; Viola palustris; Drosera rotundifolia; Lotus tenuis; Rosa micrantha, R. subcristata, R. Hailstonii, R. Borreri, R. bibracteata; Rubus adornatus, R. thyrsoideus, R. pilosus; Lathyrus Nissolia; Pyrus torminalis; Epilobium angustifolium; Myriophyllum spicatum; Valerianella dentata; Anthemis arvensis; Artemisia Absinthium; Serratula tinctoria; Carduus crispus; Campanula patula; Myosotis repens; Pedicularis palustris; Limosella aquatica; Veronica Anagallis, V. scutellata; Primula caulescens; Anagallis tenella; Euphorbia amygdaloides; Rumex Hydrolapathum; Triglochin palustre; Butomus umbellatus; Sagittaria sagittifolia; Acorus Calamus; Potamogeton polygonfolius; Ophrys apifera; Juncus squarrosus; Eleocharis acicularis; Scirpus setaceus; Calamagrostis Epigejos; Nardus stricta; Equisetum sylvaticum; Ophioglossum vulgatum; Chara flexilis.

VII. SALWARP.—Country from the S.W. foot of the Lickey Hills, to the Salwarp below Droitwich. Surface strata: Red Marl, Waterstones. The most noticeable features are the extensive tract of woodland known as the Randans, and the Salt Works of Stoke and Droitwich. The latter have rendered the canals and streams in the vicinity more or less saline.

The characteristic plants are—

Geranium lucidum, G. Pyrenaicum; Rhamnus catharticus; Dipsacus sylvestris; Sison Amomum; Scandix Pecten-Veneris; Picris hieracioides; Senecio erucifolius; Carduus crispus; Inula Conyza; Vaccinium Myrtillus; Melampyrum pratense; Plantago media; Scirpus

Tabernæmontani; Calamagrostis Epigejos; Aspidium angulare; Nephrodium spinulosum; Lycopodium clavatum.

Polypodium Dryopteris, and *Cystopteris fragilis*, which grew at Catshill up to 1861, are believed to be extinct. The plants of the saline waters of Droitwich deserve separate mention. They are—

Lepidum ruderale, L. latifolium; Spergularia salina: Apium graveolens; Samolus Valerandi; Glaux maritima; Juncus Gerardi; Sclerochloa distans.

VIII. AVON.—The country about Feckenham on the streams tributary to the Avon, is situated partly on the Lias, and partly on the Red Marl. It is the only one of the eight sub-districts in which the Lias occurs. The following plants are principally characteristic of the calcareous soil of the Lias—

Trifolium fragiferum; Lotus tenuis; Melilotus officinalis; Astragalus glycyphyllus; Lathyrus Nissolia; Poterium muricatum; Sison Amomum; Conium maculatum; Pastinaca sativa; Torilis nodosa; Picris hieracioides; Helminthia echioides; Campanula latifolia; Lithospermum arvense; Daphne Laureola; Ophrys apifera.

A large tract of bog land known as Feckenham Moor existed in this sub-district in the time of Purton, and produced the following plants, recorded in his "Midland Flora"—

Parnassia palustris; Hydrocotyle vulgaris; Carduus pratensis; Pinguicula vulgaris; Triglochin palustre; Alisma ranunculoides; Schœnus nigricans; Cladium Mariscus.

The moor was drained many years ago, and its plants are all extinct.

STAFFORD.

The Staffordshire portion of the district extends

from Upper Arley, on the west to Penkridge and Rugeley on the north, and to Tamworth on the east. The parish of Dudley, which, although in Worcester is entirely surrounded by Stafford, will be treated as part of the latter county. The principal elevations are the Silurian Hills of Dudley Castle, 550 feet, and of the Wren's Nest, 500 feet above the sea, situated on the central water parting. West of these are Kinver Edge, 550 feet, and on the east Barr Beacon, 654 feet. It is watered on the west by the Severn, on the north and east by the Trent and Tame, and other tributary streams. It produces on the whole an interesting flora, notwithstanding the fact that the South Staffordshire Coalfield with the collieries and iron works, so destructive to vegetation, is included within its limits. The sub-districts adopted are: I. SEVERN, II. TRENT, III. TAME.

I. SEVERN.—This sub-district comprises Upper Arley, Kinver, Enville, Dudley and Sedgley, with much of the country W. and N.W., of Wolverhampton. The Coal measures extend over a considerable area, and Silurian limestones and shales occur about Sedgley and Dudley.

The more interesting plants are:—

Ranunculus circinatus, R. fluitans, R. parviflorus; Berberis vulgaris; Sinapis nigra; Cardamine amara, C. impatiens; Teesdalia nudicaulis; Viola palustris; Saponaria officinalis; Silene Anglica; Cerastium arvense; Sagina ciliata; Hypericum Androsæmum, H. dubium, H. humifusum; Geranium pyrenaicum, G. columbinum; Erodium moschatum, E. maritimum; Euonymus Europæus; Rhamnus catharticus; R. Frangula; Genista tinctoria; Ulex Gallii; Melilotus officinalis; Ornithopus perpusillus; Vicia sylvatica, V. lathyroides; Prunus insititia, P. Padus; Sanguisorba officinalis; Potentilla argentea; Comarum palustre; Pyrus Malus, var. mitis; Saxifraga granulata;

Chrysosplenium alternifolium; Helosciadium inundatum; Œnanthe fistulosa, Œ. crocata; Torilis nodosa; Chærophyllum Anthriscus; Viscum album; Viburnum Opulus; Carduus nutans, C. eriophorus, C. pratensis; Carlina vulgaris; Gnaphalium sylvaticum; Doronicum Pardalianches; Inula Conyza; Solidago virga-aurea; Hypochæris glabra; Leontodon hirtus; Picris hieracioides; Helminthia echioides; Hieracium umbellatum; Campanula Rapunculus, C. patula; Monotropa hypopitys; Gentiana Amarella; Chlora perfoliata; Atropa Belladonna; Verbascum Thapsus, V. Lychnitis, V. Thapso-lychnitis; Linaria Elatine; Limosella aquatica; Mimulus luteus; Nepeta Cataria; Scutellaria minor; Galeopsis Ladanum; Echium vulgare; Lithospermum officinale; Myosotis sylvatica; Cynoglossum officinale; Parietaria officinalis; Ulmus montana; Chenopodium polyspermum; Salix decipiens, S. cærulea, S. vitellina, S. undulata, S. purpurea, S. Woolgariana, S. acuminata, S. laurina; Sparganium neglectum; Orchis mascula, O. Morio, O. latifolia; Epipactis latifotia; Colchicum officinale; Carex pulicaris, C. pallescens, C. strigosa, C. pendula; Poa nemoralis; Nephrodium Thelypteris; Botrychium Lunaria; Lycopodium clavatum.

II. TRENT.—Comprises much of the country lying N. and N.E. of Wolverhampton, including Codsall, Penkridge, Cannock Chase, Rugeley, Abbotts Bromley and Alrewas. Much of this sub-district has a sub-Alpine character in its physical features and flora, and is beautifully undulated throughout. The rocks are mainly Triassic, but the coal measures prevail over a considerable area. The more rare plants are:—

Thalictrum flavum; Ranunculus circinatus, R. trichophyllus, R. Drouetii, R. Baudotii v. confusus, R. Lenormandi, R. flamula var. pseudo-reptans, R. Lingua, R. hirsutus, R. parviflorus; Caltha Guerangerii; Actæa spicata; Papaver Rhæas v. strigosum; Chelidonium majus; Thlaspi arvense; Erysimum cheiranthoides; Arabis perfoliata; Nasturtium amphibium; Viola palustris, V.

Reichenbachiana; Drosera rotundifolia; Polygala depressa; Tilia parvifolia; Montia fontana; Prunus Padus; Potentilla argentea; Rubus rhamnifolius, R. villicaulis, R. Schlechtendalii, R. Sprengelii, R. Bloxamii, R. rosaceus, R. infestus, R. Guntheri, R. Bellardii; Rosa scabriuscula, R. tomentella; Epilobium roseum; Hippuris vulgaris; Chrysosplenium alternifolium; Hydrocotyle vulgaris; Œnanthe fistulosa, Œ. Phellandrium; Bidens cernua, B. tripartita; Hieracium maculatum; Wahlenbergia hederacea; Vaccinium Oxycoccus, V. Vitis-Idæa, V. Myrtillus; Menyanthes trifoliata; Mentha piperita; Lamium Galeobdolon; Myosotis palustris; Pinguicula vulgaris, Lysimachia Nummularia; Anagallis tenella; Polygonum Bistorta; Rumex maritimus; Empetrum nigrum; Salix pentandra, S. triandra, S. Forbyana, S. Smithiana, S. holosericea, S. hyppophaefolia; Typha angustifolia; Potamogeton lucens; Fritillaria Meleagris; Narthecium ossifragum; Scirpus lacustris, S. sylvaticus; Eriophorum angustifolium, E. vaginatum; Carex dioica, C. curta, C. disticha, C. muricata, C. pilulifera, C. binervis, C. pseudo-Cyperus, C. vesicaria, C. ampullacea; Calamogrostis Epegeios; Milium effusum; Molinia cærulea; Avena pubescens, A. fatua; Triticum caninum; Nardus stricta; Osmunda regalis.

III. TAME.—This sub-district, includes Walsall, Lichfield, Shenstone, Barr and Handsworth. The surface rocks are Trias, Permian and Coal measures, and the limestones of Walsall, Rushall, and Hay Head. The greatest elevation is Barr Beacon. Both the source and the mouth of the Tame are within the limits of this sub-district. The principal plants are:—

Thalictrum flavum; Arabis perfoliata; Cardamine amara, C. impatiens; Nasturtium sylvestre; Teesdalia nudicaulis; Reseda Luteola; Silene noctiflora; Malva moschata, M. rotundifolia; Erodium cicutarium; Genista Anglica; Lathyrus Nissolia; Orobus tuberosus; Prunus insititia, P. Padus; Geum rivale; Rosa subglobosa, R. micrantha, R. collina; Rubus suberectus, R. rharmnifolius; Pyrus Aria; Sedum Telephium; Saxifraga granulata; Chrysosplenium

alternifolium; Parnassia palustris; Helosciadium repens; Myrrhis odorata; Apium graveolens; Œnanthe crocata; Dipsacus pilosus; Valerianella dentata; Galium Witheringii; Carduus nutans, C. pratensis; Anthemis nobilis; Erigeron acris; Campanula Trachelium, C. latifolia, C. patula; Solanum nigrum; Linaria minor; Veronica Buxbaumii, V. montana, V. scutellata, V. Anagallis; Limosella aquatica; Pinguicula vulgaris; Utricularia vulgaris; Lysimachia vulgaris; Centunculus minimus; Parietaria officinalis; Ulmus montana; Salix pentandra; Acorus Calamus; Epipactis palustris; Convallaria majalis; Typha angustifolia; Lemna gibba; Narthecium ossifragum; Colchicum autumnale; Scirpus sylvaticus, S. cæspitosus; Carex pallescens, C. pseudo-Cyperus; Calamagrostis Epegejos, C. lanceolatus; Milium effusum; Avena pubescens; Triticum caninum; Asplenium Ruta-muraria; Aspidium lobatum; Osmunda regalis.

Chapter II.
The Mosses, Hepatics, and Lichens.

BY J. E. BAGNALL, A.L.S.

In describing the rarer Mosses, Hepatics and Lichens, to be found within the district, the materials at command are not sufficient to admit of so minute an analysis of distribution as that given for the flowering plants in the preceding pages. For the mosses four sub-districts will be adopted: I. WARWICK, TAME; II. WARWICK, AVON; III. WORCESTER; IV. STAFFORD. For the Hepatics and Lichens, the enumeration will be restricted to Warwick only; information for Worcester and Stafford not being within reach. The nomenclature of the Mosses and Hepatics is that of the “London

Catalogue of British Mosses and Hepatics," 2nd Edit., 1881. The nomenclature of the Lichens is that of "The Lichen Flora," of the Revd. W. A. Leighton, 1871.

MOSSES.

The Moss Flora of the whole district under review, so far as records are available, is about 272 species and varieties; that of Warwickshire alone being about 261. Its comparative poverty may be attributed, partly to the absence of great elevations, partly to the prevalence of smoke over large portions of the district, and partly to the draining of bogs and marshes, and reclamation of heath lands.

I. WARWICK, TAME.—This sub-district includes that portion of the country watered by the Tame and its affluents, the Cole, Blythe, Bourne, and Anker. The following are the more noticeable mosses.

Sphagnum fimbriatum, S. squarrosum, S. rubellum, S. papillosum, S. cymbifolium, var. squarrosulum; Systegium crispum; *Dicranum spurium, D. fuscescens, D. majus; Campylopus flexuosus; Archidium phascoides; Pleuridium alternifolium; Leucobryum glaucum; Sphærangium muticum; Pottia minutula; Trichostomum tophaceum; Tortula aloides, T. marginata, T. rigidula, T. spadicea, T. insulana, T. tortuosa, T. subulata, T. papillosa; Encalypta streptocarpa; Racomitrium canescens; Zygodon viridissimus; Ulota intermedia; Ephemerum serratum; Funaria fasciculare; Bryum pallescens, B. roseum; Mnium rostratum, M. stellare, M. subglobosum; Polytrichum gracile; Fissidens adiantoides, F. exilis; Leucodon sciuroides; Amblyodon dealbatus; Philonotis fontana; Homalia trichomanoides; *Hedwigia ciliata; Brachythecium albicans; Eurhynchium speciosum, E. Teesdalii; Plagiothecium sylvaticum, P. elegans, P. latebricola; Amblestegium fluviatile; Hypnum

commutatum, H. exannulatum; H. Cossoni, H. vernicosum, H. falcatum, H. giganteum, H. stramineum, H. revolvens.

II. WARWICK, AVON.—This sub-district includes that portion of Avon within the area, and its affluents, the Sow, Alne, and Arrow. The following are the more rare mosses:—

Sphagnum auriculatum, S. subsecundum; Gymnostomum tenue; Dicranum montanum; D. scoparium; Campylopus pyriformis; Pottia intermedia, P. cavifolia, var. incana; Tortula rigida, T. ambigua, T. atro-virens, T. Brebissoni, T. lævipila, T. intermedia, T. papillosa; Grimmia crinita; Orthotrichum saxatile, O. stramineum, O. tenellum, O. leiocarpum, O. Lyelii, O. rivulare; Leptobryum pyriforme; Bryum pendulum, B. murale; Mnium undulatum; Polytrichum formosum; Fissidens Lylei, F. incurvus, F. pusillus, F. inconstans, F. tamarindifolius; Cryphæa heteromalla; Anomodon viticulosum; Thamnium alopecurum; Climacium dendroides; Camptothecium lutescens; Scleropodium cæspitosum, S. illecebrum; Brachythecium rivulare; Eurhynchium pumilum; Rhynchostegium tenellum; Hypnum Lindbergii, H. stellatum, H. chrysophyllum, H. cordifolium, H. splendens, H. brevirostre, H. loreum, H. palustre.

III. WORCESTER.—The moss flora of this sub-district has not been published; but the moss herbaria of Mr. Mathews and the writer afford records of about 127 species. Many of these have already been recorded for Warwick, and are therefore omitted here. The following, which are mainly from the Stour sub-district, are the more noteworthy:—

Sphagnum auriculatum; S. cuspidatum, S. intermedium; Dicranum scoparium; Leucobryum glaucum; Pleuridium nitidum; Pottia Wilsoni, P. intermedia; Tortula cuneifolia, T. convoluta; Encalypta vulgaris, E. streptocarpa; Racomitrium aciculare, R. lanuginosum, R. fasiculare; Ptychomitrium polyphyllum; Ulota intermedia;

Orthotrichum Lyellii; Ephemerum serratum; Physcomitrella patens; Amblyodon dealbatus; Philonotis fontana; Leptobryum pyriforme; Bryum pendulum, B. roseum; Mnium stellare; Aulacomnium palustre; Fissidens exilis, F. adiantoides; Fontinalis antipyretica; Neckera crispa; Homalia trichomanoides; Pterygophyllum lucens; Climacium dendroides; Brachythecium populeum; Rhynchostegium murale; Hypnum commutatum, H. palustre, H. chrysophyllum; *H. scorpioides.

IV. STAFFORD.—The record given in Garner's Natural History of Staffordshire, of the mosses of that county, refers to localities which are all outside the area. Hence it is impossible to do more than mention the rarer species collected by myself, mostly within a ten mile radius of Birmingham, and a few additional records supplied by Dr. Fraser. They are as follows:—

Dicranella cerviculata, D. rufescens, D. crispa; Dicranum Scoparium, D. palustre, D. majus; Pleuridium nitidum; Tortula Hornschuchiana, T. ambigua, T. aloides; Didymodon rubellus; Pottia lanceolata, P. intermedia, P. minutula; Ephemerum serratum; Encalypta streptocarpa; Philonotis fontana; Bartramia pomiformis; Webera carnea, W. annotina; Bryum pendulum, B. atro-purpureum, B. cuspidatum; Polytrichum strictum; Fissidens adiantoides; Tetraphis pellucida; Entosthodon fasciculare; Brachythecium populeum, B. albicans; Eurhynchium murale, E. Teesdalii; Plagiothecium elegans, P. undulatum; Hypnum intermedium, H. chrysophyllum, H. vernicosum, H. giganteum.

HEPATICÆ.

The Hepaticæ and Lichens are poorly represented, and as no available record of these plants occurs, only those of the Warwickshire portion of the district will be given.

Of the Hepaticæ only about 41 species have as yet

been found, the more noteworthy being:—

Fossombronia pusilla; Madotheca platyphylla; Radula complanata; Scapania nemorosa, S. irrigua; Plagiochila nemorosa; Aplozia crenulata, A. sphærocarpa; Gymnocolea inflata; Jungermannia ventricosa; Cephalozia byssacea, C. Starkii, *C. curvifolia, C. connivens; Trichocolea tomentella; Metzgeria furcata; Aneura multifida, A. sinuata, A. pinguis; Lunularia cruciata; Conocephalus conicus; Anthoceros punctatus, A. lævis; Riccia glauca; Ricciella fluitans.

LICHENS.

So far as experience serves the Lichen flora of the district appears to be very limited. From Worcestershire I have seen no records except that probably exhaustive one by Mr. Edwin Lees in his "Botany and Geology of Malvern," where we find about 240 species recorded for the Malvern district, but outside the area under notice here. For Staffordshire, Garner records about 51 species, few of which are localised, and those few are outside the area.

In Purton's "Midland Flora," a fair record is given of these plants for the Midland district, several of the species there recorded are, however, now either assigned to other orders as algæ or fungi, or are considered to be imperfect states of other lichens. So far as it is possible to judge from Purton's records, and the observations of the present writer, the Lichen flora of that part of Warwickshire within the area here adopted comprises about 100 species, of which the following are some of the more noticeable:—

Collema nigrescens; Calcium trichiale, C. hyperellum, C. trachelinum; Trachylia tympanella; Cladonia alcicornis, C. furcata, C. rangifera, C. uncialis; Stereocaulon paschale;

Usnea hirta; Alectoria jubata; Evernia furfuracca: Ramulina fraxinea, R. fastigiata; Cetraria aculeata; Peltigera rufescens, P. polydactyle; Sticta pulmonacea; Parmelia olivacea, P. caperata, P. lanata, P. perlata; Physcia ciliaris, P. pulverulenta, P. stellaris; Pannaria pezizoides, P. nigra; Lecanora candelaria, L. pruinosa, L. parella, L. atra, L. sulphurea, L. ferruginea; Urceolaria scruposa; Pertusaria communis; Phylictis agelæa; Lecidea æruginosa, L. quernea, L. parasema, L. fusco-ater; Graphis scripta, G. serpentina; Opegrapha atra, O. notha; Arthonia astroidea, A. Swartziana; Verrucaria gemmata, V. epidermidis, V. nitida.

Chapter III.
The Algæ.

BY A. W. WILLS.

The great class of Algæ includes the sea-weeds, together with a large number of plants, mostly of microscopic size and of simple cellular structure, which abound wherever fresh water is found, whether in the form of running streams or stagnant pools, or even as covering damp surfaces of ground.

A broad subdivision of the Algæ into three groups has been generally accepted by botanists, these being the Rhodosporeæ (red-spored), Melanosporeæ (dark-spored), and Chlorosporeæ (green-spored). The marine genera are distributed over all three of these groups; the freshwater ones belong almost exclusively to the last. The classification of the freshwater Chlorosperms is by no means satisfactory, but it is impossible to discuss it within the limits of this article.

It is to be regretted that scarcely any of the botanists of Birmingham have made the Algæ their special study; hence the information at our disposal is insufficient to enable us to group the recorded species with reference to their occurrence in the several adjacent counties. This is, however, the less important because the distribution of this class of plants is not dependent, to the same extent as that of Phænogams, either on climate or soil, though it is probably not altogether independent of either. Their abundance, therefore, is in pretty direct proportion to that of such spaces of water as afford favourable conditions for their growth.

Hence, as the neighbourhood of Birmingham is mostly characterised by light and porous soils, the habitats in which Algæ are to be found are somewhat restricted. There are, however, two conspicuous exceptions. The tract of land about seven miles from Birmingham, known as Sutton Park, embraces a singular variety of scenery and presents conditions highly favourable to algoid growth in the shape of clear springs and streams, large sheets of water, and a considerable area of peaty bogs. Again, the mining district of South Staffordshire and Worcestershire, popularly known as the Black Country, affords among its pit-banks a great number of pools which are seldom dried up even in the hottest summer, and many of which are partially fed by water from adjacent mines or engines. Their number has been much diminished during the last few years by the operations of the South Staffordshire Mines Drainage Commission, but is still very large and these constitute a rich hunting ground to the student of freshwater Algæ.

The brief notes which follow must be regarded

merely as an indication of the general character of this branch of the Midland Flora. Any attempt systematically to enumerate the recorded species would far exceed the necessary limits of this notice.

The great group of so-called Unicellular Algæ is universally distributed, and the familiar forms included under the ill-defined genera of Pleurococcus, Glœocystis, Tetraspora, Pediastrum, &c., are found abundantly in this district wherever conditions favourable to their growth are present. Among these low forms may be mentioned *Apiocystis Brauniana*, parasitic on larger Algæ in stagnant pools; the extremely rare *Mischococcus confervicola*, recorded as found near Stafford, and *Polyedrium tetrahedricum* found on decaying leaves in a small pit near Sutton. *Ophiocytium cochleare*, until lately regarded as a very scarce plant, is not uncommon in similar habitats.

The remarkable *Hydrodictyon utriculatum*, popularly known as "Water Net," appeared some years ago in Blackroot Pool, Sutton Park, in enormous quantities, but shortly disappeared and has not been seen there since. It has also been recorded by Mr. T. Bolton as found in Bourne Pool, near Aldridge.

The large tribe of Volvocineæ is represented by the well-known forms of Gonium, Pandorina, and Eudorina, and by the typical *Volvox globator*, which, as is its wont, occasionally appears in some of the pools of the district in great profusion, only to vanish as capriciously. Mr. Bolton has recorded the rare and interesting *Volvox globator* ♂,—the *Sphærosira volvox* of Ehrenberg—as occurring in the small pool in the gravel pit near Blackroot Pool, Sutton Park.

Passing to the Zygnemaceæ, Vaucheriaceæ and

other filamentous Algæ, we find a large number of species of Zygnema, Spirogyra, Zygogonium, Mesocarpus, Staurocarpus, Vaucheria, &c., occupying ditches, small pools and other stagnant waters; it is scarcely possible to take a bottleful of water from these stations in summer and autumn without finding examples of the curious modes of reproduction characteristic of these genera.

In running streams and in the still ponds of the district the long fronds of Enteromorpha, the dense tresses of brilliant green Cladophoræ and the graceful tufts of Stigeoclonium and Chætophora abound. The exquisite *Cœtophora endiviæfolia* reappears at intervals in Keeper's Pool, Sutton Park; this species has also been found by Mr. Bolton in an old gravel pit at Hill Hook and in Earlswood reservoir.

The elegant *Bulbochœte setigera* is met with in small fragments in stagnant pools, and the singular *Coleochœte scutata* is to be found adherent to submerged water weeds.

The tepid waters of the South Staffordshire coal district are specially favourable to the growth of Oscillatorieæ, which form on their margins immense sheets of the deepest green velvet.

Several species of Batrachospermum (among which *B. atrum* is locally the rarest, having been found at Halesowen only) occur in small masses in clear streams, but they must be regarded as somewhat scarce plants. *Lemania fluviatilis* should be mentioned as common in the Avon and Severn, and the very rare *Bangia atropurpurea* as occurring on a water wheel in the former river at Stratford-on-Avon, although these habitats are somewhat beyond the limits contemplated in this sketch.

The Diatomaceæ of the neighbourhood do not appear to have been the objects of systematic study, and the only species of special interest which we remember to have found is the wonderful *Bacillaria paradoxa*, well known as a remarkable microscopic object from the strange manner in which its linear frustules glide over one another, so that the whole plant is incessantly assuming a different form. It has been found by Mr. Bolton, along with many other species, in a disused arm of the canal near Albion Station, and by the writer in a small stream near the same spot. A careful search would doubtless result in the discovery of a large number of representative species of this class.

In conclusion, we turn for a moment to the very beautiful tribe of Desmidieæ, and, although the district by no means abounds in the peaty bogs which are their especial haunts, a goodly list of ordinary species has been recorded. Sutton Park is the best locality for these plants, and in addition to the commoner forms of Micrasterias, Euastrum, Closterium, &c., which are here found in abundance, this habitat has yielded many rare and several new species, among which the following are worthy of special notice, viz.:—*Micrasterias papillifera*, *M. Cruxmelitensis*, *M. angulosa*, *M. denticulata*, var. *lichmoides*, and *M. Americana, forma major*; *Cosmarium coronatum*, *Closterium directum*, *Cl. angustatum*, and *Cl. Pritchardianum*; *Penium closteriodes*, *P. Jenneri*, and *P. Nägeli*.

A more detailed list of species is inadmissible, but the foregoing brief sketch will suffice to show that the Freshwater Algæ of the neighbourhood are tolerably abundant, and by no means devoid of interest.

Chapter IV.
The Fungi.

BY W. B. GROVE, B.A.

The district of which Birmingham is the centre is in some ways peculiarly interesting to a British Mycologist. It was the scene of the labours of two students of British Fungi who will always hold an honourable place in the history of the development of the science in this country—William Withering and Thomas Purton.

Withering was in his time (1741-1799) the foremost physician of this town. He lived for many years at Edgbaston Hall, a residence still situated among picturesque scenery just on the edge of the town, and then no doubt a wilder and more productive spot than now. Many species and varieties of Fungi new to Britain or new to science rewarded his constant researches in the park surrounding the hall, and some of the forms which he described still linger in this retreat. Packington Park, about ten miles from the town, is another locality frequently quoted by him; in fact by far the great majority of the species found by Withering himself came from these two places.

Withering enjoys the distinction of being one of the earliest authors on the British Flora, who devoted to the Fungi a space even decently comparable with that devoted to the Flowering plants. In his "Arrangement of British plants" (3rd edition), 1286 species of Phanerogams are recorded, and 566 of Fungi, which thus fill more than one-third as much space as their superiors in rank.

Thomas Purton was a surgeon of Alcester, a town

about 18 miles from Birmingham. In his “Midland Flora” (1817-1821), he gives descriptions of over 400 species of Fungi, found chiefly in the neighbourhood of Alcester, especially in Oversley Wood and Ragley Park. He provides moreover excellent coloured engravings of 35 species. Since the whole number of Flowering Plants recorded by Purton from the Midlands is only 798, it will be seen that he surpasses Withering in devoting more than half as much space to the Fungi as to the Phanerogams.

Mrs. Russell, of Kenilworth, made, a few years since, a nearly exhaustive study of the Hymenomycetes of Kenilworth, Stoneleigh, and Warwick, and bequeathed to the British Museum her valuable series of over 300 coloured illustrations. But with this exception little has been done recently to elucidate the Fungi of the neighbourhood of this town, until the subject was taken up, within the last few years, by Mr. J. E. Bagnall and the writer. On reckoning up the number of species now known to occur in this district it will be found that they considerably exceed 900. It is probable that the district is as productive as any other in the smaller and microscopic kinds, but the larger species of Fungi are, with few exceptions, not to be found in any great abundance.

From want of sufficient material, it is not possible to treat this group successfully, as has been done with the Phanerogams, according to the counties. It will be preferable merely to string together short notices of a few of the more remarkable or uncommon kinds, according to the orders into which the class “Fungi” is divided. The names are those of Stevenson’s “Hymenomycetes Britannici,” so far as it

is published, and of Cooke's "Handbook" or "Grevillea" for the rest.

The first and most conspicuous of these orders is the Hymenomycetes, the mushroom and toad-stool family, of which the common mushroom may be taken as the type. These are all distinguished by having the spore-bearing cells arranged in a more or less continuous exposed surface, even or variously folded. In the more typical species, this surface assumes the form of the flat laminæ which are termed gills. Of these, *Agaricus nitidus* has been found at Coleshill Pool; the yellow variety of *Ag. cepæstipes* at Sutton Coldfield; *Ag. polystictus* and *Ag. pessundatus*, near Kenilworth; *Ag. stans* in Edgbaston Park; *Ag. virgatus*, both there and at Coleshill Pool; *Ag. inornatus* at Kenilworth; *Ag. tuba*, at Middleton; *Ag. ditopus*, there and in Edgbaston Park; *Ag. platyphyllus* frequently in and near Sutton Park; *Ag. rancidus* at Middleton; *Ag. pullatus*, at Coleshill Pool; *Ag. leucogalus*, at New Park, Middleton; *Ag. electicus*, on rush stems in Sutton Park; *Ag. subpalmatus*, at Kenilworth and near Studley Castle; *Ag. petaloides*, var. *spathulatus*, at Oversley; *Ag. volvaceus*, *Ag. speciosus*, and *Ag. umbrosus*, at Kenilworth; *Ag. jubatus*, near Barnt Green; *Ag. heteroclitus*, many striking and well developed specimens at Sutton Coldfield; and *Ag. lanuginosus*, in Oversley Wood. *Ag. horizontalis* is said by Purton to be "not rare" near Alcester, and he records *Ag. erinaceus* and *Ag. pezizoides* from the same locality. *Ag. echinatus*, with its remarkable blood-red gills, is found frequently at Sutton Coldfield. At this point in the systematic order comes in the mysterious *Ag. versicolor* of Withering, of which he found only a few specimens in Edgbaston Park, and which has never since been seen by any other author; yet neither Fries nor the others

venture to omit it, because Withering gives so clear and unmistakeable a description as almost to preclude the possibility of error. *Ag. luteonitens* and *Ag. sarcocephalus* have been found at Kenilworth; *Ag. udus* is common in Sutton Park and the neighbourhood, and is also found among the Lickey Hills, accompanied in the latter place by the variety *polytrichi*. *Ag. areolatus* has been found at Warwick; *Ag. atrorufus* at Sutton; *Ag. retirugis* at Kenilworth and Middleton; and Bolton's *Ag. cinctulus* ("History of Funguses," tab. 152), which is omitted by Fries as possibly incorrectly figured, is said by Purton to be "not rare" near Alcester.

Of the genera allied to Agaricus, the rare species found here are rather few. The district seems to be especially ill supplied with the larger Cortinarii. Scarcely more than thirty species of this genus are recorded, of which the following may be mentioned: —*Cortinarius cyanipes*, from Kenilworth; *C. callochrous*, from Edgbaston; *C. scaurus*, from Packington; *C. violaceus*, which seems to have been found by Purton; *C. callisteus* and *C. ochroleucus*, from Kenilworth; *C. sanguineus*, in Sutton Park; *C. bulbosus*, from Oversley; *C. armillatus*, at Coleshill Pool; *C. brunneus* (recorded only by Withering among British authors), in Packington Park; and *C. hemitrichus*, in Sutton Park.

The other gilled genera may be briefly dismissed. *Gomphidius viscidus* and *G. glutinosus* have both occurred in the district. Lactarii are not uncommon. *L. deliciosus* is frequent in a certain part of Sutton Park, and is recorded by both Withering and Purton; it also occurs at Hagley and at Bromsgrove Lickey, but is very local. *L. turpis*, of large size, abounds in several woods in the neighbourhood of Sutton; *L.*

cilicioides, *L. uvidus*, *L. hysginus*, *L. zonarius*, *L. pyrogalus*, *L. glyciosmus*, and *L. camphoratus*, in addition to the more common species, have all been found; as also *Russula delica*, *R. rosacea*, *R. citrina*, *R. lutea*, and the very rare *R. drimeia*, *Hygrophorus chrysodon* and *H. russo-coriaceus* have been found at Kenilworth; Purton found the pretty little *Marasmius Hudsoni*; *Lentinus tigrinus* is recorded by Withering, from Packington Park; *L. adhœrens* by both Withering and Purton; and *L. lepideus* and *L. cochleatus* have been met with several times. *Panus conchatus* was found by Withering at Edgbaston, and by Purton at Studley, and the writer has found *P. torulosus* in Packington Park.

Among the pore-bearing Hymenomycetes, the most striking and rare is *Boletus (Strobilomyces) strobilaceus*, found at "the Valley," Bromsgrove, in 1861. *Boletus badius* is rather common, and is an edible species. The rare *B. parasiticus* has been found at Middleton; *B. striœpes* and *B. olivaceus* are also on record. The writer has found the true *Polyporus frondosus Fr.* once in Sutton Park, and fine specimens of *P. giganteus* in Edgbaston Park. Purton records *P. heteroclitus* from Oversley, and *P. molluscus* is occasionally found at Sutton and Coleshill Pool. The curious *Ptychogaster albus*, which is now usually considered a conidial form of a Polyporus, called *P. ptychogaster*, has occurred in Sutton Park on stumps of firs. *Trametes gibbosa* is found at Sutton; *Dœdalea confragosa* in the coppice near Windley Pool; and the edible *Fistulina hepatica* is occasionally met with on old oaks in Sutton Park, Hagley Park, and elsewhere.

Dismissing the rest of the Hymenomycetes, in which there is little worthy of mention to record, we come to the Gastromycetes, or Puff-ball family, in

which the spore-bearing surface is more or less concealed within an outer coating, and most frequently breaks up into a dusty mass. The Myxomycetes, which were formerly included in this group, will here be placed in their proper position at the end of the Fungi. Of the aberrant group to which the common Stinkhorn (not very common in this district) belongs, the more brilliant *Cynophallus caninus* is recorded by Purton, from near Bridgnorth, and was found at Bromsgrove Lickey, in 1856. The very rare and remarkable Earth-star, *Geaster coliformis*, has not been found in the district to which this notice is limited, but it has been twice found in the county of Worcester. The localities are given as "near Hanley Castle, Worcestershire," *Mr. Ballard*, by Withering; and "Hanley Common, Worcestershire," *Mr. Rufford*, by Purton. In the same place *Geaster fornicatus* occurred, and this is said by Withering to have been found also "at Birches Green, near Birmingham." *G. limbatus* is recorded from Edgbaston Park, Stonebridge, Allesley, Oversley, and Rushford.

Another group of Fungi is that which grows upon living leaves, the various forms of which are known as Cluster-cups, Rust, Smut and Brand. These are what are usually called Leaf-Fungi. Many species are common here; but, as most kinds grow only upon certain specified plants, it follows that their range is determined in great measure by the presence or absence of their hosts. *Podisoma sabinæ* and *P. juniperi* have been found in the district. The only rare cluster-cup recorded is *Œcidium depauperans*, which occurs every summer on cultivated Violas in a few localities, and in one of these it is uniformly accompanied and followed by the Puccinia, to which the name of *Puccinia ægra* has been given by the writer. Till lately this Œcidium was not known to

occur out of the United Kingdom, but Professor Trelease, of St. Louis, in a private letter says that he has recently seen in the United States specimens apparently identical with it. *Puccinia sonchi* was found by Mr. Hawkes, near Great Barr, on seedlings of Sonchus, and as yet has not been found anywhere else in Great Britain.

The species of the next group, the Discomycetes, or Cup-fungi, are not uncommon, though few of the showy forms are to be seen. The common Morell occurs, sparingly in the district, and *Morchella semilibera* is recorded from Badsey. *Helvella crispa*, *H. lacunosa*, *H. elastica*; *Mitrula paludosa*; *Spathularia flavida*; *Leotia lubrica*; *Geoglossum glabrum*, *G. hirsutum*, and *Rhizina undulata* have all been found, though rarely. Among the minuter species may be mentioned *Peziza dematiicola*, of which the writer found a few specimens at Sutton two years ago, this being the first and at present the only locality cited, since the place where the original specimens of Berkeley were discovered is unknown. *P. asperior* has been found at Berkswell (the only British locality); the curious *P. Curreiana*, on rush stems in Sutton Park and elsewhere; and the rare *P. Crouani*, *P. Dalmeniensis*, *P. stereicola*; *Ascobolus minutissimus*; *Vibrissea leptospora*; *Propolis pyri*, and a new species which Mr. Phillips has named *Dermatea nectrioides*, at various places in the neighbourhood.

The next group of Fungi is the Pyrenomycetes or Globe-fungi. They occur usually on dead bark and wood, or stalks of plants, and are mostly black, more rarely red or brown. Several common species look like grains of gunpowder scattered over the wood. Among these Withering mentions no species at all rare from this district, and Purton only three—

Melogramma Bulliardi, *M. gastrinum*, and *Sphæria pomiformis*. To these may be added *Nectria mammoidea* and *Hypomyces candicans* from near Sutton; *Eutypa velutina* and *E. scabrosa* from Berkswell; *Valsa cincta* Fr., *V. aglæostoma*, and *Sphæria ampullasca*, from Sutton; *Lophiostoma angustilabra*, from Middleton; and the interesting *Gymnoascus ruber*, which affords a glimpse of the mode by which the Pyrenomycetes were evolved, has appeared in Birmingham itself.

Of the Mucorini or Pin-mould family, to which belongs the pin-shaped mould, so common on decaying meat—two species of Pilobolus, *P. œdipus* and *P. Kleinii*, remarkable for their extraordinary explosive power, have been found here and nowhere else in the kingdom. The same is true of two species of Mortierella, *M. Candelabrum* and *M. polycephala*, of which even the genus is not known from any other British locality.

Lastly we come to the Myxomycetes, a group which, though distinctly fungal, approximates in some degree to the animal kingdom. These are rather abundant here, nearly one third of the British Species having been found; including the rare *Didymium pertusum*; *Badhamia hyalina*; *Enerthenema papillatum*; *Dictydium umbilicatum*; *Cribraria aurantiaca*; *Arcyria cinerea*, and *Prototrichia flagellifera*. Worthy of especial notice is *Physarum leucophœum* Fr., hitherto only known as British by specimens published by Cooke in his “Fungi Britannici.” The writer has found this at Sutton in abundance, and identifies it with the heretofore unidentified *Trichia rubiformis* of Purton, whose description is accompanied by an exceedingly accurate and picturesque plate (“Midland Flora,” tab. 37.)

Besides the groups of Fungi enumerated above, there are others more obscure and consequently less interesting to many students, of which no mention will be made here, although numerous rare or undescribed species belonging to them have been found in the district within recent years.

APPENDIX.
Articles Received too Late to be Included Alphabetically Between Pages 117 & 212.

Chains, Cables, and Anchors.—[BENJAMIN HINGLEY, M.P.]—(B. 99). The manufacture of chains, cables, and anchors is carried on at Tipton, and to a much larger extent at Netherton, and in the neighbourhood of Old Hill near Dudley. The manufacture of chain cables in their present form, namely, with elongated links supported by a bar or stud in the centre of each link is of comparatively modern origin; there are Naval men still living who remember that Men-of-War and Merchant Ships were fitted with hempen cables of large diameter, which occupied a considerable space in the fore-hold of the ship. The British Fleet in Nelson's fighting days knew not chain cables, but was encumbered with large coils of hempen rope.

It is certain that iron chains of some description were known and used in the days of the Romans, as

it is recorded that Julius Cæsar could not cut the cables of the vessels of the Gauls, because they were made of iron. Such chains were doubtless a succession of iron rings, or "S" hooks of comparatively small size. It is believed that the first chain cable was used on a British Ship, in the year 1808. It was made by a blacksmith named Robert Flinn, at North Shields, for a vessel which at that time was reckoned to be of a considerable size, namely, the "Ann and Isabella." of 221 tons. It not only saved that vessel when in peril, but also saved a whole tier of ships that had been made fast to her, their hempen cables having been cut by the ice, owing to a great flood with much ice in the Tyne. This notable instance gave a great impetus to the making of chain cables on the banks of the Tyne, where it is still carried on to a considerable extent.

At about the same date, Samuel Brown, afterwards Sir Samuel Brown, a Lieutenant in the Royal Navy, having, it is said, been in communication with Flinn, and taken a great interest in Flinn's iron cables, took out a patent, and in the year 1810 he prevailed upon the British Admiralty to put iron cables on several Men-of-War, with such successful results that the days of hempen cables became numbered; Lieutenant Brown afterwards devoted his attention to the making of chain cables, and established a manufactory at Millwall on the Thames, he also, with the assistance of "John Rennie, an Engineer," constructed an efficient testing machine as he "was of opinion that there was nothing more essential in completing an iron cable than the most rigid attention to proving."

The manufacture of chain cables naturally commenced on the sea coast, and it rapidly spread

from the Tyne and Wear, where it first commenced, to London, Liverpool, Bristol, and to Aberdeen, and Irvine in Scotland. It may be said, that up to the year 1820, although chain making was a local industry in the district of Birmingham, it was confined to small welded chains in the form of elongated rings, for farming and domestic purposes; but about the year 1820 a new impetus was given to it by the late Mr. Noah Hingley, who then carried on business as a nail master and dealer in small chains at Cradley Heath near Dudley. He in the course of his business made periodical visits to the Port of Liverpool, travelling sometimes by the Stage Coach, and at other times on horseback, and there, one of the new chain cables, with a stud in the centre of each link, attracted his attention. He at once resolved to develop the trade in Staffordshire, and without hesitation made a contract to supply to a Liverpool ship owner, a chain cable made of iron 1½ inch diameter to be used in lieu of an hempen one. It was a bold venture, as no workman in the Midland district had ever seen a chain of such large size, or one fitted with studs, but after a few trials a workman with the assistance of two strikers, and two boys to blow the bellows, succeeded in turning out a good chain cable which was duly delivered in Liverpool, and did good service on board ship. The making of this first chain cable was a source of wonder in the district, and people came from far and wide to see it.

Mr. Hingley afterwards introduced the making of anchors in a similar manner—bringing men from Liverpool with a knowledge of the trade, and afterwards erecting the first Nasmyth's steam hammer for that purpose in the Staffordshire district, namely, at Netherton Ironworks, near Dudley.

Mr. Hingley lived to see the chain cable and anchor trade developed to a large extent, and by several eminent firms who engaged in the business in and about Dudley; he also took part in the establishment of efficient public testing machines at Netherton and at Tipton, under the authority of an Act of Parliament, making compulsory the testing of cables and anchors for British ships. The machines in question are under the control of the Board of Trade, and of Lloyd's Registry of British and Foreign shipping, and are of the most powerful description. One of the machines at Netherton is not only capable of testing, but also of breaking for experimental purposes, a chain made of bar iron 4 inches in diameter.

The manufacture of anchors and cables is now almost exclusively located in Staffordshire, having entirely left the sea coast except at Newcastle-on-Tyne. The making of chain cables and anchors is for the most part carried on in factories and exclusively by men and boys with the aid of machinery, but the smaller chains for a variety of purposes, and especially trace chains, are made to a large extent by women and girls in shops attached to the cottages. There are many hundreds, probably a thousand or two, of the shops in question spread around the district of Cradley Heath and Old Hill in the county of Stafford. It cannot be said that such work is unsuitable for women and girls within certain limits; but there is no doubt that close inspection under the Workshops Act is necessary, and that there should be strict limitations of the hours of labour. The tendency is not only to work children of tender years, but to do so until late at night, especially at the end of the week, to make up for lost time in the earlier part of the week. It is computed that the Staffordshire chain

and anchor trade as a whole consumes annually about 50,000 to 70,000 tons of iron, according to the state of trade, and the annual value, when trade is fair, approaches one million sterling. The workpeople earn from five shillings per week—the wages of a woman or girl—to fifty shillings per week, the wages of a large cable maker. It is a singular fact that anchor makers are to a considerable extent either Irish or of Irish origin, the descendants of the original stock imported from Liverpool by the late Mr. Noah Hingley. Their work is laborious and the wages continue high, varying from thirty to sixty shillings per week, and for the most part they spend it freely.

Die Sinking.—[G. SHERRIff TYE.]—(B. 560.) For brooches, buttons, &c., a block of iron is moulded by the forger on to which a piece of cast steel is welded. Medal dies are all steel, as the powerful pressure applied would flatten them were they of iron. When a sharp blow is given, instead of pressure, the part-steel die stands the blow well, though it will not withstand a squeeze. While the steel is soft the die is cut out with steel cutting tools and finished by gravers, previous to the final polishing. The die sinkers of Birmingham make dies for the following purposes, among others: buttons, military ornaments, brassfoundry, plated wares, tea trays and tin work, gun work and small iron work, medals and coins, jewellery, seals for wax and paper embossing, brass dies for paper wrappers and bands, as used in the wholesale linen trades; needles, papers, etc., wheels and rolls for ornamenting metal tubes or sheets.

Saddlery Trade.—[THOMAS MIDDLEMORE.]—(B. 463). *Obsolete Articles of Manufacture.*—The articles supplied by the Saddlery trades being for use rather

than for ornament, it follows that fashion can have little effect in making any of them obsolete. Old wants have still to be satisfied.

It is yet worth noticing that whilst a very large trade was done some 30 years ago in shot belts, shot and cap pouches, and powder flasks, this trade has now become practically obsolete, since the breechloader has superseded the muzzleloader. Cartridges, both for military and sporting purposes, are now carried in a bag, or a bandolier, *i.e.*, a shoulder or waist belt, to which is fastened transversely a series of pockets, each of which holds a cartridge.

New varieties introduced.—For welts of saddles, "hide bellies" split very thin have for the most part taken the place of seal skins. Crocodile skins have been used occasionally for saddles with indifferent success, but for bags, purses and pocket books, they, along with snake skins, have been largely and successfully employed. Calf skins for the latter purposes have been superseded by hides split specially thin. Kangaroo skins are now used in the whip trade for covering whips, but still more for making the whip thong. Hog skins, for which formerly the sole use was the saddle manufacture, are now prepared for furniture purposes, bookbinding, and bags. They have the advantages of being very durable, and of having a unique and handsome grain.

Saddles—The old "spring bar," to which the stirrup leather is fastened, is gradually giving way to the "safety bar," the object of which is to release the rider in the event of a fall, and to remove the danger of his being dragged, which is an universally admitted fault of the old "spring bar." Further,

increased safety is secured to lady riders by various "safety stirrups" which render dragging by the foot impossible. For the comfort of the horse the following inventions are worth notice:—"Gaussen's corrugated rubber pannels" which break the jar caused by the weight of the rider—"Inflated air pannels," which have the same effect—"ventilating pannels," which are at the same time movable; these last prevent the danger of sore backs, and are very readily cleaned; they promise to become of general use.

Harness.—The changes that have here taken place concern rather the furniture or metal work, than the general form. For cheaper kinds of harness, electro-plating has superseded close plating. Again, electro-plating in its turn is being superseded by the new white metals, which are alloys having the colour of silver, and of analogous composition to German silver. The advantages of the new metals are, that they are uniform in their composition, and therefore durable, cheap, and of good appearance.

Military.—The regulation saddle of 20 years back, called the "Nolan," has been superseded by an "Iron Arch Saddle," and now another regulation, introduced in 1884, made entirely of steel, with the exception of the wooden side bars, is being used along with the "Iron Arch Saddle." The old "knapsack" has given place to the new "Valise Equipment," which was designed to distribute the weight of the pack more evenly. On the introduction of the Camel Corps, a special equipment was designed. Large quantities of this pattern were used in the Egyptian campaign.

Travelling Appointments.—The "Gladstone Bag," a combination of a bag and portmanteau, has become

more popular than any kind of either the one or the other. Tin Boxes have quite replaced the old wooden trunks. The quality has, however, of late years, been so reduced in order to force a sale, that unquestionably a reaction has set in against them. When damaged they are unsightly, and cannot be repaired. Baskets covered with canvas or leather are now, in consequence of their cheapness, lightness, and strength, much used for ladies' travelling trunks. The introduction of Bicycles and Tricycles has created a new and vast trade in saddles, satchels, and the like for wheelmen. The trade is now only second in importance to that for ordinary English riding saddles.

Increase since 1865.—In the year 1864, the declared value of the exports of saddlery and harness for the United Kingdom was £345,419. For the year 1885, the total value was only £385,687. This increase, of less than 12 per cent., compares unfavourably with that of the sixteen years from 1849 to 1865, which was more than 300 per cent. The exports for the first four months of the present year were £122,093, which is less than the exports for the same period in 1865 by £8,569. This declining prosperity, which has occurred during the past five years, is due to a strangled trade in South Africa, and droughts in Australasia. Good seasons, and a rise in the wool market, give promise of an immediately better future for the saddlery trade.

Effects of the spread of Civilization on Supply of Raw Material.—The most noteworthy fact in the leather trade, with regard to the spread of civilization upon its supply of material, is furnished by the basils now sent in enormous quantities from the Australasian Colonies. Before 1865, a sheep was grown simply for

its fleece, and tallow. Of late years the skin has been tanned, and converted into a basil. These Colonial basils supply a demand which the home production has, of late years, failed to satisfy. The Colonial basils are excellent in colour and texture. If they were tanned in larch instead of the native mimosa bark, they could scarcely be further improved. The increase of competition has, during the past twenty years, led to the adulteration of leather. The adulterants most used are glucose and barytes. Such adulteration is now so general, that large consumers of leather are compelled to avail themselves of the resources of chemical science, in order to learn the true value of the leather they buy, by ascertaining the kind, and by estimating the quantity of the adulterant employed in the leather tested.

New Processes introduced in Leather Dressing.—The old "Splitting" Machines have been improved, and a new kind called the "Band Knife" has been introduced. Further Machines for "Scouring," "Setting," and "Rolling" leather have been invented, which do their work both better and cheaper than hand labour. The currier, as a rule, welcomes these machines, since he is thereby relieved from much hard physical toil, whilst his special skill has an unimpaired scope, and is just that part of his work that is best remunerated. Saddles—The sewing by Machine has now become universal, and in point of quality is only just inferior to hand work. Harness—The "Lock Stitch" Machine has superseded the "Chain Stitch" Machine. The former sews with hard wax, such as is used in handwork. Generally for all cutting, where quantities are required, and when shaped pieces other than strips are wanted, the steam press has superseded the hand knife.

Machinery or Hand Labour.—During the last 20 years all branches of the saddlery trades have benefited by the steadily increased employment of machinery—this is most marked in the currying of leather.

Effects of Improved modes of Manufacture on Cost of Production.—The articles of the saddlery trade combine so many different kinds of material and include such a variety of labour, that no estimate could be relied upon of the reduction of cost due to improved methods of manufacture. The values of articles generally reckoned in money are about 10 per cent. below the values of 1865.

Present Extent and Description of Manufacture.—In regard to the Home trade it is only needful to say that owing to the agricultural depression of the past 10 years, the demand for saddlery has very greatly fallen off. To some extent this falling off in bulk is supplied by the demands of cycle riders. In the Foreign trade the past 20 years have witnessed a vast development of the demand from the South African Colonies. This, owing to a series of seasons of drought, to the commercial panic of the diamond fields, and to the unsettled political state of the Colonies, has been followed by an unparalleled state of depression, which has made the export saddlery trade one of the most disastrously depressed of our industries. Indeed, it has been remarked by one thoroughly conversant with the trade, that, if the present state of things continue, Walsall, which solely depends on the saddlery and leather trades, will, before long, wear the same look as Bruges, with grass growing in its streets.

Effects of Foreign Tariffs.—The effect of the continued high duties in the United States has been

to practically kill the English trade both in saddlery and saddlers' ironmongery. Since the Franco-German war, the French tariff has been increased. This seems to have had little effect on the saddlery trade between England and France. Unquestionably, however, France is now losing markets where formerly her goods were preferred to those of this country.

Where else Manufacture carried on.—Since 1865, Glasgow has ceased to be an important centre of the saddlery trade. It is now chiefly carried on in Birmingham and Walsall, for export saddlery. In military goods, Bermondsey competes with Birmingham and Walsall.

Approximate Number of Persons employed in this Town and District.—Men, Women, Boys, and Girls.—No satisfactory statement can now be made, as the present time is one of exceptional depression.

Average Earnings.—Speaking generally there has been a reduction in money wages of about 10 per cent. This wage reckoned in commodities, of course, represents a substantial improvement, as compared with 1865. In good times the workman was never so well remunerated, and, on the other hand, his employer so poorly rewarded.

Social Condition of Workpeople.—No remark need be made in regard to the improvement of his social condition which the saddler has shared with those of other trades. The Factory Acts have practically ended the employment of children. The trade hardly knows the "half-timer." The new Patents Act has proved a great stimulus to the invention of the workman.

Utilisation of Waste.—If the past 5 years have been disastrous for the saddlery trade, misfortune has yet

taught its lessons. Chief amongst these are an economical use of material, and the utilisation of waste. The belly and shoulder parts of hides, which used often to be sent to market, are now mostly consumed, thus saving capital and enabling a cheaper article to be produced. Again, the scrap leather, which is necessarily created by even the most careful cutting, is now utilised in making goods of extraordinary cheapness. A splitting machine for dividing pieces of leather, however small, into any required number of thicknesses, is of great help to this end. When leather is reduced in size below what is required for any article of commerce, it is then used either for hardening purposes, or to form imitation leather when reduced to a pulp and rolled either by itself or with rope fibre.

Chemicals.—In obtaining the statistical information on p. 152, I am indebted in great measure to Dr. Bostock Hill, Secretary of the Birmingham Section of the Society of Chemical Industry.—C. J. W.

APPENDIX TO GEOLOGY AND PHYSIOGRAPHY.

PART III., PAGES 213 TO 265.

MINERALS. (OF THE BIRMINGHAM DISTRICT.)

BY C. J. WOODWARD, B.SC., F.G.S.

The crystalline minerals occurring within the limits of the Birmingham district may be most conveniently referred to under the titles of the

several counties in which they actually occur. These counties are: Derbyshire, Gloucestershire, Leicestershire, Northamptonshire, Nottinghamshire, Oxfordshire, Shropshire, Staffordshire, Warwickshire, and Worcestershire.

Derbyshire.—The mines in this county are worked out, and there is but little opportunity of meeting with minerals. On the spoil-banks of the old mines poor specimens may be found. Mr. John Tym, of Castleton, is a local dealer, and the guide to the High Tor Grotto has minerals for sale. The following list with localities is taken from a paper on "Economic Geology of Derbyshire," by Mr. A. H. Stokes, F.G.S., H.M. Inspector of Mines. *Barytes*, nearly all lead mines, Newhaven; *Blende*, Old hillocks, near Ashover and Hartington; *Gypsum*, Chellaston, also railway cutting between Trent and Loughborough; *Brown Hæmatite*, north west of Hubberdale mine, near Taddington, also near Elton; *Brown Lead Ore "Linnets,"* Elton, and Newhaven, Winster; *Calcite*, colourless at lead mines of Nether Haddon, near Bakewell. Alpart, Ashover, and Wirksworth yield good specimens. *Elaterite*, Windy Knoll Quarry, Main Tor, Castleton; *Fluor Spar*, Blue John and other mines, Castleton; *Limonite*, a field, one mile north of Castleton, and to the east of Odin Lead mine; *Petroleum*, Riddings Colliery, near Alfreton. A sump is sunk at the bottom of the mine, and into this the oil finds its way. Some years as much as 100 tons of oil have been obtained at a price as high as £7. 10s. per ton. *Phosgenite*, very scarce, Meer Brook Sough mine, near Worksworth; *Pyrites*, large cubic crystals at Gregory mine, near Ashover; *Rock crystal*, Buxton, in amygdaloid cavities of toad stone; also Diamond Hill, near Miller's Dale station; *Towanite*, Old hillocks at Ecton mine, Cumberland mine, Matlock Bath; *Wad*,

mines near Elton; *White Lead Ore* (*Cerussite*), near Brassington; Heyspots mine, near Elton; Cabin mine, Newhaven. A more extensive list of the minerals of Derbyshire, compiled by the Rev. J. M. Mello, will be found in "The Midland Naturalist," Vol. iv., p. 183.

Gloucestershire.—Mr. H.B. Woodward, of the Geological Survey, has given the following list:—*Agate*, Berkeley, Damory Bridge; *Barytes*, Tortworth; *Bitumen*, Clifton; *Brown Spar*, Tortworth; *Celestine*, Tortworth, Thornbury, Wickwar, Aust; *Fluor Spar*, Clifton; *Göthite*, Clifton; *Jasper*, Tortworth; *Prehnite*, Woodford Bridge, Berkeley; *Rock Salt (pseudomorphs)*, Aust; *Steatite*, Tortworth; *Talc*, Tortworth; *Vivianite*, near Clifton.

Pyle Hill, near Clifton, is a well-known locality for Celestine. At Garden Cliff, near Westbury-on-Severn, the "bone bed" is well exposed, and in this bed occurs plenty of iron pyrites; and in the shales, as might be expected, crystals of selenite occur.

Leicestershire.—*Gold* occurs in the quartz veins round Pedlar Tor, Charnwood Forest. *Garnets* occur in "gneiss" at Brazil Wood (Mr. W. J. Harrison). *Copper pyrites*, *Molybdenum*, Mount Sorrel and Breedon. *Galena*, *Blende*, Dimminsdale; *Dolomite*, Cloud Hill; *Gypsum* and *Selenite*, various places; *Iron pyrites* in cubes, Swithland Great Pit (Mr. James Plant).

Northamptonshire and Oxfordshire.—*Barytes*, *Blende*, *Calcite*, *Galena*, *Glauconite*, *Gypsum* (*Selenite*), *Lignite*, *Limonite*, *Pyrites*, *Websterite*, occur in the neighbourhood of Banbury (Mr. Thomas Beesley).

Nottinghamshire.—*Gypsum* occurs in veins near Retford, and is used for garden rock-work.

Shropshire.—At Lilleshall an old mine known as the Stump Leasow, worked for limestone, yielded the following minerals:[67]—*Quartz*, a minute crystal only. *Erubescite*, a few minute patches in the massive form. *Copper Pyrites*, in sphenoids. *Iron Pyrites*, in radiating masses. *Hæmatite*, in minute chocolate-coloured hemispherical masses, also in an almost continual film containing the calc spar and other minerals with a coppery sheen. *Barytes*, in pink, lamellar, somewhat radiating masses. At the free surfaces of these masses are transparent crystals. *Calcite*, in beautiful ice-like clusters of crystals taking the form of steep three-faced pyramids. The groups are made up of steep scalenohedrous with rhombohedral summits. The calcite is in some cases pink due to manganese, a sample contained 1·20 per cent. of MnO. In the lower measures the calcite occurs in pointed scalenohedrous lining cavities in the stone. *Dolomite*, is the most interesting mineral of the group. It occurs in nodules made up of a succession of laminæ of varying diameters, the laminæ crystallizing at the edges in rhombs resembling pearl spar. The composition of one sample of this dolomite is nearly identical with what according to Boricky is one of the possible values of Ankerite. Another approximates to the formula 3 $CaCO_3$ + (FeMn) CO_3 + $MgCO_3$ and should be described as a ferriferous dolomite.

In the mining district of West Shropshire many beautiful and interesting minerals are met with. The district is best reached from Birmingham by taking train to Minsterley, via Shrewsbury. At Snailbeach Mine, near Minsterley, occur beautiful rhombs of *Calcite*, having a violet tinge, due to a small quantity of manganese. There are also crystals of *Blende* and *Galena*. At several of the mines *Witherite* and *Barytes*

are found, and, according to Mr. Morton, other minerals met with are *Quartz*, *Chalcedony*, *Petroleum*, *Pyrites*, *Malachite*, *Redruthite*, *Wad*, *Minium*, and *Cerussite*. At Wotherton, two miles from Chirbury, is a fine barytes lode which has been worked for more than 60 years, at first as an open mine, and subsequently by means of a shaft. The barytes is remarkably pure, and after grinding is sold in large quantities. In the lode are crevices and cavities filled with a fine mud, and penetrating into the mud are fine transparent crystals. These crystals have been measured by Mr. Miers, of the British Museum, and a record of the forms present will be found in his description.[68] ("Nature," vol. xxix., p. 29.)

In connection with the mineralogy of Shropshire, it should be recorded that the extremely rare instance of the fall of an iron meteorite in the British Isles took place in this county at Rowton, near Wellington, on April 20th, 1876. This meteorite was extracted by Mr. G. Brooks, from the hole in which it had buried itself, and was hot when removed. It is now in the possession of the British Museum, and Prof. Maskelyne has given particulars of it in "Nature," vol. xiv., p. 472. It weighs 7 lbs. 11 oz., "is a mass of metallic iron irregularly angular, although all its edges appear to have been rounded by fusion in its transit through the air, and, except at the point where it first struck the ground, it is covered by a thin black pellicle of the magnetic oxide of iron … the exposed metallic part of the surface exhibits crystalline structure very clearly when it is etched. It is only the seventh aërosiderite or meteoric iron of which the fall has been witnessed, although upwards of a hundred iron masses have been discovered in different parts of the globe, which are undoubtedly meteoric, and two such have been found in Great

Britain."[69]

Warwickshire.—Many years ago a pocket of *Grey Oxide of Manganese* was found near Atherstone, but I have been unable to find now any traces of it. *Gypsum* occurs in the cutting of a disused railway near Henley-in-Arden, and at Spernall (Spernall Plaster Pits), near Alcester. Mr. A. H. Atkins has called attention to the fact that gypsum was met with in sinking an artesian well in Small Heath Park, near Birmingham; he also mentions the occurrence of *Green Copper Carbonate* at Vaughton's Hole, near Birmingham.

Worcestershire.—Dr. Harvey B. Holl mentions the following minerals as occurring at the Malvern Hills: —*Quartz*, *Orthoclase*, *Labradorite*, *Anderine*, *Potash Mica*, *Ferruginous Mica* (*Biolite*), *Augite*, *Hornblende*, *Epidote*, *Chlorite*, *Hæmatite*, *Calc Spar*, *Graphite*, *Zeolites*, and *Garnet*.

[The following articles refer to subjects which could not be included in previous papers, and which are yet worth notice as part of the history of Birmingham.—ED.]

Botanical Gardens.—[SAM: TIMMINS.]—The first proposal to establish Botanical Gardens, in accordance with the science of horticulture of the time, was made in 1829. Twelve acres were secured in the then rural suburb of Edgbaston, and on the advice of the famous J. C. Loudon four more acres were added, and the buildings erected by Clarke of Birmingham, and opened to the public in 1831. The original capital was 500 shares of £5 each, and an

annual payment of three guineas which secured certain privileges of admission beyond those of the subscriber's payment. The institution flourished, with some vicissitudes, for many years, but was necessarily exclusive, and only recently have admissions been made more easy by reduced and varying charges on different days. On Monday—the people's day—large numbers attend, and the experiment has proved successful. The buildings were recently greatly extended and rearranged from the designs of Mr. Frank Osborne, and are now believed to be amongst the best of the kingdom. Flower shows are held during the summer, and prizes awarded, which are eagerly contended for by numerous horticulturists and florists of the town and neighbourhood.

Guinea Gardens.—[SAM: TIMMINS.]—Near the Botanical Gardens a group of small gardens may be seen, which are the only "survivals" of the acres of "allotment gardens" or "guinea gardens," which surrounded Birmingham within a mile from the centre as late as 1830 to 1840. Birmingham was, in fact, a town of gardens fifty years ago, not merely as to the gardens attached to houses—front and back gardens in the principal parts of the town,—but of the groups of gardens rented by workmen and others, who could reach their gardens easily from their homes by a short walk, and devote mornings and evenings to them. The sites of the Kent Street Baths, and those opposite St. Thomas's Church,—at Ladywood, Spring Hill, Hockley, Handsworth, and Aston road,—all within the Parish Boundary, formed a belt of gardens where the workman and his family often spent the summer evenings and enjoyed the (then) country air. All is now changed, and the distances even by rail and tram are too great, and

land too valuable, to be let out in readily accessible gardens for the workers of the town, who cannot for many reasons live in the suburbs which railways have opened since 1840.

Sunday Lecture Society.—[THOS. ROSE.]—This Society, which has now become one of the most successful of our local institutions, had a very humble origin. In 1877, a few members of the Birmingham Temperance Society (foremost amongst whom was Mr. Thos. Hewins), conceived the idea of holding Meetings on Sunday evenings "for the social, moral, and intellectual improvement of the non-church and chapel-going portion of the community." They accordingly formed themselves into a Committee, who engaged the then newly erected Board Schools in Bristol Street, for the winter season of 1877-8, and commenced what were described as "Sunday Evening Meetings for the People." For a short time these meetings were of a purely temperance character, but finding that they were not so thoroughly appreciated as they had expected, the Committee extended the variety of the subjects, and lectures were delivered embracing a wide range of thought, both moral and religious, literary and dramatic, scientific and historical, occasionally interspersed with musical evenings illustrative of the principal oratorios. Foremost amongst the lecturers (who numbered many of our chief local literary and scientific men), was Mr. Sam: Timmins, who from the first took an active part in the movement, the success of which was from this time assured, the lectures being attended by crowded and appreciative audiences every Sunday evening, and occasionally hundreds were unable to obtain admission.

In 1880, the then Mayor (Alderman R.

Chamberlain), generously offered the Committee the free use of the Town Hall, and for some months the lectures were delivered consecutively in that place to audiences numbering from 3 to 4,000 each Sunday. This gave rise to considerable opposition on the part of the various religious sects of the town against what was considered to be "a monopoly of the use of the hall by one particular sect," and after much controversy in the public press, and debate in the Town Council, the question of the letting of the Town Hall on Sundays was left in the hands of the Mayor for the time being, on the understanding that its continuous use by any one sect should be refused. Thereupon the lectures were resumed in the Bristol Street Board School, with occasional special lectures in the Town Hall.

In 1881, the movement assumed a more representative character. The then Hon. Sec. (Mr. T. Rose), assisted by some of the leading members of the Committee, took steps to organize a Sunday Lecture Society, and a Meeting was held on July 1st, 1881, under the Presidency of Mr. William Harris, J.P., when the present Society was publicly inaugurated, the objects being—"To provide for the delivery on Sundays in the Borough of Birmingham, and to encourage the delivery elsewhere of lectures upon subjects calculated to promote the social, moral, and intellectual well-being of the community at large, as hitherto conducted by the Committee of the Sunday Evening Meetings for the People."

The constitution of the Society also provided that a minimum subscription of One Shilling per year should constitute membership, and that any pecuniary profit should be applied to the further promotion of the objects of the Society. Mr. Sam:

Timmins was elected first President, and the management of its affairs was entrusted to a Committee of 30, exclusive of Officers, to be elected annually from amongst the body of members.

In the first year of the Society's existence the members numbered 80, including the names of many of the most influential public men of the town, and the subscription list amounted to £45. 14s. 6d. The number of members is now 168, and the subscription list amounts to £70; the income being further augmented by the collections taken at the various lectures (which are thus largely self-supporting). Nearly all the lectures being given voluntarily, the cost of working the Society is comparatively small, and is fully met by the income derived from subscriptions and collections. Five of the principal Board Schools are engaged every Sunday evening throughout the winter season, from October to April, and at intervals special lectures are delivered in the Town Hall. During the season from 1885 to 1886, 71 lectures were delivered at the Board Schools, with a total attendance of 23,150, or an average of 326 to each lecture, and 10 lectures were delivered at the Town Hall, with a total attendance of 33,000, or an average of 3,300 for each lecture. Ald. R. Chamberlain, M.P., is now President of the Society, as well as one of its most popular lecturers. In Councillor R. F. Martineau, the Committee possesses a most able and energetic Chairman. Mr. W. B. Smith is the Treasurer, and Mr. J. H. Forrester, No. 1, Summer Hill Terrace, worthily fills the office of Hon. Secretary.

Newspapers.—[SAM: TIMMINS.]—The earliest known Birmingham Newspaper was "The Birmingham Journal," published by Thomas Warren,

in 1733. It was at first published on Thursdays, but afterwards on Mondays. Only one copy has survived, that of May 21st, 1733, No. XXVIII. The "Journal" is interesting as it shows some traces of the style of Dr. Johnson, who very probably assisted Warren in his newspaper. "Aris's Birmingham Gazette" was first published in 1741, and its original title is used on the Saturday issue from the Daily Gazette Office to this day. It was originally published on Mondays, and some of its earlier issues bore another heading, for special County circulation. "Swinney's Birmingham Chronicle" was published for several years, from 1796 to 1816, but no complete file has been preserved. Jabet's "Commercial Herald" was issued from 1804 to 1813. The "Birmingham Journal" was revived in 1825, by Wm. Hodgetts, and was continued until absorbed in "The Daily Post." The "Birmingham Advertiser" was commenced in 1833, and continued till 1845. In 1836, the "Midland Counties Herald" was begun on a new plan of gratuitous circulation and is continued as a sheet of advertisements and news relating to the land and agricultural interests to this day. The "Birmingham Morning News" appeared in 1871, with George Dawson as its first editor, and was continued till 1875.

"Aris's Birmingham Gazette" was one of the first two country papers which began a series of "Local Notes and Queries" in 1856. The example has been very generally followed, and the series continued in the "Weekly Post" and the "Weekly Mercury," and many important facts of local history have thus been discovered and preserved.

The removal of the "taxes on knowledge"—the stamp duty and advertisement duty and the paper

duty—soon produced local daily papers, the first being the “Daily Press,” in 1855, edited for some time by George Dawson, and followed by the “Daily Mercury.” In 1857 the “Daily Post” was started, and in 1879 the “Daily Globe” appeared. In 1869 the “Midland Illustrated News” was begun, but it survived only about a year and a half. Among the other newspapers were the “Birmingham Chronicle” (1823); the “Midland Chronicle” (1811); the “Philanthropist” (1835). Many other short-lived newspapers have been issued from time to time—many of which are to some extent preserved by odd copies in the Reference Library, and among them a German newspaper of which only one number appeared. Birmingham was one of the first towns which produced a Sunday newspaper—the “Sunday Echo,” and some others have been issued since. The “cheap press” secured a very large number of readers, when the first halfpenny daily evening paper, the “Daily Mail,” was established in 1869, followed for some time by a similar issue from the “Daily Gazette” office, and afterwards by the “Midland Echo.”

Many monthly pamphlets—practically newspapers—were issued, such as the “Independent” (1827), and “Inspector” (1817); the “Weekly Recorder” and “Register” (1819), by George Edmonds; and many serials, sarcastic or humorous, have appeared from time to time. The scurrilous “Argus” of fifty years ago, and later the “Town Crier” (1861), “Brum,” “Graphic,” “Dart,” “Owl,” “Free Lance,” &c., with our illustrated “Phonographic Punch,” and one local monthly, “Edgbastonia,” in which many interesting biographies of local celebrities have appeared. On several occasions Sunday sermons have been published in serials such as the “Birmingham Pulpit”

(1871-73). Other attempts to establish newspapers for discussion rather than mere news have been tried as in the "Liberal Review" (1880).

Theatres.—[SAM: TIMMINS.]—Birmingham has been famous as a theatrical town for nearly a century, and especially as the "training ground" where many of the leading actors of the present century learned their art and won their first laurels. The stage was, however, rather a late creation in Birmingham, and no traces are found earlier than about 1730, when mere booths served the purpose of a "play-house," and actors were only "rogues and vagabonds" according to law. "A shed in Temple Street" and a "stable in Castle Street," with admission threepence each, and the small band parading the town during the day, in the absence of newspapers, to announce the performance, formed, according to Hutton, the "rise of the drama" in our town. As early as 1750 travelling circuses and theatres appeared in Coleshill Street; and in 1802 the famous Astley brought his circus to the "back of the Stork Hotel." In 1730 a temporary building was erected in Moor Street, in 1743 another in New Street, in 1747 another in Smallbrook Street, and in 1776 a more important and permanent theatre was built in King Street—a street covered by the railway station and Stephenson Place, and the site of the theatre being now that of the front of the Exchange. This became an important theatre, and existed till late in the century in competition with the present Theatre Royal, which was founded about the same date. The few play bills which have survived, and the expenditure on the building, show that every effort was made to do justice to the drama a century ago. At this date theatres were merely tolerated, but in 1777 an application was made for a licence for the

New Street Theatre to play for “four months in the year,” and this application was somewhat famous, for it was eloquently supported by Edmund Burke, who used the phrase—since so well-known and so little understood—that Birmingham was the “great Toy-shop of Europe.” The phrase, however, was not new, but was used in a book by Sir Samuel Morland a hundred years earlier to describe the shops where trinkets and small steel and iron wares were sold, and not in connection with children’s “toys.” The second reading of the Bill, to enable His Majesty the King to grant a Patent was, however, lost, but the enterprise was continued, and in 1780 the present front of the Theatre Royal was erected with a commodious theatre, well lighted by wax candles, and with “the passages warmed with stoves” as the performances were to be given in the winter as well as the summer months. It was not till 1807 that a “Patent” was secured for the Theatre which then became the Theatre Royal, and still remains under the jurisdiction of the Lord Chamberlain. In 1778 a “wooden building” was erected as an “opera house,” near the Plough and Harrow, in the Moseley Road, but this was burned down soon after. In 1792, the Theatre Royal was destroyed by fire, and again in 1820, but the front remained unharmed in these two great fires and the medallions of Shakespeare and Garrick remain as placed in 1780. In both cases the fires were believed to be incendiary and with good reason too. In 1795 the Theatre was rebuilt and re-opened by William Macready, who remained till 1810, in which year, on June 11, his future famous son, William Charles Macready, appeared as Romeo, —“a young gentleman and his first appearance on any stage.” In 1813, Macready was followed by Elliston, as lessee, and in 1819 he was succeeded by

Alfred Bunn. During all this period all the great actresses, and actors, and singers, and celebrities of the time appeared on the Theatre Royal stage, and a very complete series of Play Bills has fortunately been preserved. The present lessee, Mr. M. H. Simpson, and his father have had the Theatre Royal for fifty years, and recently additions and alterations have been made, not only in the Theatre proper, but in the accessory rooms for actors and scenery which have never been surpassed for extent and convenience. The Theatre Royal was, practically, the only theatre for many years, but in 1853 a dramatic licence was granted by the magistrates for a building on the Bingley Hall site: in 1856 the "Music Hall" in Broad Street was built, but in 1862 it was converted into a theatre, and opened as the Royal Operetta House, by Mr. W. H. Swanborough. In 1866 it was bought by Mr. James Rodgers, and in 1876 was practically rebuilt, and additions and alterations are now in progress under Mr. Rodgers and his Son. In 1879 a license was granted to the Holte Theatre, in the Aston Lower Grounds; and the Grand Theatre, Corporation Street, built and managed by Mr. Andrew Melville, was opened November 14, 1883. In 1785 an Amphitheatre existed in Livery Street and was converted into a Chapel: in King Street the Theatre was also converted into a Chapel, and afterwards back again to a Public Hall; and in 1827 the Circus of James Ryan, permanently built some years later, was converted into the Circus Chapel. In short, the great progress of Birmingham in the second half of the last century was felt in every way: the Musical Festival was founded, and the drama grew rapidly as the town extended and the taste of the public improved.

THE COVENTRY INDUSTRIES.

BY W. G. FRETTON, F.S.A.

An exhaustive account of the ribbon and watch manufactures of Coventry, with technical descriptions of the various processes involved in the treatment of the raw material, in its progress of manufacture from its primitive condition to its finished state, having already appeared in the comprehensive series of articles in the midland industries, published on the occasion of the former visit of the Association in 1865, it only remains to note the changes and additions which have been made since that period in the Industries of Coventry.

Ribbon Trade.—Several causes have combined to produce a very serious decline in the manufacture of silk fabrics, the chief of them being the French commercial treaty, to which may be added change of fashion, and increased competition and more rapid production by the further development of machinery. From 1860 to 1878 the ribbon trade in Coventry and its neighbourhood, had decreased by at least one half, and the decline has been going on since that period, with exceptional experiences of spasmodic improvement, ever since. Efforts have been made in various ways to direct the textile skill of the artisans into other channels wherein their weaving abilities might be turned to their advantage, and the area of textile manufactures increased. In one of these departments may be specially noticed the manufacture of *bookmarks*, and other illuminated ribbons. This trade was chiefly introduced by Mr. Thomas Stevens, and has been most successfully developed by himself and other manufacturers, until their extent, beauty of design, variety of application,

&c., have been marvellous. Portraits, valentines, presents suitable to the seasons, birthdays, views of noted buildings, poetical sentences, mottoes, labels, and other decorative and descriptive ornaments have been produced, which, half a century ago, it would have been deemed impossible to produce from a loom. But this has involved the construction of complicated and expensive machinery, and has raised the art of loom-making considerably. Such a trade is, after all, but limited, it is the production of a luxury, a merchandise "which none but the rich can buy."

Trimming Trade.—Another department of textile industry which has sprung up, somewhat analogous to the Ribbon manufacture, is the Trimming trade, for which special looms have been adopted—cambric frilling, mainly introduced by Messrs. Cash; bead work, and other ornamental fabrics have also been introduced.

Cotton Spinning and Weaving.—Soon after the decline of the ribbon trade the attention of the Coventry manufacturers was drawn to the experiment of introducing the cotton spinning and weaving. A large factory with suitable annexes for carrying on a large trade was erected on the north side of the city by a company formed in 1860, the Rev. S. H. Widdrington, then vicar of St. Michael's, taking a great interest in the project. Its operations have been attended by varied success; the distance from the centres of the cotton trade forming an obstacle to its full development, the spinning department has received most attention.

Elastic Web.—In 1859 Messrs. Dalton and Barton introduced the manufacture of elastic webs, but afterwards disposed of this department of their

business to Mr. Pridmore, by whom it is still carried on at Foleshill. In 1862 a company was formed for carrying on the same kind of trade, chiefly through the instrumentality of the vicar of St. Michael's, and known as the Coventry Elastic Weaving Company, and for nearly twenty years it conducted a large business, having branches at Red Lane, Foleshill, and in White Friars' Lane, Coventry. Owing to a brisk competition in other weaving centres, and consequent over-production, the company dissolved a few years ago, a portion of the plant and trade being retained by Mr. J. C. Odell, one of the members of the company, and still successfully carried on. There are several firms in the city conducting similar business.

The Bradford Stuff Manufacture was introduced into Coventry in 1864, and established in a large disused factory, originally erected as a cotton mill, in Hill Street, afterwards occupied as a ribbon manufactory. The firm is known as the "Leigh" Mills Company (Limited), the present Lord-Lieutenant of the County having shown much interest in the promotion of this and other new industries in Coventry. Excellent woollen and worsted goods are made here, silk and cotton being also used in some of the varieties manufactured.

Coach Lace and Broad Stuffs for railway and other carriages, trimmings for furniture, &c., are largely manufactured by Messrs. Dalton and Barton, Messrs. Perkins and Son, and others.

Silk Dyeing is still carried on to a considerable extent by several firms, and the city maintains its old character for the permanence and brilliancy exhibited in this class of work, which is one of the ancient staples of the city.

It will be seen that while Coventry still maintains its textile productions in the weaving industry, its works are not confined to ribbons, and the manufacturers and artisans generally deserve the highest commendation for the spirit and the aptitude they have displayed in adapting themselves to the altered circumstances of the textile industry of the city, and the opening up of new branches of the weaving industry has emancipated the city from dependence on the ribbon trade alone.

Many firms are still engaged in the manufacture of ribbons, sashes, ladies' scarfs, &c., and during the last year or two, gauzes having been in demand have been largely made.

Watch Manufacturing.—Coventry is one of the principal places in England for this branch of manufacturing industry, and at the head of the numerous firms engaged therein, Messrs. J. Rotherham and Sons hold the first and oldest position. A trade of such extent, and exhibiting so many stages of progress in its production, necessarily possesses many features of interest, and may be divided into the following, with minor divisions springing from them:—watch manufacturers, case makers, engravers, springers, engine-turners, and polishers; cap makers, dial makers, escapement, balance, pallet, roller, and lever makers; movement, motion, index, hand, and glass makers; fuzee cutters, gilders, examiners, and finishers; jewellers, keyless motion and movement makers, and motioners.

The trade has been subject to many changes and fluctuations, and is at present in a depressed state, owing largely to foreign competition, and the production of cheap watches by means of machinery. Efforts have been made by more than one of the

Coventry firms to meet the latter source of competition by the introduction of machinery in the construction of various parts of the watch, and in the subdivision of labour, more especially in the class known as “going barrels” with various measures of success; but for the better class of watch, the old system bids fair to maintain its position. A project for the establishment of technical schools for special instruction in the various processes in connection with the Coventry staple trades in general, and that of Horology in particular, is still under consideration, and may lead to satisfactory results. There are about 150 manufacturers of watches in Coventry.

The Cycle Manufacture was introduced into this city about 20 years ago in conjunction with the making of sewing machines. The latter branch of trade has given place almost entirely to the former, and the reputation which the various firms engaged in the trade have succeeded in obtaining, have placed Coventry in the first rank in this new and peculiar manufacture. The Coventry Machinists’ Company (Cheylesmore) were the first to introduce this trade into this country, and it is still one of the largest of the producers. Among the rest may be mentioned the Rudge, Premier, Singer and Co., Fleet, Centaur, Meteor, Excelsior, Wellington, Victoria, and others, all of which have some speciality claiming some peculiar excellence.

Artistic Work in Metal was introduced into Coventry chiefly by the exertions and artistic taste of Mr. Skidmore over 30 years ago, and has been followed out by himself, and by various Companies in the same direction ever since. Work from the different firms established in Coventry of great excellence, may be found in many of the principal

towns in the British Islands, and on the Continent, notably in Lichfield and Hereford Cathedrals, Prince Consort Memorial, Burlington House, &c. Ironfounding and agricultural implement manufacturing has also attained a high position of excellence under the firm of Matterson, Huxley, and Watson of this city.

FOOTNOTES

[1] The information in this section, up to the close of 1884, is taken from the very accurate and interesting "History of the Corporation of Birmingham," by J. Thackray Bunce. Two vols., 1878 and 1885.

[2] In 1795 it had risen to £1,200; in 1818 to £3,000; in 1861 to £11,000; in 1880 to £21,983; and it is reckoned that at the end of the century the revenue of the School will be £50,000.

[3] This barn and croft were taken away in 1738 from both chief master and usher, and their salaries raised in lieu to £88. 15s. 0d. and £60.

[4] In all these provisions boys from the manor had the preference.

[5] An alternative plan, apparently not adopted, was to have two exhibitions of £5 each, at Catherine Hall, Cambridge; and two fellowships of £30 a year each at the same college.

[6] The first exhibitioners were William Milner and Bartholomew Baldwin, in 1677. Up to 1817, eighty-two exhibitioners had been elected. In 1723, however, a chancery commission declared it a manifest breach of trust on the Governors' part that no exhibition had been granted for twenty years; while on January 18, 1734, *the chief master, having no scholars under his care*, William Spilsbury, jun., a scholar in the *usher's* school, was elected exhibitioner at Oxford, no other boy being qualified or likely to be qualified for some years.

[7] See the illustrations in *Hutton's* Birmingham.

[8] The first appointed were in 1752, as follows: William Latham, in Dudley Street; Thomas Wilson, near the Old Cross; Mary Ankers, wife of Noel Ankers, in Freeman Street; another Widow Austin, in London Prentice Street.

[9] For some reason not very clear, the *branch* school in Shutt Lane, as also a drawing school established by the Governors, were in 1829 declared by a decree in Chancery to be unauthorised by the charter, and were then discontinued.

[10] This was the original intention. But one of these two large apartments was taken by the Governors, and the room designed for the library was given to the commercial school in its place. The latter is now the assembly room of the Girls High School.

[11] It should be added that Mr. Green's report also declares that "it is universally admitted that the present Board has discharged its duties with all care and conscientiousness."

[12] The present bailiff.

[13] See the development of 1883.

[14] The imposition of fees has ever been a sore point. The first report of the new Town Council Governors was issued on January 7th, 1879, and stated that they had endeavoured to reduce these fees; and in 1880 they expressed their regret at their imposition.

[15] In 1800, there were 120 boys: in 1850, 250 boys; in 1860, 456 boys in Grammar School, and 1080 children in the Elementary Schools: there are now 343 boys and 195 girls in the High School: 849 boys and 644 girls in the Grammar Schools. Grand total, 1493.

[16] The number of Masters in the Grammar School was, in 1878, 26; in the Elementary Schools there were 20 teachers and 21 monitors.

[17] Existing rights reserved; in 1878 the Head Master had 17, and the second Master, 5 boarders.

[18] These amounts have been greatly exceeded. The annual expenditure on exhibitions is, Boys' High School, £690; Girls, £200; Boys' Grammar School, £270; Girls, £360. There is only one James Exhibition.

[19] Opened September, 1883.

[20] Five sums of £1,000 each for Scholarships, Prize Essays, Chaplaincy, Divinity Lectureship, and Medical Tutorship.

[21] *e.g.*, Law, which was shortly added.

[22] The arts department being henceforward regarded as preparatory to the other two.

[23] In that year the present Warden, the Rev. W. H. Poulton, came into office, and the

number immediately increased to 22.

[24] The purchase value of the property was £110,000, yielding an annual rent of £3,700. £60,000 was spent upon the building and furnishing. The total amount of the benefaction will, in the end, approach £200,000. As early as 1882, however, we find that the Council "view with regret the narrow margin that is likely to exist unless the present endowment is supplemented by other gifts,"—[Report, p. 11.]—and this anxiety is again forcibly expressed in 1885. It was relieved in that year, however, by an "Additional Endowment Fund," the subscriptions to which reached £4,855.

[25] In 1882, it was ordered that wives and children of Professors, Lecturers, and Secretaries, who died during their term of office, be admitted to all classes without payment.

[26] Two exhibitions of £15 each, increased next year to four, awarded by the Governors of King Edward's Schools, and a Science Scholarship of £20 a year, created by the Trustees of Piddock's Charity, are also tenable at the College.

[27] Various other societies have been formed within the college, *e.g.*, Physical, Chemical, Botanical, Poesy, and French Debating Societies.

[28] The Libraries and Fine Art Gallery were shortly undertaken by the town, and have never formed part of the work of the Institute.

[29] *Paid* Teachers were substituted in 1860.

[30] The Perry Barr and Harborne Institutes had been opened previously.

[31] M. Achille Albitès.

[32] Now covered by the Schools of the Society of Friends, and where Wyatt and Paul's first spinning of cotton by rollers was tried.

[33] The principal object of this part is to shew the development of the parochial system, and readers will therefore kindly notice—

1.—All architectural details are omitted, and will be found under the head, "Architecture," where there is anything special to notice.

2.—Particulars as to patronage, annual value of livings, number of sittings, are, in order to economise space and prevent repetition, relegated to a table at the end of this section, in which table all the churches in the Borough are arranged alphabetically, irrespective of whether they are in the parish of Birmingham, Edgbaston, or that part of Aston parish which is within the Borough.

[34] For the records of these sales see a valuable paper by Mr. J. R. Holliday on St. Martin's Church, in the Transactions for 1873 of the Archæological Section of the Birmingham and Midland Institute.

[35] See the excellent monograph, "Old St. Martin's," by J. T. Bunce, 1875.

[36] A copy and translation of this interesting document will be found in Toulmin Smith's Memorials of Old Birmingham, 1864.

[37] The materials for the historical facts are to be found in the "Sketch of the History of Protestant Non-Conformity in Birmingham," by the Rev. J. R. Wreford, formerly minister of the New Meeting House, Birmingham, 1832, and "Protestant Non-Conformity in Birmingham," by the Rev. J. A. James, Birmingham, 1849.

[38] See the interesting volume, "Memorials

of the Old Meeting House and Burial Ground." by Catherine Hutton Beale. Printed for subscribers by White and Pike, Birmingham.

[39] In the order of time there was an intermediate meeting house in Livery Street, originally a circus, and used by the congregations of the Old and New Meetings, whilst those meeting houses were being rebuilt after the riots of 1791. It was afterwards occupied by a part of the Carr's Lane congregation, on Mr. Brewer's resignation of the pastorate there in 1802, and, it becoming too small, it was resolved to build Ebenezer Chapel. The chapel in Livery Street was pulled down in 1853, and the printing establishment of M. Billing, Sons, and Co., is built on the site.

[40] An excellent paper on the Old Church may be found in the third vol. of the Transactions of the Archæological Section of the Birmingham and Midland Institute.

[41] The principal chemicals manufactured on a large scale are:—Sulphuric, Sulphurous, Hydrochloric, Nitric, Crude Carbolic, Hydrocyanic, and Hydrofluoric Acids; Washing Soda, Bicarbonate of Soda, Rochelle Salt, Glauber's Salt, Carbonate of Potash, Bicarbonate of Potash, Chlorate of Potash, Cyanide of Potassium, Iodide of Potassium, Oxalate of Potash, Bleaching Powder, Ammonia, Sulphate of Ammonia, Sal Ammoniac, Carbonate of Ammonia, Precipitated Chalk, Bisulphite of Lime, Citrate of Magnesia, Fluid Magnesia, Nitrates of Barium and Strontium, Sulphate of Copper, Phosphorus, Milk of Sulphur, Tin Crystals, Benzol, Toluene, Xylene, Phenol, Naphthalene, Crude Anthracene, and other Tar Products, Fruit Essences.

[42] Mungo consists of tailors' scraps of

cloth torn up into shreds, and rendered suitable for working up afresh. Shoddy is a similar material, but made from old garments instead of new material.

[43] A heavy knife used for cutting down sugar cane.

[44] Among goldbeaters Gypsum goes by the name of talc

[45] I am indebted to my colleague Mr. A. H. Hiorns for these particulars.

[46] Sometimes "the process is simply performed by rubbing two pieces of bone quite flat on a smooth stone, and then cutting in one of the pieces the shape required, leaving a hole through to the edge by which to pour in the metal."—Mr. C. B. Bragg.

[47] For these particulars I am indebted to my colleague, Mr. A. H. Irons.

[48] "Birmingham and Midland Hardware District," edited by Samuel Timmins, London, Hardwicke, 1866.

[49] The screw hand-press so generally used in Birmingham trades was the first great means of cheapening the making of steel pens, which had previously been made by hand, in Sheffield and London. Mr. Mitchell, Mr. Joseph Gillott, and Sir Josiah Mason, were the first to make steel pens by press work.—Ed.

[50] This mechanism was first used by James Watt, for copying medallions and busts, and his machines are still preserved at Heathfield Hall, Handsworth.—Ed.

[51] For the Enfield-Martini of 0·4″ bore, the thickness is 0·130 inch, and the disc cut out is 1·205 in diameter.

[52] I am indebted to Mr. J. W. Davis for

these particulars.

[53] In these cases the value of the gold is trifling as compared with the labour expended, hence there is every confidence in the value of the metal.

[54] The statistics given have been supplied by Messrs. Crawley, Parsons and Co.

[55] I have been surprised to note Birmingham made pearl buttons put on cards headed *Nouveauté, Paris*. I understand that many of these buttons are sent to the United States.—C. J. W.

[56] Sir William Thomson has proposed intervals corresponding to the dots and dashes of the Morse alphabet in order to distinguish lighthouses. C. J. W.

[57] It is interesting to know that Mr. Edward White Benson, father of the present Archbishop of Canterbury, was associated with Mr. Askin in the early experiments on extraction of nickel.

[58] Mr. Henry Bore, who has been connected with the Perryan Pen Works for nearly thirty years, has in the press a work dealing principally with the origin of pen making. Mr. Bore's investigation points to Mr. John Mitchell as the first to introduce the making of pens by means of tools principally if not entirely his invention, but there is little doubt that the use of steel pens by the writing public is due in the first instance to the energy of Mr. James Perry, who was assisted in this work by the late Sir Josiah Mason.

[59] An amalgam of gold is spread on the work to be gilt. The article is then put in an oven and heated till the mercury escapes, leaving the gold behind. Military buttons and

ornaments are gilt in this manner.—C. J. W.

[60] Ramsay. Quart. Journal Geol. Society, 1855, p. 191, &c.

[61] Jukes, South Staffordshire Coalfield, 2nd Edition, p. 15.

[62] For a Note by the writer on the distribution of this species in Britain, see *Midland Naturalist*, Vol. 1, 1878, p. 323.

[63] Those who are interested in the Embryology of these lowly creatures will find a paper upon the subject by Professor E. Ray Lankester, in the "Philosophical Transactions of the Royal Society." Part I. 1875.

[64] A paper by Professor E. Ray Lankester on the Invaginate planula, or Diploblastic phase of *Paludina vivipara*, may be found in the "Quarterly Journal of Microscopical Science." New Series. No. 58. April, 1875.

[65] For a paper by the writer on this habit in the Mollusca, see "Conchological Journal," Vol. I., p. 401, et seq. 1874-8.

[66] See the "Quarterly Journal of Microscopical Science," New Series, No. 56, October, 1875, for the Embryology of *L. stagnalis*, by Professor E. Ray Lankester.

[67] For detailed description see "On a group of minerals from Lilleshall, Salop, by C. J. Woodward." "Quarterly Journal Geological Society," August, 1883, p. 466.

[68] For particulars relating to this mine, I am indebted to Mr. W. Yelland.

[69] Professor Maskelyne in Report of the British Association Committee on Luminous Meteors, 1876, p. 166, quoted in a paper by Townshend. Mr. Hall on "Contributions towards a History of British Meteorites," in the

"Mineralogical Magazine," 1879.

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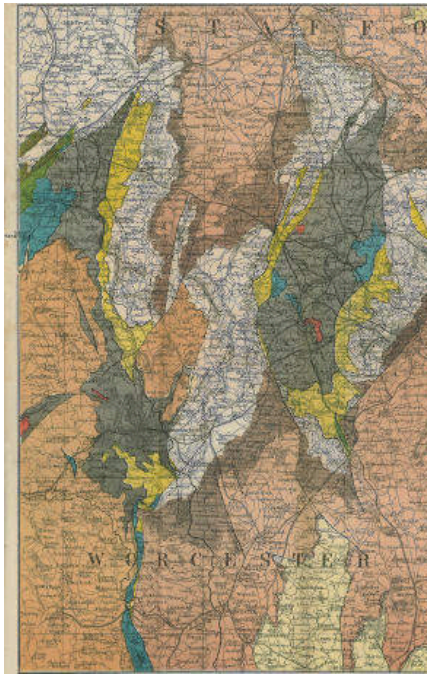
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GEOLOGICAL SKETCH-MAP OF THE BIRMINGHAM DISTRICT.

By CHAS. LAPWORTH, LL.D., F.G.S.



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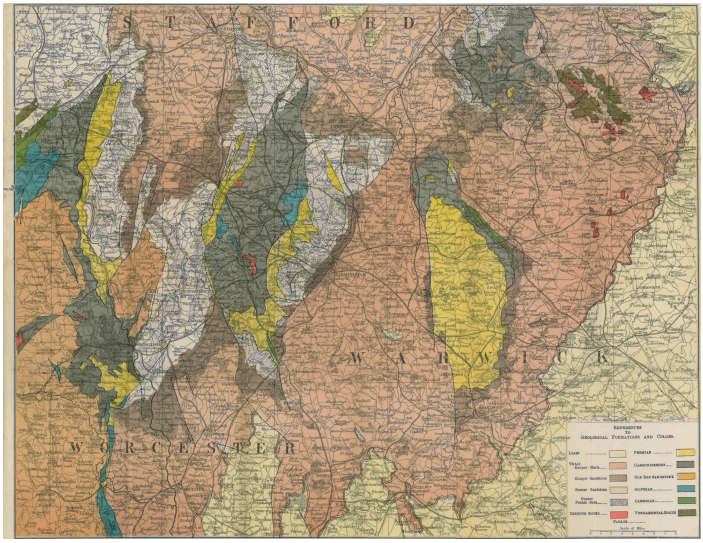
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