DUBLIN, 1908.

HANDBOOK

TO THE

CITY OF DUBLIN

AND THE

SURROUNDING DISTRICT.

PREPARED FOR THE

MEETING OF THE BRITISH ASSOCIATION,

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PREFACE.

The following pages are the work of a number of volunteers, students of science, history, and archæology, and others conversant with the industrial progress of the district described. The illustrations are derived from a number of sources; and special thanks are due to those persons and institutions that have sanctioned the use of copyright material. Mr. T. J. Westropp has given great help in bringing together the illustrations in the section of History and Archæology, for which Mr. W. Lawrence kindly gave some original blocks. The geological details on the coloured map were supplied by the Geological Survey of Ireland. The names of the editors of the sections, and of the contributors of the several articles contained in each, are given in the table of contents which follows, or in the body of the work. The general editing of the Handbook has been done by Grenville A. J. Cole and R. Lloyd Praeger.

Dublin, *August*, 1908.

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THE ENVIRONS OF DUBLIN.

By F. Elrington Ball, M.R.I.A.

The beauty of the surrounding country, combined with its maritime position, gives to the metropolis of Ireland a charm possessed by few of the larger municipalities of the United Kingdom. Within the comparatively narrow bounds of the county to which Dublin gives its name there is a variety of scenery such as is seldom found in similar limits; and the proximity of this scenery to the crowded streets has often caused the situation of the city to be an object of envy to the inhabitants of towns less fortunate in their environs. In the bay, which affords entrance to the port of Dublin, the blue waters of the Irish Sea merge in the gorse which covers the promontory of Howth, and in the wooded slopes which rise above the suburbs of Clontarf and Merrion. A few miles to the south there stretches along the coast from Dalkey Island to Bray Head the crescent-shaped shore of Killiney Bay, comparable, some persons have thought, to that of Naples; and to the north there lie the picturesque form of Ireland's Eye, the silvery sands near Malahide estuary, and the green islands of Lambay and Holmpatrick. Inland the landscapes are no less attractive. To the west, near Lucan, the valley of the Liffey reveals a scene of sylvan richness, the hill of Athgoe, near Newcastle Lyons, a panorama of the Meath and Kildare lands, and the plain of the Phœnix Park wide prospects of the Dublin mountains. To the north, again, the district, known from Danish times as Fingal, is covered with fields of golden corn and verdant meadows; and to the south the mountain torrent of the Dodder rushes through heather-clad moorland.

Owing to its extension during the last century, Dublin

has lost some of its more immediate rural environment, and lands which a hundred years ago were devoted to grass and tillage are now covered by the chain of suburbs which surrounds the city. Besides these suburbs, Clontarf, Drumcondra, Glasnevin, and Kilmainham to the north and west, and Rathmines and Pembroke to the south and east, there are along the sea-border, in the south-eastern direction, the populous urban districts of Blackrock, Kingstown, Dalkey, and Killiney, and inland from these the villa-covered lands of Foxrock, Stillorgan, and Dundrum. But building has not been so continuous as to destroy the natural features of the country, and in some cases seems to intensify their effect. The handsome terraces and houses, and the massive churches with their pointed spires, make a pleasing foreground to the trees and hills which rise above them; and the busy existence of the residents throws into strong contrast the pastoral peacefulness which pervades the greater part of the county. As one traverses more than two-thirds of the roads, the impression is of life in which agriculture is the only interest. Here and there the house of some one engaged in the occupations of the city meets the eye; but the villages are small, and the only considerable centres besides those already mentioned are the sea-side resorts of Howth, Malahide, Skerries, and Balbriggan, with the inland one of Lucan. Nowhere is the smoke of factories seen to darken the sky; and the only employment besides husbandry is such as the fisheries on the coast and the quarries in the mountains provide.

As regards relics of past ages, the metropolitan county forms no exception to Ireland in general; and in all directions destruction, change, and decay have laid heavy hands upon objects of archæological and antiquarian interest. The principal remains are those relating to primeval and early Christian times; and rock-monuments and primitive churches are to be seen in places denuded of every trace of inhabitants from those periods until the present. Of medieval architecture, domestic as well as ecclesiastical, the specimens are few and unimportant; and of the buildings of the Jacobean period, when in Ireland the transition took

place from fortified dwellings to those designed for comfort and convenience, there is not a perfect example. But the converse is found to be the case in dealing with the history of the county; and it is not until Dublin became, under the Anglo-Norman settlement, the seat of government, that material for the historian begins to accumulate. In such literature as has been published with relation to earlier times, there are few references to the lands now included in County Dublin, which were then no more important than those of many of the territories into which Ireland was divided; and until more progress is made in the examination of Irish manuscripts it is not possible to write with authority on that portion of the county's history.

Before the Christian era, the chief event of which there is record in connexion with the lands now embraced in the county is the construction of a dun on Dalkey Island. It has been attributed to the dim age which saw the commencement of Milesian rule in Ireland, and the place-name, which means thorn island, originated possibly in the prickly circumvallations of the fortress. But some further light is thrown on the condition of the district in pre-Christian times by a legendary tale, the scene of which is laid within the limits of the present county. This saga, one of the oldest and most important in Irish literature, has formed the subject of Sir Samuel Ferguson's well-known poem of "Conary," and has been also recently translated for English readers by an eminent Irish scholar.[1] It describes the pillage and destruction by a predatory band from Britain of a palatial residence which stood close to the River Dodder, and not far from the sea. On the owner, one Da Derga, was imposed the obligation of providing shelter and hospitality for all comers; and at the moment when the marauders descended upon the house no less a person than the king of Ireland was his guest. In the tale we see the king with an immense train of attendants advancing across the plain where Dublin now lies, by a great road which led from Tara, the seat of supreme

[1] "The Destruction of Da Derga's Hostel," by Whitley Stokes, Revue Celtique, vol. xxii., passim.

royalty, to the south; and we are told how the marauders, who saw his approach from the Hill of Howth, steered their "thrice fifty vessels" for the Merrion shore, on which the ships were cast by a mighty wave with a shock that made Da Derga's house tremble to its foundation. Two place-names, Booterstown and Bohernabreena, still remain to prove that in this tale there is fact as well as imagination. Booterstown, which means the town of the road, is the name of a district between Dublin and Kingstown, and indicates the line of the road from Tara along the coast; and Bohernabreena, which means the road of the court, is the name of a district in the mountains near the Dodder, and indicates the former existence along that river of a road on which an important dwelling stood. The discovery near the famous village of Donnybrook, close to the Dodder, of a mound under which a number of persons killed by violence had been buried has led some persons to identify this place as the site of Da Derga's house, and the skeletons as those of the inmates who fell in the massacre that occurred. But this is open to doubt, and the swords and other implements, which were found under the mound and are now in the National Museum, are attributed to a much later period.[1]

At that time the northern half of County Dublin, which lay in Meath, then one of the provinces of Ireland, formed part of a territory called Bregia, and the southern half, which lay, as now, in Leinster, formed part of a territory called Cualann. In the portion of the county comprised in the former territory, few traces of the prehistoric age remain, a cromlech at Howth and another in the Phœnix Park being the chief relics. But the whole range of the Dublin mountains and their immediate vicinity, in what was once the territory of Cualann, are rich in rock-monuments. At Mount Venus (fig. 20) and Larchfield near Rathfarnham, at Kiltiernan, at Glendruid near Cabinteely, and at Shanganagh near Killiney, great cromlechs, some of

[1] See Paper by William Frazer, F.R.C.S.I., Proceedings of the Royal Irish Academy, sec. 2, vol. ii., pp. 29–55; and *cf.* "A Social History of Ancient Ireland," by P. W. Joyce, LL.D., vol. ii., p. 172.

them quite exceptional in size, are to be seen,[1] and at Killiney there is a stone erection called the Druid's Judgment Seat, which marks the site of three cromlechs enclosed in a stone-circle, near which, in the eighteenth century, a number of skeletons were found (*cf.* p. 246). In the hilly country near Tallaght, Saggart, and Kiltiernan, raths,

Fig. 20.—Dolmen, Mount Venus, Co. Dublin.
(Photo. by T. J. Westropp.)

giants' graves, stone-circles, cairns, and pillar-stones abound. Further to the west, near Crumlin, many cists have been found, one of which is exhibited in its original

[1] See "On the Orientation of some Cromlechs in the neighbourhood of Dublin," by Professor J. P. O'Reilly, Proceedings of the Royal Irish Academy, ser. 3, vol. iv., p. 589; also W. Borlase, "Dolmens of Ireland," pp. 376–395.

condition in the National Museum[1] (fig. 21); and at Lucan there is an interesting sepulchral chamber.

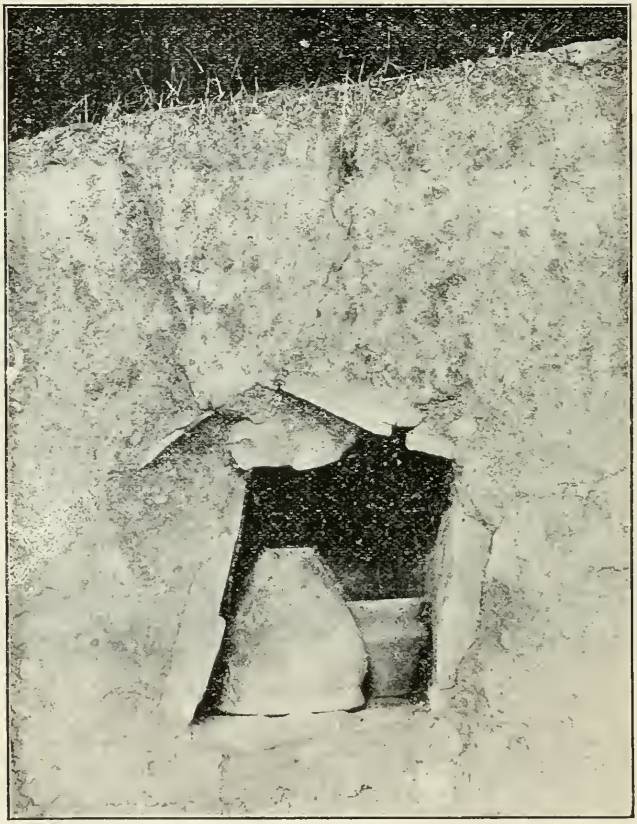

Fig. 21.—Urn in cist, Greenhills, Co. Dublin. (From Proc. R. I. Acad.)

[1] See "On a Cist and Urns found at Greenhills," by Lieut.-Colonel G. T. Plunkett, Proceedings of the Royal Irish Academy, ser. 3, vol. v., p. 338.

On the districts now included in the County Dublin Christianity took an early and firm hold. St. Patrick, when he arrived on his evangelizing mission, is said to have sailed along the coast of the county, and to have touched at Malahide as well as at the island of Holmpatrick, on which his name is impressed; and it is not improbable that he proceeded inland, since the original designation of the church at Donnybrook, and of another in the northern part of the county, indicate that these sacred edifices owed their origin to him. The dedications of the ancient churches in the county show that St. Patrick was followed by a number of holy men, through whose teaching and example the truths of Christianity were disseminated; and the number of religious establishments in Celtic times of which trace is found is most remarkable. In the country rising over Killiney Bay, at a place called Rathmichael, some portion of the cashel which surrounded a Celtic monastery, a ruined church, and the base of a round tower are to be seen; and it is possible to picture the establishment of which they formed part. In the centre stood the church, originally a small quadrangular edifice of Cyclopean masonry, with a low, square-headed doorway in the western end, and one or two narrow openings for light; and near its south-western corner rose the belfry and place of refuge for the ecclesiastics in time of distress, a tall, graceful tower, circular in shape, tapering upwards, from a base some fifty feet in circumference, and terminating in a conical roof of stone. Round the church were scattered bee-hive huts, in which the monks lived; and the whole was enclosed by a wall some seven feet high, with an entrance through a covered gateway. Not far from Rathmichael, at a place called Tully, two high crosses and a ruined church mark the site of a similar monastery; and across the mountains, to the west, lay one of great renown, at Tallaght, and another at Clondalkin, where its tower —one of the few round towers still in a perfect condition— is a prominent object. On the northern side of Dublin, Celtic monasteries are known to have existed at Glasnevin and Finglas, as well as at Swords and Lusk, where round towers are to be seen (figs. 30 and 31); and monks were

also established on the islands of Ireland's Eye, Lambay, and Holmpatrick, where they found freedom, away from distraction and interruption, for literary work and meditation. Of the churches of that period the most striking example is one at Killiney (fig. 27), which is now enclosed on every side by villas of the most modern kind, but which stood originally on a bare cliff overhanging the sea; and others may be seen not far from it, on Dalkey Island (fig. 22), at Kill-of-the-Grange, and at Kiltiernan, as well as on the northern side of Dublin, at a place called Donabate.[1]

The invasions of the Northmen, inspired as they were by hatred of Christianity as well as thirst for plunder, fell with terrible severity on the Celtic monasteries, and in the possession of a round tower lay the only hope of safety for the unhappy inmates. First, the island monasteries were burned, and then those on the mainland, such as Lusk and Clondalkin. The Scandinavian settlements which succeeded the invasions specially affected the northern portion of the present county, which became known as Fingal, the territory of the white strangers, and from these settlers Howth, Ireland's Eye, Lambay, Holmpatrick, and a village called Baldoyle obtained their present names. In the southern part of the county a large tract near Rathmichael belonged to the sons of Thorkil, and the place-names Dalkey and Clondalkin are in their present form of Danish origin. On the great battle between the Irish and the Danes, in 1014, which is known as the Battle of Clontarf, but which extended over ground now covered by the northern half of the City of Dublin, it is impossible to dwell here; and we must pass on to the arrival of the Anglo-Norman invaders, when the local historian begins to find firm ground.

So far as the lands in the county of Dublin are concerned, the Anglo-Norman conquest was complete—a conquest in reality, and not, as elsewhere in Ireland, only one in name. The partition of the lands which ensued is clearly

[1] See "On the Churches of Dalkey, Kill-of-the-Grange, Killiney, and Ireland's Eye," by Professor J. P. O'Reilly, in Proceedings of the Royal Irish Academy, vols. xxiv., Sect. C, p. 195, and xxv., Sect. C, p. 107.

St. Begnet's Church, Dalkey Island.

defined in the ancient records, and before the close of the twelfth century we find Anglo-Norman magnates established in every part of the area now comprised in the county. To the south of Dublin the principal settler was Walter de Rideleford, Lord of Bray, one of the most brave and noble of Strongbow's followers, who was given lands near Donnybrook, as well as near the place from which he took his feudal title; and, further inland, Milo le Bret of Rathfarnham and Hugh de Barnewall of Drimnagh (fig. 23) upheld Anglo-Norman rule. To the north of Dublin, ancestors of the St. Lawrences of Howth and of the Talbots of Malahide shared with a number of other invaders the spoils which fell to the victors; and to the west, Hugh de Tyrell, Lord of Castleknock, the site of whose castle may be seen near the Phœnix Park, was unrivalled in the extent of his possessions. In what is now the south-western corner of the county, the Crown reserved certain lands which became known as the royal manors of Newcastle, Saggart, Crumlin, and Esker; and in the same direction an estate was given to the Irish chieftain MacGillamocholmog, who held sway over the territory of Cualann when the Anglo-Normans arrived.

Ecclesiastical owners occupied in the Anglo-Norman settlement a no less important position than lay proprietors. The property which the Church possessed at the time of the invasion was left to its sacred uses; and it was largely increased by grants from such Anglo-Normans as acquired lands. The Celtic monasteries disappeared; but the possessions of those at Tallaght, Clondalkin, Finglas, Swords, and Lusk were given to augment the revenue of the See of Dublin, and the possessions of the others to various religious establishments. New monasteries and nunneries were founded. At Grace Dieu, in the northern portion of the county, there was a house for Canonesses of the Order of St. Augustine; at Clontarf, a house of the Knights Templars; at Kilmainham, a house of the Knights Hospitallers; and near Lucan, at St. Catherine's, a house of the Congregation of St. Victor. But the largest ecclesiastical owners within the limits of the county were the great Dublin religious houses. A tract, extending from the

sea at Killiney to the Dublin mountains, as well as the lands of Glasnevin and Grangegorman to the north of the city, belonged to the Augustinian Priory of the Holy Trinity, afterwards merged in Christ Church Cathedral. The district now covered by Kingstown and the adjacent Monkstown was owned by the Cistercian Abbey of

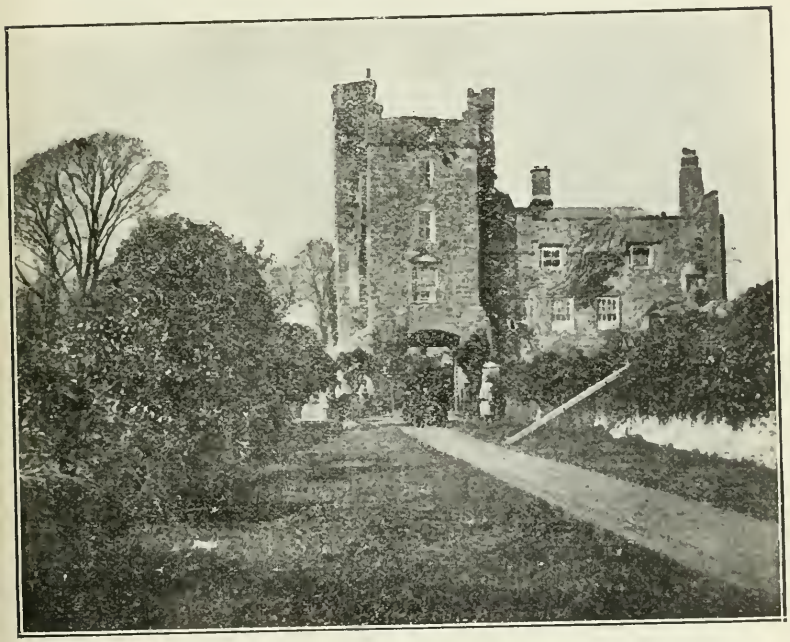

Fig. 23.—Drimnagh Castle, Co. Dublin.
(Photo. by T. J. Westropp.)

St. Mary. Two estates—both known as Palmerstown—from one of which Queen Victoria's well known Prime Minister derived his title, belonged to the Hospital of St. John the Baptist, which had been founded by a pilgrim to the Holy Land. And Baldoyle, near Howth, and

Drumcondra were owned by the Priory of All Hallows, whose site Trinity College now occupies.

By the Anglo-Normans the system of land tenure then existing in England was introduced. The estates were constituted into manors, and the lands were worked as in England by the owners, by free tenants, and by servile occupiers known as betaghs, who were drawn from the old inhabitants. A great number of the latter retreated, however, to the fastnesses of the Wicklow mountains, whence, after a time, they began to make raids on the property of the colonists, carrying off their cattle, and devastating and burning their lands. In the beginning of the fourteenth century, during the incursions of the Scots under Edward Bruce, the situation reached its climax. The betaghs employed in the low lands rose in rebellion, joined their brethren in the mountains, and regular warfare began between the colonists and the O'Byrnes and O'Tooles, as their neighbours were called. Every effort was made by the colonists to stem the advance of these tribes, and the southern border of the county became the battlefield. A garrison was stationed at Bray, where the river offered a natural obstacle, and a barrier, afterwards united to that which surrounded the English Pale, was carried from the river under the mountains round by Tallaght and Saggart towards the County Kildare. Its custody was committed to the Archbolds, the Harolds, and the Walshes, clans sprung from sturdy English and Welsh yeomen, who had been planted on the marches; and for a time good watch and ward were kept by these guardians, who became, however, subsequently as troublesome to English rulers as the tribes whom it was their duty to hold in check.

A brief survey of the principal buildings in the county of Dublin in the fourteenth century may help to illustrate its condition. Starting from the city along the sea to the south there was to be found at Monkstown a castle, the country adjunct of St. Mary's Abbey, and a little way off on the coast at Bullock a smaller fortified edifice protecting the fishery rights of the Abbey at that point (fig. 28). Dalkey next appeared. It was then a walled-in medieval town,

containing seven castles and a church of considerable size, and was a place of much importance as the port of Dublin, not only for passengers, but also for merchandise, and as a trading centre where weekly markets and frequent fairs were held. To the west, at Kill-of-the-Grange, lay the home-farm of the Priory of the Holy Trinity, with its manor-house and extensive farm buildings, of life on which an interesting picture is presented in the Account Roll of

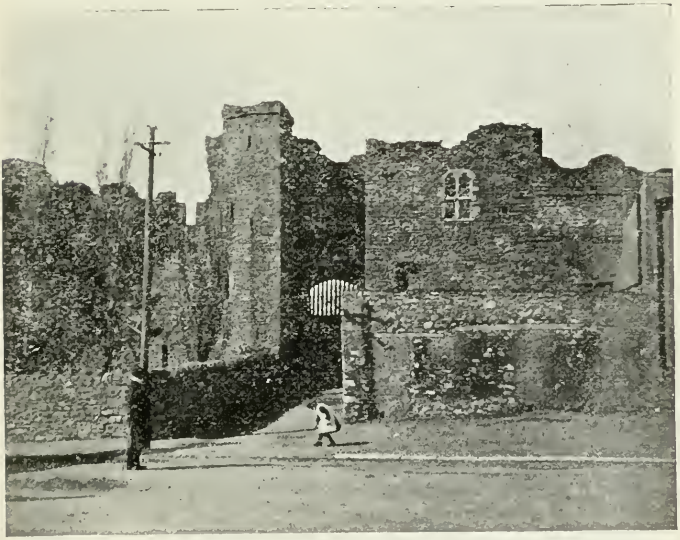

Fig. 24.—Gateway of Castle of Archbishops of Dublin, Swords.
(Photo. by T. J. Westropp.)

the Priory, edited by the present Deputy-Keeper of the Records of Ireland.[1] Passing across the mountains, a large castle, the principal country residence of the Archbishop of Dublin, was to be found at Tallaght, and a small town with a handsome Gothic church in his manor of Clondalkin.

[1] "Account Roll of the Priory of the Holy Trinity, Dublin," edited by James Mills for the Royal Society of Antiquaries of Ireland: Dublin, 1891.

In the south-western corner of the county was the king's town of Newcastle, strongly fortified, and containing, like Dalkey, a number of castles, whose inhabitants have left a fine fourteenth-century window in the church as an indication of their wealth and taste; and near Dublin lay the king's smaller town of Crumlin, close to which flowed the ancient water-supply of the city.[1] Not far off from the latter place was Drimnagh (fig. 23), the seat of the Barnewalls, which survives as an inhabited dwelling to the twentieth century, and is the most typical specimen of the architecture of the English Pale to be seen near Dublin. Crossing to the north of the city by the Hospitallers' great priory at Kilmainham and by the Tyrells' fortress at Castleknock, which dominated the western part of the county, Swords was reached. Under the fostering care of the archbishops of Dublin, the ruins of whose castle may still be seen (fig. 24), this Celtic settlement had developed into a medieval town, rivalling Dalkey and Newcastle, and the parish had become so valuable as to be distinguished as the golden one. To the west of Swords lay at Dunsoghly a large castle, the seat of a branch of the Plunket family; to the north there were at Baldungan a fortress built by the Knights Templars, and at Balrothery, another owned by the Barnewalls; and to the east lay the castles of Malahide (fig. 25) and Howth, still to be traced in the present structures.

Under the Tudor sovereigns, owing to the increasing prosperity of the English Pale, additions were in many cases made to the existing castles, and the new dwellings which were erected, although still fortified buildings, were designed on more commodious and stately lines. Amongst the residences in the county at that period one of the first in importance was the castle of Merrion, which was then made their chief abode by the Earl of Pembroke's ancestors, the Fitzwilliams, who had been previously seated at Baggotrath, now part of the Pembroke Township, and at Dundrum; but all trace of this castle has long disappeared, and its site

[1] See "The Water-Supply of Ancient Dublin," by Henry F. Berry, Assistant Deputy-Keeper of the Records of Ireland, Journal Royal Society of Antiquaries of Ireland, vol. xxi., p. 557.

on the Blackrock Road is now covered by the buildings of an asylum for the blind. Another castle which came into prominence in the sixteenth century as the home of Sir Thomas Luttrell, a judicial personage of much eminence, was that of Luttrellstown, which lies in a superb demesne on the banks of the Liffey near Lucan ; and at Rathfarnham Queen Elizabeth's Irish Chancellor, Archbishop Loftus, erected a mansion, which remains, according to the prediction of one of his contemporaries, a monument to the

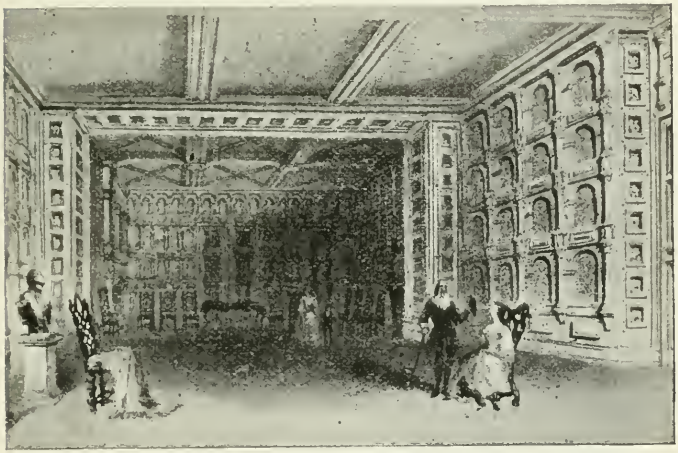

Fig. 25.—Room over the Hall, Malahide Castle, Co. Dublin.
(From Bartlett's "Scenery of Ireland.")

greatness and grandeur of its builder. Other servants of the Crown who settled in the county found fitting homes in the houses vacated by the religious establishments on their dissolution, as, for instance, at Monkstown, Sir John Travers, one of the military rulers for whom the condition of Ireland then provided employment; at St. Catherine's, Sir Nicholas White, a statesman whom Queen Elizabeth often summoned to her court ; and at Grace Dieu, Sir Patrick Barnewall, one of Henry the Eighth's most trusted law officers.

With the accession of the Stuarts an advance began towards dwellings of the modern kind; and while the seventeenth century was still young, the viceroy was provided with a country retreat in a Jacobean house called the Phœnix, whose site, now occupied by the Magazine for the Dublin Garrison, formed the nucleus of Dublin's royal park. About the same time a distinguished soldier, Sir Henry Power, on whom the viscounty of Valencia was first conferred, made use of brick in the construction of a fine residence, subsequently purchased for the viceroys, close by the Phœnix in the village of Chapelizod; and his wife's family, the Buckleys, followed his example in the erection near Tallaght of a house called Old Bawn, which has only recently been dismantled.[1] During the Earl of Strafford's short but energetic rule in Ireland his friend Sir George Radcliffe was induced to expend what was, in those days, the enormous amount of £7000 on a mansion at Rathmines, the very existence of which is now forgotten; and near Swords, where a house called Drinham still possesses many characteristics of that period, the Chief Baron occupied "a dainty, pleasant, high-built wood house" called Brazeel; and the Speaker of the House of Commons "a gallant, pleasant seat," now known as Brackenstown.[2] As a result of the Rebellion and of the long war which succeeded, terminating in the county of Dublin in the battle between the forces of the King and the Parliament at Rathmines, many fortified buildings, which had survived from medieval times, disappeared. The Archbishop of Dublin's castle at Tallaght and the Fitzwilliams' castle at Baggotrath were amongst those demolished; and Dalkey (which had sunk into insignificance, owing to the use of Ringsend as the port of Dublin), Newcastle, and Swords became villages such as they are to-day. After the Restoration, the construction of the Phœnix Park, under the direction of Charles the Second's

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[1] A remarkable chimney-piece from this house, representing the building of the Walls of Jerusalem, may be seen in the National Museum, Dublin.

[2] See "Travels of Sir W. Brereton in Ireland, 1635," in "Illustrations of Irish History and Topography," by C. Litton Falkiner, p. 376.

LUCAN HOUSE, CO. DUBLIN, IN 1785.

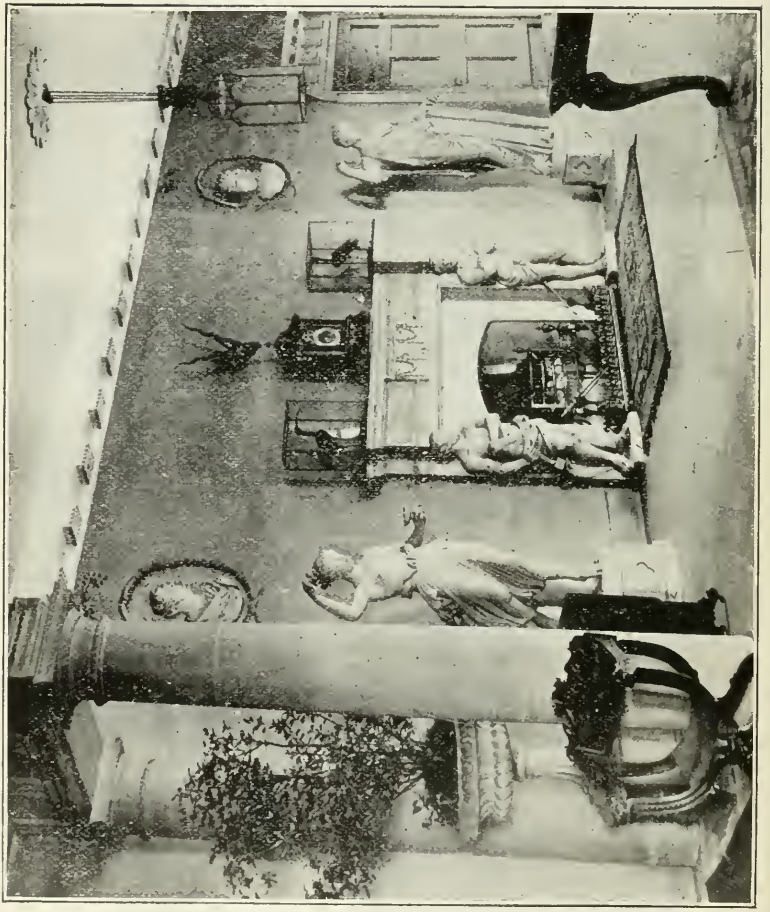
(From a plate in Milton's "Views of Ireland."

[*To face page 239.*

illustrious viceroy, the Duke of Ormonde, was imitated by several of the leading proprietors in laying out great demesnes. The gardens of Howth Castle are believed to date from that period; and towards the close of the seventeenth century the Earl of Carysfort's ancestors, the Allens, began to empark a vast extent of country round Stillorgan, where they built a great mansion.

Shortly before the accession of George the First, the Fitzwilliams' castle at Merrion gave place to the house which their descendant, the Earl of Pembroke, now owns; and the broad avenues and noble plantings of Mount Merrion Park, which commands the most enchanting prospect of the bay of Dublin, were designed. Under the Hanoverian dynasty, building in the county advanced with rapid strides. On the south side of Dublin, at Tallaght, a palace was substituted for the medieval seat of the Archbishop of Dublin; at Rathfarnham, Archbishop Loftus' descendants, the Earls of Ely, transformed the castle into a modern house (fig. 26), whose walls Angelica Kauffman adorned, and to which a graceful classic gateway affords entrance; and at Cabinteely Earl Nugent erected a handsome residence. To the west at Lucan the husband of the far-famed Mrs. Vesey, the friend of Johnson, and a central figure in the blue-stocking circle, built a mansion in the Grecian style, which testifies to his architectural skill (Plate XIII). And on the north side of the city, Santry Court as the seat successively of the Barrys and the Domviles, Brackenstown as the seat of the Molesworths, Rush as the seat of the Echlins, and Abbeyville as the seat of the influential John Beresford, were added to the great residences of the county.

To the Victorian age the rise of suburban Dublin is to be attributed, which had its beginning in the construction of Kingstown Harbour; but to country seats the reign of our late Queen saw no notable addition.



EARLY CHRISTIAN AND MEDIEVAL ANTIQUITIES OF COUNTIES DUBLIN AND WICKLOW.

By T. J. Westropp, M.A., C.E., M.R.I.A.

The County of Dublin and its neighbourhood have the rare advantage of possessing a very typical series of remains, both ecclesiastical and residential. The early stone oratory and church, the later hermitage and vaulted church, collegiate, cathedral, and parish churches from the twelfth to the fifteenth century, the earthen ring-fort, the dry-stone ring-wall, enclosing a monastery, and the stone-castles, peel-towers and mansions of the Englishry from the thirteenth century downwards, are all represented. Those, however, who look for examples of ornate and beautiful architecture comparable to the churches of Great Britain and the Continent, will be much disappointed, for the poor and unsettled state of Ireland since the Norman invasion left neither time nor money for the construction of expensive and elaborate buildings. They will, however, be able to study not a few features of beauty, and many of interest, at Glendalough and Monasterboice (illustrating Irish art from the ninth to the eleventh century), with the Norman transitional work of Christchurch Cathedral and some beautiful Gothic details in it and the sister Cathedral of St. Patrick, which last lie outside the scope of this present section. The beautiful sense of proportion and effect that elsewhere in Ireland compensates so largely for the lack of magnificence is also wanting in this county, and must be looked for rather in the counties from Kilkenny through Tipperary and Limerick, and through the western coast-counties, with some pleasing examples in the Valley of the Boyne, and a few survivors in Ulster.

In our limited space we can best help our readers by giving a short list, classing the principal remains under their periods as far as possible.

The earliest-known type of stone church, the "boat-

shaped" oratory of dry-stone (of which specimens occur on the Atlantic coast), is not represented in this neighbourhood, nor are the early "bee-hive" cells found. Only one case of the early monastery in the ring-wall occurs; it is at Rathmichael. The stone double-vaulted oratory is found at Glendalough and at Kells in Meath; a much later equivalent remains at St. Doulough's (or St. Doolagh's). The early church, with projecting antæ, is more abundant, and there are excellent examples at Dalkey Island, Glendalough, and Dean's Grange. A richly decorated church of the later eleventh or early twelfth century stands at Glendalough; and there are traces of similar ornament, some of slightly earlier date, in certain of its other churches.

Round towers may be found within easy reach of Dublin (and, save the first, within a mile of a railway station), at Swords and Lusk (*via* Amiens Street Station), Clondalkin and Kildare (*via* Kingsbridge). A stump of a tower is at Rathmichael, the others being perfect, as at Clondalkin, or with only the tops modified. Within a short railway journey and drive are the towers at Glendalough (perfect), Monasterboice (*via* Amiens Street and Drogheda), and Donoughmore (car from Navan station, *via* Broadstone). Kells, in Meath, has a nearly perfect tower close to the station. At Monasterboice are three high crosses, two of rich design (a cast of the great cross put up by Abbot Muiredach, early in the tenth century, may be seen in the Museum, with casts of those at Kells). Kells possesses three, two of elaborate carving; plainer examples remain at Finglas, Tully, St. Doulough's, and Kilgobbin. The car excursion from Drogheda (see p. 266) can include in one day Monasterboice, the remains of the fine Cistercian Abbey at Mellifont, the tumuli and carved stones of Dowth and Newgrange, the mote, friary, and hermitage of Slane, the battlefield of the Boyne, and the gate, abbeys, and monuments at Drogheda. Trim, Bective, and Tara would require a day for each. There are small churches at Kilbarrack and Bray.

Of later churches of the Anglo-Norman period, the following are accessible:—St. Mary's Collegiate Church, Howth; St. Doulough's, with overcroft, attached cells, well-house, and cross; and the churches (so-called abbeys)

at Lusk, Swords, Malahide, and Baldungan. The last might be included with the others and St. Doulough's in a drive from Malahide.

There are but few good examples of "forts" (ring-mounds) near the city. Some occur on the flank of the Three-Rock Mountain near the Scalp, and one near Dunsoghley. The promontory fort of the Bailey of Howth is entirely defaced. Howth, Malahide, and Swords possess considerable remains of their fortified houses. Of peel-towers we have two at Dalkey, and others at Bullock, Monkstown, Kilgobbin, Howth (Corr Castle), and Puck's Castle, near Rathmichael; there is a very interesting tower and moated house at Drimnagh (see p. 233), not very far from the tramway station at Inchicore, and other peels occur farther away at Dunsoghley, Rob's Wall, near Malahide, and Portrane.

Very fine examples of principal Norman fortresses remain at Maynooth and Trim, which latter, with the ruins of the Yellow Steeple, the church, monastery, and hospital of Newtown, and St. Patrick's Parish Church, would supply abundant material for a day's excursion (see p. 279).

We now briefly describe the nearer remains rather by the lines of travel than by the periods which they represent.

Dalkey

is a small but ancient town, deriving its name from the neighbouring islet, the Dalkey of the Norse, the Delgh-inis of the Irish, the name meaning thorn island. Dalkey at one time possessed seven "castles"—a circumstance by no means incredible to anyone who has studied the Tudor and Stuart maps of Irish towns, showing rows of castellated houses in every street. The place was at one time a frequented port, and preferred by larger ships to the shallow river-mouth of Dublin. A place of wealthy merchants, we expect to find numerous relics of its past prosperity, but only two peel-houses remain; one is repaired, and forms part of the Town Hall, the other is an ivied ruin near the Roman Catholic church, which itself is on the site

of a third. There was a fourth, used as a forge till comparatively recent times, but now demolished. The existing towers are entirely devoid of ornament, and the details seem usually of the sixteenth century; they have the usual vaulted rooms, "murder-hole" commanding the entrance, loop-holes, &c.

The church is dedicated to St. Becnat (locally "Begnet"), daughter of Colman, after whom the older church on the island is also named; her date is uncertain. One of these churches figures as Kylbekenet in a charter of Luke, Archbishop of Dublin, in 1240. The north wall of the chancel, with its built-up window-slit (the semicircular head hollowed out of one block), is pre-Norman. The rest is of various periods, showing evidence of extensive repairs in the fourteenth and fifteenth centuries; the lintelled west door is curious, and the bell-chamber is characteristic of the smaller churches of the English Pale. The whole has been much tampered with. An early stone, with a Celtic cross, stands near the south wall.

Near the harbour is a rock on which we remember a defaced description, reputed to be "Danish," but certainly not Runic. This was destroyed by the unfortunate insertion of a brass tablet, about 1880, commemorating the landing of certain viceroys, and the tablet was soon afterwards torn out and stolen.

Taking boat from the harbour, we reach the island and visit St. Begnet's Church, a small oblong oratory of very early date (fig. 22). It has projecting end-walls and antæ, and a fine door with heavy lintel and inclined jambs; the east window was destroyed, and the gap built up when the church was used as a house by the workmen engaged in building the Martello tower about a century ago. Note the rude encircled cross cut on the rock-surface to the west of the church. Professor Joseph O'Reilly published some curious notes and theories in a paper on the fabric and orientation of this church.[1]

[1] Proc. R. I. Acad. (1903).

KILLINEY—BALLYBRACK.

Here is another very early church, Cill inghine Lenin (the church of Lenin's daughters), which gives its name to

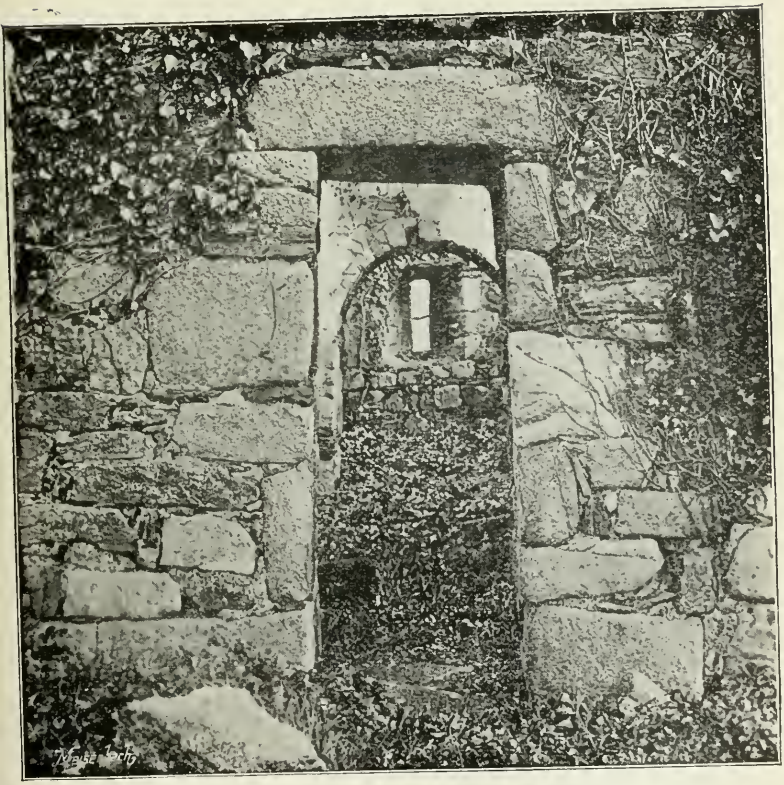


FIG. 27.—Killiney Church, Co. Dublin: West door.
(Photo. by T. Mason, Dublin.)

the place. It has a nave, chancel, and side-aisle. The first is entered by a west door like that of Dalkey, but with a cross on the soffit. Near it is a bullaun, or basin-stone.

The chancel-arch is semicircular, and, like all the features of the building, very plain. A lateral chapel or aisle has been added to the north side at a comparatively late period.[1]

The so-called "Druid's Seat" and "Sun and Moon Stone" farther up the hill, in a grove, seem to be the much-altered remains of a dolmen and circle. An attempt was made to cut two millstones out of a side-block, originating the second name in the days when "ophite worship" and "druidism" dominated Irish archæology.[2]

A small but very perfect dolmen stands in a field over half a mile away, near Ballybrack. Another dolmen of large size is found in the pretty valley of Glendruid, about two miles away. It and the old church of Tully, with two early high crosses and some curious carved slabs, are more easily reached by Carrickmines station, being within a mile distant from it. One of the Tully crosses, though plain, is of beautiful outline, and of the encircled type, in use in the tenth and eleventh centuries.

On the road from Dalkey to Dublin may be seen the very perfect peel-tower, the harbour, and portion of the wall of the little, early, walled "town of Bullock" (fig. 28). At Dean's Grange, about a mile behind Monkstown (which has the rude but fairly perfect remains of a castle with two late towers), we find a picturesque old graveyard. The church is an early building, with antæ and a defaced lintelled west door. It has a late chancel; two small crosses set in massive bases are found, one in the graveyard, and one in the southern lane-way. A rock with several basins lies near the gate in this lane in a private garden.

Howth.

Proceeding from Dublin by train, we pass at Ballybough Bridge the site of the weirs of Clontarf. Here, on Good Friday, 1014, the Danes, after their defeat by the Irish under King Brian, were driven into the river and drowned in hundreds. The body of the king's grandson,

[1] Proc. Roy. I. Acad., xxv., p. 107, plan, p. 112.
[2] See W. C. Borlase, "Dolmens of Ireland," p. 393.

with its fingers tangled in the hair of a Dane, was found in the weirs. Passing Clontarf and Raheny, we see the picturesque ivied ruin of Kilbarrack, which is well seen from the tram; here the notorious Francis Higgins, "the Sham Squire," the betrayer of Lord Edward FitzGerald, was buried. His tomb bore a most laudatory inscription, but was broken up by an indignant mob after the publication of the history of the betrayal.

Fig. 28.—Bullock Castle, Co. Dublin.
(Photo. by T. J. Westropp.)

Changing at Sutton, we descend the hill, passing Shelmartin (or Slievemartin), a barren peak, capped by the cairn alluded to by Sir Samuel Ferguson in his beautiful poem of "The Cromlech on Howth." Below it, nestling in a grove, is the tiny oratory of St. Fintan, embodying the features of an earlier church, and a supposed Runic inscription, of most doubtful character. At the

south-west corner of the Head, we see the Bailey Lighthouse, and what remains of the promontory-fort of the Great Bailey, alleged since 1838 to be the ancient Dun Criffin; but the latter was probably a fort near Howth Harbour, since it faced Meath, and was near the sea-shore. Getting a series of charming views northward, including the islands of Lambay and Ireland's Eye, and a long reach of coast, with the great Mourne Mountains in the far distance, we run into the little fishing town of Howth.

Howth derives its name from the Norse word "hoved," a head; the Irish name was Ben Edar; the island of Edros is recorded in this place in Ptolemy's Atlas. It was captured on the landing of the Normans by Almeric de St. Laurence, whose title is still enjoyed by his lineal descendant, Lord Howth, after nearly seven centuries and a half.

The bold island opposite the harbour is Ireland's Eye, or Inis Mac Nessain. The former name, a mistranslation of the Irish "Inis Ereann," is really Eria's Island, a female name, confused with "Eriu" (or Ireland) by the Norse. It is interesting to note the group of other Norse names (Dalkey, Lambay, Fingal, Howth, Leixlip, Oxmantown) surviving round Dublin (*cf.* p. 230). A monastery on the island, founded by the three sons of Nessan, is marked by a church, once a very remarkable structure, with a round tower over the chancel; it was then nearly levelled, and finally rebuilt by well-meaning local endeavour, which left it valueless and modern.

The more distant island of Lambay corresponds to the Rikina of Ptolemy, the native name being Reachra (Rechrainn), now only surviving in Portrane (the port of Rechrainn) opposite the island. It has a promontory-fort, and some trace of a castle. It is not impossible that Edros was really an island when Ptolemy wrote, for the broad, low neck at Sutton is part of a raised beach, and may have been overflowed by high water, at any rate.

The steep drift-banks abound in arctic shells, and these glacial beds are of considerable height; the Martello tower is on one, on a site once occupied by an earthen fort. St. Mary's Collegiate Church stands on another.

Dr. R. Cochrane[1] points out that the church of Howth consists of an early portion, probably of the eleventh century, forming the porch and western end of the nave, a side chapel of about 1235, and a fifteenth-century addition, forming a chancel to the north, and a mortuary chapel of the St. Laurence family (Lords of Howth) to the south. A late three-chambered belfry was erected on the west gable, the bells of which are preserved in Howth Castle. The result is a two-aisled church, divided by an arcade of six opes, 95 feet long (fig. 29). The east gable of the mortuary chapel contains a window of rather pleasing design of the late fourteenth century, or the beginning of the following period, styles in Ireland being sometimes as much as forty or fifty years later than in England. In front lies an ornate and interesting altar-tomb, the sides having elaborate panels, with foliage common in Irish work of the later fifteenth century, and figures of the Crucifixion, saints, and angels, the instruments of the Passion, and the arms of the St. Laurences and other English families. The weather-worn recumbent figures of a knight and lady lie on the top slab; the inscription is much defaced. The late fifteenth-century house, a college of canons, is well preserved, but crowded with poor small tenements. Dr. Robert Cochrane's papers on Howth should be consulted.[2]

The Castle of Howth is greatly modernised, save some ivied towers and a tablet of Christopher Lord Howth, an Elizabethan carving, with the arms of St. Laurence and Plunkett. The great sword of Sir Almeric, *circa* 1170, and the bells of St. Mary's Church are preserved; also a wooden carving of the abduction of the son and heir by the Amazonian, Grania Uaille, or Grace O'Malley, who was offended at finding the castle gates closed at dinner-time in the reign of Elizabeth.[3] The family long commemorated the event by keeping the hall-door open. There is also a

[1] Journ. Roy. Soc. Ant. Ireland, vol. xxvi., p. 1.

[2] Journ. Roy. Soc. Antiq. Ireland, vol. xxv., and paper on "The Howth Monument," by Lord Walter Fitz Gerald, *ibid.*, vol. xxxvii.

[3] The tradition is unreliable; but a similar event occurred at an earlier period. The subject of the representation is also open to doubt.

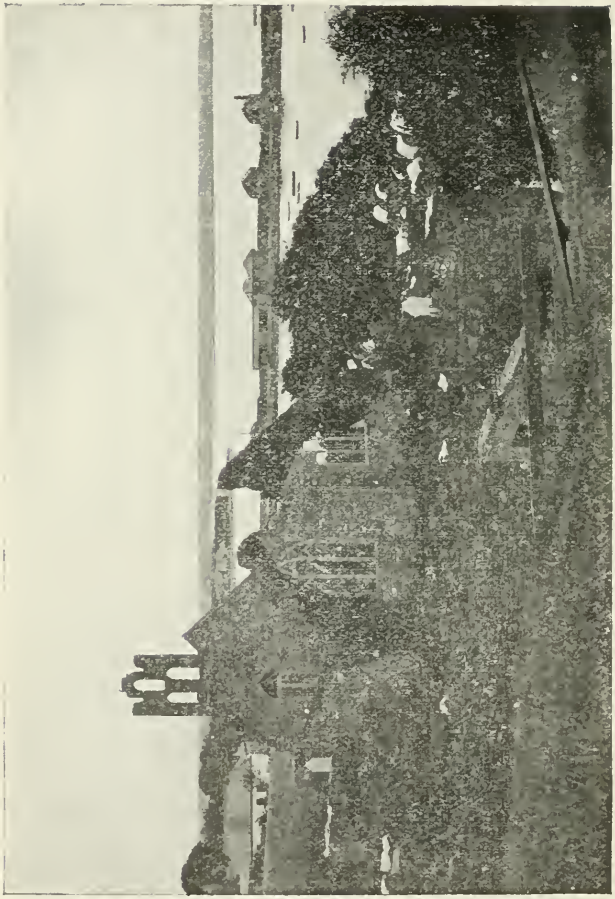


Fig. 29.—St. Mary's Collegiate Church, Howth, Co. Dublin.
(Photo. by T. F. Geoghegan, Dublin.)

very ancient tree, which local legend connects with the existence of the family, a branch being said to fall on the death of any man of the St. Laurences.

Malahide.

This place lies about eight miles to the north of Dublin. By taking a car, a pleasant excursion may be made to St. Doulough's Church, Lusk, Swords, and, perhaps, Baldungan, though the last is best reached from Skerries, being nine miles and upward from Malahide. These places all lie in the old Norse territory of Fingal.

Malahide, a quiet little watering-place on a creek, the mouth of which is defended by a very small peel-tower, called Rob's Wall, is chiefly remarkable for its castle and church. The former is still occupied by the descendant of its original owners, the ancient Norman house of Talbot de Malahide. Though greatly modernised, it retains several round towers and other relics of the older building, a fine panelled room over the porch, and a picturesque dining-hall (see fig. 25).

Richard Talbot, the founder, obtained these lands by a grant from Henry II about 1174. The church, or abbey, lies close to the castle. It consists of a nave and chancel, with a two-storied residence for the priest to the south-east. The remains are in fair preservation, though, as occurs too often, greatly overgrown. The features are clumsy, especially the east window, which is a very interesting example of perpendicular tracery, as rendered by the masons of the English Pale. In the nave is a fine altar-tomb, very like that at Howth and others of the fifteenth century; it is surmounted by the effigy of a lady wearing a long pleated dress and a horned cap. It commemorates Maud Plunkett, "maid, wife, and widow in one day," for her first husband, Hussey, Lord of Galtrim, was killed on her marriage-morning, when engaged in repelling a band of plunderers. She afterwards married Lord Talbot.

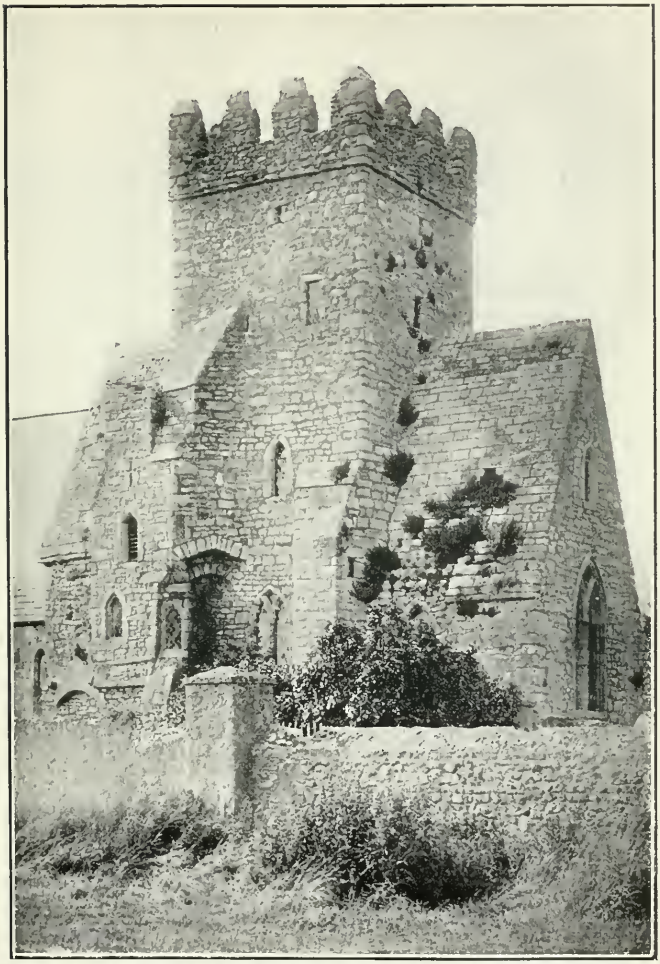
St. Doulough's Church.—This is a unique edifice, dating mainly from the later thirteenth century, but having affinities in its vaulted church and overcroft to the early

Irish stone-roofed churches of Wicklow, Louth, Meath, and Clare. The name is very suggestive of the Irish word Damhliag (Duleek, stone church), but is supposed to be taken from an obscure seventh-century monk, Dulech, or, in the opinion of others, from the Norse Olaf. The church is vaulted, with an overcroft; the west end is occupied by the cell of a recluse, containing a plain altar-tomb, the reputed bed of St. Doulough. There are seven apartments, three stone staircases, and a low, battlemented tower; the approximate dates are about 1230, 1406, and 1506 (Plate XIV).

In a field to the north is the well-house, a quaint, octagonal structure. The sill of the well is cut out of a single stone; the older broken ring is seen underneath; the vaulted dome was once painted with figures, but little trace remains. The building has four upper lights and a lintelled door; it stands in a sunken area. By the roadside, and at the entrance to the churchyard, is a primitive-looking cross, the lower limb expanding, and the arms square—a form found from Bosnia to the extreme west of Ireland. The tower seen on a ridge between this church and Malahide is the ruined windmill of Feltrim; the name means "ridge of the wolves."

Swords.

Our space barely allows us to call attention to this most interesting place, the ancient Sord Choluimbcille, an important Columban foundation, and in later times (like Tallaght) one of the country residences of the archbishops of Dublin. It is pleasantly situated in an undulating wooded country, about three miles from Malahide, at the head of the creek. The massive plain tower, with hideous modern battlements, alone remains from the fabric of the medieval abbey, of which extensive ruins stood even in 1790. They were removed to build a pretentious modern church in the Gothic of the early nineteenth century. The Irish monastery, strange to say, has also left no trace but its belfry, a round tower, the upper story, and conical cap evidently rebuilt (fig. 30). It is 75 feet high, and about 55 feet in



ST. DOULOUGH'S CHURCH, CO. DUBLIN, FROM THE SOUTH.

circumference, with its ancient lintelled door, which, by the raising of the ground, is (like that of Lusk, and unlike most examples) easily accessible. In the valley, beside the stream, and adjoining the village, is the Archbishop's

Fig. 30.— Round Tower and Abbey Belfry, Swords.
(Photo. by T. J. Westropp.)

Castle. The outer walls, with their various buildings and towers, including the great gateway, the chapel, and residence, are in fair preservation. It now only defends a kitchen-garden. (For view of gate, see fig. 24.)

Lusk.

The monastery of Lusk (lusca, a cave or artificial souterrain) was founded at the end of the fifth century by Macculin. The holy well, with a stone "marked by his knees," still bears his name; it is now enclosed in a modern garden. The history of the abbey actually begins with Petranus, a Breton, bishop and abbot about 616; he is also patron of Llanpadarn in Wales. It flourished till its destruction by the Danes in the ninth century, struggling to survive, but again and again ravaged by the foreigners. It was probably, like all ancient monasteries in Ireland, a village of wooden-wicker and earthen huts, crowded round one or more churches, and, in this case, round a fine round tower, its only existing relic. When the district was occupied by the Anglo-Normans, the church was rebuilt and dedicated to the Virgin. In 1179 a papal bull assigned it to St. Laurence O'Toole, Archbishop of Dublin, whose successors held the lands till the disestablishment of the Church of Ireland in 1870. The Normans expelled the Irish monks the year after the bull was granted. The round tower was fortunately preserved and embedded in the medieval belfry by the later builders (fig. 31). Their intention was probably to make it a north-east turret, as they built round turrets to the three other angles, but by some oversight the corner of the new belfry overlapped it. The old belfry is about 95 feet high, and 53 feet in diameter. It only lacks its ancient conical cap, and none of its features are modified; they include the four small windows facing the cardinal points in the top story and other little lights; the door is plain, massive, and lintelled, facing the east. (For section and sketch of door, see fig. 32, Nos. 1 and 2.) The later belfry is a castle-like structure, with (as already said) three corner-turrets, one with a spiral stair. The top commands a fine view. In the interior should be examined the Bermingham and Barnewall tombs, removed for shelter from the site of the older chancel. That of Sir Christopher Barnewall of Turvey, 1589, has effigies of that knight and his wife, with elaborately carved embroidered clothing. The names of nineteen of their children are carved on it. The second tomb, of James Bermingham, displays a knight in armour,

in lower relief, with a hawk holding a bird; the date is 1627, but by a break appears to be 1527; the style is probably copied from some older tomb. The ancient

Fig. 31.—Round Tower and Belfry, Lusk, Co. Dublin.
(Photo. by T. J. Westropp.)

church, with two aisles, divided by an arcade of seven Gothic arches, was swept away after 1839, and a neat edifice built on part of the site. Among its monuments was once a supposed idol, a hideous face, with legs issuing from it, probably one of the curious and usually indecent grotesques (not confined to Ireland) called "Sheela-na-gigs" from a well-known figure in County Cork. The Lusk "idol" was buried by a too scrupulous rector as a relic of heathenry.

Round Towers of Clondalkin, &c.

We may here close the subject of the Round Towers in Co. Dublin. That at Clondalkin is a perfect but rather poor structure, 89 feet high and 47 feet round. (For section and view of doorway, see fig. 32, Nos. 3 and 4.) At Rathmichael is a stump 8 feet high and 52 feet round. It stands beside a ruined church, part of the nave wall early, the chancel late. In the graveyard are several curious early tombstones, with scribings and a holed stone. Outside the modern boundary are considerable remains of the ancient ring-wall of earth and dry stones, and the piers of the gateway, the well, basin-stone, &c. The round tower of St. Michael le Pole stood in the city, in a court off Ship-street, behind the Castle. It was much injured by storms and decay, but was repaired judiciously by Dean Swift about 1738. A severe storm in 1775 so shook it that it began to lean over in 1778, though otherwise perfect, even to its conical cap; the authorities and architects, after trying to preserve it, were compelled by signs of collapse to level it. Beranger's striking view of it is well known; it was taken in 1778.

Glendalough.

This picturesque glen and group of ruins, reached through a beautiful stretch of country, lies in the heart of the Wicklow mountains. The remains have been described at some length in the Journal of the Royal Society of Antiquaries for Ireland in 1895, to which we refer for details.

Glendalough, the valley of the two lakes, lies over nine

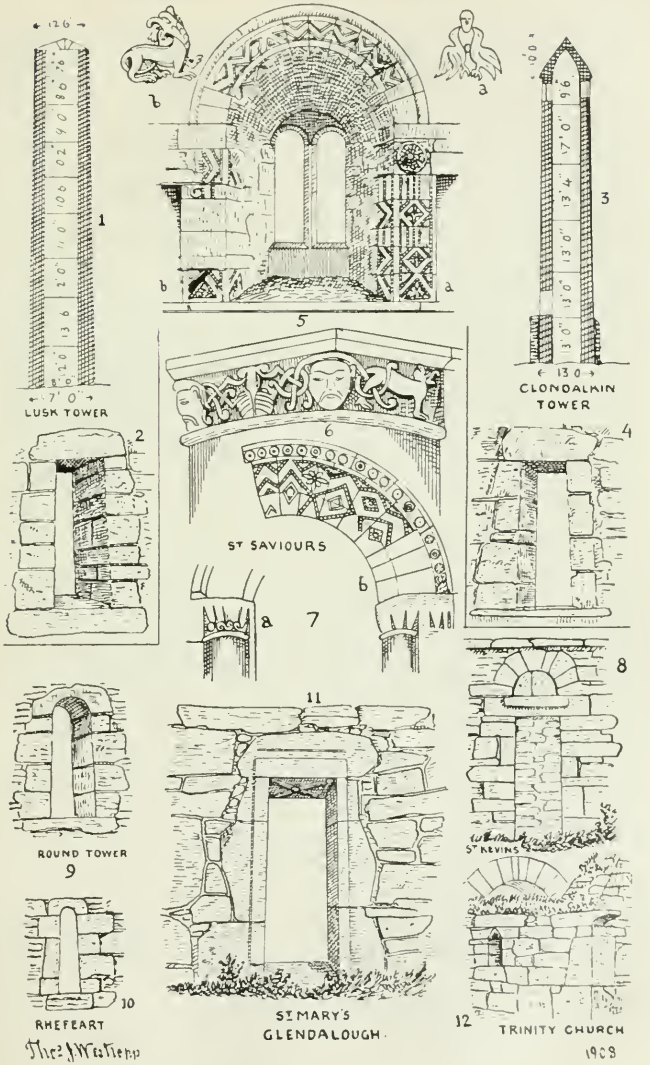


FIG. 32.—Details of Early Irish Buildings.
(References in text)

miles from Rathdrum station in one of the most beautiful nooks of Wicklow. We drive through picturesque woods and hills, with charming views over the valleys, and finally enter on a long glen, overshadowed by heathery or wooded ridges, and brightened by more than one rapid mountain stream. As the view opens up, we see the lofty round tower, the similar, but smaller, belfry of St. Kevin's Kitchen, and the gables of the ruined cathedral, with the shimmer of the lakes beyond, making, with the dark hills behind, a most impressive picture.

The monastery was founded at the end of the sixth century by St. Kevin, or Coemhgen (fair-born), a scion of the then ruling clan in County Wicklow. Two brothers and two sisters of his have also won places among the saints of Ireland. One brother founded the lonely little church half buried in the sandhills of the isle of Inishere, in Galway Bay, and is a powerful storm-queller in the belief of the fishermen. St. Kevin was educated by his uncle Eugene, Bishop of Ardstraw, by whom he was ordained priest, and, deserting the world, adopted the life of an anchorite, dwelling in a hollow tree, and, later on, in a small artificial cave, overhanging the upper lake, in the "desert of Glendalough." Crowds were attracted by his austerity and piety; a monastery sprang up, with several churches, and at his death (June 3rd, 618) its future was well assured. The city prospered for many generations, but by the time of the Norman invasion it had become deserted, and the valley was a "cave of robbers." St. Laurence O'Toole, Archbishop and patron of Dublin, endeavoured to revive it at the end of the twelfth century. He in some degree succeeded, and its "chorepiscopi," or rural bishops, are named in the following century. At last, though united to the See of Dublin, in the arrangement recognized by the English Government, it obtained bishops of its own, recognized by the Pope and the hill-tribes; but these never troubled to get formal grants of the temporalities, over which, indeed, the feeble English Government at Dublin had no control. Dublin was long kept in fear of the ferocious O'Byrnes and O'Tooles, who "wasted all the plain" to the Liffey, and laid ambuscades for the citizens in the present suburbs of

the city.[1] The bishops' names occur down to the sixteenth century; but we have at present no evidence to show when the series closed, and the cathedral and churches fell into ruin.

The two churches lying nearest to the mouth of the glen are the "Trinity" or "Ivy Church" beside the road, and St. Saviour's monastery across the river, reached by a path along the flank of Lugduff, from the bridge near "St. Kevin's Kitchen."

Trinity Church should be first visited; it is an early building, probably dating, at latest, from the early tenth century. It has a nave, chancel, and west room. The latter was an afterthought, though an early one. A tall, circular belfry rose upon its square enclosure, but, save the under corbelling of the vault, nothing of the tower remains. Several views are preserved, which show it as thickly ivied; it appears to have fallen towards the end of the eighteenth century. The church is still entered by a south door, the old west door with lintel and inclined jambs now leading into the west room. The choir arch is a massive, plain, but finely-built structure. The east chancel window is round-headed, both in ope and splay-arch, with a curious hood-slab; the southern is of that very early type (frequently found in the round towers), the head of which is formed of two slabs leaning together. Note the "Handle Stones" projecting from the east corners of the outer angles (see fig. 32, No. 12).

Passing an old slate block, engraved with a cross, we find near the hotel the ancient gatehouse of the monastery. It was a low tower, resting on two well-built, round-headed arches; the tower and one arch fell, but the latter was rebuilt from the original blocks. A rudely paved road leads inwards and upwards from this building.

The *Cathedral* was once a plain, oblong church, with projecting antæ to each face; fragments of the pillars of some earlier church are embedded in its walls. In later days the chancel and vestry were added. The elaborate

[1] The "three castles on fire" in the City arms refer to an act of English retaliation against the hill tribes (*cf.* pp. 234 and 284).

chancel window, illustrated by Ledwich (1780) and Petrie, is somewhat mythical, as the inner arch alone, with its simple, shallow chevrons, was standing at the earlier date, when the drawings were done, and the arrangement in the restored window (as drawn) is unlike any other of the period as known to have existed in Ireland. By the time of Petrie the arch had fallen, and only a rugged gap remained, much as we saw

Fig. 33.—St. Kevin's Church, Glendalough, Co. Wicklow.
(Photo. by T. J. Westropp.)

it in 1876, when it was repaired in the restorations made by the Board of Public Works. Some early tombstones, with defaced Irish inscriptions, and other slabs (highly ornamented, but of later date), lie in the chancel. The latter division measures 25 feet by 21 feet 10 inches; the nave 48½ feet by 30 feet. The chancel is an afterthought. In the nave we

note the broken piers of the once elaborate north door and the west door, an advance on the lintelled type in having a semicircular relieving arch above its lintel. The lower part of the walls show larger and older masonry of the original structure. The church was dedicated to SS. Peter and Paul after the coming of the English.

St. Kevin's Cross is a granite monolith, a Latin cross, with only very small segments of a circle at the junction of the arms. It is 11 feet high; the shaft has a spade-like projection at the base.

Regles an da Sinchell (the church of the two Sinchells) was burned, with the neighbouring Cro Chiarain, in 1163; the foundations of its nave and wall have been excavated, but Cro Chiarain has not yet been unearthed; it lies near Kevin's Kitchen.

Cro Chaeimghin, or "St. Kevin's Kitchen" (fig. 33), a most perfect specimen of the two-vaulted oratory with a steep stone roof, is an oblong church, 23 feet by 15 feet, with a barrel vault, through a circular ope, by which access can be had to the overcroft. The west door is lintelled with a relieving arch, closed by two stone slabs, and the cornice below the roof is continued across the west face (fig. 32, No. 8). The round-headed original east window is seen above the later chancel-arch. Soon after its erection several additions were made. A round-headed arch was cut in the east end, a chancel built with a vaulted sacristy, or "Erdamh," to the north, and a circular belfry (a miniature round tower with upper lights facing the cardinal points) built on the west end of the roof. The chancel has been removed, but the belfry and sacristy are in admirable preservation. A small high cross, carved slabs and fragments, querns and mortars, have been gathered into this church, which forms the museum of the explorations made in 1876.

The *Priest's House* lies to the north-west. It had remarkable capitals, with human heads at the angles, the long moustaches held by whale-like monsters; only parts now remain. These support an unusual arched recess in the outer east face. Part of another curious carving of St. Kevin, between a bishop and a bell-ringer, is of early

date, and set over the south door. The old dry-stone cashel (or enclosure) of this church should be noted.

The *Round Tower* (fig. 34), the most prominent feature

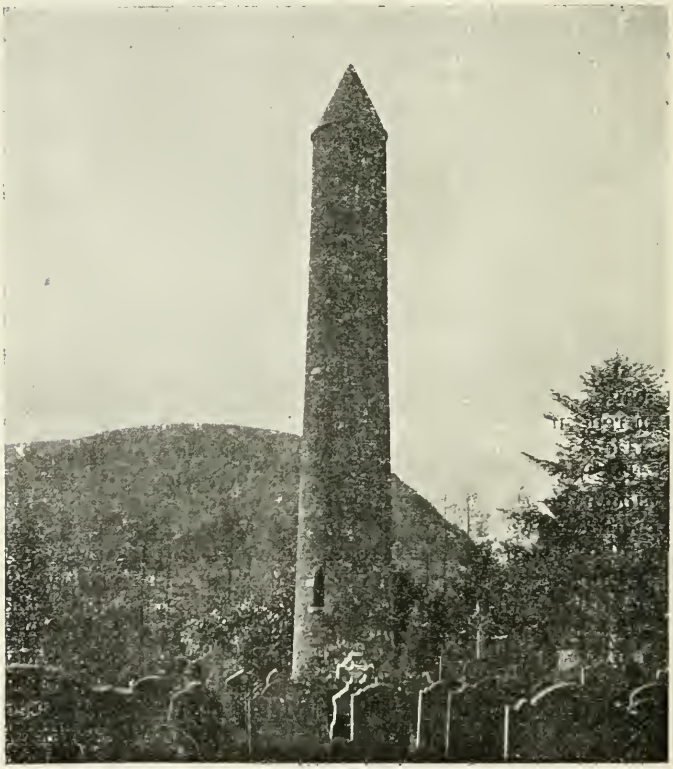


Fig. 34.—Round Tower, Glendalough, Co. Wicklow.
(Photo. by T. J. Westropp.)

of the ruins, stands about 50 yards from the Cathedral. It is 110 feet high and 52 feet round, coarsely built of mica-slate and granite. It has a slight base, a round-headed

door (not arched, but the head formed of one stone) standing 10 feet above the ground, and the usual slit-windows (fig. 32, No. 9). The cap was rebuilt from the original stones found inside the tower in 1876.

Crossing the stream, we see a rock, with a basin called the "Deer Stone," after the legend of a doe supplying St. Kevin with milk. If we turn eastward down the valley, we find in the low fields the most elaborate of the churches, its modern name being *St. Saviour's*. It is surrounded by a fir grove, and consists of a chancel, 14 feet by 11½ feet, and once vaulted, and a nave, 45 feet by 19 feet. The chancel arch, of very rich Hiberno-Romanesque work, from about 1080 to 1120, rests on clustered columns; the arch is rich with dog-tooth, chevrons, and beading. The east window-jambs are decorated by those curious carvings of ravens picking a skull, dragons, &c., so often illustrated in works on Irish antiquities (fig. 32, Nos. 5–7). The residence is almost featureless, lying to the north of the nave; steps lead from it up the east gable to the broken vault of the chancel.

St. Mary's Church, or Kill Iffen, lies to the west of the great cemetery. It was named "Cil Ifin" after a certain Aiffen (commemorated on June 3rd), whose history is unknown. He is named in the Life of St. Kevin and the Martyrology of Donegal, and lived early in the seventh century. The former work tells us how St. Kevin, warned by a vision, directed a church to be made to the east of the lesser lake to be the "place of his resurrection." Dima and his sons, the owners, gave him the site, asking where it should be. St. Kevin replied that it should be built round a shepherd's grave, a spot covered with thorns. He was laid there when he died. There was a beautiful strain of tenderness in St. Kevin, shown in the older "Lives." He loved and was loved by birds and beasts. Later legend "improved" on this theme by telling how the blackbird laid her eggs on his hand, outstretched in prayer, and he let her hatch them there. This gives him his distinctive symbol in Art. The very late legends, full of vulgar pleasantry or bad taste, include his pushing the too loving Kathleen into the lake and drowning her; in the older

legends he only gives her prototype a well-deserved whipping. The church has a nave and chancel, 32 feet by 20½ feet and 21½ feet by 19½ feet. The former is the oldest, having a very fine lintelled door, with inclined jambs, a raised band round it, and a saltier with rings at the ends cut on the soffit (fig. 32, No. 11). Before this door Sir Walter Scott once amazed his companions by sitting for some time wrapped in contemplation. The north door is unusual, narrowing from the top downwards. There is a cornice across the west face, level with the side-walls. The choir-arch is broken, several ancient tombs lie in the chancel, and the east window is round-headed, and has a "Wall of Troy pattern" on its outer hood, probably belonging to the late twelfth century.

Between the lakes were two burial-grounds. One remains, a primitive-looking ring-wall, with small cairns and a cross. Another larger, but broken, cross stands to the north side of the lower lake and beside the road.

Rhefeart Church.—To the south of the neck between the lakes we find an early church founded by St. Kevin; round it is the cemetery of the Wicklow chiefs. It is beautifully situated, though the new plantations are rapidly shutting out the view of the lake, which once made a delightful background to the ruin and the mossy green graveyard, with its crowd of slabs and ancient Celtic and Latin crosses.

The church has a nave and a chancel, 29 feet by 17½ feet and 14 feet by 8½ feet, and has been extensively rebuilt since I first saw it in 1876. The chancel arch was rebuilt from the fallen blocks, and is plain and semicircular; the windows are round-headed (see east window, fig. 32, No. 10). Those of the south wall have each the arch of the splay as well as the light scooped out of a single stone. The chancel has projecting handle-stones at the angles. The west door is also a fine specimen of the lintelled type, with inclined jambs, like that at Kill Iffen. The alleged tomb of King O'Toole has been broken up and sold piecemeal by the unscrupulous and ignorant "guides" to more ignorant tourists as "bits of the tomb of a real old ancient Irish king." The trade continued till very

recent times, for stones were as abundant as the tourists' credulity. The inscription which led to this miserable vandalism was alleged to have run: "Jesus Christ mile deach feuch corp Re mac m thuill"; it really read: "Or do Corpre mac Cathail," a person who died in 1013. Unfortunately the inscription, as misread, fell in with the vulgar modern legends of the "guides."

The place was the "Prioratus de Rupe," "Conventus de Deserto," and "Disert Coemghin" of the ancient records, traditionally the hermitage of St. Kevin. It was given to the Augustinians in 1264.

St. Kevin's Bed.—Taking boat on the upper lake (the only safe alternative to a most dangerous and rugged path), we come below a narrow square cell, hewn, or perhaps enlarged, from a natural cave, in the precipitous rock. It can be entered from overhead. It is said to have been "Kevin's bed," where he kept Lent. Archbishop Laurence O'Toole used to do the same in veneration of his saintly predecessor.

Teampull na Skellig.—The church of the rock, latest and most western of the ruins, stands on a steep slope of fallen rocks. It is an irregular oblong oratory, about $25\frac{1}{2}$ feet by $11\frac{1}{2}$ feet. The east window, like that of St. Saviour's, has two lights under one splay, cut in this case from a single stone. Three old slate crosses stand in the cemetery; one has an arrangement of squares and concentric circles. The view from the hillside above it down the glen is very beautiful: the ruin at our feet, the dark lake, the steep crags, with their oaks and hollies, and, far down the valley, eastward, the lofty round tower rising over the clustered trees, with the brown heathery hills behind.

ANTIQUITIES OF THE BOYNE VALLEY.

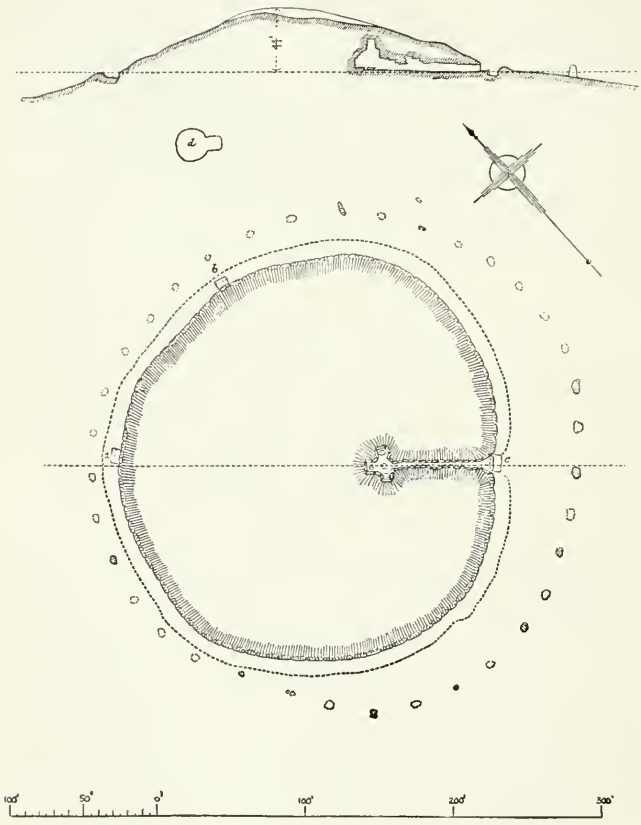
By John Cooke, M.A., M.R.I.A.

The Boyne Valley is one of the most interesting tracts of country in Ireland. In it are some of the finest remains of pagan Ireland now existing; it was the scene of the labours of Ireland's greatest saint, and is remarkable for the number of its churches, abbeys, crosses, round towers, and other ecclesiastical remains. As the border of the Pale it bristled with Anglo-Norman castles, and its banks saw the most decisive battle in Irish history, and hardly less so in English, since it proved the downfall of a British dynasty..

Drogheda.

Drogheda—Irish, *Droichead-atha*, "the Bridge of the Ford"—dates from an early period, the broad estuary of the Boyne being one of the most important inlets on the eastern seaboard of Ireland. Turgesius, the Dane, made it a strong Norse settlement, and a centre from which to raid the rich midland country; and here, later on, the Anglo-Normans erected a castle on each side of the river and a bridge across the Boyne. It grew in importance in the middle ages as a great stronghold of the Pale, and successive Parliaments were held in Drogheda, notably Poynings' (1494), whose enactment, that no law could be passed by the Irish Parliament which was not approved of by the English Privy Council, was the cause of much subsequent dissension. Drogheda figured in the wars of the seventeenth century; and in 1649 Cromwell took it by storm and put the garrison to the sword. Behind the workhouse stood the mound from which he made his attack on the town, "made the breach assaultable, and, by the help of God, stormed it." The town was held by Lord Magennis of Iveagh for James II in 1690, but it surrendered on the day after the Battle of the Boyne.

Drogheda was a walled city, and was strengthened with many towers and entered by many gates. Of the latter St. Lawrence's is the only gate remaining, one of the



PLAN AND SECTION OF TUMULUS AT NEWGRANGE.

(From Trans. R.I.A., vol. xxx.)

most interesting examples now standing in Ireland. The ruins of the Abbey of St. Mary are few—a central tower with a pointed arch is all that has survived the ravages of time and the terrible battering of Cromwell's guns. The abbey belonged to the Augustinians, and was founded in the reign of Edward I on the site of an older church, said to have been established by St. Patrick. The Magdalen Steeple, a lofty tower of two stories, springing from a fine pointed arch, and a conspicuous object on the north side of the town, is all that remains of the Dominican Abbey which was founded in 1224 by Lucas de Netterville, Archbishop of Armagh. St. Peter's Church, with its massive tower and lofty spire, has been erected to the memory of Oliver Plunkett, Roman Catholic Archbishop, who was a victim in the days of the "Popish Plot," and was hanged at Tyburn. His skull is preserved in the Dominican Convent in the town.

Drogheda is well situated on both banks of the Boyne, four miles from the sea; and at the harbour end a fine railway viaduct, designed by Sir John McNeill, crosses the river at a height of 90 feet above high water. It consists of twelve arches of 60 feet span on the south side, three similar arches on the north, and these are connected by a lattice-bridge 550 feet in length. The harbour has been improved at different times, and there is a good cross-Channel trade, chiefly in provisions, with Liverpool. Drogheda has flour and other mills, breweries, tanneries, salt-works, and soap-works.

Within a drive of three miles by the river is the site of the Battle of the Boyne. The spot where William III was wounded is marked by an obelisk (1736), and the small village of Oldbridge existed at that time on the south bank of the river.

Newgrange.

The great chambered Tumuli,[1] situated in the valley of the Boyne towards Slane, are amongst the most remarkable monuments of pre-Christian ages in western Europe.

[1] These tumuli have been described and illustrated by G. Coffey, Transactions Royal Irish Academy, vol. xxx., 1892, p. 1.

These have been identified with the Brugh na Boinne of the manuscripts and tradition. The largest is Newgrange, about four miles from the battlefield, which has been open since its entrance was first discovered in 1699 by Edward Lhwyd, Keeper of the Ashmolean Museum, Oxford. Particulars of his remarkable discovery, with a description of the chambers, were published in the Transactions of the Royal Society. Newgrange stands on rising ground, and the trees and bushes growing on it give the mound the appearance of an ordinary hill. It has suffered much in the course of time, as the inhabitants had for ages been using it as a quarry from which to draw material for road-making and building purposes. A great circle of standing stones seems originally to have surrounded this tumulus, and of these twelve now remain, four of which vary from 6 to 8 feet high and 15 to 20 feet in circumference; these stand 30 feet apart, and if the circle were complete, the original number would be thirty-five. Within this circle a rampart or ditch of loose stones encloses the base of the mound, well defined everywhere except on the east side. The tumulus consists of a mass of loose stones about an acre in extent and covered with grass; and if the ground to the circle of standing stones be included, it would extend to two acres. The base of the tumulus is retained by a belt of large stones from 8 to 10 feet in length, on which a dry wall has been raised to a height of 5 to 6 feet. The entrance to the passage is to the south, and across it lies an immense block covered with a series of spirals, a cast of which is in the National Museum (Plate XVI); two others have been discovered in the circle of great stones enclosing the mound, and a carved stone is seen immediately above the entrance. The passage runs nearly north and south, and measures 63 feet in length; it is 4 feet 9 inches high at the entrance, increasing to 6 feet at a distance of 26 feet from the opening, but decreasing again to the first height at 43 feet, when it rises again rapidly until it joins the chamber-roof. It is 3 feet 5 inches broad at the base, and some 3 inches less at the roof; and these dimensions are nearly average throughout its length, except at one

ENTRANCE TO TUMULUS, NEWGRANGE.

(From Trans. R^d^ I. Acad., vol. xxx.)

or two spots where the supporting stones have been forced from their position. The passage is formed of great upright blocks of stone, measuring from 5 to 8 feet high, and numbering twenty-two on one side and twenty-one on the other; and across these slabs are placed, forming the roof. The plan of the chambers is cruciform,

Fig. 35.—Carving on stone, west recess, Newgrange.

three recesses opening out of the central chamber. This is formed by successive layers of stones, each course projecting slightly over the one beneath, and gradually closing, in beehive fashion, until a single flag is sufficient to form the last course and complete the roof. The height of the chamber is 19½ feet; the east recess is 7 feet 9 inches in depth; the north, 7 feet 6 inches, and the west, 3 feet 4 inches. On the floor of each is a large stone, hollowed out into the shape of a shallow basin; a finer basin, with two peculiar

cup-like depressions, stands in the centre of the great chamber; it originally stood in the east recess, but was removed here in recent times. The stone is granite, and the suggested origin is either the mountains near Newry, or those of Wicklow. (Plate XVII.)

The basins were very probably used for the reception of the cremated remains of the dead, with an inverted urn placed over them. Burnt bones have been found in a kistvaen on the west side of the slope of Newgrange. Similar finds have been made at Dowth and Loughcrew, in the latter case in connexion with fragments of urns, which goes far to establish the theory that these basins were connected with urn-burial.

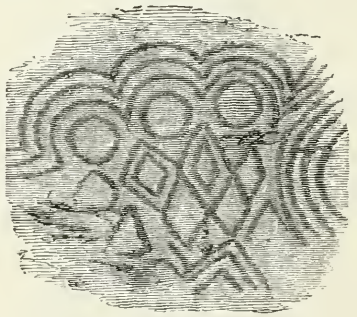


Fig. 36.—Carving on stone, east recess, Newgrange.

The sides of the recesses are formed by large blocks of stone, and several of those in the passage and here are covered with carving of great variety and interest. The cuttings on the roof of the east recess exhibit much ingenuity and care, and a stone at the entrance of the west recess has a carving of what appears to represent a branch of fern (fig. 35). Most of the cuttings on these stones must have been made before the passage and chambers were built, especially those in the east recess, for in their present position they could not be worked upon with any instrument (fig. 36). Casts of many of the worked stones are in the National Museum of Science and Art. With

Recesses in Tumulus, Newgrange, showing Basins.
(From Trans. R. I. Acad., vol. xxx.)

the exception of the basins, all the stones used in the construction of the passage and chambers are local.

According to the "Annals of the Four Masters" and the "Annals of Ulster," the cave of Achad-Aldai, which is supposed to be Newgrange, was plundered by the Danes in 861. As it was the custom of the Norsemen to bury their chiefs and warriors, with their arms, ornaments, and other valuables, in mounds and cairns, the Danish invaders would, no doubt, expect to find treasures in the cemetery of Newgrange, and would consequently explore it with that hope.

Dowth.

Over a mile to the north-east is the great tumulus of Dowth, which is about the same size as Newgrange, and,

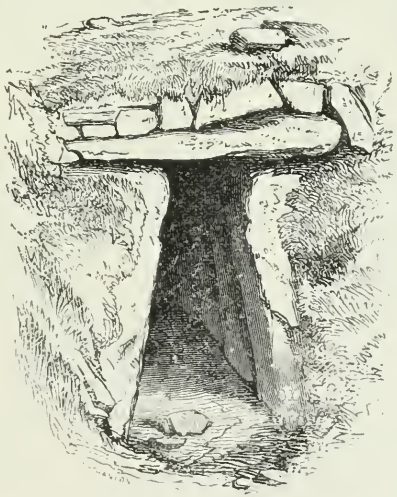


Fig. 37.—Passage into tumulus of Dowth.

like it, was plundered by the Danes at the same time. It is 280 feet in diameter, and 47 feet high; it is surrounded by a belt of stones, but, unlike Newgrange, has no retaining wall. It was explored by a committee of the Royal Irish

Academy in 1847, of whose survey no account whatever has been preserved. An opening then existed on the west side, and this was followed, and the central chamber and recesses were revealed. The cutting was continued to the centre of the mound without any further discovery. About fifty feet to the south, however, another set of chambers was found, and a number of small sling-stones, glass and amber beads, pieces of jet, bone and copper pins, iron knives, human and other bones, were discovered during the exploration. The entrance has been protected by new work, so that its original form cannot now be seen.

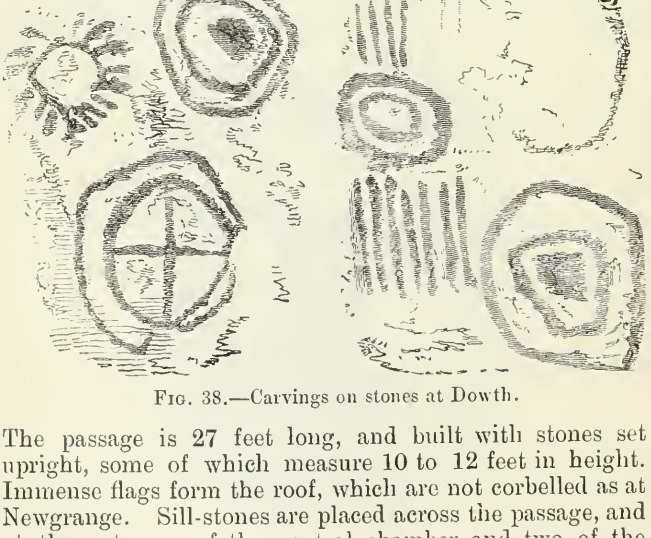


Fig. 38.—Carvings on stones at Dowth.

The passage is 27 feet long, and built with stones set upright, some of which measure 10 to 12 feet in height. Immense flags form the roof, which are not corbelled as at Newgrange. Sill-stones are placed across the passage, and at the entrance of the central chamber and two of the recesses; these are not found at Newgrange. The general plan is cruciform, the central chamber being 11 feet high, and 9 feet in diameter; on the floor is a large shallow basin, which has been broken to pieces, but is now put together; the recesses are smaller than at Newgrange, and they contain no basins. A great stone 9 feet high and

8 feet broad, between the north and east recess, is remarkable for its peculiar and varied carving; other stones in this chamber are also carved, but all are of a ruder character than those at Newgrange. The south recess leads into a double set of chambers, one extending to the west and the other to the south; and a single stone, 8 feet in length, forms the floor of the latter; there are sill-stones in these chambers also. On the south side of the mound another opening discloses two chambers, some of the stones of which have a great variety of carving (fig. 38). In 1885 further excavations were undertaken by the Board of Works, and, to the south of the passage leading to the first set of chambers, a short curved passage with steps was discovered, terminating at each end in a circular cell. The character of this work, and the kind of stones used—that of an ordinary field size—show that the structure was of a much later date, being of the usual souterrain type common in many parts of Ireland.

Knowth.

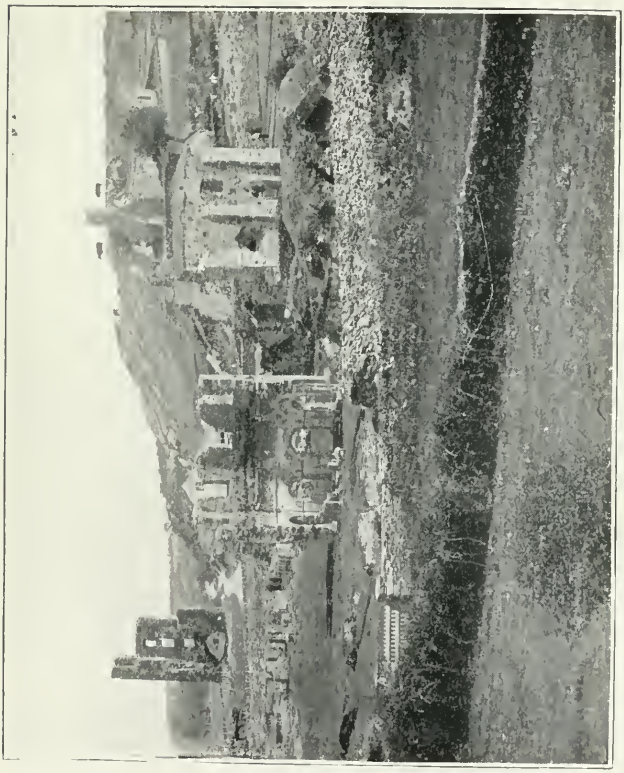
The third great tumulus of the Boyne group is at Knowth, less than one mile away, to the west towards Slane. It, too, was rifled by the Danes, but since that time it has not been entered. It is about 700 feet in circumference, and over 40 feet high, and for many years was used as a quarry by those requiring material for house-building or mending roads.

Among the objects found about these tumuli were a gold coin of Valentinian, one of Theodosius, a denarius of Geta, a gold chain, two finger-rings, two gold torcs, and some bronze and iron objects. These, however, should be considered with great care in determining the age of the tumuli: the later construction and occupation of the chamber at Dowth and the visits of the Danes are sufficient to account for those objects of a late date. Taking the character of the architecture into consideration, the nature of the ornamentation, and the objects found, expert opinion assigns the tumuli to the Early Bronze Period, and makes Newgrange the oldest member of the group.

Mellifont Abbey.

About four miles north of Newgrange stand the ruins of the first Cistercian monastery established in Ireland. This was due to Malachy O'Morgair, Archbishop of Armagh. He visited St. Bernard at Clairvaux, and a lasting friendship was created between them ; and it was here, when on another visit eight years later, that Malachy died, and St. Bernard wrote his "Life." Donough O'Carroll, prince of Oriel, gave a grant of land on the banks of the river Mattock, and a monastery on the lines of those of the great Cistercian order was founded in 1142. Many others soon followed, and by the time of the coming of the Normans twenty-nine monasteries of this order were established throughout the land ; but the Abbot of Mellifont took precedence of all the Cistercian abbots in Ireland. In 1157 an important synod was held here, attended by the primate Gelasius, seventeen bishops, and four provincial kings. Henry II specially favoured Mellifont, and granted it a charter, as did also King John. In 1190 Malachy was canonised by Clement III. The monastery was richly endowed by Dervorgilla, wife of Tiernan O'Rourke, whose abduction by Dermot MacMurrough was the immediate cause of the Anglo-Norman invasion ; here she died, but the site of her tomb is now unknown. The abbey became rich and prosperous in the course of time, and at the suppression of the monasteries in 1539 it contained 140 monks, besides lay brothers and servitors ; and the abbot owned 4,000 acres of land, extending along the south bank of the Boyne. In 1566 Mellifont and its great possessions passed into the hands of Edward Moore, afterwards knighted, and ancestor of the Marquis of Drogheda. In 1727 the abbey became by purchase the property of Mr. Balfour of Townley Hall, and it has remained in the hands of his successors since that time.

The ruins are prettily situated on the banks of the Mattock, which here divides the counties of Meath and Louth (Plate XVIII). The approach is by the ruins of the porter's lodge, a massive square tower, which rises on one side to a considerable height. On either side of this originally stood a



MELLIFONT ABBEY.
(From a photograph by W. Lawrence, Dublin.)

range of buildings for the reception of strangers, and portions of the old encircling wall may still be traced. According to the usual plan of the Cistercian monasteries, the space between the gate-house and the church was occupied by a pile of buildings, rectangular in plan, of which the church formed one side. Of the latter, which lies to the left, little now remains; it was cruciform in plan, as can be distinguished by a series of concrete blocks, marking the site of the nave piers. The nave had seven bays and was probably 120 feet in length; and the breadth, including the aisles, was 54 feet; the width across the transepts was 116 feet. In the north wall of the north transept is a fine doorway, an exceptional feature in a Cistercian church, with jambs of clustered pillars. In the excavations under the direction of the Board of Works two semicircular chapels were shown to have existed in each transept in a line with the high altar, as at Clairvaux. The foundation of the altar remains, at a few feet distant from the east wall. The chancel was 46 feet long and 26 feet wide; on the south side are a piscina and the remains of a sedilia, and under the latter a tomb was found during the excavations. On the north side is an arched tomb-recess with an ornamental moulding. Mellifont underwent several changes during the successive developments of style in Gothic architecture in the middle ages, and by the fifteenth century little was left of the early foundation. The cloisters were entered from the south side, and of these but the bare traces now remain. On the left is the chapter-house, generally known as St. Bernard's chapel. It is 30 feet long and nearly 19 feet wide, and originally consisted of a lower and an upper chamber, the latter probably being the muniment-room. It has a beautifully groined roof, and three sets of arches which spring from clustered columns with capitals carved in foliage. The centre column runs to the ground, but the others end at a basement a short height from the floor. It is lit by an east window and two side-windows of decorated style, with rather heavy mullions, but good tracery; these have been restored. A quantity of cut stone-work and tiles, which were collected about the grounds and among the ruins during the excavations, are

now stored here. Without is an interesting building, which was entered from the cloisters, and is usually called the "baptistery." It was octagonal in shape, and but five sides now remain; it measured 29 feet across, and the original height was about 30 feet. There was a semicircular arched opening in each face, the arch springing from pillars with foliage-carved capitals; above the crown of the arches is a string-course. All the roof is gone but the fluted columns. The corbels and groins within show where the arches rose that supported it; the upper story was lit by two windows which now show no architectural details. This building was really the lavatory, which was entered from the cloisters, and the monks, having washed their hands in basins from a central fountain, then passed into the refectory opposite to it. In the work of excavation, drains were found in connexion with the building.

Monasterboice.

About four miles to the north is Monasterboice, which contains in its group of ecclesiastical antiquities two pieces of sculpture of exceptional interest. This group consists of two churches, three high crosses and a round tower. The early religious establishment which existed here is ascribed to St. Buithe or Boetius, who founded it about the end of the fifth century, and from whom it derives its name. St. Buithe died on the day St. Columba was born, and was buried at Monasterboice; he is said to have foretold St. Columba's birth. The annals of Monasterboice are not marked by any events of importance, with the exception of the destruction of its belfry by fire in 1097. The churches are of different dates, that standing a little to the north-east of the round tower being the earlier. It was entered by a square-headed doorway in the west gable, and seems to have formerly consisted of a nave and chancel, which were separated by a semicircular arch, now fallen; the chancel, too, has disappeared. The second church is more modern, and has been attributed to the thirteenth century; it was entered by a low round-headed doorway.

The Round Tower is considered by Petrie to date from

THE GREAT CROSS, MONASTERBOICE, CO. LOUTH.
(From Miss Stokes' "Early Christian Art in Ireland.")

the ninth century; Miss Stokes places it a century later. It is about 51 feet in circumference at the base, and 110 feet high. A special feature is the doorway, which is 6 feet from the ground; and the head is cut out of two stones, one laid horizontally over the other. A band runs round the head and down the sides of the doorway to the level of the sill, and then runs horizontally for about 8 inches, ascends and passes round the head, thus forming a kind of a double band. Above the doorway is a pointed window; the remainder are square-headed. The Board of Works has repaired this tower, and placed steps from floor to floor, so that the summit can be reached, from which a fine view is obtained.

The two Crosses at Monasterboice are perhaps the finest now remaining in Ireland, and are remarkable examples of the high degree of perfection to which Irish sculpture of this kind had attained in the early middle ages. The Great Cross (Plate XIX) stands 27 feet high, and was sculptured in three sections: the shaft, the ring and arms, and the top piece. The shaft where it joins the base is 2 feet broad and 15 inches thick. The west side is divided by fillets into seven panels, each containing two or more figures, which are now much worn by exposure to the air and rain of many centuries. The lowest panel is much disfigured, through an attempt made to throw down the cross. In the top panel above, where it runs into the binding ring, is a representation of the Crucifixion, with the usual figures of a soldier on each side, one piercing the body, and the other offering a sponge. The body of the cross, consisting of arms and ring, measures 6 feet 3 inches: the figures on the right are seen to be in the act of adoration; those on the left are obscure, being much worn. The cap is shrine-shaped, and is 2 feet 3 inches high; there are altogether twenty-two panels, of which only nine have been deciphered with any degree of satisfaction. They are: the fall of man, expulsion from Eden, Adam delving and Eve spinning, Cain slaying Abel, the worship of the Magi, the three warriors before David, Michael and Satan weighing souls, the Crucifixion, and the last Judgment.

The second or Muiredach's Cross (Plate XX) is much

smaller, but better preserved; it is 15 feet high, 6 feet in breadth across the arms; and the shaft at the base is $2\frac{1}{2}$ feet in breadth and 1 foot 9 inches thick, diminishing slightly upwards; its sides are divided by twisted bands into panels, each of which contains sculptured figures, intricate designs, or animals. There are three panels in the west face of the shaft, and the figures are of much interest, as they show the type of dress, ecclesiastical and military, used by the Irish

Fig. 39.—Detail from Muiredach's Cross, Monasterboice.

in the ninth and tenth centuries. In the lowest is a figure in a long cloak, staff in hand, between two figures armed with long swords (fig. 39). In the centre the figures are in ecclesiastical garb, each holding a book. In the third the figures are in long, flowing dresses, the one in the centre seemingly giving his staff to one and his book to the other. At the foot of the shaft are two dogs couchant; the centre

The Cross of Muiredach, Monasterboice, Co. Louth.
(From a photograph by W. Lawrence, Dublin.)

of the head has a figure of the Crucifixion as in the larger cross; in the same place, on the east face, Christ is sitting in judgment; a choir of angels fills the arm to the right, several being represented with musical instruments, in which the harp appears, resting on the knees of the Psalmist, and on the harp lights the Holy Spirit in the form of a dove. The space on the left is crowded with figures doomed to punishment, and a fiend with a trident drives them from the throne. Beneath is the Archangel Michael, weighing souls. The next division has a representation of the adoration of the Magi. The third and fourth panels are obscure; in the latter is a seated figure blowing a horn, with soldiers crowding round. The last contains the temptation of Adam and Eve and their expulsion from the Garden of Eden. On the base are two dogs fighting, one holding the other by the ear. On the northern arm, to the left of the Crucifixion and underneath, is a representation of the *dextera Dei*, or hand-symbol used in early Christian art to represent the First Person of the Trinity. An inscription on the lower part of the west side of the shaft runs, "A prayer for Muiredach by whom was made the Cross." There were two of that name connected with Monasterboice according to Irish annals, one an abbot in 844 and the other in 924; but which of them erected the cross remains a matter of uncertainty. As the latter was a man of greater distinction, and probably wealth, he is more likely to have been the founder. The Cromwellian soldiers bear the odium of having broken the third cross, which is very imperfect, the head and part of the shaft only remaining uninjured.

Trim.

(Contributed by T. J. Westropp, M.A., M.R.I.A.)

This most interesting old place is the ancient "Ath trium" of the Lives of St. Patrick, a frontier town and castle of the English, and in later years closely connected with the youth of the Duke of Wellington. We can barely enumerate the ruins. The castle, with a large enclosure, with fosse, curtain walls, towers, and gates, is dominated by a massive

keep, square, with square side-turrets in the middle of each face. The church of St. Patrick retains its picturesque belfry, ruined chancel, with a handsome side-window, curious tombs, and a font, carved with grotesque animals. The great abbey of St. Mary, whose famous image ("the idol of Trim" of the ultra-reformers) is believed to be the fine statue of the Virgin preserved in the Carmelite Convent, Dublin, has only the noble shattered belfry and some foundations to mark its site. Eastward, beside the Boyne, about a mile from Trim, is Newtown, with the ruins of a fine church, a little church embodying the monumental effigy of the first English bishop (as reputed), and an interesting Hospital of St. John. The views of the ruins from the different points of this walk are charmingly picturesque.[1]

SKETCH OF THE HISTORY OF DUBLIN.

By C. Litton Falkiner, M.A., M.R.I.A.

It is a curious circumstance which has often been noted that the story of the Irish capital does not become the story of the capital of the Irish people until a period long subsequent to the first foundation of Dublin. Although the Irish annalists make occasional mention of the site of the future city of Dublin by its earliest name of Ath Cliath, or Ath Cliath i Cualu, from the district of Cualain, a territory corresponding to the diocese of Glendalough, it is not until the end of the eighth century that vague tradition and unauthenticated legend begin to crystallize into history with the coming of the Norse invader. Owing its origin to Danish auspices, Dublin was neither first built by Irish hands, nor originally peopled by men of Irish race. To the Ireland of the ages before the advent of the Vikings, the spot round which the city was

[1] See Eugene A. Conwell, "A Tour in Trim," Journal Royal Hist. and Arch. Soc. (Roy. Soc. Antiquaries Journal), vol. xii., consec. ser, (1872–3), p. 361.

to rise had no doubt always been a place of some importance. For its maritime situation must from the earliest times have necessitated some sort of assemblage of dwellings near the junction of the River Liffey with the Irish Sea. But there is nothing to indicate that either in pre-Christian or early Christian times the ancient Ath Cliath had reached a position of consequence. Until the Danes had fixed their seat in the immediate neighbourhood, no Leinster chieftain or Irish king appears to have chosen the place for stronghold or for residence. Even during the first hundred years of its Norse ownership, it is improbable that any considerable town can have grown up. Indeed, both the name originally given to the place by the native Irish and the later one, likewise of Gaelic origin, which the Scandinavian invaders adopted, indicate that the early importance of the spot was geographical rather than political, and arose less from any settlement of which it had become the site than from the different uses, appropriate to the physical features of the locality, to which the Celt and the Norseman respectively put it. To the former it was Ath Cliath, the ford bridged by hurdles, which formed the most direct means of communication between the ancient kingdoms of Meath and Leinster; and as such it is said, but without any sufficient authority, to have been utilized by St. Patrick when making his way from Wicklow to Armagh. To the latter it was Dubhlinn, the dark pool or haven lying eastward of the ford, a little further down the river, in which the warships of the Viking might find safe harbourage in the course of his marauding visits to the Irish coast.

The earliest ravages of the Danes in Ireland commenced towards the close of the eighth century; but it was not until the year 837 that the Vikings paid their first recorded visit to Dublin. In that year there came "three score and five ships and landed at Dubhlinn of Ath Cliath" to plunder the adjacent territory. This was the prelude to the incursions of the Finn Gaill or Fair Strangers, the memory of whose settlement in the district north-west of Dublin is embalmed in its name of Fingal. Their advent seems to have been followed within a year or two by the

erection of the first recorded building in Dublin, a fortress or fixed encampment which, ten years later, was destroyed by a fresh horde of Northmen. The new-comers represented a different branch of the Scandinavian stock, and are called by the annalists Dubh Gaill, or the Dark Strangers. For some time after their arrival the story of Ireland is a succession of struggles between the two opposite elements in the Scandinavian immigration; but about the middle of the ninth century this antagonism terminated in the general recognition of Aulaf or Olaf the White by all sections of the invaders. It was by this coalition that the Scandinavian power in Ireland was permanently consolidated; and it is in King Aulaf that we are to recognize the true founder of Dublin. In 851, according to the chronicles of the Four Masters, "Aulaiv, son of the king of Loch-lann, came into Ireland, and all the foreigners submitted to him, and had rent from the Irish."

For above a century and a half from the establishment of Aulaf's authority, Dublin was the centre of that important Viking confederacy, stretching from Carlingford to Waterford, to which the name of Scandinavian Kingdom of Dublin has been applied. But it is not to be supposed that the Danish supremacy was left unchallenged throughout this long period. The story of the early wars of Ireland after the coming of the Norsemen contains the record of more than one struggle between the native and the alien race for the possession of that fortress by means of which the Danish kings of Dublin sought to buttress their power, and which was to form the nucleus of the future capital. In these contests there were many vicissitudes, and fortune was fickle with her favours. But, though the Irish had their triumphs, they were, for a long period, temporary and barren; whereas from the date of the great battle, fought on October 17th, 917, on the banks of the Liffey, within a mile or so of the very site of the original Ath Cliath, until that of the still greater Battle of Clontarf, fought close on a century later, the Danish supremacy in Dublin was complete and unbroken. And although the famous victory of Brian Borumha in 1014 effected the expulsion of the foreigner from Meath and

Leinster, it did not effectually achieve the deliverance of Dublin from foreign rule. For above half a century after Clontarf, the city remained in Danish hands. Down to the time of the coming of the Normans, Dublin continued to be, predominantly at least, the city of the Ostmen, as the Norse inhabitants had come to be known. It was by a garrison of Ostmen that in 1170 it was stoutly, though ineffectually, held against Strongbow and his followers. Thus it is that the oldest memorials which Dublin has to boast are those of its early Norse owners, and that its pre-Norman remains are of Scandinavian rather than of Gaelic origin. Its oldest cathedral—Christchurch—was founded almost a quarter of a century after the Battle of Clontarf by Sitric, its Danish king. Its oldest church, St. Michan's, recalls a Danish saint. And an important quarter of the modern city, on the north bank of the Liffey, has but lately lost its long-preserved name of Oxmantown or Ostmanstown.

But if the earliest traditions of Dublin are undoubtedly those which connect the city with its Norse founders, its earliest authenticated records are as unquestionably Norman. Beyond the associations just mentioned, there is little, if anything, to identify the Dublin of to-day with the capital of the Scandinavian kingdom; or to indicate what manner of city it was that on St. Matthew's Day, September 21st, 1170, after its abandonment by the Danish king, Hasculf McTorkil, surrendered to Strongbow and his valiant lieutenant Miles de Cogan; and which, after the abortive attempt at recapture by a Danish squadron under the dispossessed sovereign, was to become the central stronghold of Norman authority in Ireland. It is impossible to affirm decisively that the fortress of king Aulaf once stood on or near the site of the "royal palace roofed with wattles after the fashion of the country," which Henry II, on his first arrival in Dublin in 1174, erected for the accommodation of his Court at Christmastide. But it is at least extremely probable that it was so. For the physical configuration of the rising ground to the south-east of the city-walls must at all times have suggested the eminence on which Dublin Castle now

stands as the most appropriate site for a fortress. Thus it may well have been that the battlements of the watch-tower from which king Sitric had followed the varying fortunes of the fight at Clontarf rose from the self-same spot on which for seven centuries His Majesty's castle of Dublin has been the citadel of the governing authority in Ireland. But however that may be, no trace of the Danish fortress survived the final overthrow of Scandinavian power; and it is really with king John's order for the construction of "a strong fortress in Dublin, suitable both for the administration of justice and, if need be, for the defence of the city," that the history of Dublin, considered as a metropolis, must be said to begin.

The Norman captors of the Danish town had received from Henry II the charter under which Dublin was to remain, during the long Plantagenet era, the one secure stronghold of English power in an island only half subdued. After the expulsion of the Norsemen, the sovereign "granted to his men of Bristol his City of Dublin to inhabit and to hold of him, and of his heirs for ever, with all the liberties and free customs which his men of Bristol then enjoyed at Bristol, and through all England." This charter, subsequently confirmed by king John and others of Henry's successors, gave to the city and its inhabitants an impress which lasted down to Stuart times. "It is resembled to Bristol, but falleth short," was the verdict of an English visitor in the time of James I. The people of Dublin long retained the mercantile characteristics of the great capital of the west of England; and the parish church of St. Werburgh's, dedicated to the patron saint of one of the earliest of Bristol churches, still bears witness to the connexion between the two cities. The essentially alien character of Dublin, as thus colonized, is well illustrated by the fact that its citizens were long a prey to the depredations of the Irish septs who dwelt within its neighbourhood. Easter Monday of the year 1209 was marked by a memorable raid by the O'Byrnes and O'Tooles, who, descending unexpectedly on the holiday-making citizens, drove them within the city walls, after a slaughter which caused the day long to be remembered in the capital as Black Monday. And

Stanihurst, the sixteenth-century chronicler, has recorded how, at a somewhat later date, the Irish enemy carried their raids on one occasion even into the precincts of the Court of Exchequer, "where, surprising the unweaponed multitude, they committed terrible slaughter by sparing none that came under their dint, and withal, as far as their Scarborough leisure would serve them, they ransacked the prince's treasure."

It was doubtless upon some such provocation as this that the work of building the castle and raising the walls of Dublin was ordered and enforced by King John. To that monarch, who as Lord of Ireland had a peculiar interest in his father's conquest long before he succeeded to the English Crown, Dublin was perfectly familiar, and he thoroughly understood its needs. The first instructions for the building of the castle were issued to the Justiciary, Meiller FitzHenry; but it is to a Norman Archbishop of Dublin, Henri de Londres, that the honour of its erection is really due. The fortress appears to have been completed about the year 1220, and the city walls a few years later. But both castle and city underwent considerable expansion at the hands of the Viceroys of the early Plantagenet sovereigns. Henry III gave orders for the erection of a great hall, 120 feet in length and 80 in breadth, "with glazed windows after the manner of the Hall of Canterbury," a building which in later days appears to have served as the place of meeting for the earlier Irish Parliaments; and it was at the behest of the same monarch that a splendid chapel was raised within the castle precincts to the honour of Edward the Confessor. There is not much of external splendour about Dublin Castle as it exists to-day; but there can be little doubt that, as conceived by its Plantagenet founders, it was intended to be a pile worthy to be the principal edifice of a stately capital.

The limits of the medieval city, as encompassed by the walls and turrets designed to defend it, were far from extensive. From the date of its first origin, as the seat of a settled political system, Dublin has a history of over seven centuries, in the course of which the metropolis has from time to time been extended, until at the present day its

limits have come to embrace an area of close on eight thousand acres, and to contain a population of nearly three hundred thousand. But these imposing figures have only recently been attained by the inclusion within the city boundaries of several of what until recently were deemed its northern and western suburbs; and down to the year 1900 the city of Dublin had long been understood to mean the area within the North and South Circular Roads, a circumference of about nine miles. But the walls of the medieval city were much less extensive, and can hardly have measured more than an Irish mile, or encompassed an area much larger than that now enclosed in St. Stephen's Green. Its dimensions can be gauged with fair accuracy from the accompanying map (fig. 40), by which it will be seen that the city lay along the south bank of the Liffey, whose waters at high tide ran right up to the walls from a point just below the castle, at which Grattan Bridge now spans the river, to the Old Bridge; the whole forming an irregular quadrangle, near the middle of which stood Christchurch Cathedral. Although portions of the ancient walls are still discernible, their traces are of the faintest, only St. Audoen's Arch surviving to show the precise situation of one of the eight city gates. But no substantial change in the boundaries of the capital having taken place between the thirteenth and seventeenth centuries, a late Elizabethan description of "the whole circuit of the city walls" enables us to gain a fair notion of the character of the medieval town. The walls were about 17 feet high, with a breadth of 4 or 5 feet, and the numerous towers by which they were defended varied from 16 to 40 feet in height. Within was a rampart, 15 feet thick, and the walls were stoutly buttressed at various points without. The gates, of which the chief was Newgate, were of imposing dimensions.

Few studies in historical topography can have more real interest than the analysis of the process by which so many of the great cities of modern Europe have been gradually developed from the walled enclosures, which were indispensable conditions of a medieval town, into the spacious and

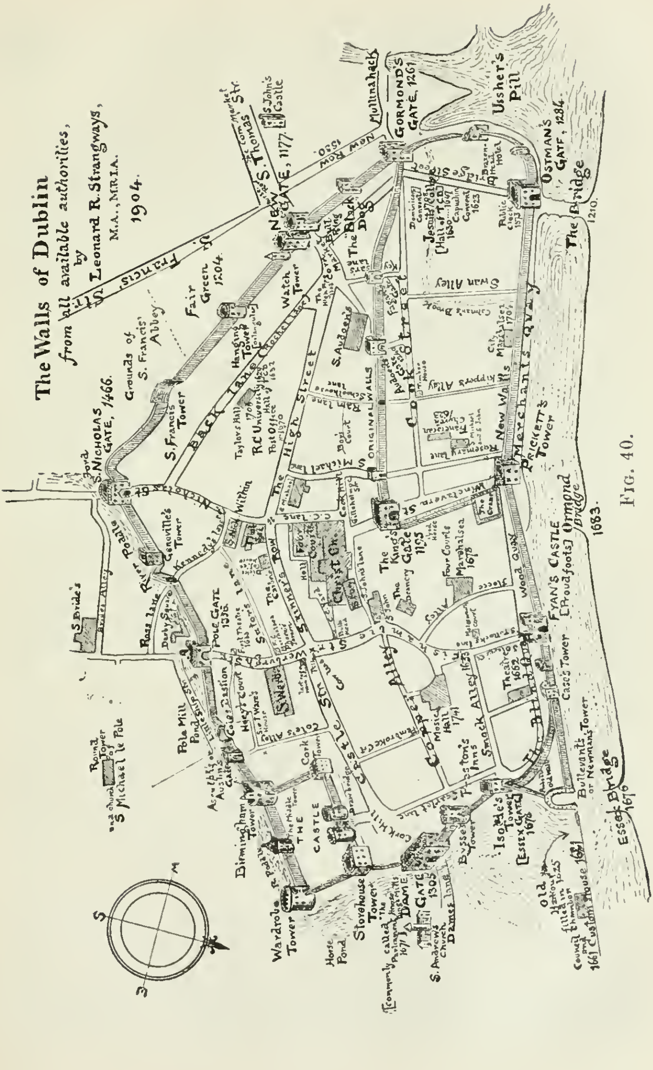

The Walls of Dublin
from all available authorities,
by
Leonard R. Strangways,
M.A., M.R.I.A.
1904.
S. Nicholas Gate, 1466.
S. Francis Tower
Grounds of S. Francis' Abbey
Fair Green 1204.
Watch Tower
Hanging Tower
Back Lane
New Gate, 1177.
S. Thomas St.
S. Francis St.
New Row
S. John's Castle
Gormond's Gate, 1261.
Ussher's Pill
Ostmans Gate, 1284.
The Bridge 1210.
The Black Dog
The Bull Ring
High Street
S. Audoen's
Cook Street
Swan Alley
Merchants Quay
New Walls
Pricketts Tower
Original Walls
S. Michael Lane
Winetavern St
The King's Gate 1195
Four Courts
Christ Ch.
Skinner's Row
Wood Quay
Fyan's Castle
Ormond Bridge 1683.
Cases Tower
Copper Alley
Smock Alley
Music Hall 1741
Preston's Inns
Isolde's Tower
Essex Bridge 1676
Bullevant's or Newman's Tower
Bysses Tower
Dame Gate 1305
Dames Lane
Storehouse Tower
Wardrobe Tower
The Castle
Cork Hill
Birmingham Tower
Castle Street
S. Werburgh
Pole Gate 1336.
Genevilles Tower
River Poddle
S. Bride's
Pole Mill
Round Tower of S. Michael le Pole
S. Andrew's Church
Horse Pond
Custom House 1621

Fig. 40.

unrestricted amplitude of a twentieth-century metropolis. In the case of Dublin the process is peculiarly well marked and easy to trace, and is the work in the main of three great periods of expansive growth. As late as the era of the Commonwealth, Dublin still remained a walled town, within the ambit of whose fortifications few changes affecting its general aspect had taken place for a couple of centuries. From the days of the later Plantagenets to those of the later Stuarts, it may be said with little exaggeration that no changes on a scale large enough to affect its general configuration were wrought in the appearance of the capital or in its geographical outline. Some extensions of the residential quarter had indeed taken place in the closing years of the sixteenth century, the erection of Trinity College on the site of the old monastery of All Hallows naturally leading to the occupation of the intervening area between College Green and Dublin Castle, now traversed by the spacious thoroughfare of Dame Street. Thus, almost contemporaneously with the foundation of the University, the site on which the Parliament Buildings in College Green—now the Bank of Ireland—were subsequently raised was utilized for the first time by the well-known statesman and soldier, Sir George Carew, for the building at first called Cary's Hospital, but afterwards known as Chichester House, from the name of its owner under James I, the celebrated Lord Deputy, Sir Arthur Chichester. But no attempt had as yet been made to enlarge the metropolis, either to the north, where the ancient Oxmantown still sufficed for all the inhabitants of Dublin on that side of the river, or to the south-east, where the modern enclosure of St. Stephen's Green was still a common. And along the line of the southern quays, already antiquated to our twentieth-century eyes, fresh meadows ran from the river banks to the old Priory of Kilmainham.

But the Restoration was to change all that. Under the auspices of an illustrious Irishman, the first Duke of Ormond, who held office as Lord Lieutenant for fifteen of the last twenty-five years of the *de facto* reign of Charles II, a remarkable transformation was effected. Ormond, and those who with him constituted the viceregal court, had,

like so many of the followers of his sovereign, passed more than ten years in an enforced exile in the cities of the continent. The experience was not without a marked educational influence on the exiled cavaliers, who returned from abroad with new and liberal ideas of what a capital ought to be. The walled medieval city, which, as late as 1649, had endured a siege in much the same form in which an attack might have been conducted two centuries earlier, speedily vanished before the more advanced notions of the returned royalists. Houses everywhere sprang up without the walls of Dublin. The space from Cork Hill to College Green, previously but sparsely occupied, was speedily filled up; and the quays began to be formed. On the north bank of the river, Oxmantown Green was so largely encroached upon that St. Stephen's Green, which was first walled in about this time, had to be requisitioned as an exercise-ground for the garrison. The capital grew so quickly that it was noted in 1673 by Lord Essex, one of the Restoration Viceroys, that "the city of Dublin is now very near, if not altogether, twice as big as it was at His Majesty's Restoration, and did till the Dutch war began every day increase in building." So rapid was the extension that some of the old-fashioned citizens, accustomed to rely for security on the protection of the city walls, were filled with alarm, and felt obliged to warn the Lord Lieutenant of the dangers likely to be occasioned in time of war by the large number of dwellings which had sprung up outside the defences of the city. But, apart from the actual extension of streets and buildings throughout this period, the era of the Restoration was marked in Dublin by two great and abiding memorials of the public spirit and enterprise of its seventeenth-century rulers and citizens. The formation of the splendid recreation-grounds of the Phœnix Park, and the enclosure of the spacious area of St. Stephen's Green, at opposite sides of the city, produced a marked effect on the conditions of the further development of Dublin. The Phœnix Park, from the moment it was provided, enormously enhanced the amenities of residence in Dublin. And, although a full century was to elapse before residential Dublin transgressed beyond the

eastern limits of St. Stephen's Green, the permanent dedication of so large an area as an open-air space has had an abiding effect on the aspect and atmosphere of the modern city.

Of these two improvements, the first was the work of the Viceroy, the second of the municipality. The germ of the Phœnix Park was found in certain Crown lands, which, having originally formed portion of the possessions granted to the Priory of the Knights Hospitallers at Kilmainham, had been resumed by the Crown on the suppression of the monasteries. To this nucleus Ormond added extensively by the purchase of adjacent property to the north and west; so that, as first designed, the Park comprised above 2,000 acres, including the area south of the river now forming the grounds of the Royal Hospital—another monument of post-Restoration magnificence. The Park was not designed by Ormond as the seat of the Viceregal residence; and the present Viceregal Lodge became so only by purchase from a private owner, who, towards the close of the eighteenth century, had been permitted to build a residence in connexion with his office of Ranger of the Phœnix Park. But in its present state the Park, as a whole, owes much to the care and interest of a succession of Viceroys, notably of the celebrated Lord Chesterfield, who took a lively interest in its plantations, and by whom the Phœnix Column in the centre of its principal drive was erected.

St. Stephen's Green, on the other hand, owes its origin to municipal auspices, stimulated in part by the pressure of financial exigency, and in part by the spirit of emulation and zeal for improvement which was abroad under the Duke of Ormond's *régime*. The confusion of the Civil War had worked havoc alike with the material prosperity of the general body of the citizens of Dublin and with the municipal finances. The State Papers of the time depict in mournful colours the ruin and indigence wrought in the course of the long struggle, which in Dublin had been marked by all the horrors of a sustained siege and the desolation inevitably produced by the constant apprehensions of military assault. Accordingly the city fathers

could find no better means of replenishing an exhausted exchequer than by letting out the lands round the common called St. Stephen's Green as building lots, at the same time providing for the enclosure of the central space. Although the allotments were taken up by persons of wealth and position, it was not until the succeeding century that the building ground was fully utilized. But in the early half of the eighteenth century the Green became the centre of fashionable Dublin, and the Beaux' Walk, along its northern side, was long the chief resort of the leaders of Dublin society. Down to a late period in the nineteenth century St. Stephen's Green was maintained at the expense of the residents. It owes its present splendour as a public park solely to the munificence of Lord Ardilaun, who, in 1880, carried out, at a cost of £20,000, the scenic transformation which has converted it from an ordinary city square into one of the handsomest of city parks. Besides these two great alterations in the geographical aspect of the city and its environs, two striking memorials of the reign of Charles II survive in Dublin. The first is the stately building near its western boundaries known as the Royal Hospital, an institution similar to Chelsea Hospital, which was built towards the close of the reign from the design of Sir Christopher Wren on the site of the ancient Hospital of the Knights of St. John. The second is the Hospital or Free School of Charles II, better known as the Blue Coat School, founded and endowed by the liberality of the citizens of Dublin, acting under a Royal Charter. But in the latter case the original Caroline building has given place to an eighteenth-century successor.

With the close of Charles the Second's reign and the ensuing political disturbances, a period was put to the development of Dublin under the Stuarts; and it was not until the reign of George II that those extensive additions began to be made which render the latter half of the eighteenth century the grand period in the architectural adornment of the Irish capital. But the interval between the accession of James II and the demise of George I, though unmarked by any striking memorials, was, never-

theless, characterized by a gradual development of certain districts theretofore but sparsely inhabited, or even wholly waste, whose occupation was an essential preliminary to the more imposing additions of the succeeding age. Thus the considerable territory between the enclosure of the College Park and the river had become so thickly populated as to necessitate the erection of a new parish, now known as St. Mark's; and some progress was made towards the inhabiting of the low-lying lands immediately adjacent to the north-eastern bank of the Liffey. These extensions were in part the effect of the pronounced development of the city along the banks of the river in an easterly direction, which its growing wealth and prosperity rendered necessary. But they were in part also due to the important enlargement of the port of Dublin by the clearing of the river channel for the better accommodation of shipping. This was an improvement which ultimately transformed the neighbourhood from a wilderness of slough and slob into the busy hive of railway and river-side enterprise of which it has more recently become the scene; but its most immediate and most conspicuous effect was the laying out of Sackville Street and its adjacent northerly extensions—thoroughfares which the subsequent construction of Carlisle, now O'Connell, Bridge first brought into direct contact and communication with the centre of the modern capital.

The age of Queen Anne, which in England has left so clear an architectural imprint, has but few memorials in Dublin. No great building of the first rank survives to recall that era, unless it be the fine Library of Trinity College, which, however, though begun in Queen Anne's reign, was not completed till 1732; and, though the period was marked by a good deal of rebuilding on old sites, the houses then erected have given place for the most part to the more spacious residences of a later time. The main importance of this period in the history of Dublin lies not so much in its visible enlargement as in the extension of its local and municipal institutions, more than one of which, such as the Port and Docks Board, date from the beginning of the eighteenth century. The development of

the linen trade, and the diffusion throughout the country of a spirit of mercantile enterprise, which, though it has unfortunately not been maintained, was a very marked feature of the early part of the eighteenth century, exercised a direct effect upon the progress of the Irish capital; and to this increased commercial prosperity must be attributed in a great degree that marvellous outburst of architectural enterprise which marked the reign of George II and his successors, and which has left such indelible marks on the face of the city.

For, in its essential features, in almost all that attracts the attention of the passing traveller, the Dublin of to-day is still the Dublin of the closing years of the eighteenth century. With the exception of the cathedrals of Christchurch and St. Patrick's, the only buildings of real antiquity which it contains, almost every structure of interest, and every characteristic feature of the capital, apart from its natural environs, are memorials of that period. Of those public buildings upon which Dublin now prides itself, the Royal Hospital at Kilmainham is almost the only one which existed in the seventeenth century, and curiously few were added in the nineteenth. Of the great distinctive features in the centre of the modern city, the Parliament House, now the Bank of Ireland, was built in the reign of George II; and the great façade of Trinity College, erected at the cost of the Irish Parliament, dates from that of his successor. Modern municipalities have often indulged in lavish expenditure for the housing of their civic councils; but the handsome meeting-place of the Corporation of Dublin has only been adapted from the Royal Exchange of the eighteenth century, whilst the Four Courts and the Custom House, the two chief adornments of the River Liffey as it flows through the city, are monuments of architects of the same period. Nor are the memories of the most vivid period of Irish history in the Dublin of to-day confined to its public buildings. For the residential quarters of Dublin within the old city boundaries still belong as exclusively as its public edifices to the same period. The great squares commemorate in their names the Viceroys and nobility of the

Georgian era, and few of the more important streets were unbuilt a hundred years ago. Save the handsome Post Office in Sackville Street, which dates from very early in the last century; the fine group of buildings round Leinster House, forming the National Gallery, Museum, and Library; and a few of the public statues; there is little in the configuration of the modern streets of Dublin which would be unfamiliar to an eighteenth-century citizen. In the last-named adornment, indeed, Dublin has never been opulent, and it was notably deficient in statues before the erection of those of Burke, Goldsmith, and Grattan, in College Green; of those of Nelson and O'Connell, in Sackville Street; and of the recently erected monument to Queen Victoria at Leinster House.

The best-known of books about Dublin, Sir John Gilbert's "History of Dublin," originated in its author's rambles as a young man through the streets of his native city, and in the memories which his well-stored mind enabled him to recognize as enshrined in the street-names affixed to the principal thoroughfares. And as there is no better stimulus to the faculty of historical imagination than the traditions which are preserved in the street-nomenclature of a modern city, so there is perhaps no better key by which a stranger interested in such associations can attempt to unlock the past than that which is afforded by the simple process of noting the names attached to its more important streets. In the case of Dublin this method of investigation is more than ordinarily simple, requiring for the most part no more elaborate equipment of historical lore than a list of the names of the statesmen who have represented the Sovereign in Ireland for the last two hundred and fifty years. The succession of the Viceroys of Ireland is embalmed in the names of the principal streets of the Irish capital; and whoever would trace the gradual development of Dublin has only to make himself acquainted with Viceregal chronology from the Restoration to the Union. For the order of its municipal development corresponds with curious precision with the order of the Viceregal succession, the name of each

succeeding Viceroy being stamped on each fresh extension of the streets of the metropolis. Thus, the earliest development of Dublin after the Restoration consisted, as already noted, in the extension of the quays on the north bank of the Liffey. Accordingly, we find in this extensive thoroughfare memorials of the chief governors of the period—Ormond Quay perpetuating the name of the great Duke of Ormond; Arran Quay that of his son Richard, Earl of Arran, who twice held office as deputy in his father's absence; and Essex—now Grattan—Bridge, preserving until quite recently the memory of another Restoration Viceroy. In the more modern additions to the city the same rule holds good. Grafton Street, Harcourt Street, and Westmoreland Street on the south side of the city; Bolton Street, Dorset Street, and Rutland Square on the north side, exhibit the order of the street extensions of the eighteenth century. The process might be minutely followed in the names of many of the lesser streets. It can be traced in a less noticeable but still remarkable degree in the case of nineteenth-century extensions in Dublin, and in the street-nomenclature of the various townships outside the borough boundary.

It has not been possible in such a sketch as this to attempt to exhibit the many remarkable events in the history of Ireland with which Dublin has direct associations. To do so would be to tell both too much and too little of the larger story of Ireland. For, though in one sense the story of the capital is the story of the country, the chronicle of Dublin can scarcely be said to abound in striking episodes. Since its capture by Strongbow's followers the incidents of its history have not often been exciting. In Plantagenet times its most thrilling experience was the imminence, in the reign of Edward II, of a siege at the hands of Edward Bruce, as the result of an invasion from Scotland which had very serious effects on the course of Irish history; but the Scottish commander stopped short of assaulting the city, and turned his arms in a different direction. Under the first of the Tudors the city was the scene of Lambert Simnel's brief masquerade in the character of the rightful King of England; the pretender being

crowned with all the pomp and circumstance of royalty in the cathedral of Christchurch. And, in the reign of Henry VIII, the capital witnessed the most serious revolt against English authority of which it has ever been the scene, when, in 1534, Lord Thomas FitzGerald, while governing the country in the absence of his father, the Earl of Kildare, who had been summoned to England on a charge of treason, laid siege to Dublin, and sought to carry Dublin Castle by storm. But the young Geraldine, who is known in history as Silken Thomas, was unable to cover his treason with the justification of success, and perished with his five uncles at Tyburn. In spite of the general unsettlement of the country, and the prolonged Irish wars which filled the reign of Queen Elizabeth, the close of the Tudor era was unmarked by any very notable event in Dublin history; and the close of Strafford's administration on the eve of the great Civil War was the occasion of the next outbreak by which the peace of the city was menaced. On October 23rd, 1641, the Irish Rebellion was heralded by the abortive attempt of Sir Phelim O'Neill to surprise Dublin Castle, as the preliminary to the capture of the capital. But the Government of the day was served on this occasion by the treachery, or indiscretion, of one of the conspirators, and Dublin was spared the bloodshed which elsewhere characterized the outbreak of the insurrection. But, though the authority of the English Government was maintained throughout the struggles of the succeeding decade, Dublin was a witness of many vicissitudes of fortune, in the course of which the city and its citizens were severe sufferers. In the earlier part of the conflict between Cavalier and Roundhead, the Duke of Ormond, as Charles the First's vicegerent, had to meet the attack of the generals of the Catholic Confederation; but, though successful in repelling their assault, he was obliged a year or two later to surrender the capital of his sovereign into the hands of foes more formidable than the King's Irish enemies, and to abandon it to the Commissioners of the English Parliament. Two years later, in 1649, the death of the King having produced a temporary union among all factions in Ireland, the same Viceroy, who had

formerly defended the city, was called upon to besiege it. But Ormond's attack was foiled and his army completely dispersed by Michael Jones, the Parliamentary Governor of Dublin, at the Battle of Rathmines; and thenceforward the capital remained in Cromwellian hands until the Restoration. That event, however, was greeted with enthusiasm by the citizens; and Charles II was proclaimed in the Irish capital in a perfect delirium of loyalty.

Next, and most exciting of all perhaps among the incidents of Dublin history, comes the brief episode of James the Second's visit, when that monarch, exiled from two of his kingdoms, found a temporary refuge in the third, establishing himself in the Irish capital till the decisive defeat at the Boyne obliged him to abandon it. James was followed by another royal visitor in the person of William III, whose stay in Dublin is commemorated in Grinling Gibbons' famous equestrian statue of that monarch in College Green. The war of the Revolution was the last occasion on which Dublin experienced the excitement of actual hostilities; and for more than a hundred years the peace of the city remained undisturbed by any formidable civil outbreak. The military disturbances of the seventeenth century gave place to the more peaceful, though scarcely less exciting, political agitations of the succeeding age, in which Swift, in the character of the author of the "Drapier's Letters," and Charles Lucas, a noisy but capable politician, whose statue by Edward Smyth still stands in the City Hall, were the central figures. In 1778 the celebrated meeting of the Ulster Volunteers in College Green was the prelude to the triumph of the patriot party in the Irish Parliament, and the restoration of those parliamentary liberties of Ireland which are inseparably associated with the splendid names of Flood and Grattan, but which in less than twenty years were to be extinguished as a consequence of the agitation of the United Irishmen and the rising of 1798. That insurrection, which was planned to commence on May 23rd of that year, was precipitated by the arrest in Dublin, two months earlier, of several of the chiefs of the movement, followed after a short interval by the capture and death in melancholy and

dramatic circumstances of its principal leader, the ill-fated and picturesque patriot Lord Edward FitzGerald. For some months after this event Dublin was under martial law, and its citizens were enrolled in yeomanry corps for the protection of the capital. An echo of the United Irish movement was heard five years later, when another brilliant apostle of popular principles headed the short-lived insurrection known as Robert Emmet's rising—an outbreak which proved a hopeless fiasco as a menace to the authority of the Government, but which was attended with melancholy results in the murder of Lord Kilwarden, the Irish Lord Chief Justice, and in the death on the scaffold of the romantic but misguided youth whose enthusiasm had hurried him into a foolhardy enterprise.

The history of Dublin during the nineteenth century is upon the whole a history of municipal prosperity and expansion. None of the great movements of the period can be said to have originated in Dublin. Nor are the chief triumphs of such great leaders of public opinion as O'Connell and Parnell associated in any particularly striking manner with the capital. The great agitations of the nineteenth century—the movement for Catholic Emancipation, the Young Ireland movement, the Fenian rising in 1867, the Land League agitation of more recent years—though all of them enjoyed in a greater or less degree the sympathy of the Dublin populace, were movements which left the surface of Dublin life practically untouched and untroubled. A melancholy exception is to be noted in the tragic crime known as the Phœnix Park murders in 1882, when Lord Frederick Cavendish and Mr. Burke were the victims of the Invincible conspiracy. In recent years Dublin has been happy in having no history, and its chronicles for the last quarter of a century have been fortunately filled with no more notable items than those which testify to the improvement in the appearance of its thoroughfares. The last generation has witnessed the adornment of some of the leading quarters of the city with such architectural successes as the Museum and Library in Kildare Street, and such triumphs of sculpture as the statue of O'Connell in Sackville Street; and last, but not

least, the public-spirited munificence of Lord Iveagh in clearing away the dilapidated houses in the neighbourhood of St. Patrick's Cathedral, and the creation of St. Patrick's Park, has effected a striking improvement in the amenities of the poorer quarters of the city.

CATHEDRALS AND CHURCHES OF DUBLIN.

By John Cooke, M.A., M.R.I.A.

Dublin is unique among the cities of the United Kingdom in possessing two cathedrals belonging to the same denomination. The **Cathedral of the Holy Trinity, or Christchurch,** the name by which it is best known, was originally founded in 1038 by Sigtryg, son of Aulaf, King of the Danes of Dublin. It is the opinion of the present architect, Sir Thomas Drew, that the crypt shows the original plan, which pier for pier corresponds with the cathedral of Waterford, also a Danish foundation of the same period. The character of Christchurch was completely altered in the years following the Anglo-Norman invasion at the instance of Laurence O'Toole, Archbishop of Dublin, and the expense of Strongbow, Fitzstephen, and Raymond le Gros. In 1163 it had been converted into a priory, the regular order of Arrosian canons superseding the old community of secular clergy. The successors of O'Toole looked coldly on the mixed Danish and Celtic independent establishment; and John Comyn, the first Anglo-Norman archbishop, founded a collegiate church without the city walls, and selected as a site the ancient church of St. Patrick; and in 1213 Henry de Loundres, who succeeded him, raised it to the status of a cathedral, modelled on that of Salisbury. Jealousy and rivalry existed between the two cathedrals; but in 1300 it was settled by an ordinance from Rome "that the Convent of Holy Trinity, as being the greater, the mother, and the elder church, should have the precedence in all rights and concerns of the Church." It suffered many vicissitudes in the subsequent centuries, and was the scene of many interesting events in the history of

the city. It served as the Chapel Royal down to 1814; and here until the sixteenth century the Lord Deputy and other officials of the State were sworn into office. It was in Christchurch that Lambert Simnel was crowned in 1486 by the Lords of the Council, led by the Earl of Kildare, then Lord Deputy, the Bishop of Meath being the preacher on that occasion. Mass was celebrated during the time of James II in Ireland, the tabernacle and candlesticks then used being still kept in the crypt; and William III celebrated his victories with a thank-offering of a magnificent service of plate to the cathedral. At the time of the disestablishment of the Irish Church the building was in a poor and mean condition, and shut in by an equally poor and mean mass of buildings and narrow streets. Much of these have been swept away, and the opening of Lord Edward Street in the more recent city improvements now affords an ample view of the great scheme of restoration, almost amounting to a rebuilding, due to the munificence of the late Mr. Henry Roe, a Dublin distiller. The work was carried out by Mr. George E. Street, the well-known architect; and the total cost, including endowment and the erection of the adjoining Synod House, is said to have amounted to £222,000 (Plate XXI).

On the south side lie the remains of the cloister garth of the ancient monastery excavated in 1886. The entrance to the south transept is by an old Norman doorway, removed from the north transept in 1831. From the south porch of the nave, steps lead to a covered-in bridge connecting the Cathedral with the Synod Hall and spanning the street. The Hall stands on the site, and retains the old tower of the church of St. Michael. Of the exterior, the dressing of the transept, the clerestory windows, the turrets over the north and south side-chapels, the belfry windows of the tower, and the roof and flying buttresses are new. The Caen stone used in the work already shows signs of weathering. The stone for which it was mistaken is said to have been a Somersetshire oolite of a very durable kind, and largely used in the erection of the medieval churches in the east of Ireland.

The nave, in the developed pointed style, dates from about

CHRISTCHURCH CATHEDRAL, DUBLIN, FROM THE S.E.
(From a photograph by W. Lawrence, Dublin.)

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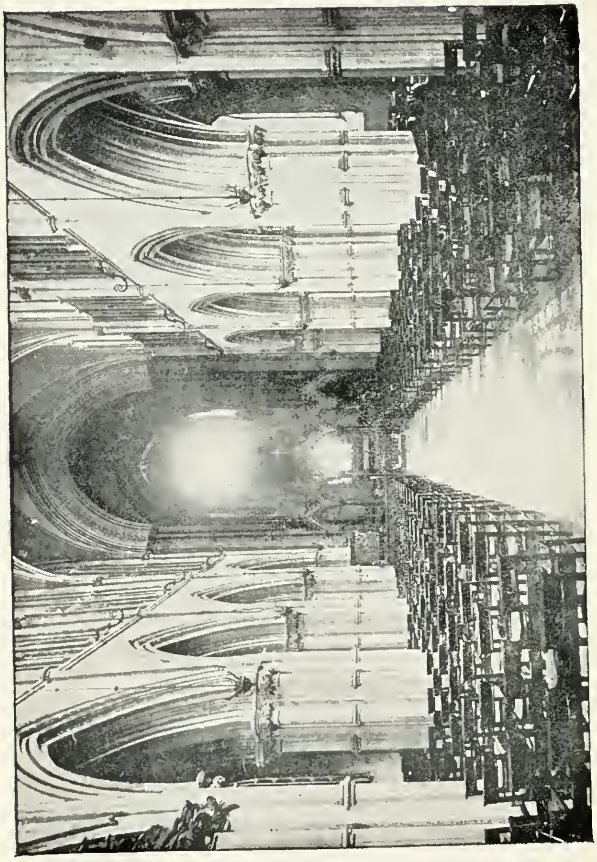

INTERIOR OF CHRISTCHURCH CATHEDRAL, DUBLIN.
(From a photograph by W. Lawrence, Dublin.)

1230, and shows the work of English masons of the Glastonbury school (Plate XXII). It consists of six bays, the western one on the north side showing evidence in the arch-mouldings and capitals that it was a subsequent erection. The north side is a careful restoration; and the south wall is a complete rebuilding, replacing the sixteenth-century erection by Sir Henry Sydney after the fall of it and the roof in 1562. The débris was never entirely removed until 1875. As will be noticed, this destruction caused the north wall to hang out about two feet from the perpendicular. The west window and doorway are new, fragments of the old work being found sufficient for patterns to restore both on the original lines. The composition of the clerestory and triforium windows within one arch was justified by Mr. Street on the grounds that he had found lines of such in the old masonry. The work has been carried out with great care and finish. The nave and aisles were vaulted in stone; and the thrust of the roof on the north side was resisted by the flying buttresses already mentioned. The great square piers supporting the central tower were altered by the addition of clustered marble shafts, and the old low arches were cut away, and new stone-moulded arches on the present line inserted 10 feet above the apex of the vaulting of the old. This was a risky undertaking, but successfully accomplished. The screen, which much interrupts the view of the choir and chapels, is entirely of modern design, and built on the fragmentary line of an older one. The cross which crowns it is modelled from the cross of Cong in the National Museum. The floor is a true reproduction of the thirteenth-century tiling, taken from fragments found under the refuse of the fallen roof. The Baptistery is a new feature by Mr. Street, based on details of a northern porch found at the restoration; the stained glass is a gift in memory of his wife.

Under the third arch of the south aisle is Strongbow's tomb, showing a recumbent figure in chain armour; the half-length effigy beside it in Purbeck marble is said to be that of his son, whom he killed for cowardice in battle. Controversy has been raised over these monuments: that Strongbow was buried in Christchurch, lying *in conspectu*

crucis, we know from ancient records. The monument was broken by the fall of the roof, and restored by Sir Henry Sydney, as the tablet on the south wall relates; and it is possible that the effigy is a sixteenth-century replacement, for the arms on the shield differ from those of Strongbow. The small figure is that of a female in the twelfth-century costume.

The transepts are part of the original building, and an interesting example of the transitional style, from Norman to Early English, in the enclosure of the triforium and clerestory pointed arches within almost semicircular arches, and in the free use of chevron and other mouldings in both. The arches in the north and south walls of the transepts were made at the restoration. The choir and eastern chapels of the original foundation were thrown into one by Archbishop John de St. Paul, in 1357, to form one long choir (102 feet); but Mr. Street restored the whole on the ancient lines. In the chapel of St. Laud is a metal case containing a human heart, said to be that of St. Laurence O'Toole, and a reputed effigy of Basilia, sister of Strongbow. The Lady Chapel in the north-east end, long used as a church by the French refugees in the city, has been converted into chapter-room, school, and library. The crypt is Norman work throughout, and the great strength of the vaulting was shown at the removal of the fourteenth-century choir, when it was found that some of the piers rested not on the crypt piers, but on the arching between. In the sub-chapels are the candlesticks and tabernacles used in the celebration of mass for James II in 1689. The statues of him and Charles II, removed from the old tholsel, the city stocks, numerous monumental remains, and specimens of the old stone-work of the cathedral are also stored here. The vaults were let for liquor and tobacco shops in the sixteenth and down to the end of the next century, which was a cause of great offence to many. The narrow passage (slype), now to be seen between the remains of the old chapter-house and the cathedral wall, had its houses, and was called "Hell"; and, by way of contrast to the name, one of the taverns in the crypt was known as "Paradise." Christchurch is

ST. PATRICK'S CATHEDRAL, DUBLIN, FROM THE N.E.

(From a photograph by W. Lawrence, Dublin.)

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rich in manuscripts: the Black and White Books are kept in the cathedral; but the great bulk of the documents are now in the Record Office.

St. Patrick's Cathedral. A short walk down Nicholas and St. Patrick's Streets brings the visitor to St. Patrick's Cathedral. The whole area to the north of it was a few years ago a slum of the worst description; but through the generous, philanthropic spirit of Lord Iveagh, this has been entirely cleared away, artisans' dwellings and the Iveagh House for working men have been erected, St. Patrick's public park has been laid out, and the whole conveyed in trust to the city (Plate XXIII).

Tradition assigns an early church and a well to the site where the cathedral now stands, and in 1901, when excavations were being made, a cross of a ninth or tenth century type was discovered at the spot indicated by Sir Thomas Drew some dozen years before as the site of the well. A church was here at the Anglo-Norman conquest —*Ecclesia St. Patricii in Insula*, so called as it stood between the divided stream of the Poddle river, now confined underground; and here, outside the city, John Comyn founded his church, and Henry de Loundres raised it to the dignity of a cathedral, intending that it should supersede the older foundation of Christchurch. The church and houses of the clergy were strongly enclosed, the walls having four embattled gates; but these did not prevent the frequent and successful raids of the Wicklow septs. Within the liberties of the cathedral and St. Sepulchre, the archbishops exercised complete jurisdiction; but the fortifications and manses have long since disappeared, the library and the old palace of St. Sepulchre, the residence of the archbishops for six centuries, and now a police-barrack, alone remaining. In 1380, a portion of the nave was destroyed by fire, but restored the next year by Archbishop Minot, who also built the massive tower (147 feet), which, it will be noted, is out of square with the cathedral walls; the spire (101 feet) was built in 1739. The injuries of time and repeated alterations had almost destroyed the original architectural details of the whole building. Great efforts were made by the deans of the

cathedral in the first half of the nineteenth century to prevent the ruin of the structure; but it was not until 1863 that a complete restoration was undertaken, at the sole cost of Sir Benjamin Lee Guinness. The cathedral is now approached by a fine roadway made at that time. The exterior of the building had suffered so much in the course of time that little of the original details was left. The south-west porch is new; the west Early English window replaces the restored (1830) perpendicular one, probably of the seventeenth century. The north porch is new, and the north transept rebuilt, which was long used as the parish church of St. Nicholas Without. The organ chamber on the north side of the choir is entered from the east aisle of the north transept by a spiral staircase, designed by Sir Thomas Drew, after the style of one at Mayence; these were constructed in 1901 at the expense of Lord Iveagh.

The floor of the cathedral lies much below the level of the street, and under it the Poddle runs. The design of St. Patrick's is a perfectly symmetrical Latin cross, 300 feet external measurement in length, and 156 across the transepts. The nave has eight bays, the transepts have three, and the choir has four; the last has aisles, eastern ambulatory, and lady-chapel of three bays, with aisles and two square-ended chapels. The diversity between the two cathedrals in every respect is great, and shows that they were the work of two distinct schools of builders. The nave and transepts of St. Patrick's are mainly Early English; the lady-chapel (*circa* 1270) is considered to have been the work of Archbishop Fulk de Saundford, whose effigy is in the north choir aisle. It was carefully restored by Carpenter in 1845; it may have been modelled on that of Salisbury, and in its delicacy of design and details may be compared with contemporary work in the Temple Church, London. It was consigned to a congregation of French refugees in 1663; and here worship was held by their descendants and other settlers for 150 years.

The work of restoration within the Cathedral included the rebuilding of five bays of the south aisle of the nave and the bays of the original triforium, the south wall of

the south transept, and the whole of the north transept, as already stated; the clerestory throughout was restored, and the roof of the nave and transepts, being unfit to bear great weight, were grounded in lath and plaster; the octagonal piers of the nave were encased in Caen stone; the three on the north-west side date from Minot's work of the fourteenth century, and the arches are wider and higher than the remainder, making a break in the string-course, and causing the vaulting shafts to rise from corbels in the triforium, in place of reaching the ground as all the others do. The absence of a reredos, however otherwise it may be missed, gives an uninterrupted and noble view of the choir and lady chapel, and is a distinct feature of this building. The entire cost of Sir Benjamin's work was £150,000. A further restoration was made, in 1900–1, by Lord Iveagh, who, at an expense of £30,000, completely restored the choir and its aisles, including the beautiful stone groining of the roof, and the removal of the organ from the north aisle, revealing beauties in the Early English work unseen and unknown for generations.

The chief interest of the Cathedral to many visitors lies in its connexion with Swift, who held the office of dean for thirty-two years. He and Stella lie buried at the foot of the second column from the west door, on the south side of the nave, marked by a brass-plate. His pulpit is near the south door. Near the door of the robing-room, to the left, is a bust of him by Cunningham; his own famous epitaph is on a slab near it, and Stella's close by. At the south-west corner is the baptistery with a curious font, and a case containing some ancient charters and other documents; and against its north wall in the nave is the massive monument of the "Great Earl" of Cork. The cathedral is rich in memorials of all kinds: the north transept has several to the 18th Royal Irish; the north choir aisle has a tablet with an inscription by Swift to the Duke of Schomberg, styled by Macaulay "a famous libel"—a term it scarcely deserves; in the lady chapel is a chair used by William III at a thanksgiving service after the victory of the Boyne; against the south wall is the effigy of Archbishop Tregury (1471), and on the wall of the south choir aisle are four fine brasses—Sir

Henry Wallop (1599), Deputy under Elizabeth; Dean Sutton (1528), Dean Fyche (1537), and Sir Ed. Fitton (1579), President of Connaught and Thomond.

The fine peal of ten bells by Taylor, of Loughborough, was a gift by Lord Iveagh; the old peal by the Purdues of Salisbury (1670) is hung in a lower chamber of the tower. On the south side of the cathedral is Marsh's library, containing about 20,000 volumes and 200 manuscripts; the works are mostly theological, and include Stillingfleet's collection.

The **Cathedral of St. Mary**, generally known as the "Pro-Cathedral," is in Marlborough Street, opposite to Tyrone House. It was built (1816–25), it is said, from a design by an amateur artist in Paris, and is in the prevailing classical style. The front is based on that of the Temple of Theseus, with a hexastyle portico of Portland stone, raised on a platform, and an entablature (which is continued round the sides) and pediment surmounted by figures of the Virgin, St. Patrick, and St. Laurence O'Toole. The sides of the building extend for 160 feet, with a recessed portico in the centre of each, enclosed by a colonnade, and surmounted by figures. The interior consists of nave and aisles, separated by rows of heavy pillars, with an apse at the west end, containing a fine white marble altar by Turnerelli, the roof above which contains a basso-relievo of the Ascension. In the nave are statues of Cardinal Cullen and Archbishop Murray, both by Farrell. Practically all the Roman Catholic churches in Dublin belong to the nineteenth century.

Of the medieval parochial churches, **St. Audoen's**, in Corn Market, is the only one now remaining. It was founded by the Anglo-Normans, and named after St. Owen of Rouen. It consisted of a nave and south aisle and a west end tower, the aisle being a subsequent addition (1431) as a chapel in honour of St. Ann, and a continuation by Fitz Eustace, baron of Portlester (d. 1455). The nave is the only portion now remaining; it opened into the aisle by an arcade of six pointed arches resting on octagonal columns. The west doorway is in the transitional style of

the twelfth century, and the church has a fine Norman font. The Portlester altar-tomb was removed to its present position under the tower, and bears the recumbent effigies of Roland Fitz Eustace and his wife. Here for several centuries were buried many persons eminent in the trade of the city; for the church was once a group of guild chapels, and in the neighbourhood were the halls of many of the Dublin guilds.

St. Werburgh's, near Christchurch, was also an Anglo-Norman foundation, being built by the men of Bristol on the site of an ancient Church of St. Martin, and dedicated, like its sister church of that city, to St. Werburgh, abbess of the convent at Chester, and daughter of Wulfhere, king of Mercia. The church was burned down in the fourteenth century, rebuilt, and was again destroyed by fire in 1784. Five years later it was rebuilt, with a lofty and graceful spire, which, becoming defective, was taken down in 1810. The front is of mixed Ionic and Corinthian orders after the fashion of the prevailing Greek style in Dublin in the eighteenth century. In the vaults lie the remains of Lord Edward FitzGerald, who died of the wounds received at his capture in 1798; and in the graveyard the noted Major Sirr, who arrested him, was buried. In the south wall is a fine sculptured slab of the FitzGerald family. The church was used as a private chapel by the Lord Lieutenant until the Chapel Royal was built, and attracted crowds of fashionable people. It has a very handsome carved pulpit, generally, but we believe wrongly, attributed to Grinling Gibbons.

On the north side of the city, in Church Street, is **St. Michan's**, up to the end of the seventeenth century the only parish church on that side of the Liffey. The present building is a seventeenth-century structure, restored in 1828. The tower has embattled parapets, common to many of the medieval Irish churches, but it too is considered modern. The vaults of St. Michan's have the remarkable quality of preserving the bodies laid in them. The cause of this has been the subject of much controversy; it is due, probably, to the extreme dryness of the air within, owing to the absorbing power of the yellow limestone

of which they are constructed. Several mummified bodies may be seen, among them those of the brothers Sheares, who were executed for high treason in 1798.

A portion of **St. Mary's Abbey** stands off Capel Street. The Abbey was originally a Benedictine foundation, but was given to the Cistercians by Malachy O'Morgair in the twelfth century. It was suppressed by Henry VIII; and nothing now remains but the chapter house with its groined roof and windows. The building is spoiled by a floor seven feet from the ground, and has been long used as a store. It was here that "Silken Thomas" threw off his allegiance, and started the rebellion so unfortunate for him and his house.

St. George's Church, at the head of Temple Street, is one of the finest of the city churches, and was built in 1702, from designs by Francis Johnston. The portico has four fluted Ionic columns supporting an entablature and pediment; behind rises the steeple to a height of 200 feet. Another church of classical design is **St. Stephen's** (1825) in Upper Mount Street, the portico of which is copied from the Temple of Minerva, with its tower surmounted by a dome. The **Church of St. Ann**, Dawson Street, erected at the beginning of the eighteenth century, has a fine Norman front (1869), from a design by Sir Thomas Deane. Of the suburban churches, the richest in design is St. Bartholomew's, Clyde Road, in early English Gothic, by Wyatt. The **Presbyterian Church**, Rutland Square, built (1864) at the expense of Alexander Findlater, is a handsome decorated Gothic building, with a lofty spire (180 feet).

The religious orders have many churches in Dublin. The **Church of St. Francis Xavier** in Gardiner Street is one of the finest in Ireland, and was from designs by T. B. Keane (1832). The plan is cruciform, and its entrance is through a tetrastyle Ionic portico, surmounted by an entablature and pediment. The **Church of St. Saviour** in Dominick Street belongs to the Dominican order, and is a fine example of modern decorated Gothic from designs by J. J. MacCarthy (1858); side-chapels were added to the north aisle in 1895. It has a well-carved façade,

with figures over the doors. Hogan's beautiful *Pietà* is in the face of the altar at the east end of the south aisle. The figure of Christ above is Italian. The Priory is on the north side of the church. The **Carmelite Church** in Clarendon Street dates from 1793, and the transepts were added in 1877. It possesses Hogan's noted piece of sculpture, *The Dead Christ*, which is set in the face of the altar. The **Church of St Andrew** in Westland Row is a cruciform church, built 1832–7, with a central cupola. It has a heavy Doric portico, with entablature and pediment, on the apex of which is a figure of St. Andrew. Above the altar is Hogan's carving of *The Transfiguration*. The **Catholic University Church**, St. Stephen's Green, South, is especially associated with the late Cardinal Newman. It was erected in 1854–6, and is a good example of the Roman basilica type of church; a lady chapel has since been added. It is entered by a Romanesque doorway, and the interior is mixed Byzantine and Italian in style. The **Augustinian Church** in Thomas Street was commenced in 1862, and finished in 1895, from designs by Pugin and Ashlin, and is one of the finest ecclesiastical structures in the city. It has a most striking front, in fourteenth-century French style, rising into a lofty tower 160 feet high, and entered by an elaborately carved doorway. **St. Peter's Church**, Phibsborough, is in the early pointed Gothic style, and belongs to the Vincentian Order. Dating from early in the last century, it has twice been largely rebuilt. The nave and west tower, rising with the spire to a height of 200 feet, are recent, from designs by Ashlin. The transepts, with a fine rose-window in each, are also new, from designs by Goldie, as are also the choir, the apse of seven bays, and a series of chapels off them.

THE ARCHITECTURE OF DUBLIN.

By Count Plunkett, M.R.I.A.

The qualities of a city's architecture are generally the outcome of trade or of national necessities. Some cities are shaped mainly by their traditions, while others cast off the old, in a fever of progress. Dublin has a rule to itself. With few manufactures, and only irregular employment for many thousands of its artizan population, it is subject to rapid changes in its aspect. Its large leisured class of citizens, of a moderate but fixed income, might be supposed to resist novelties, which indeed result largely from the decay of our country towns, and consequent centralization in the capital.

Since old cities commonly illustrate the growth, development, and vicissitudes of a people, we can read in their streets many chapters of a country's history. Though this general proposition applies indifferently to Dublin, our city still retains some interesting examples of architecture dating from an age of luxury and public spirit.

The natural conditions which affected its foundation continue to exercise a strong influence on the preservation, expansion, and sanitation of Dublin. The site of the city was an irregular slope towards the river and the sea, diversified with small hills. Among the drawbacks of its position were the low-lying stretches of land within the city, and the expanse of sand through which the river meandered. Towards the river ran several water-courses, and even on the hillocks were many springs, and some undrained bogs. Several rivulets still run under the city. Like many of the English cathedrals, Christchurch and St. Patrick's were built on morasses, which continue to menace these ancient buildings. The Dublin Mountains, on the south, with their wooded slopes, reflect some beauty on the city; but the low-lying sea-shore that touches it has been of necessity a neglected foil to the city's architecture.

Indeed, the old plan of the city remains practically

unaltered. The principal thoroughfares, though more or less direct, are not so straight in line as to sacrifice variety. We have few streets of any length that are absolutely straight. Westmoreland Street and D'Olier Street diverge from the line of Sackville Street. Thoroughfares like Grafton Street, though short, and altered in recent times, and South Great George's Street, congested with business, are as winding as neglected back streets. The building of a city market, and the running of tram-lines, make little change in the width and general plan of a Dublin street, owing to the penal cost of promoting Improvement Bills in the Imperial Parliament. One of the greatest of our thoroughfares, Capel Street, though it has lost all its old-time quaintness, is as narrow as it was a hundred years ago; and Parliament Street, which continues it on the south side of the river, cramps the view of the City Hall. The Wide-street Commissioners in the eighteenth century made some bold changes, and planned reforms that are still called for.

Many of our modern buildings suffer greatly from the want of "distance," caused mainly by the narrowness of the streets. While a house like that of the Royal Irish Academy, in Dawson Street, can be fairly seen, its neighbour, the Church of St. Ann, loses in dignity and effect by the nearness to the eye.

The most extended roadway in the residential quarter is that beginning at the east side of Merrion Square, and running in a straight line to Leeson Street. Owing to the irregular rise of the ground, the varying heights of the red-brick buildings, and the pleasant breaks made in the course by green squares and cross-streets, this affords one of the prettiest and most reposeful views in the city.

One may roughly group the leading institutions in the city. On the south side of the river are the venerable Cathedrals, the Universities, the Castle, and the principal Banks, and on the north the Four Courts, Custom House, Post Office, King's Inns, Rotunda, and many fine churches.

College Green may be looked on as the centre of the city, and (apart from the Cathedral area) the most interesting quarter in it. Few, if any, of the world's

capitals can show—in a little space, and in like admirable contrast—buildings so full of classic feeling, and so popular in their appeal.

The **Parliament House** (now the Bank of Ireland) underwent many changes (Pl. XXIV). It is erected on the site of Chichester House; the main building was carried out under the supervision of Sir E. Lovat Pearce, about 1739, from the plans (it is thought) of Cassels, who designed Leinster House. In 1785 James Gandon was commissioned to enlarge the east side; to bring the Lords' Portico to the street-level, he used Corinthian columns, with an Ionic entablature to match the rest of the building. In 1792–4, more space being required by the Commons, the West Portico (to balance the eastern, but Ionic) was added, with a screen wall and Ionic colonnade connecting the old House and the wings—improvements attributed to Robert Parkes. After the Union, the Bank made some external additions from the plans of Francis Johnston, erecting the great gateways in Foster Place and Westmoreland Street, and altering the positions of the entrances; and within, while the House of Lords is unchanged, no trace of the Court of Requests or of the Commons remains. The statues—Hibernia on the central apex, Fidelity on her right, Commerce on her left, and Fortitude, Justice, and Liberty over the pediment of the East Portico—were the work of Edward Smith, an Irish sculptor. The Royal Arms in the tympanum were modelled by Flaxman.

The general effect of the Parliament House, with its "confusion" of styles, is singularly beautiful and noble. It took genius to devise those great sweeping curves of the wings, to lighten the expanse of the screens with Ionic columns, to make the wide exposed portico solemn with massive Corinthian. The Parliament House covers an acre and a half with its semicircle. One of the purposes suggesting the employment of Corinthian columns on the Lords' entrance was the harmonizing of the House with Trinity College.

The front of **Trinity College** (Plate XXV), re-facing the Elizabethan building, was built in 1759, principally at the

COLLEGE GREEN, DUBLIN, WITH THE PARLIAMENT HOUSE (NOW BANK OF IRELAND), IN 1791.
(From Malton's view.)

[*To face page* 312.

Trinity College, Dublin, in 1791.
(From Malton's view.)

cost of the Irish Parliament, from the designs of Sir William Chambers. It is fortress-like and impressive, and in great contrast to its beautiful neighbour. The quadrangle contains its earliest buildings. The Library, overlooking the quadrangle, was built in 1732; at that time it was accounted one of the principal libraries in Europe. It is an imposing building of cut stone; formerly there were cloisters at the north and south sides, but, the space being required by readers, the arches were filled in. The Library proper is on the second story, and contains 300,000 volumes; formerly this hall had a flat ceiling, but now is open to the arched roof. This improvement was devised by Sir Thomas Drew. On the further side of the quadrangle is the Chapel, insignificant externally, but containing some good wood-carving. The Dining Hall, attributed to Cassels, is interesting and peculiar; it has a fine fireplace and panelled walls.

Adjoining the Library is the Examination Hall, a very lofty and beautiful room rather daintily decorated, and containing the remarkable monument of Dr. Baldwin by Hewitson, an Irish sculptor. This Hall and the Chapel were designed by Chambers and executed by Meyers. Facing the Library is the new Graduates' Memorial Building, occupied by the College Societies; and the east end of the quadrangle is closed by a terrace of Queen Anne houses (Sterling's Buildings), now unhappily modernized. In a further square is a little Doric Temple, the Printing Office of the University Press; and opposite this are the New Buildings, mainly used by the Engineering School—a Romanesque structure, by Woodward and Deane, with a great hall that is almost Byzantine. The string-courses and other projecting ornaments are elaborately carved; and the *ensemble* and detail of the work won the enthusiastic admiration of Ruskin.

In the quadrangle there is a graceful, and rather modern-looking Campanile, built in 1852. Its centre is said to mark the crossing of the old monastic church of All Hallows; the cloisters are supposed to have extended to what is now the Provost's garden, and to have suggested the open treatment of the Library corridors.

To the right of Trinity College is the **Provost's House**, a rather solemn dwelling (a duplicate of that of the famous General Wade, in Piccadilly, which is now altered beyond recognition).

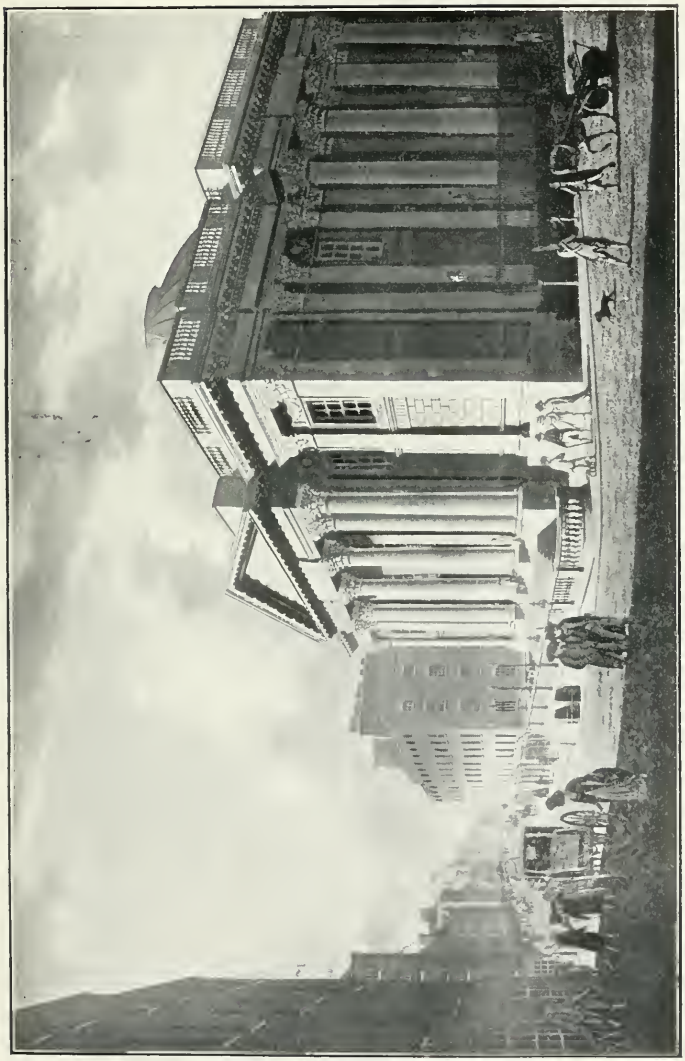
College Green, a banking quarter, contains many fine modern buildings. In the older Dame Street are the Commercial Buildings in Irish granite, designed by Waldre about a century ago. Further up, on the slope of Cork Hill, is the **City Hall**, originally the Royal Exchange (Plate XXVI). It is evident that this

> "far-withdrawing line
> Of palace fronts Palladian"

should have been made visible from Dame Street. From the height on which it stands, its splendid Corinthian front, and the great dome above it, were meant to dominate the City. A fairly good view of it is obtainable from Parliament Street; and it is observable to some effect from Capel Street, now that the old Essex Bridge is removed. Formerly the colossal statue of O'Connell, by John Hogan, stood in front of the porch, but it is now in the circular hall, under the lantern and flanked by other statues. The Council Chamber, a comparatively small hall, is reached by a narrow staircase, for the building was designed for beauty rather than for convenience. It is the work of Thomas Cooley (1769), who succeeded in a competition with Sandby and Gandon. Some injury is done to the effect of the building by recent changes; the steps were originally designed to be stylobate.

The adjoining **Municipal Buildings**, in cut stone, also do credit to the eighteenth century. Beside them a new avenue, Lord Edward Street, was made about twenty years ago, to lead directly to Christ Church.

The charm of the Dublin streets was greatly added to by the beautiful curves of our old stone bridges, of which only a couple remain; they rose too steeply for the convenience of traffic. One bridge of a later date, the Wellington—or, as it is generally called, "the Rialto"—a slim iron footway—arches its delicate lines against the sunset, and brings a needed grace to the river.



THE ROYAL EXCHANGE (NOW THE CITY HALL), DUBLIN, IN 1791.
(From Malton's view.)

THE CUSTOM HOUSE, DUBLIN, IN 1791.

[*To face page* 315.

The old Custom House, built in 1707, far up the river, adjoining Essex Bridge, was, by the middle of the eighteenth century, found to be too remote from the docks, and otherwise unsuited for its purpose. Through the influence of the Rt. Hon. John Beresford, the new **Custom House** (Plate XXVII) was commenced in 1781, and completed in 1791. With the quays and docks, it is said to have cost half a million pounds; the great building is now used mainly for tax-offices. The Custom House can hardly be seen to good effect, as the view of it is obscured from the river-entrance and from O'Connell Bridge by the Loop Line Railway. It was planned on a scale that seems quite out of proportion to the business of the city, for it is 375 feet long by 205 feet deep. It has four fronts, being chiefly Doric in style. Open arcades lighten the effect of the building on the river-front, and it is decorated with much beautiful carving and many allegorical statues. The lantern, with its slim pillars, crowned by a small dome, gives an unusual grace to the building.

Some distance up the river are the **Four Courts**, as they are called, begun in 1776, by Cooley, and completed, after his death, by Gandon in 1797. This building has the impressive quality aimed at by the architects of the period. The great portico, with its six Corinthian columns, and the large and lofty dome behind it, require the wings and the carved stone entrances to the court-yard to justify their proportions. The pediment is surmounted by the statues of Moses, Justice, and Mercy. The decorative effect of the building is very fine; the visitor is, however, greatly disappointed at the meagre accommodation of the interior. The round hall, which is of remarkable beauty, contains a few statues of eminent public men. The fine quays are here fenced with graceful balustrades.

A little further up, on the southern side of the river, stands **Moira House**—that famous palatial building, where, in an octagon room decorated with mother-of-pearl, John Wesley met Lady Moira. It is now transformed into a dismal institution for mendicants.

Of the main thoroughfares, the most noteworthy is Sackville Street, which extends from Foley's beautiful

O'Connell Monument to the Rotunda. Unluckily, Nelson's Pillar, a bold Doric column of granite, 110 feet in height, breaks the vista midway, and effectually obstructs the traffic. The Pillar likewise spoils the effect of the adjoining **General Post Office**, a classical nineteenth-century building designed by Johnston.

The **Rotunda Hospital**, founded by Dr. Mosse, was opened in 1745, being, it is said, the first maternity hospital in the British dominions. It was built by Cassels; the charming little chapel is attributed to Gandon. Pretty colonnades connect the main building with the wings. To its right is the **Rotunda**, a lofty round hall, built in 1755, from the designs of Richard Johnson. It is charmingly decorated within and without; the exterior frieze of draped ox-skulls in white pottery is the work of Flaxman. This hall is famous as one of the meeting-places of the Irish Volunteers of 1782; for over a century it was used as an Assembly Room, for the benefit of the Hospital, and it is still in use.

The ancient **Cathedrals** still draw us with the fascination of their history, in spite of changes and restorations. Their principal features, however, have been dealt with in a previous section (p. 299).

In Nos. 6 and 7, Christchurch Place, adjoining Christchurch Cathedral, there are remains of the oak beams of the **Carbrie House**, the last of our wattled dwellings, demolished in 1780.

Near St. Patrick's Cathedral is **Marsh's Library**, a quaint little treasury of sixteenth- and seventeenth-century books.

The interest of **Dublin Castle** is due to its history rather than its beauty. The Lower Castle Yard, though flanked on one side by Johnston's Castle Chapel (in modern "Gothic"), is rather unattractive. The only ancient building visible from the Yard is the great round (twelfth-century) Bermingham Tower, which is entered from the roadway to Ship Street, and which seems incongruous in its latter-day surroundings. The Upper Castle Yard is more in harmony, having two handsome gateways (one disused), and the picturesque Queen Anne Bedford Tower,

LEINSTER HOUSE, DUBLIN, IN 1791.
(From Malton's view.)

with its very fine cupola, and its open gallery for musicians. The Castle contains some well proportioned rooms, with florid modelling in plaster. St. Patrick's Hall, which is 82 feet long and 41 feet broad, and nearly 40 feet in height, was decorated for the Knights of St. Patrick in 1783. Its great ceiling-paintings by Waldre, the architect, are of some merit. This Hall was very tastefully coloured and gilt about five years ago.

Many of the most important public bodies and institutions in Dublin are housed in eighteenth-century dwellings, formerly the "town-houses" of members of the Irish Parliament.

Leinster House (Plate XXVIII), the residence of the Dukes of Leinster, in Kildare Street, was built by Cassels about the year 1745; it was for a while the home of Lord Edward FitzGerald. It is a massive and dignified structure, more beautiful within than without. The large, finely proportioned reading-room, on the first floor, has an Adams ceiling which is a triumph of exquisite workmanship. This house was acquired by the Royal Dublin Society, which occupies it; here also are the offices of the National Museum of Science and Art.

The adjoining modern classical renaissance building, to the right, is the **National Museum**; and facing it is the **National Library of Ireland**. These buildings, designed by the late Sir Thomas Deane, are handsome and decorative examples of their style.

The native exhibits in the Museum include models of "Irish Romanesque" architecture, and of the greater Irish crosses; of statuary by modern Irish artists; also some interesting examples of craftsmanship from Dublin interiors of the seventeenth and eighteenth centuries. Here also is deposited the great treasury of Celtic arts, the collection of the Royal Irish Academy.

A large wing of the Museum (containing the Natural History Collection) extends through Leinster Lawn to Merrion Square. On the opposite side of the Lawn is the **National Gallery**, notable for its Old Masters and Irish portraits.

Of the private dwelling-houses whose merits have stood

the test of time, the most distinctive in the city is **Powerscourt House**, in William Street, built for Lord Powerscourt in 1771–4 by Robert Mack, from the designs of Cassels(?). The work, executed in granite from the Powerscourt quarries, has remarkable dignity and grace of line. The curious square structure over the pediment was intended for an observatory. This lovely building is now a warehouse.

The first Earl of Charlemont returned home, after a long sojourn in Italy, with a taste for classical architecture. He gave a commission to Sir William Chambers, whose fine fancy produced a little square casino, a Doric temple with four porticoes, which glimmers in white marble in the wooded grounds at **Marino** (Clontarf).

In St. Stephen's Green there are several interesting houses. For instance, the **Loreto Convent** (Grattan's house), on the east side, and the house of Richard Whaley, now **University College**, on the south (see p. 336). The latter contains a great deal of elaborate stucco-work, which is altogether inferior to the ornament in another Jesuit College, Belvedere, north of the city. In Ely Place, adjoining the Green, there are two houses, the Valuation Offices, which contain work of much delicacy. Some of the earliest and most beautiful stucco and carved work in Dublin is to be found in 10 Henrietta Street, which belonged to the Countess of Blessington. Near by is the **King's Inns** (designed by Gandon, who is supposed to have also planned Charlemont House in Rutland Square).

Among the more modern buildings of merit are the **Royal College of Surgeons** (1809), on St. Stephen's Green, and the **Royal College of Physicians**, in Kildare Street.

Dublin possesses some thirty large and well-conducted hospitals. The **Royal Hospital** for Disabled Soldiers at Kilmainham is one of the oldest buildings on the city's border. The Duke of Ormond laid its foundation in 1680; and it was completed in four years. Standing amidst beautiful grounds, it covers a square of 250 feet, round a courtyard, and presents four fronts. The splendid dining-hall, 100 feet long by 50 feet wide, contains some interesting

historical portraits, and the chapel is ornate with wood-carvings.

A distant view of Dublin in the eighteenth century showed the city apparently spireless; and the first church of modern times with a spire of considerable elevation was St. George's (in Temple Street), built by Johnston at the beginning of the nineteenth century. To-day the city's prospect is punctuated by spires of no little beauty, for its churches are many, and mostly Gothic.

Those who planned the city—while it was still in the making—had to consider the general perspective, and to calculate on the peculiar aerial effects of a climate almost moist. Their success in building according to their environment is strikingly illustrated by Malton (see p. 325), who has recorded the impressionism of our streets with absolute fidelity. In certain streets, such as Upper Fitzwilliam Street, the sky-line leads the eye directly to the Dublin Mountains, which, far from being dwarfed by their distance, loom up in the magnifying Irish atmosphere. Chromatic colouring was a thing not dreamt of by our old architects, but they had mellow-tinted bricks, and they frequently used cut stone up to the first floor.

Though a flatness of façade was the rule in private houses, many of the shops were saved from monotony of appearance by rounded fronts and the most elaborate "leading"; and entablatures decorated with tenuous festoons were until lately to be seen in some of our back streets.

Irish architecture is generally reposeful; and our Queen Anne work seldom ran into the eccentricities common to the style.

An ancient city, Dublin has no corbelled or timbered houses, and few gables. Most of its landmarks have disappeared. It has no gates; part of the old "Dame's Gate" was turned to use for the pedestal of the statue of William III in College Green; and the castellated gate built by Johnston in 1812 was removed, in 1846, from Barrack Bridge to the Hospital at Kilmainham.

Some thirty years ago there were in the Coombe and neighbouring quarters many quaint structures of the close

of the seventeenth century. Now the type of house with Dutch gable, and sashes flush with the wall, is only a memory. Little of Queen Anne work remains. About 1776 extensive changes began in the city—streets were opened in all directions, and the building mania lasted for nigh fifteen years. The style of architecture then common tried the gifts of the designer rather severely. The houses of this period stretch monotonously in a straight line through many of our most fashionable districts. They have suffered greatly from modernization, and the consequent sacrifice of effects relied on by the architects. The cross-line of small-paned sashes and the graceful scrolls of fan-lights are gone, leaving vacant spaces; of the striking link- and lamp-holders, and other fine iron work, there is hardly a trace. Many of the balconies have been removed, to be sometimes replaced by the pretentious castings of the fifties. It is only in architectural detail that we discover the finer qualities of the earlier time—in the beautiful proportions of doors, windows, and porticoes. The sense of beauty, however, found free play in the interiors—in their noble spaciousness, worthily balanced by the quality of the workmanship in stucco and joinery and carving and inlaying, which made the seventeenth-century Dublin house one of the most artistic of European dwellings.

Fig. 41.—Parliament House in flames.
Gentleman's Magazine, 1792.

OLD DUBLIN, AS REPRESENTED IN ENGRAVINGS.

By E. MacDowel Cosgrave, M.D.

Old engravings of Dublin are of interest, as they enable us to reconstruct places and buildings at various dates, and to study the steps of the physical evolution of the city.

They illustrate also the appearance of the inhabitants, their dresses and many peculiar customs; and if the more fugitive caricatures and "penny plain and twopence coloured" sheets are included, a more intimate knowledge of the inner life of our forefathers is gained; so that we get, as it were, flashlight-peeps at their aspirations, their prejudices, and their quarrels.

The description of a picture conveys but little, and there is here room to illustrate only a few examples. Those interested in the subject are accordingly recommended to visit the excellent and well-arranged collection of engravings of Dublin, which is shown in one of the rooms of our National Gallery. In the space at my command it would be impossible, even if desirable, to attempt to give a catalogue of engravings of Dublin, such as has already appeared in the Journal of the Royal Society of Antiquaries of Ireland.[1] All that can be done here is to call attention to the finer sets of pictures and to the more interesting individual examples.

It is unfortunate that hardly any pictures of Dublin anterior to the eighteenth century are known, as up to that period Dublin had not spread with any freedom outside its walls, and had preserved many medieval features, illustrations of which would have been of historic value.

The two earliest pictures of any importance are illustrations to John Derrick's "The Image of Ireland," 1581. They show Sir Henry Sydney, Lord Deputy for Queen Elizabeth, leaving Dublin to chastise the rebels and return-

[1] Journal of the Royal Society of Antiquaries of Ireland, vol. xxxv., pp. 95, 363; vol. xxxvi., p. 400; vol. xxxvii., p. 41.

ing victorious, and give interesting peeps of the walled city. The eighteenth century is well illustrated. Brooking's map, 1728, engraved by J. Bowles, is a fine engraving, measuring 23 inches high, 55 inches wide. Its centre is occupied by a good map of the city, over which is a view

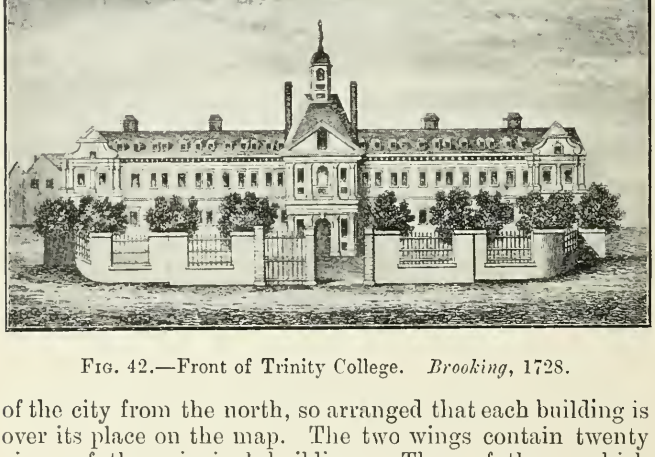


Fig. 42.—Front of Trinity College. *Brooking*, 1728.

of the city from the north, so arranged that each building is over its place on the map. The two wings contain twenty views of the principal buildings. Three of those, which have since vanished, are here figured, viz.: fig. 42, *Front of the College*; fig. 43, *The Tholsel*; fig. 44, *The Custom House*.

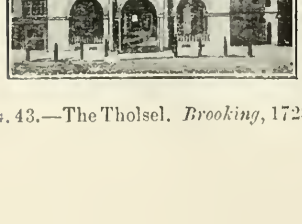


Fig. 43.—The Tholsel. *Brooking*, 1728.

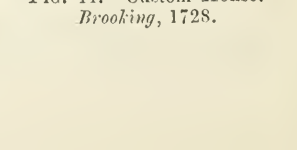


Fig. 44.—Custom House. *Brooking*, 1728.

The cathedrals, which were omitted by Brooking, are illustrated in Harris's edition of Sir James Ware's works in 1739. Fig. 45 shows the view of St. Patrick's Cathedral as it appeared before the spire was added to Minot's fine tower. The cathedrals are also engraved in Harris's History of Dublin, 1766, and in Grose's Antiquities, 1792.

The first important series of engravings of Dublin appeared in 1753. They were from six drawings by Joseph Tudor (ob. 1759), and the names are given both in English

Fig. 45.—St. Patrick's Cathedral. *Ware*, 1739.

and in French. They were issued, with slight alterations, by three publishers, but it is not easy now to secure a full set. They represent: 1, *Dublin from the Magazine Hill*, one of the most frequently copied of Dublin engravings; 2, *Barracks*; 3, *Castle*; 4, *Custom House*; 5, *Parliament House* (fig. 46); and 6, *Library, Trinity College*—chiefly interesting as affording the only view of some of the Elizabethan buildings.

A rare engraving appeared in 1756; it shows *Sackville*

Street and Gardiner's Mall (fig. 47); the uniformity of the houses, and the central walk protected by walls and obelisks, are strangely lost in the Upper Sackville Street of to-day.

In 1762 magazine-illustrations of Dublin buildings began in Peter Wilson's *Dublin Magazine*, the first six being drawn by John Aheron, the author of a rare treatise on architecture. Walker's *Hibernian Magazine*, Exshaw's *Gentleman's and London Magazine*, and the *Gentleman's Magazine* (London), issued a large number of Dublin views in the last quarter of the century (fig. 41).

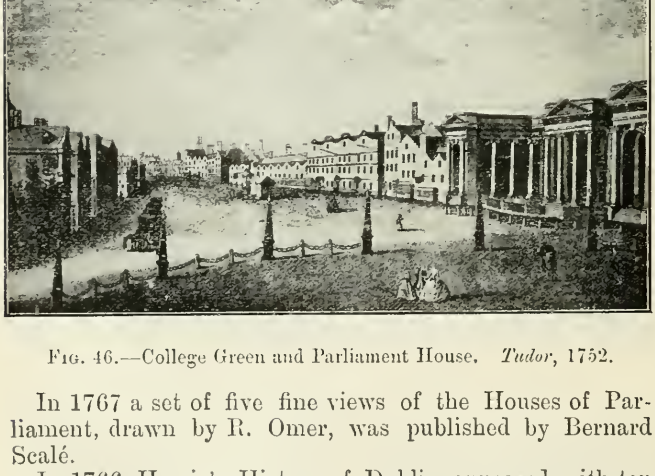


Fig. 46.—College Green and Parliament House. *Tudor*, 1752.

In 1767 a set of five fine views of the Houses of Parliament, drawn by R. Omer, was published by Bernard Scalé.

In 1766 Harris's History of Dublin appeared with ten plates, some of which were copied from Brooking (1728); and in 1780 Pool and Cash published their book containing twenty-nine accurately-drawn plates.

In 1783 a series of small engravings from drawings by Wheatley and Barralet was published by John Milton, in his Views of Seats, &c.

In 1784 the well-known engraving of Wheatley's picture of the *Volunteers in College Green* was published; it is still frequently met with. In 1780 Wheatley painted a fine interior of the House of Commons, showing Grattan moving the claim of Irish Rights. This was published—photogravure—for the first time in 1907.

In 1784 a very rare series of aquatints, bearing only the date and the address, "15 Leicester Fields," was published. Nine of the series are in the possession of the writer; one showing the Irish Volunteers in College Green (fig. 48) hangs in the National Gallery, near Wheatley's large picture of the same subject.

Fig. 47.—Sackville Street and Gardiner's Mall, 1756.

The eighteenth century closed with the appearance of Malton's views (Plates XXIV–XXVIII), the best-known and finest series of pictures of Dublin; the twenty-five plates appeared in 1791–9, and are large and boldly drawn. Several altered and re-engraved plates are sought by collectors. Sets, both plain and coloured, are often sold, and command good prices. Malton's plates give an excellent idea of Dublin as it appeared in its period of greatest magnificence. During the same period La Porte

issued some half-dozen larger views of the neighbourhood of Dublin that are of considerable merit.

The nineteenth century opened badly; political unrest and financial weakness were its key-notes, so that art did not get much encouragement; and even in 1818, when Whitelaw, Warburton, and Walsh's ponderous History of the City appeared, most of the illustrations were unacknowledged copies of Malton, no effort being made to bring them up to date.

Good work, however, was done between 1813 and 1818,

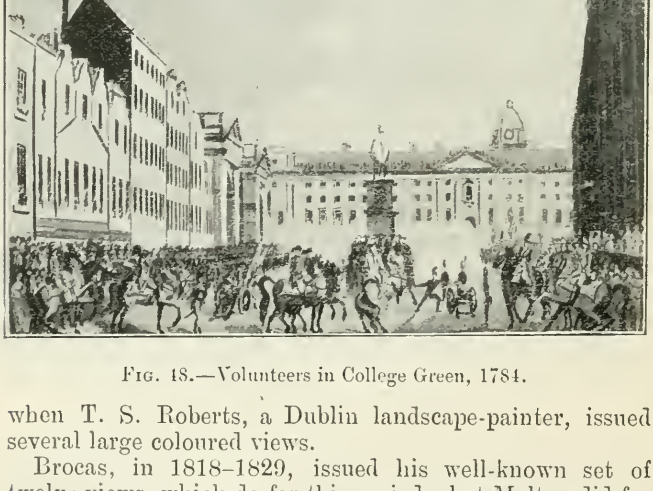


Fig. 18.—Volunteers in College Green, 1784.

when T. S. Roberts, a Dublin landscape-painter, issued several large coloured views.

Brocas, in 1818–1829, issued his well-known set of twelve views, which do for this period what Malton did for his. The buildings and people are spiritedly sketched in, and the series is a valuable record.

Some of the most interesting work of the earlier part of the century are the etchings from the drawings of the well-known archæologist, George Petrie. Petrie was prolific, accurate, and artistic, and some fifty of his drawings are reproduced in Wright's *Dublin*, Cromwell's *Tours*, and

Dublin Delineated. The original sketches from Wright's *Dublin* hang in the Royal Irish Academy House (fig. 49).

George IV's visit in 1824 led to the appearance of a large number of views, of which the reception of the King in Sackville Street, and his departure from Kingstown, are the best known. But these illustrations are poor in comparison with older work, and mark the decadence of the large coloured view.

From 1820 lithographs were issued, and numerous copies of older pictures appeared. Soon after 1830 woodcuts began to oust copper etchings, the possibility of printing with type making up for their deplorable quality; later on woodcuts improved and flourished, until in turn process-work displaced them.

Fig. 49.—Barrack and Queen's Bridges.
Petrie, 1819.

The introduction of railways and the Great Exhibition of 1853 led to other special outputs.

Many other classes of pictures reward both the collector and the student. The coloured caricatures and fugitive prints, so popular at the end of the eighteenth and in the early years of the nineteenth century, show street-scenes and buildings, costumes (fig. 50), and portraits. Local events of the latter half of the century, and the additions and alterations to public buildings, can be followed in the pages of the *Illustrated London News* and other weeklies. But whilst these help to make the picture-story more complete, the era of fine pictures, of pictures which will be prized by collectors, is undoubtedly

the latter half of the eighteenth and the first third of the nineteenth centuries.

Those who wish to make a representative and choice collection should aim at securing full sets of good impressions of Tudor (1753), Malton (1791–99), and Brocas (1818–29).

Fig. 50.—*Taste à la mode.* Rotunda Gardens. Coloured print, 1790.

Maps of Dublin.

The earliest plan of Dublin is dated 1610. It appears in the corner of the map of Leinster in *Speed's* "Prospect of the World." A contemporary copy occurs in Braun and Hogenberg's Geography. Speed's map was reissued in 1676, with no printing on the back. This map shows how little the city had spread outside its walls, except about St. Michan's Church to the north of Old Bridge (fig. 51).

T. Phillipps' map, 1685, is carefully done. L. R. Strangways published *An Attempt to Identify the Streets as Depicted by T. Phillipps*, 1685, in 1904.

Collins' map, 1686, of the Bay of Dublin, gives an interesting plan of the city.

Mill's map, 1714, shows the water approaches to the city, the deepest channel skirting the College grounds, close to the site of Westland Row.

Brooking's magnificent map of 1728, already alluded to, comes next. It shows the city as it was before its great expansion in the latter half of the eighteenth century.

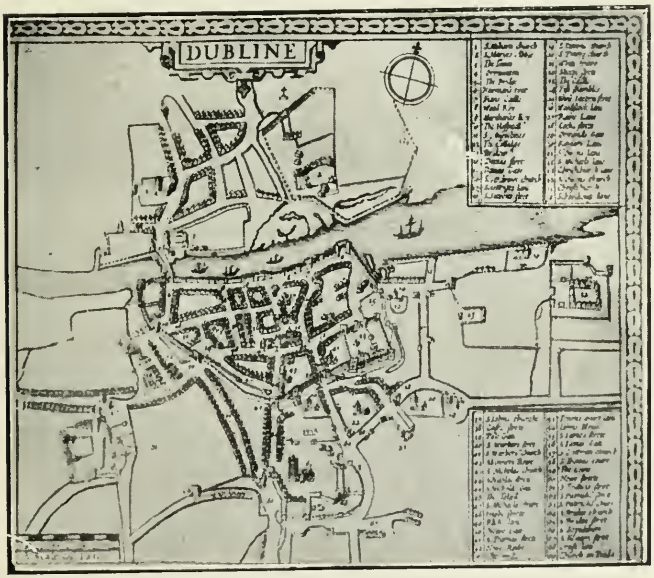


Fig. 51.—Speed's Map of Dublin, 1610.

John Rocque issued several maps. The first, a plan of the city and its environs, on a single sheet (20¾in. by 30in.), appeared in 1754 (?); it was engraved by J. J. Perret. A copy of this, engraved by A. Dury and P. Halpin, appeared in 1757. B. Scalé also engraved copies.

Rocque's four-sheet map, engraved by A. Dury, appeared in 1756, and was reissued, with additions and improvements, by B. Scalé in 1773.

Cook's Royal map (issued in connexion with George IV's visit) appeared in 1822, with twenty-five views on the margin. It was reissued in 1831.

Heffernan brought out maps in 1861 and 1868. The former had thirty-six views, and the latter twenty-two.

Maps have been issued with the Dublin Directories from 1773 onwards.

Ordnance Survey maps were issued from 1837, and were revised in 1864 and 1887.

GAELIC PLACE-NAMES IN THE DUBLIN DISTRICT.

By E. Fournier d'Albe, B.Sc., M.R.I.A.

As in all parts of Ireland, the majority of place-names in and around Dublin are of Gaelic origin. A few Norse names remain to bear witness to the period of Norse rule which gave Dublin its first claim to distinction. To these belong such names as Howth, Dalkey, Lambay, Leixlip (Salmon's Leap), and Oxmantown (Ostmen's Town). But these are exceptions to the general rule, and both the modern names of Dublin are pure Gaelic. One of these, Dublin, Irish Dubhlinn (*Duibh-linn*), means Black Pool, and is strictly equivalent to the Welsh *Dulyn*, which means the same. The "pool" was formed by the lower tidal reaches of the River Liffey. The other native name for Dublin, and the name by which it is generally known in the Irish-speaking districts of Ulster, Connaught, and Munster, is Baile Átha Cliath (Baile Atha Cliath, pronounced Bla-cleea), and means "The Town of the Ford of Hurdles." The main road from Tara, the seat of central government, to Wicklow crossed the Liffey at what is now Bridgefoot Street, by a ford which was marked by hurdles.

The interpretation of Gaelic place-names is facilitated

by the constant recurrence of certain elements such as Ard (árd, a height), Bally (baile, a town), Boher (bóthar, a road), Caher (cathair, a city), Carrig (carraig, a rock), Cashel (caiseal, a circular stone fort), Clon (cluain, a bog-island), Clough (cloch, a stone), Coomb (cúm, a hollow, a vale), Derry (doire, an oak wood), Drum (druim, a ridge), Dun (dún, a fort), Gall (gall, a foreigner), Glen (gleann, a glen), Inish (inis, an island), Inver (inbhear, a river-mouth, an estuary), Iska (uisge, water), Kil (cill, a church), Knock (cnoc, a hill), Lis (lios, an enclosed fort), Lough (loch, a lake), Lug (lug, a mountain hollow), Maghera (machaire, a plain), More (mór, great), Moy (magh, a plain), Moyle, Meel (maol, bald, unwooded), Muck (muc, a pig), Rath (ráth, an earthen fort), Rinn (rinn, a point of land), Ross (ros, a headland), Shan (sean, old), Skeagh (sceach, a whitethorn), Slieve (sliabh, a mountain), Tee (tigh, a house), and Tubber (tobar, a well).

Among the more important Gaelic place-names about Dublin are the following:—

Clontarf (cluain tarbh, bull meadow).

"Phoenix" (finn-uisge, limpid water).

Kilmainham (Cill Maighneann, St. Magnen's Church).

Chapelizod (Seipéal Íosóilde, Isolde's Chapel).

Glendalough (gleann dá loch, glen of two lakes).

Naas (nás, a meeting-place, formerly the capital of Leinster).

Poulaphuca (poll an phúca, the hole of the pooka, or goblin).

Enniskerry (áth na scairbhe, the ford of the stony crossing).

Scalp (scealp, a chasm).

Stillorgan ('s Tigh Lorgáin, (in) Lorgan's House).

Dundrum (dún droma, ridge-fort).

Killiney (? Cill Inghean Leinín, the Church of the daughters of Leinin).

Ballybrack (baile breac, speckled town).
Terenure (tír an iubair, land of the yew).
Glenageary (? gleann an gaorthaid, a wooded glen).
Raheny (ráth Éanna, Enna's rath).
Malahide (mullach Íde, Ida's summit).
Balbriggan (baile Breacáin, Brecan's town).
Drogheda (droichead átha, the bridge of the ford).

The Dublin and Wicklow Mountains bear chiefly Gaelic names. Thus we have—

Kippure (cip iubair, a yew-stick).
Tonduff (tóin dub, a black bottom).
Douce (beann Damhair, peak of Damhus).
Carrignagunneen (carraig na gcoinnín, rabbit's rock).
Lugduff (lug dub, black hollow).
Lugnaquilla (lug na coille, hollow of the wood).

The practice of giving both the Irish and English names on name-plates and sign-posts in the Dublin district was begun in 1898, and has been greatly extended since then. Several stations on the Dublin and South-Eastern Railway have their Irish names prominently displayed, notably that of Dalkey, where the old name Deilginis (thorn island) is seen in large letters on the embankment. Within the area controlled by the Dublin Corporation all name-plates and sign-posts will within a few years become bilingual, the practice being to make all new plates and renewals of old plates bear the names in both Irish and English. The Irish equivalents are furnished by a special Reference Committee appointed by the Celtic Association, the Gaelic League, and the Society for the Preservation of the Irish Language.

EDUCATION AND RESEARCH.

GENERAL EDUCATIONAL INSTITUTIONS.

By John Cooke, M.A., M.R.I.A.

Dublin University; Trinity College (Plate XXV). Several attempts were made to found a university in Dublin before the sixteenth century. Owing to the action of the mayor and corporation of the city in petitioning the Privy Council of England through Henry Ussher, a warrant was granted by Queen Elizabeth; and the foundation of Trinity College was laid in 1591, on the lands of the priory of All Hallows, suppressed by Henry VIII, but bestowed by him on the Dublin corporation, to be granted by them in turn for the site of the new university. Much of the land was then a marshy waste; but it has now become a valuable property, worth £10,000 a year. Lord Burleigh was the first chancellor, and Adam Loftus, archbishop of Dublin, the first provost of the new institution. The income of the college at first was the small sum of £300; successive grants were made by the Queen and James I, and the buildings grew in the course of time. It suffered in the rebellion of 1641; and James II pursued the same policy towards Dublin that he pursued towards the English universities; and on the refusal of the governing body to admit a Roman Catholic to a Fellowship, £400 a year was taken from them. The college was taken for a garrison in 1689, and the chapel used as a store for gunpowder. Dr. Moore, a Roman Catholic, was appointed provost. He did much to preserve the institution during his short tenure of office, and alleviate the condition of the Protestants imprisoned within its walls. The battle of the Boyne sealed the fate of James II; the banished Fellows returned, and the college resumed its usual course. In 1693 the centenary of the foundation of the university was celebrated with much state and ceremony, and the poet laureate, Nahum

Tate, being a graduate, contributed an ode for the occasion. Provost Baldwin bequeathed some £75,000 to the university; and his munificence is fittingly commemorated by a monument in the examination-hall. To his successor, provost Andrews, the university owes still more; for it was chiefly through his influence that the fine pile of buildings, including the west front and Parliament Square within, were built from grants generously given by the Irish House of Commons, in the latter half of the eighteenth century. The foundation of the library began in 1601, when the soldiers, to commemorate the battle of Kinsale, subscribed £700 out of arrears of pay to buy books; and in 1661 Archbishop Ussher's library was purchased for £2200 by a similar act of generosity on the part of the Cromwellian army, and presented to the college. The Library Act of 1801 has been the chief source of supply since that date. The library contains nearly 300,000 volumes and about 2000 manuscripts. Among its chief treasures are codex Z, a palimpsest of St. Matthew's Gospel, the Book of Durrow (Gospels), Book of Armagh (New Testament), Book of Dimma, Book of Mulling (Gospels), the Book of Kells (Gospels), styled "the most beautiful book in the world," the Book of Leinster, and many others.

During the nineteenth century the magnificent block overlooking the park—"the schools," or new buildings, the new square, the medical school and museum—were erected; and the college, as far as her means permitted, made every endeavour to meet modern requirements in equipping her various departments for scientific teaching and research. In 1893 she celebrated her tercentenary, when representatives of seventy-five universities and other institutions from all quarters of the world assembled to do honour to Dublin University. The Graduates' Memorial Building is a fitting tribute from her children, not only as a mark of their affection, but as a memorial of the great occasion.

In 1793 Trinity College admitted the students of denominations other than the Church of Ireland to her degrees—more than half a century before the sister universities in Great Britain removed their disabilities. Dublin University

was also the first to grant degrees to Jewish students. It established non-foundation scholarships in 1845, to meet the difficulties students of other creeds had in taking the declaration then required of scholars. In 1858 studentships (£100 annually for seven years) were instituted and made open to all denominations; and in 1873 all religious tests were abolished, except, of course, in connexion with the divinity school. In 1904 degrees and honours were thrown open to women. Dublin was the first university to confer degrees in surgery and engineering. Lectureships in modern languages were established as far back as the eighteenth century; and English literature took its place in the curriculum long before Oxford and Cambridge gave it a place in their course of studies. The classical and moral science triposes in Cambridge were subsequent to moderatorships in these subjects in Dublin; and in specializing in physical and natural science this Irish university has played a foremost part. The main difficulty with Trinity College, as, indeed, with all the older universities, in the present and increasingly in the future, is how to meet modern requirements, scientific and otherwise, in an ever-widening curriculum, from endowments which were only sufficient while the institutions were run on the old and more confined academic lines. (For the Scientific Institutions, see p. 340.)

The Royal University, in Earlsfort Terrace, occupies the site of the Dublin Exhibition of 1864, the permanent buildings being maintained, to which considerable additions have since been made. The Royal University was founded in 1880, taking the place of the old Queen's University, and established on the same lines as London University. To it the Queen's Colleges of Belfast, Cork, and Galway are attached; the Catholic University College also sends its students, and large numbers are prepared for its examinations by many provincial colleges and schools. The large hall is one of the most commodious in the city, and here degrees are conferred yearly in the presence of a crowded assembly. A lofty clock-tower stands on the north side of the entrance, and the new south wing contains laboratories and lecture rooms. (For the Scientific Institutions, see p. 345.)

University College is on the south side of St. Stephen s Green. The following account has been contributed by Dr. E. J. M'Weeney :—"This institution and the Medical School, Cecilia Street, represent the surviving elements of the Catholic University, which was founded in 1853 and had as its first rector the Rev. Dr. J. H. (afterwards Cardinal) Newman. It is domiciled on the south side of St. Stephen's Green, in several adjoining houses, of which Nos. 85 and 86 are the finest. Their history is not without interest. The house No. 86, at once recognizable by its imposing dimensions and the crouching figure of a lion with which the portico is adorned, was built in the middle of the eighteenth century by Richard Chapell Whaley, whose family was connected by marriage with the Cromwells, and originally came to Ireland with the Lord Protector. Richard Whaley was a wealthy and influential man, and represented Wicklow in the Irish Parliament from 1747 to 1760. He first lived at No. 87. He is said to have been stung to envy by the fine mansion No. 85, built by Sir John Meade, afterwards first Lord Clanwilliam, and to have boasted 'that he would build something to make his noble neighbour's house look like a pig-stye.' He accordingly acquired the plot of ground that intervenes between the two houses, and erected on it the magnificent house No. 86, one of the finest private residences in Dublin. The walls, ceiling, staircases and mantelpieces are lavishly decorated in the best Italian manner of the eighteenth century. After Richard Whaley's death the house remained in the occupation of his widow, and afterwards of his son John, who lived there till his death in 1847. But its most famous inmate, whose wild life and reckless exploits (many of which are exaggerated or quite apocryphal) are still, more than a century after his death, traditional in Dublin, was John's elder brother Thomas, the celebrated 'Buck' or 'Jerusalem' Whaley. This last sobriquet he earned by carrying out a successful expedition to the Holy City—at that time a difficult and hazardous exploit—for a wager of a sum variously stated at £15,000 and £20,000."

The Catholic University consists of a group of Colleges—that in St. Stephen's Green being connected with Maynooth,

Carlow, Blackrock, Clonliffe, and the Cecilia Street Medical School; but degrees are granted only in theology and philosophy, the other professional and Arts degrees being taken out in the Royal University.

Secondary Schools and Colleges.—These are numerous, and many of them occupy large private houses never intended to be used for such purposes; none either in wealth or dignity reaches the standard of the great and old foundations in England. But the standard of education is especially high, and can well bear comparison with that attained in the secondary schools in England. This is in a large measure due to the impetus given by the Intermediate Education Board, which was established with a grant of one million sterling out of the disestablished Irish Church funds. Since then Ireland's portion of the beer duties has been added, and the Board now administers over £80,000 a year in the shape of results fees, awards, etc., based on the results of a great general examination, which is held in the month of June.

Among the chief schools is the **High School** under the Erasmus Smith Education Board. The schools under their management were founded by Erasmus Smith, an Irish landowner, for the education of Protestant children, in 1669. The High School stands in an open space near the head of Harcourt Street.

The **Incorporated Society's Schools** are widely spread. This society was also established (1733) for the education of Protestant children, and has its chief school, recently established, in Mountjoy Square.

St. Columba's College, Rathfarnham, was founded in 1843, on the lines of the English public schools. It occupies a beautiful situation on the slope of the Dublin mountains, and has a pretty chapel.

Wesley College, St. Stephen's Green, S., is a new and well-built institution, but it cannot be seen to advantage from the thoroughfare, owing to its being shut in by the houses fronting it.

St. Andrew's College, managed by a board of Presbyterian citizens, is on the north side of the same square, and of quite recent establishment.

King's Hospital, or the **Blue Coat School**, at Oxmantown, on the north side of the Liffey, was founded in 1670 by Charles II for the children of freemen. The present building dates from 1770, and was originally intended to be crowned by a steeple. From lack of funds this was not done, but an unfinished appearance has to some extent been removed by a cupola, erected in 1904. The boys dress in uniform, which is in no sense picturesque compared with the sixteenth-century costume of the Christ's Hospital scholars.

All the chief Roman Catholic schools have been established by the teaching orders of the regular clergy. Among them are the fine **Castleknock College**, belonging to the Vincentians, and occupying a beautiful situation beyond Phœnix Park. **Blackrock College** belongs to the order known as the Society of the Holy Ghost. It stands on a fine site on the main road from the city to Kingstown, and recent improvements have thrown the college and grounds open to public view.

Belvedere College, in Great Denmark Street, belonging to the Jesuit order, occupies one of the most interesting of the old Dublin houses. The Marist Fathers have an establishment, the **Catholic University School**, in Lower Leeson Street. The well-known teaching order of the Christian Brothers has numerous schools in Dublin. **North Richmond Street Schools** are very extensive, and here about 2000 boys are educated. There is also a large school at **Marino**, Clontarf.

Alexandra College for the higher education of women faces the Royal University, and was established in 1866 by the late Archbishop Trench and Mrs. Jellicoe, its first lady principal, to whose memory the hall of the college has been erected. This college preceded Girton by three and Newnham by five years. From the first, a strong connexion has been maintained with Trinity College, Dublin; and the students of Alexandra entered for examinations specially intended for them. From 1880 the college took every advantage that the Royal University offered to women. Its students have also largely availed themselves of the recent privileges which Trinity College has

afforded by opening its doors to women, the great majority of girl-students belonging to Alexandra College. A system of training for secondary schools has recently been established; and in general culture the Hermione art lectures and the Margaret Stokes archæological lectures are worthy of special mention. **Alexandra School** is an attractive-looking block adjoining the college, built from designs by Mr. Kaye-Parry (1890). The school is a sister institution for younger girls, and was established in 1873.

The leading orders of Nuns conduct institutions for the education of Roman Catholic girl-students. The chief residentiary college is the **Loreto Abbey**, Rathfarnham, and the principal day-schools are the **Loreto College**, St. Stephen's Green, and the **Dominican College**, Eccles Street.

The **Primary School** system in Ireland is under the control of the National Education Board, established in 1831. There is no school-rate in Ireland; and the whole cost is defrayed from direct Treasury grants. Voluntary parochial aid is given in many schools to augment the teachers' salaries, which are at a much lower scale than in England. All schools are under the control of managers, the majority of whom are clergy of the various denominations; and they are responsible for the maintenance and heating of the schools. A recent report by specially appointed inspectors showed that the general condition of the schools was unsatisfactory; and an annual grant of £40,000 was given in 1907 for a period of five years for the improvement of existing and the establishment of new schools. Down to 1884 the Central Training College in Marlborough Street, Dublin, undenominational, and under the direct control of the Commissioners, was the only one for teachers. The offices of the Board occupy Tyrone House, the old town residence of the Beresford family; the College and Model Schools are adjoining. In 1884 St. Patrick's College, Drumcondra, under the control of the Vincentian order, was established by the National Board for Roman Catholic male students; the Training College for girls is now at Blackrock. These are both in new buildings. In 1884 the Church of Ireland Training College was also

established by the National Board. It occupies the site and some of the old buildings of the Kildare Place Society's schools, founded in 1811, which passed to the Church Education Society in 1839. It has thus preserved its continuity and site as a training college; and in this latter respect is the oldest of its kind in the United Kingdom. It has been largely rebuilt and extended since 1884; and its new front is a very effective addition to the architecture of Kildare Street.

SCIENTIFIC INSTITUTIONS.

Trinity College.

By Henry H. Dixon, d.sc., f.r.s.

With the exception of the Observatory at Dunsink and the Botanic Gardens at Ball's Bridge, the scientific institutions of Trinity College are all grouped within its own precincts, and are for the most part located within the College Park.

The Museum Building—containing the Schools of Civil Engineering and Geology—forms the south side of the "New Square." It was erected in 1857, "and is perhaps the most successful piece of modern architecture in the British Isles." The stone-carving, both for diversity of design and delicacy of execution, is admirable. It is the work of the brothers Shea, of Cork, who were subsequently employed in decorating the Oxford Museum. The School of Civil Engineering was founded in 1842, Dublin being the first University to confer degrees in Engineering. The Drawing Room and Museum of Engineering Models are on the right at the top of a very fine staircase, while on the left is the Museum of Geology. The lower floor is occupied by the Geological laboratories and class-rooms—formerly devoted to the School of Experimental Physics —and by lecture theatres for Geology and Engineering. On the stairs is a clock electrically controlled by the mean-time clock of the Observatory at Dunsink. The Geological Museum, in addition to typical collections of minerals, rocks, and fossils, arranged for students' use, contains

many valuable and rare specimens, among which may be mentioned fine examples of *Cervus giganteus*, fossil reptiles, and the famous Dundrum meteorite. The Engineering Museum contains a variety of engineering models, *e.g.*, a series representing the progress of invention in the steam-engine, a large collection of timber bridges, a model of the Boyne Viaduct, &c.

Leaving the Museum Building, and passing from the New Square, we see at the east end of the Park the large group of granite buildings in which the greater part of the science schools are housed. The southernmost of this group is the School of Pathology, built in 1897. It contains large and small class-rooms, lecture theatre, and research laboratories, and also gives accommodation to a department of X-ray photography.

The central block of this group of buildings, which Trinity College largely owes to the energy of the late Rev. Samuel Haughton, contains (i) the School of Chemical Science, with large laboratories and theatre for the instruction of students in pure and applied chemistry, research laboratories, and a museum; (ii) a Pathological and Surgical Museum; (iii) a Department of Materia Medica and Therapeutics, including a laboratory and a museum; (iv) the School of Anatomy. The last-mentioned comprises a large general dissecting-room, a museum, a lecture-theatre, an embryological laboratory, and a women's dissecting-room. In the Anatomical Department are displayed sections of the frozen body, and dissections and models illustrating embryonic development.

The north end of the group is occupied by (i) the Zoological Museum and Laboratories, (ii) the Museum of Anthropology, (iii) the Department of the Institutes of Medicine, which includes a large laboratory for practical physiology and histology, and a lecture theatre, and laboratories for research in physiology. The Zoological Museum contains a large series of typical specimens.

Among the rarities of the Zoological Museum may be mentioned a fine example of the Great Auk, which was taken in Waterford Harbour in 1831—the last recorded living specimen of this bird. In the gallery a set of museum microscopes are set up to exhibit specimens to students.

In the Museum of Anthropology, which is in connexion with the School of Anatomy, may be seen a representative collection of the skulls of different races. The death-mask

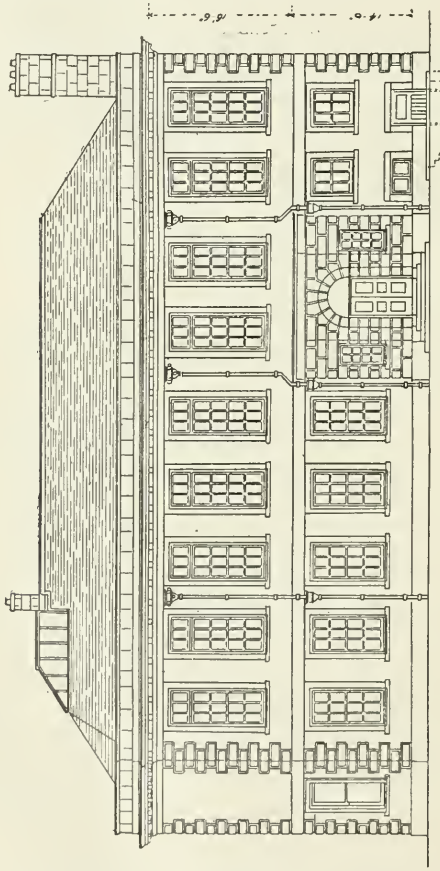


Fig. 52.—School of Botany, Trinity College. (From *British Medical Journal*, 1907.)

of Dean Swift and the skeleton of the remarkable Irish giant Cornelius Magrath are preserved here.

Standing out from these buildings into the Park are the Schools of Experimental Physics and of Botany, the

gift of Viscount Iveagh to the University. The former was completed in 1906 and the latter in 1907. The former is a three-storied building, and gives accommodation to a

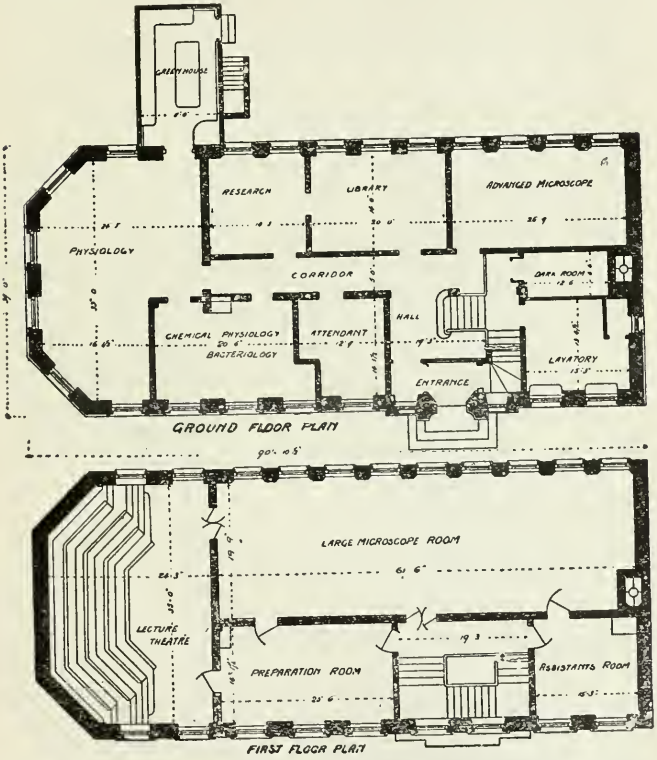


Fig. 53.—School of Botany, Trinity College.
(From *British Medical Journal*, 1907.)

fine lecture-theatre, large and small class-rooms, and laboratories suited for research in the various branches of Physics. In connexion with the School of Physics is a

Meteorological Observatory in the Fellows' Garden. The School of Botany lies to the north of the School of Physics; it, too, contains a fine theatre, large and small class-rooms, laboratories equipped for research and instruction in Botany, a greenhouse for experimental work, and a library. In connexion with the Botanical Department of the College, though not housed in the School of Botany, is a valuable Herbarium. It, together with a library of botanical literature, presented by Dr. E. P. Wright, is accommodated in No. 5 Trinity College. Among its possessions may be noted a British collection, rich in species and varieties, including collections made by Mackay, Greville, Balfour, Henslow, A. G. More, Harvey, and others; and a collection of algæ, including many type-specimens of Harvey, Agardh, Mueller, &c. The School of Botany is also fortunate in possessing a Botanic Garden of about 6 acres, situated at Ball's Bridge, and founded in 1806. The inner garden contains a collection of the principal natural orders of hardy plants for teaching-purposes; while in a series of seven glass-houses are grown tender and tropical exotics; there are also several ponds for the cultivation of water and marsh plants, and suitable conditions are provided for the cultivation of trees, herbaceous, alpine, and bulbous plants.

Close to the School of Botany, on the north side of the Rugby football ground, are the Laboratories of Electrical and Mechanical Engineering—erected in 1903. In the Laboratory of Mechanical Engineering are the apparatus and machinery necessary for the instruction of students in this branch of engineering, *e.g.*, a fine testing-machine, experimental steam-engine, and various gas and oil engines. There is also attached to it a laboratory for cement-testing. In the Laboratory of Electrical Engineering is the apparatus necessary for the instruction of students in the theory and practice of electrical engineering, together with some early forms of the dynamo, now of historic interest.

Dunsink Observatory, the residence of the Astronomer Royal for Ireland, is five miles north-west of the centre of Dublin, on an eminence commanding a superb view. The

principal instruments here are a meridian circle by Pistor and Martins, a chronograph by Grubb, a 12-inch refractor by Cauchoix, presented by Sir James South; and a 15-inch reflector, the gift of the late Isaac Roberts, F.R.S.

The Royal University of Ireland.

By W. E. Adeney, D.Sc., M.R.I.A.

The Royal University Buildings are situated in Earlsfort Terrace. They include general offices, examination halls, and large, well equipped laboratories. These last have been specially designed, and are maintained for carrying out practical examinations in the faculties of Arts, Medicine, and Engineering. The number of candidates presenting themselves for the University Examinations has been steadily increasing during the past few years, as shown by the following returns:—

Year.	No. of Candidates.
1882	1898
1902	2894
1903	3019
1904	3267
1905	3474
1906	3733
1907	4115

Fellows of the University and Examiners are appointed by the Senate to carry out these examinations; the former are also required to teach in certain specified colleges in Dublin, Belfast, Cork, Galway, and Londonderry.

Although the laboratories have been solely designed for examination work, the Senate have allowed them to be used, when possible, for research; and important investigations have been carried out in them during recent years, including the well-known work by the late Professor T. Preston, D Sc., F.R.S., on the Zeeman effect.

University College.

By J. A. M'Clelland, D.Sc., F.R.U.I.

Most of the students of University College are reading for the examinations of the Royal University, to which it is in a sense affiliated; for, while the Royal University is essentially an Examining Board, and admits to its examinations without demanding attendances at any college, it at the same time appoints University Fellows, who are required to deliver lectures at University College, the Catholic University School of Medicine, one of the Queen's Colleges, or Magee College, Londonderry. The laboratories and lecture-halls of the College are taxed to their fullest capacity in providing for the absolute necessities of students preparing for the University Examinations; and recently temporary buildings have been erected to accommodate rapidly increasing numbers. The want of funds, however—for beyond the University Fellowships attached to the College it has no public endowments—renders it impossible suitably to provide for post-graduate and general research work, although, indeed, in these domains the College is not without considerable activity.

The Catholic University School of Medicine.

By E. J. McWeeney, M.A., M.D.

This unattractive building, in the midst of no less unattractive surroundings, is the home of the medical faculty of the Catholic University—the only component of that institution which has enjoyed a career of uninterrupted success since it was founded in 1855. It is a building facing the northern end of Crow Street—a narrow thoroughfare running from Dame Street towards the river. How a school of medicine came to be named after St. Cecilia has often been the subject of discussion. The name owes its origin to a music-hall which formerly existed on the same site, having been opened in 1731 by a Mr. Johnson. It is described as a building with large gates facing the

lower end of Crow Street. Subscription balls were held here in the year 1753 ; whilst, by a curious forewarning of the ultimate fate of the premises a century later, we learn that "in the following year (1754) there was exhibited by Mr. Rackstrow the series of anatomical waxworks now preserved in Trinity College, in the production of which forty years had been spent by Denoue, Professor of Anatomy to the Academy of Sciences at Paris."[1] In 1758 this music-hall was replaced by "The New Theatre in Crow Street," which was capable of seating over two thousand persons, and maintained its position as the leading playhouse in Dublin for more than half a century. Its glories waned about 1820, when the Theatre Royal was built in Hawkins Street. In 1836 portion of the site was acquired by the Apothecaries' Hall of Ireland for their medical school, which was taken over in 1855 by the Catholic University. In 1892 its internal arrangements were remodelled and greatly improved by the late Dr. Ambrose Birmingham, Professor of Anatomy. The building is, however, quite inadequate to the number of the students, in regard to which it is only surpassed by three medical schools in the United Kingdom—those of Edinburgh, Glasgow, and Cambridge.

The Royal College of Physicians of Ireland.

By Sir John W. Moore, M.A., M.D., D.Sc., D.P.H., F.R.C.P.I.

In the year 1654 Dr. John Stearne, a Senior Fellow of Trinity College, Dublin, and a physician in extensive practice in this city, founded a body called "The President and Fraternity of Physicians" at Trinity Hall, behind the south side of Dame Street. This hall was given by the Provost and Senior Fellows of Trinity College to Dr. Stearne "for the sole and proper use of physicians"; and they appointed him President of Trinity Hall.

In 1667 King Charles II granted the first charter of incorporation to "The President and Fellows of the College

[1] Gilbert's History of Dublin, ed. 1903, p. 75.

of Physicians in Dublin." This charter, while preserving the terms of contract with the Provost and Senior Fellows of Trinity College, gave the College of Physicians the general powers of the sister college in London, and specially entrusted the College with the entire control of the practice of physic in Dublin and its vicinity.

At the request of the College the Caroline charter was surrendered on December 14, 1692, and King William and Queen Mary granted a new charter, dated December 15, 1692, in which the corporation is styled "The President and Fellows of the King and Queen's College of Physicians in Ireland"—a title by which the College continued to be known until 1890. On August 5 of that year a supplemental charter, granted by Queen Victoria, ordained that "the Corporation of the King and Queen's College of Physicians in Ireland shall henceforth be called and known by the name of 'The Royal College of Physicians of Ireland.'"

The first president under the charter of William and Mary was Dr. Patrick Dun, a native of Aberdeen, afterwards Sir Patrick Dun: he was knighted by the Lords Justices of Ireland on January 29, 1696.

In 1800 Sir Patrick Dun's Hospital was founded, in conformity with the spirit of Sir Patrick Dun's will, of which the President and Fellows of the College are the trustees. The College met in the hospital until 1863, when the fine and commodious buildings in Kildare Street, now called the Royal College of Physicians, were opened. Towards the close of the year 1876 the College admitted women for the licences in medicine and midwifery, being the first licensing body in the kingdom to take this step.

On December 12, 1878, Queen Victoria granted the College a supplemental charter, of which one of the most important provisions was the institution of a grade ororder of Members of the College distinct from the Fellows, and to which Licentiates of the College, or persons qualified at the time of their admission to become such licentiates, should alone be eligible.

In 1886 the College combined with the Royal College of Surgeons in Ireland to form a conjoint scheme of education

and examination, for the purpose of qualifying candidates for admission to the Medical Register.

The numerical strength of the College in 1908 is as follows:—Fellows, 67; Members, exclusive of 50 who were also Fellows, 205; Licentiates in Medicine, exclusive of 272 who were also either Fellows or Members, 2682; Licentiates in Midwifery alone, 281; total, 3235. There are besides 271 Diplomates in Public Health or State Medicine.

In the Statue Hall of the College are marble statues of Sir Henry Marsh, Dr. Robert James Graves, Sir Dominic Corrigan, and Dr. William Stokes, all of them past presidents. There are also many portraits of dignitaries of the College. The mace, of solid silver, dating from 1852, is a much-admired work of art.

The Royal College of Surgeons in Ireland.

By Sir John W. Moore, M.A., M.D., D.Sc., D.P.H., F.R.C.P.I.

The handsome granite building on the west side of St. Stephen's Green, and at the eastern end of York Street, on its north side, is the home of the Royal College of Surgeons in Ireland.

On St. Luke's Day, October 18, 1446, King Henry VI established by Royal charter a fraternity or guild of the "Art of Barbers." This was the first incorporation of medical practitioners in the kingdom. King Henry's charter cannot be found; but its purpose was recited in a charter granted by Queen Elizabeth in 1572, which is preserved in the Manuscript Room of the Library of Trinity College, Dublin. From the text of Elizabeth's charter it is clear that the word "barber" was the equivalent for surgeon, or "chirurgeon," in those days. It is also interesting to note that the fraternity or guild was to consist of "as well Men as Women who were willing to join as Brothers and Sisters of the Fraternity or Guild aforesaid."

The "Master, Wardens, and Fraternity of Barbers and Chirurgeons of the Guild of St. Mary Magdalene, within our city of Dublin," exercised their chartered privileges during some two centuries. By the end of that time the

surgeons in the guild had become dissatisfied with their corporate connexion with the barbers and peruke-makers. Accordingly, on March 29, 1780, a number of surgeons constituted themselves the "Dublin Society of Surgeons." This was the first step towards the foundation of the Royal College of Surgeons in Ireland, which was established by Letters Patent, dated February 11, 1784, in the twenty-fourth year of the reign of King George III, Samuel Croker-King being the first president.

The foundation-stone of the existing College buildings on St. Stephen's Green was not laid until March 17, 1806; and it was not until the year 1827 that the Doric frontage of the College assumed its present imposing appearance.

The College School of Surgery dates from 1789. In 1891 an amalgamation of medical schools was effected, and since then the Carmichael College of Medicine and the Ledwich School of Medicine have been merged in the very fully equipped and successful Schools of Surgery of the Royal College of Surgeons in Ireland. At the present day the College includes nearly 500 Fellows and nearly 3000 Licentiates, besides some 450 Licentiates in Dental Surgery.

The College Library contains about 25,000 volumes. The history of the Museum is almost coeval with that of the College. It includes departments of natural history and of pathology.

Since the passing of the Medical Act of 1886 the Royal College of Surgeons has been united under a conjoint scheme of examinations with the Royal College of Physicians, for the purpose of holding qualifying examinations in medicine, surgery, and midwifery, for admission to the Medical Register of the United Kingdom.

The Royal College of Science for Ireland.

By Geo. H. Carpenter, B.Sc., M.R.I.A.

This institution, situated on the east side of St. Stephen's Green, was founded in 1845 as a Government "Museum of Irish Industry," comprising exhibits in mining, metallurgy, and manufactures, including the collections of the Irish

Geological Survey, and giving instruction to the public through courses of lectures delivered by a staff of professors under the direction of Sir Robert Kane. In 1854 the scientific teaching work of the Royal Dublin Society was incorporated with that of this Museum. After several years of inquiry and discussion the Museum was reorganized in 1867 as the Royal College of Science for Ireland. During the forty years of its existence the College has been noted for the extent and thoroughness of the practical work done in its various courses, and the laboratory accommodation, having been for long too restricted for the growing activities of the place, a new building is now in course of erection in Upper Merrion Street, near the National Museum.

Until the year 1900 the College was under the control of the Science and Art Department, South Kensington. Then it was transferred to the newly-established Department of Agriculture and Technical Instruction for Ireland, under which it has developed most strongly as a college of pure and applied science, and as a centre for the training of teachers and instructors for Irish schools. There are "faculties" of Agriculture, Applied Chemistry, and Engineering, and "groups" of science teachers, specializing in Chemistry, Physics, or Natural Science. The training of itinerant agricultural instructors for the Irish counties, and of qualified science teachers for the Irish secondary schools—both in ordinary three-years courses and in special short summer courses—has been a notable feature of the College during recent years, while the former chemical, physical, engineering, and biological teaching and research have gone steadily on.

At present the Engineering Faculty is temporarily housed outside the College. In the College building on St. Stephen's Green are in the front (west) block, library, offices, class-rooms, and bacteriological laboratory; in the north block, metallurgical, chemical, and biological laboratories; in the south block, physical and geological laboratories; in the back (east) block, lecture-theatres and teaching collections. The biological, geological, and bacteriological laboratories are especially well-lit and commodious. The chemical and physical laboratories, though cramped through want of

space, contain many valuable pieces of apparatus, and have been the scene of well-known researches on spectroscopic analysis and the thermo-conductivity of metals and alloys.[1] The library contains a well-selected assortment of scientific books and some periodicals not taken elsewhere in Dublin. It is available for reference by the public.

In addition to the extensive teaching work, the College is a leading centre of scientific research, and its staff advise the Department of Agriculture on scientific questions. The Department's seed-testing station is situated here; and the economic bearing of biology and geology receives especial attention. It was appropriate, therefore, that the College should have been selected as the meeting-place of the subsection of Agriculture during the 1908 session of the British Association.

The Royal Veterinary College of Ireland.

By A. E. Mettam, B.Sc., M.R.C.V.S.

Strange as it may seem, an agricultural and pastoral country like Ireland did not until 1900 possess a Veterinary College of its own. True, in the eighteenth century the idea was mooted even before the foundation of the college in London, but nothing further was done. In the nineteenth century, at various times, the idea again cropped up, but until 1895 it did not take shape. In that year a Royal charter was granted, and the Chief Secretary of the time, Mr. John Morley, promised a grant in aid of buildings and equipment of £15,000. In 1900 the work of the college began as a teaching institution; and now it is claimed that, so far as the number of students is concerned, it is second only to the London Veterinary College. The sum above mentioned was speedily found to be wholly inadequate to build and equip an efficient and modern veterinary college; and it has been added to by the Department of Agriculture

[1] See "Ireland, Industrial and Agricultural," Dublin, 1902; and W. F. Barrett in "The Lynx" (R. C. Sc. Magazine), June, 1906.

DISSECTING-ROOM OF THE ROYAL VETERINARY COLLEGE, DUBLIN.

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and Technical Instruction for Ireland, who rightly consider that modern veterinary science is indispensable to progressive agriculture and to a country where the rearing and breeding of stock demand so large a part of the national energy. The College buildings are erected upon land adjoining the Botanic Garden of Trinity College, and are entered from the Shelbourne Road at Ballsbridge. At present three blocks of buildings are complete. There are a well-equipped hospital, with stalls for horses, cattle, and dogs, a pharmacy with class-room over, an anatomical museum, a large lecture-theatre opening from a dissecting-room (Plate XXIX), so that fresh subjects can be brought in and placed on the revolving-table, an extensive biological and physiological laboratory, and a pathological laboratory with research-rooms. By the autumn of 1908 the present scheme of the College buildings will be practically complete. The staff of the College includes nine lecturers with assistants, and the governing body is a board of forty, nominated by the Crown, the Royal Dublin Society, and the Department of Agriculture and Technical Instruction for Ireland.

Alexandra College.

By Jane Stephens, B.Sc.

Alexandra College was founded in 1866 for the higher education of women. A class in Botany is held weekly. The instruction is given mainly from the point of view of nature study. Special attention is also given to the study of Plant Physiology.

The study of Horticulture receives special encouragement. Practical instruction in all branches of horticulture is given to the students in the College gardens, which are to a large extent laid out with a view to afford facilities for this work. Among the special features of the gardens are a rock-garden and a wall-garden, where many rare and interesting plants are to be found. Visits are paid to the Royal Botanic Gardens and to private gardens in the neighbourhood of Dublin which present features of interest to

horticultural students. Scholarships are given yearly in connexion with both botanical and horticultural classes.

A chemical laboratory has recently been fitted up in Alexandra College. Students are prepared for examinations up to and including the examination for the B.A. degree. Facilities are also offered to students who wish to take a special course in Chemistry.

City of Dublin Municipal Technical Schools.

By L. E. O'Carroll, B.A.

The Technical Schools are under the control of a Committee which is appointed by the Corporation of the city.

Dublin had the honour of being the first city in Ireland to form a Technical Instruction Committee, and to undertake practical work. As this was actually in operation two years before the passing of the Technical Instruction Act of 1889, it will be seen that Dublin compares favourably in this respect with the majority of English towns.

In 1885 there was an Artizans' Exhibition held in the city, at the close of which a provisional committee was formed to aid industrial progress by utilizing the building for technical classes. This project fell through, more suitable premises being taken in Kevin Street. A start was made on voluntary subscriptions, the collection of which commenced in 1885 ; and in the course of time help was received from the Public Libraries Committee. At the present time the chief source of income is the penny rate, which brings in about £3,500 a year ; and the Government grant which is received through the Department of Agriculture and Technical Instruction, amounting to about £9,000 a year.

In the first session at Kevin Street the students mustered a little over 200, the numbers rising to about 1,000 in ten years. As the building would not accommodate more, and students were being refused, a considerable extension was made, and the new building was opened in January, 1901. The numbers then speedily rose from

1134 in 1900–1 to 2382 in 1904–5. The chief features of the school are the Building and Engineering Classes (Mechanical and Electrical), but provision is also made for a large number of Trade Classes.

A second school was opened in Rutland Square in 1905, the chief feature of which is the Commercial Classes.

A Printing School was opened at Chatham Row in February of the present year. It contains a very modern equipment of printing apparatus and machinery, and is one of the best housed, as well as one of the best equipped, schools of typography in the United Kingdom.

The National Museum of Science and Art.

By Geo. H. Carpenter, B.Sc., M.R.I.A.

Occupying a large area between Kildare Street and Merrion Square will be found a number of scientific and other institutions grouped around Leinster House. Northwards lie the National Library (see p. 360), the Metropolitan School of Art, and the National Gallery. To the south of Leinster House lies the Museum, the Zoological collections being housed in a building completed in 1857 on the south side of Leinster House towards Merrion Square, while the Art, Industrial, Archæological, and Botanical collections are displayed in the new building towards Kildare Street, which was completed in 1890. The Geological, Palæontological, and Circulation collections are, pending the erection of a permanent annexe, still in temporary sheds between the two main buildings. Leinster House is occupied by the Royal Dublin Society (see p. 369), and by the administrative staff of the Museum.

The collections now brought together in these buildings have been derived from various sources. As a whole the Museum must be regarded as a continuation of the Museum founded by the Royal Dublin Society in 1732 (see p. 371), subsequently assisted and subsidized by the Government, and finally handed over to the Science and Art Department in 1877. But other institutions have contributed to the

present collections—the extinct Dublin Natural History Society, the Museum of Irish Industry (now transformed into the Royal College of Science), the Irish Geological Survey, and, above all, the Royal Irish Academy (p. 368), whose unique and valuable collection of antiquities was housed in the new Museum building in 1891. In the year 1900 the Museum was transferred from the Science and Art Department to the Irish Department of Agriculture and Technical Instruction.

Most of the contents of the new building appeal to the artist and archæologist rather than to the man of science; but there are three sections well worthy the attention of scientific students. In a long room at the west end of the ground-floor, is an excellent *Ethnographical Collection*, arranged on a plan primarily geographical. Here the habits, industries, and religions of various savage and barbarous races of men are illustrated by numerous specimens of their utensils and dress. In adjacent rooms, convenient for comparison, are exhibits illustrating the old civilizations of Egypt, Assyria, Greece, Rome, Persia, and India.

In a series of three rooms at the west end of the first floor and in the adjoining galleries will be found the famous *Collection of Irish Antiquities*, collected for the most part by the Royal Irish Academy. The first room contains relics of the Stone Age (Neolithic); noteworthy exhibits in addition to a large set of implements from various Irish counties, being portions of the old sand-covered surfaces of the Ulster raised beaches, with chipped flints, split bones, and other indications of the presence of early man. In the second room is arranged the fine series of weapons, gold ornaments, and other objects of the Bronze Age. Specially interesting to the scientific antiquarian will be the prehistoric interment of cremated human remains, conveyed bodily from Tallaght, County Dublin, to an exhibition case in this hall. The third room is devoted to the unique and splendid set of Christian Antiquities. Scandinavian and Swiss objects, for comparison with the Irish Antiquities, are shown in the neighbouring gallery.

The *Botanical Collection* is contained in a set of rooms on the top floor of the new building. The staircase leads to a well-lit gallery, around which is arranged an index-collection of the Vegetable Kingdom. From this gallery open rooms where an economic collection (the various products grouped under the natural orders) and a set of fossil plants are exhibited. As might be expected, potatoes, peat, and the osier industry receive special attention in the economic series. There is also a herbarium with extensive collections of Irish and British plants.

On his way from the new building to the old ("natural history") building, the visitor passes through some temporary structures, where the *Industrial* and *Circulation Collections* are shown. The former is small, comprising only a few looms and models of factory-plant. The Circulation Collection consists of numerous small cases adapted for loan to local museums, agricultural shows, or country schools. Economic biology in its various branches and elementary engineering are among the scientific subjects illustrated.

In this group of temporary buildings are also housed the general *Geological and Palæontological Collections*. The relief map of Ireland, scale 1 mile to 1 inch, geologically coloured, is a conspicuous feature here; its effect is rather spoiled by the excessive exaggeration of the vertical scale (11 inches to 1 mile). Around the map are arranged the general collections of minerals and rocks. The fossils comprise a fairly extensive general collection, arranged zoologically, and a set of Irish fossil Mammalia. The general collection is noteworthy for the fine set of Liassic Ichthyosaurs and Plesiosaurs, and for the Carboniferous Cephalopoda. The extinct Irish Mammalia are among the most interesting features of the museum, including a very large series of the Giant Deer (so-called Irish Elk), of which three complete skeletons are mounted, Irish cattle, and the mammalian remains found during recent years in caves in the south and west of Ireland. Among these latter, the Arctic Fox, Brown Bear, African Wild Cat, Norwegian and Arctic Lemmings are remarkable.

A narrow, but well-lighted, curved corridor, connecting

Leinster House with the main natural history building, contains the *Geological Survey Collections.* Here will be found Irish rock-specimens, arranged under the four provinces and according to their mode of origin, and an extensive stratigraphical series of Irish fossils. This collection has been lately re-arranged; it is well illustrated with diagrams and maps; and it will prove an excellent guide to the geology of the country.

There remains the large natural history building on the south side of Leinster Lawn, in which are housed the

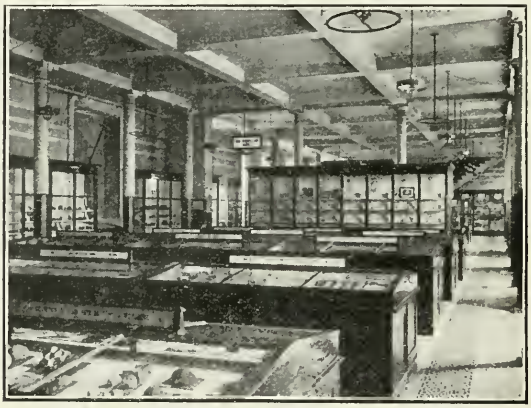

Fig. 52.—National Museum: Irish Zoological Collection.

Zoological Collections. At the east end of the ground-floor close to the Merrion Square entrance, will be found a small case, arranged to illustrate the Factors of Animal Evolution, and a series of cases showing the elementary facts of Geographical Distribution, faunistic groups being arranged according to the well-known regions of Sclater and Wallace. The attention of visitors is especially called to a small case at the north-western corner of this section, n which are illustrated some features in the fauna of the British Islands, notably the presence of rare south-western and northern forms of life in Ireland. The rest

of the ground-floor of the building is devoted to as full an exposition of the Irish Fauna as possible. In addition to the exhibition of every recorded species of which specimens can be obtained, life-histories are in many cases illustrated, notably among the Lepidoptera and the Birds. The series of mounted groups of birds, with nests and young or eggs, is worthy of careful study. In the lobby adjoining, a further series of eggs of Irish birds will be found, and a large case illustrating the nesting-habits of the herring gull. Of particular interest also are specimens of deep-

Fig. 53.—National Museum: General Zoological Collection.

sea fishes, recently obtained from the Atlantic depths off the west coast of Ireland. The upper floor of the building with its galleries contains the general Zoological Collection. The invertebrates are arranged around the top-gallery, the lower vertebrates, fishes, amphibians, reptiles, and birds around the lower gallery, and the mammals on the floor. The collection is representative, and special pains have been taken to choose good and well-mounted specimens for exhibition. The specimens of invertebrates are supplemented by numerous explanatory drawings, glass models,

and life-history groups. Representative fossils are inserted in their systematic positions. Noteworthy exhibits among the mammals are a marsupial mole (Notoryctes), a Liberian hippopotamus (Choeropsis), an okapi, a family of Alaskan fur-seals, and specimens of Weddell's and other Antarctic seals. The collection of mounted skins and skeletons of the Primates is fairly complete, and a set of casts of human skulls and faces is instructive for comparative purposes.

Adjoining the exhibition building are the offices and workrooms, where extensive study-collections are stored. The series of British and Irish insects and molluscs are well worth the attention of special students of these groups.

The National Library of Ireland.

By T. W. Lyster, M.A.

The Royal Dublin Society's Library was taken over completely by the State in 1877, and renamed "National Library of Ireland." The Library had been explicitly public since 1836, when a Parliamentary Commission on the Society had recommended the title National Library of Ireland. Practically, there is evidence to show that the Library had been public on the same terms long before 1836.

From 1877 to 1900 the Library was under the Department of Science and Art. In 1900, with the Museum, it passed to the care of the Irish Department of Agriculture and Technical Instruction. It is under the direct government of trustees—eight elected annually by the Royal Dublin Society, four appointed by the Lord Lieutenant of Ireland. The annual grant for book-purchase is at present £1300. A librarian, three assistant librarians, two cataloguers, and twenty library attendants form the technical library staff.

In 1890 the Library moved into the new building, still unfinished. The architect, Sir Thomas Deane, formed his plan in consultation with the librarian, William Archer, F.R.S. The building has good points—the central reading-room, the stack system of book-cases in the book-store, the

hydraulic lift from basement to attic. The reading-room contains some thousands of volumes for public reference without intervention.

The book-classification is the "decimal" system invented by Melvil Dewey. Under this system each new book joins others on the same subject already on the shelves, and this to the finest subdivision. The system was introduced in Ireland by William Archer, F.R.S., librarian from 1877 to 1895.

Except on Sundays and about three weeks annually, the Library is open to the public from 10 a.m. to 10 p.m. Readers' attendances in 1849 were estimated at over 8000 a year. By 1878 they numbered 27,452; in 1904–5, 198,274; in 1907–8, 190,657. The number of printed volumes may be estimated at 180,000. This is much the largest public library in Ireland. The collection of printed books is exceeded only by that of Trinity College, where there are probably twice as many. There are extremely fine collections of bound newspapers and of maps, especially Irish. The Library is rich in books on Irish topography, history, and biography. The sections Botany, Agriculture, Zoology, the Fine Arts, and Archæology have long been good; and since 1877 efforts have been made to reinforce Literature, History, Theology, Philosophy, and Political Economy. The manuscripts are few, and comparatively unimportant.

The Royal Botanic Gardens.

By F. W. Moore, M.R.I.A.

The Royal Botanic Gardens, Glasnevin, were founded by the Royal Dublin Society in 1794. In 1790 a resolution was passed at a meeting of the Royal Dublin Society that a botanical garden should be founded, the chief object of which was "to increase and foster a taste for practical and scientific botany." The Irish Parliament of that day adopted the scheme and made various grants; so that in 1794 there was sufficient money to purchase the site on which the garden now stands, and to start laying out the ground.

The management was entrusted to a Committee of Botany, selected from members of the Royal Dublin Society, an annual vote for maintenance being made by the Government. The Garden remained under the charge of the Royal Dublin Society until 1877, when it was transferred to the Science and Art Department. In 1901 it was transferred to the Department of Agriculture and Technical Instruction for Ireland—a purely Irish department—and under the care of this body it now is.

The objects for which the Gardens were founded have been steadily adhered to; and they hold a high position as an institution where practical gardening and scientific botany can be studied.

For teaching purposes and for private study a large portion of the Gardens is devoted to an arrangement of plants grouped in their orders, each order, or family, having a bed to itself. As this arrangement was made on the Candollean system, now to some extent superseded, each label giving the name of the order has also on it the number which that order bears in Bentham and Hooker's "Genera Plantarum," so that reference can easily be had to it. The collections of hardy plants in these beds are complete and representative. Teachers have free access to these collections during the hours the Gardens are open to the public, and they bring their students for demonstrations.

The Arboretum is also extensive, and there is in it one of the best public collections of trees and shrubs. There are also an excellent collection of alpines, and an aquatic garden and bog-garden.

In the conservatories there are rich and comprehensive collections of tender plants, ferns, succulent plants, hard-wooded plants, palms, cycads, and orchids. The collections of palms, cycads, and orchids (Plate XXX) are specially worthy of attention, as, outside Kew, they are the most complete collections in any public garden. No attempt at regular, systematic, or geographical arrangement is made indoors. Where possible the various groups are kept together; otherwise they are arranged according to their cultural requirements.

Large quantities of specimens for teaching purposes are

cut, and distributed to the various prominent teaching bodies, this being one of the most important of the scientific functions of the Gardens.

As regards practical horticulture, a number of young men are taken as improvers. They come for a fixed period of two years, and, besides practical work in the Gardens, they get courses of lectures on horticulture and botany.

A portion of the Gardens is made up of a series of plots, in which the principal agricultural plants, economic plants, and vegetables are cultivated; so that those interested in horticulture and agriculture can note the various plants grown, and the methods of cultivating them.

The Gardens are open in summer from 10 a.m. to 7 p.m. The conservatories are open from 10 a.m. to 5.30 p.m.

The Albert Agricultural College.

By George Stephenson.

The Albert Agricultural College, situated at Glasnevin, about a mile beyond the Botanic Gardens, is equipped for giving theoretical and practical instruction in agriculture and horticulture. Founded originally in the middle of the last century by the Commissioners of National Education "to qualify elementary schoolmasters to instruct their pupils in the theory of agricultural science," the Albert Institution became the chief centre in Ireland for the training of farmers and land stewards. In the year 1900 it passed under the control of the newly-formed Department of Agriculture and Technical Instruction for Ireland, by whom considerable extensions and improvements have been made in the College and farm buildings and equipment. It occupies in the Department's scheme of education a position intermediate between that of the provincial agricultural stations (Ballyhaise, Clonakilty, Athenry) and that of the agricultural faculty of the Royal College of Science, Dublin. There are now several good class-rooms and an extensive laboratory for the study of agricultural chemistry, while biology is taught in a temporary laboratory.

At present there are in residence about sixty agricul-

tural students undergoing a one-year's course of instruction in class-room, laboratory, farm, and workshop. Ten non-resident students are also being trained in the College and gardens for the work of county itinerant instructors in horticulture.

The College farm serves as a distributing centre for pure-bred stock, and also as an experimental station for the testing of new varieties of seed.

The Avondale Forestry Station.

By E. A. Montmorency Morris, M.A., M.R.I.A.

The Avondale estate, at one time the property of Charles Stewart Parnell, was acquired by the Department of Agriculture in 1904, on the advice of the eminent Indian Forestry expert, Dr. J. H. Nisbet, for the purposes of a forestry station. The greater part of the estate lies on the west bank of the river Avonmore, and runs from about one mile south of Rathdrum towards Ovoca, the total length of the estate being about two miles. The surrounding district is well wooded, and is almost unequalled for the purposes of a forestry school.

The total area of the Avondale property is about 550 acres. Until 1905 this was divided into woods and pasture. Of the pasture land a considerable part was heavily wooded. The woodland portion was chiefly confined to the banks of the river, and was covered with hazel scrub, or coppice, with a few ash, oak, and other trees. The soil of the estate consists of a thin gravelly loam, resting on metamorphosed slate or schist, which crops out on the surface in many places. A few acres of alluvial sand and gravel occur, but otherwise the soil varies little in character throughout. The ground is naturally well drained, and is suitable for the growth of all kinds of trees, but more especially conifers.

The elevation varies from about 250 feet along the river bed to about 400 feet on the highest ground. Along the eastern boundary the surface slopes away rapidly from the high ground to the river below (Plate XXXI). The local

AT THE FORESTRY STATION OF THE DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION, AVONDALE, CO. WICKLOW.

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climate is comparatively damp and mild, with a heavy rainfall throughout the winter. Two or three miles to the west the Wicklow mountains provide a certain amount of shelter, and the ground is nowhere greatly exposed to west or south-west winds.

The laying-out of the estate as a forestry station was begun in the winter of 1904-5 by the removal of old fences and hedges, the clearing of part of the old woodland, and the re-planting or planting of a few acres of land. This work was preliminary to the planting of the forest plots, pinetum and arboretum, which are now the chief features of the station, the object in view being that of combining the planting of these with the forestry school for working foresters and woodmen.

The forest plots are intended to demonstrate the growth and development into timber of all the more important species of trees under sylvicultural, as distinct from arboricultural, conditions. The arboretum occupies the ground round the mansion house, which is heavily stocked with old park timber. This timber consists mainly of beech from 100 to 200 years of age, together with oak, Spanish chestnut, larch, and elm. The young trees will consequently grow up around, and eventually take the place of, the old timber as this is removed, or succumbs to wind or decay. The pinetum occupies the slope immediately below and to the south of the house. This slope was previously almost bare of timber trees; and as the young trees develop, they will form a prominent feature of the station.

The principle upon which the arboretum and pinetum have been laid out is that of demonstrating the growth, botanical character, and ornamental value of all the hardy trees capable of thriving in Ireland. These two adjuncts to the forest plots have both a botanical and arboricultural value; and thus, while affording material for the instruction of the forestry students, they will also illustrate the comparative value of the various species as ornamental features of the landscape, the garden, or the vicinity of a dwelling-house.

In the arrangement of the trees attention has been paid

to landscape effect, and clumps, groups, and single trees have been distributed in as natural and harmonious a way as possible. The arboretum contains about 150 species belonging to about 40 genera, and the pinetum about 101 species belonging to about 20 genera.

The forestry school at Avondale was opened in the autumn of 1904, with the object of training young men as working foresters and woodmen for employment in Ireland; and so far the laying out of the station has been closely associated with the working of the school. The main idea in view in connexion with the school has been the training of men in such practical forestry as is carried out in well-managed woods in these countries.

According to an article published in the *Journal* of the Department of Agriculture and Technical Instruction, the function of the Avondale Forestry School is neither that of training men in the theory of forestry alone, nor of manufacturing rule-of-thumb labourers, but in so combining theory with practice that the men trained there can adapt themselves to the varied conditions under which in all probability they will have to work in the future. To attain this end, applicants for training are received as apprentices, and practical work has been made the basis of the instruction. Science and theory are included in so far as they are necessary to supplement practical work, and to invest it with sufficient intelligent interest to destroy its monotony, and prevent mere rule-of-thumb practice. Before being admitted to the school a man must show that he has not only done manual work in the past, but is willing to continue to do such work; and every precaution has been taken against the possibility of training men for positions they may never have the opportunity of filling.

The Geological Survey of Ireland.

By Grenville A. J. Cole, M.R.I.A., F.G.S.

The Geological Survey of Ireland has its office at 14 Hume Street, while its collections are exhibited in a special gallery of the Museum of Science and Art. It may be regarded as a direct successor of the geological branch

of the Ordnance Survey of Ireland, instituted under Colonel Colby and Lieutenant Larcom in 1833. Captain Portlock, who was placed in charge of the geological inquiries, and who instituted a laboratory for the examination of soils, records that in 1840, "at a period when every section of the department was moving forward with a prospect of success, . . . the office, museum, and laboratory at Belfast were . . . broken up, and everything connected with the department removed to Dublin" (Report on County of Londonderry, &c., p. 6). Official geological work was, however, continued by Sir R. J. Griffith, under the Valuation Office; and an admirable geological map of Ireland was published on the scale of four inches to one mile.

In 1844, Sir H. T. De la Beche, as Director-General of the Geological Survey of the United Kingdom, formed an Irish geological staff, including T. Oldham and G. Du Noyer, who had worked with Portlock. The former of these became Local Director for Ireland in 1846, and, on his accepting an appointment in India, was succeeded by J. Beete Jukes. The great development of our knowledge of the details of the geological structure of the southern half of Ireland coincides with the nineteen years during which Jukes controlled the issue of the maps and memoirs of the Survey. It was left to Professor Hull, in 1869, to carry on the work in the intricate districts of the north-west and north; and by 1890 a geological map, on the scale of one inch to one mile, and an explanatory memoir, had been produced for every area of the country. The local directorship was then abolished, and the staff was considerably reduced. Some of the publications naturally now required revision; and an important step forward was taken in 1901, when Mr. G. W. Lamplugh, as District Geologist, organized a series of maps round the great cities, showing the superficial deposits for the first time in detail.

In April, 1905, the Survey was transferred from the Board of Education in London to the Department of Agriculture and Technical Instruction for Ireland, and the Professor of Geology in the Royal College of Science

was appointed Director, with the help of a Senior Geologist to conduct the operations in the field. The examination of soils had been already revived, in connexion with the memoirs on the districts round the great cities; and a special assistant has now been appointed to facilitate this work. This staff in 1907–8 was mainly occupied with a re-survey of the beds of iron-ore, bauxite, and other materials occurring between the basaltic lava-flows in north-east Ireland, especially with a view to determining their extent and mode of origin; and a soil-survey was made of the agricultural station at Ballyhaise.

The Royal Irish Academy.

By R. Macalister, ll.d.

In the year 1683 a Society was formed in Dublin similar to the Royal Society, which a few years previously had been established in London, Sir William Petty becoming President, and William Molyneux, Secretary; but, owing to the disturbed state of the kingdom, its meetings were suspended in 1688. Early in the following century efforts were made to resume its functions; and at length, in 1782, the Society from which the Academy directly arose was established. Its members, most of whom belonged to the University, met at weekly meetings, and read papers in turn; and, in 1785, a Royal Letter under the Privy Seal was issued incorporating the Academy. The charter was enrolled in January, 1786. The sphere of the Academy's work was not confined to science in the more restricted sense of that word, but also included polite learning and scientific archæology. In the Transactions and Proceedings of the Academy appeared the principal works of Brinkley in Astronomy; Kirwan in Chemical Physics; Hamilton on the Calculus of Quaternions and Theories of Rays; Lloyd on Conical Refraction, on the Meteorology of Ireland, and on Magnetism; MacCullagh in Pure Geometry; Hincks in Egyptology and Assyriology. Many important investigations in physical science and natural history have been from time to time carried out on the initiative of the Academy. A series of

observations on the tides along the coast of Ireland was made by Dr. Haughton in 1866; and in 1887, a magnetic observatory was established at Valentia, at which regular observations have been made for many years. The expenses of the second expedition to Rockall were partly defrayed by the Academy, and a report upon the expedition has been published in the Transactions. The Academy established in 1893 a Committee which has since that time been engaged in a systematic investigation of the fauna and flora of Ireland; and during the last six years this Committee has extended its operations so as to include an examination of some of the caves of Ireland. The Academy has also for some years carried on an Anthropological and Ethnographic Survey of Ireland; many illustrated reports on this subject have appeared in the Proceedings, and a set of standard instruments for measurements has been placed in the Anthropometrical Laboratory of Trinity College. The Academy's special investigations have not, however, been confined to Ireland. It has assisted in the ethnographic exploration of Torres Straits; in a survey of the botany of Sinai and South Palestine, and of the marine botany of W. Australia; an exploration of the New Zealand glaciers; and in deep-sea dredgings in various parts of the ocean, as well as in observations at foreign stations of recent solar eclipses.

The Academy's Library includes an extensive collection of the serial publications of the most important scientific societies of the world and of the chief works bearing on the history and archæology of Ireland.

The Royal Dublin Society.

By Richard J. Moss, F.I.C., F.C.S.

On June 25th, 1731, a meeting was held in the rooms of the Philosophical Society of Trinity College, at which it was agreed to establish a society to be called, "The Dublin Society for improving Husbandry, Manufactures, and other Useful Arts." A fortnight later it was agreed to add the words "and Sciences" after the words "Useful

Arts" in the title. In 1749, through the influence of the Earl of Chesterfield, the Society was incorporated by Royal charter. The title "Royal" was added in 1820, when George IV became the Patron of the Society.

At the early meetings, the business consisted in the reading and discussion of papers on agriculture, manufactures, art, and science. In 1740, the Rev. Samuel Madden settled a sum of £130 per annum upon the Society, and obtained promises of annual subscriptions, amounting to a further sum of £500. In 1746 George II granted an annuity of £500 from the Privy Purse. This income gave a new direction to the work of the Society, which gradually became the medium for the administration of a system of prizes and premiums. Just before the Union, the Society's grant from the Irish Parliament was £15,500. The premium system had a marked effect in reviving many branches of industry which, in earlier years, had been effectually crushed by legislation in the interests of British manufactures and commerce. Under the Imperial Parliament the system was soon discontinued, the vote in aid was reduced, and was allocated to the maintenance of the scientific and educational institutions the Society had established.

In 1732 a plot of ground was taken at Ballybough Bridge, and laid out as "a nursery for raising several sorts of trees, plants, and roots, which do not at present grow in this kingdom, but are imported from abroad, and when raised in such nursery, may be dispersed to be propagated in the country." In 1736 a larger site was acquired at St. Martin's Lane, Marlborough Street, and in 1795 the Society secured a site at Glasnevin, and established the gardens now known as the Royal Botanic Gardens. (See p. 361.)

From an early date the Society acquired books by purchase and by presentation. The earliest catalogue, which is not dated, includes thirty-six volumes, published between the years 1618 and 1736. The Library was opened to the public in the year 1803. When it was transferred to the Crown in 1877, under the title of the National Library of Ireland, the Society retained the

scientific serials, and the publications of learned societies, and these formed the nucleus of the general library it has since accumulated.

Art received marked encouragement under Rev. Dr. Madden's prize system. In 1758 a regular school of Art was established. George Barrett, one of the founders of the Royal Academy of London, was educated in this school. James Barry's reputation was established by a work he exhibited at one of the Society's exhibitions in the year 1763. The late John Henry Foley, R.A., was perhaps the most eminent of the many sculptors trained in the Society's school. It became a Government school in 1877, under the title of the Dublin Metropolitan School of Art.

The beginning of the Museum may be traced to the year 1732, when the Lords Justices were asked to grant the use of a vault under the Parliament House for the Society's collection of "Instruments." Two years later the collection was opened to the public on two days in the week. This collection consisted chiefly of models of improved forms of agricultural implements and machinery, but natural history specimens were soon added. In 1792, the Irish Parliament, at the suggestion of Richard Kirwan, the chemist and mineralogist, voted the sum of £1200 for the purchase of the collection of Professor Leske, of Marburg. This collection contained 7331 specimens, chiefly mineralogical and geological, and is described by Kirwan as "the only one that contains specimens of almost every known species, arranged on fixed principles, and, at least for the most part, truly denominated." An apartment was specially erected for the collection, on the Society's premises in Hawkins Street (now the site of the Theatre Royal), and Mr. William Higgins, who afterwards became the Society's Professor of Chemistry, was placed in charge of it. It was at this period the Society provided the Chemical Laboratory it continues to maintain at the present time. In 1815 the museum was moved to Leinster House (see Plate XXVIII); and in 1859 the present Natural History Museum was erected on the south side of Leinster Lawn.

With the growth of the scientific institutions the Society's work became more educational. Additional professorships were created; and it was the duty of the professors to deliver systematic courses of lectures in Dublin and in the provinces. The lectures were free to the public; and the average attendance at each lecture in Dublin was from 400 to 500 persons. Distinguished scientific men were also invited to lecture. In 1810 Mr. (afterwards Sir) Humphry Davy delivered a course of lectures, for which he received a fee of 500 guineas; and in the following year he delivered another course, and received a fee of £750. In 1854 the educational staff was, at the request of the Government, transferred to the Museum of Irish Industry, of which Sir Robert Kane, who had been the Society's Professor of Natural Philosophy, was Director. This institution subsequently became the Royal College of Science for Ireland. (See p. 350.)

Early in the nineteenth century a number of inspectors were appointed to make statistical surveys of the different counties; twenty-one volumes of these surveys were published by the Society. They are now important works of reference, and interesting records of the industrial state of Ireland a century ago. Out of this work arose the Geological Survey of Ireland. It began with the survey of the County of Kilkenny, which was entrusted to Mr. (afterwards Sir) Richard Griffith, the Society's Mining Engineer. The survey subsequently extended to the rest of Ireland; and Griffith's geological map is still a standard work. A difficulty arose in this work for want of proper maps of the country. The Society commenced a trigonometrical survey; and considerable progress was made in the south of Ireland when the Government took over the work by the creation of the Ordnance Survey Department.

In 1834 the Society held the first of a series of triennial exhibitions of Industry and Art. The exhibition of 1850 was the first international exhibition held in the United Kingdom. In 1853 a still more ambitious project was carried out with the liberal aid of Mr. Dargan, who acted as sole guarantor. This exhibition was opened by Her late Majesty Queen Victoria. The Irish section of the

Jubilee Exhibition, Manchester, was organized by the Royal Dublin Society.

Meetings solely for the reading and discussion of papers on scientific subjects were not held until 1836. At the first of these meetings the Professor of Chemistry, Dr. Edmund Davy, gave an account of his discovery of the gas now known as acetylene, a discovery often erroneously attributed to Berthelot. The proceedings of those meetings were not at first printed separately. In 1855 a volume appeared, containing the papers read during the preceding seven years. This publication was succeeded by the Journal, of which seven volumes were issued up to 1877, when the present series of Scientific Transactions and Proceedings commenced. The series entitled Economic Proceedings commenced in 1900.

The promotion of husbandry was one of the primary objects of the Dublin Society, and a great deal was achieved in early years in improving methods of tillage, in reclamation and drainage, and in the introduction of new crops. Under the Imperial Parliament, State aid for agriculture soon ceased. For a few years a body, called the Farming Society, which was subsidized and largely controlled by the Dublin Society, carried on the agricultural work, but mainly in its pastoral aspects, and by means of cattle shows held in Dublin and Ballinasloe. In 1830 the Marquis of Downshire induced the Royal Dublin Society to resume its interest in agriculture. The new effort took the form of cattle shows, which were held in the grounds adjoining Leinster House. These shows had assumed considerable importance when, in 1877, the site upon which they were held was acquired by the Government. The shows were transferred to Ball's Bridge, where they have undergone a remarkable development. The Society has already expended upwards of £80,000 in enclosing and laying out about forty acres, erecting buildings which cover seven acres, and constructing a branch railway. The show of breeding cattle in the spring, and of horses in the autumn, are the largest of their kind in the United Kingdom.

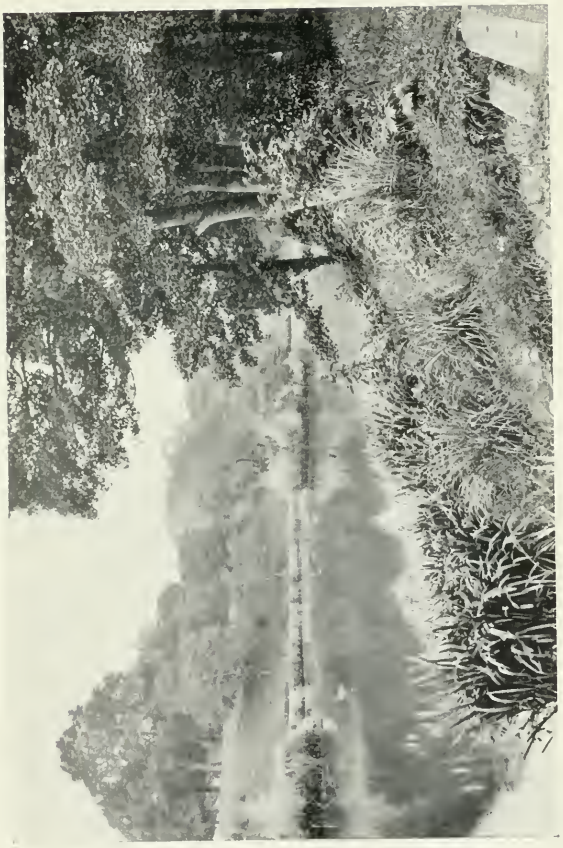
The Royal Zoological Society.

By R. F. Scharff, ph.d., m.r.i.a.

The Zoological Society of Dublin, which afterwards became the Royal Zoological Society of Ireland, was founded in 1830. At a public meeting, held in that year in Dublin, a resolution was passed "that the object of the Society shall be to form a collection of living animals on the plan of the Zoological Society of London." For the London Society had come into existence a few years before. As Dr. Whitley Stokes humorously put it, "since man is partly indebted to the beast of prey for his civilization, it was clearly our duty, in the spirit of philosophical reciprocity, to return the compliment by taking the education of the beast of prey under our care." The Duke of Northumberland, who was then Lord Lieutenant of Ireland, intimated to the new Society that he had arranged to give a portion of the Phœnix Park for the purpose of establishing a Zoological Garden. And in the same year arrived, as a gift from the London Society, two Wapiti deer, one Nylghai, two Emus, two Ostriches, and several less important animals, some of which had formed part of King William IV's menagerie in Windsor Park.

A collection of living animals, no doubt, serves to stimulate among the people a love for animals and a taste for natural history. The Dublin Gardens have also been of much value in aiding students in veterinary studies, in spreading a more general knowledge of science and art, and in providing an institution for observing the natural habits of animals. As a philanthropic institution the Zoological Gardens in Dublin occupy a prominent position, for the public are admitted at a nominal price on Sundays, and charitable institutions altogether free (Plate XXXII).

The Gardens are managed by a Council, who meet at breakfast once a week before proceeding to transact the business of the Society; and it is this friendly intercourse among the members of the council which promotes the lively interest shown by the whole community in the affairs of the Society and in the welfare of the Gardens.



IN THE ZOOLOGICAL GARDENS, PHŒNIX PARK, DUBLIN.

The Society has been particularly successful in the breeding of lions, so much so that the "Irish lion" has acquired quite a fame among connoisseurs. Lions have been exported from Ireland all over Europe; even Burma can boast of the possession of a Dublin lion. The regular breeding stock was started in 1855 by the purchase of a pair of imported lions from Natal. The first litter was born in 1857. Since that time up to the present year 260 cubs have been born in the Gardens. As a large number of these have been sold to or exchanged with other zoological

Fig. 54.—Lion born in the Dublin Zoological Gardens, and kept continually in open-air den.

gardens, it is no wonder that the Irish lion is now met with in many other countries besides his native land.

On an average about twenty lions and lionesses of all ages are on view in the Dublin Zoological Gardens, and it may be safely asserted that nowhere can the characteristic features and habits of the lion be studied to greater advantage than in Dublin.

One of the most important features of the Dublin Zoological Gardens is the extent to which the open-air treatment of animals has been carried out.

Some of the lions have not only been kept in an open unheated shelter summer and winter, but have even reared their young successfully under these conditions. Since this first experiment, part of a large open-air aviary has been handed over to a colony of Rhesus monkeys from India, and these have now passed their third winter in the Gardens in this unheated cage. Their splendid condition testifies to the success of this experiment. Open-air treatment was next tried upon the smaller carnivores, such as

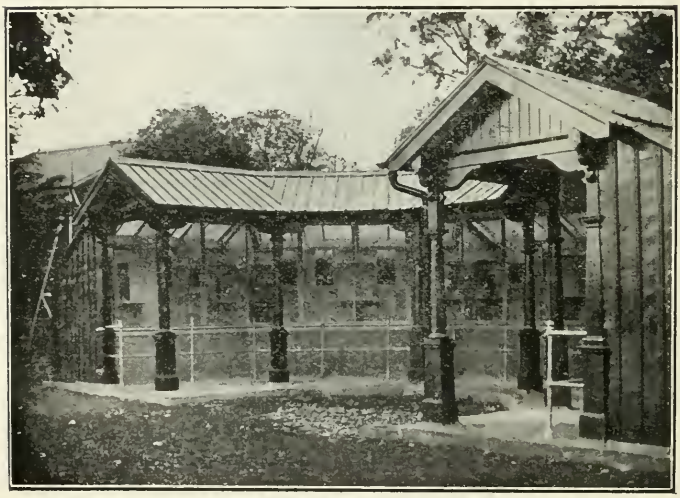


Fig. 55.—House for small Carnivores and other Mammals, Dublin Zoological Gardens.

mungooses, meerkats, suricates, and others, most of which have done well in the newly erected house (fig. 55). This building is of an octagonal shape, and contains some novel devices not hitherto carried out in similar structures. The fronts of the cages have no bars or other obstruction to impair the view of the spectator. The cleaning and feeding are done entirely from a passage in the rear. The animals are

also admitted to their dens from the same passage. While perfectly sheltered from the rain, unheated air communicates freely with the cages in front; and the building, as a whole, presents a pleasing character.

Recently another series of unheated dens has been constructed for the large carnivores, such as wolves, hyænas, and pumas, in which the cleansing and feeding of the animals is likewise done from a passage in the rear of the cages.

The Royal Academy of Medicine in Ireland.

By Sir John W. Moore, M.A., M.D., D.Sc., D.P.H., F.R.C.P.I.

Towards the close of the year 1882 the existing Medical Societies in Dublin agreed to amalgamate and to constitute "The Academy of Medicine in Ireland." The combining Societies were the Medical, Surgical, Obstetrical, and Pathological; and accordingly the Academy at first consisted of four sections—those of Medicine, Surgery, Obstetrics, and Pathology. To these were added two subsections, those of Anatomy and Physiology, and of Public Health and State Medicine. The first President was the late Dr. Banks, Physician to Queen Victoria, afterwards Sir John Banks, K.C.B., Physician to the King.

In 1887, in connexion with her Jubilee and in the presidency of the late Dr. Robert McDonnell, F.R.S., Queen Victoria commanded that the Academy should be called "The Royal Academy of Medicine in Ireland." In the same year the sub-sections of Anatomy and Physiology and of State Medicine were raised to the dignity of sections, each with a president instead of a chairman.

The sections of the Academy meet on Friday evenings during the months from October to May, inclusive, alternately in the halls of the Royal Colleges of Physicians and Surgeons. At the end of each session a volume of Transactions is published, under the editorship of the General Secretary. Twenty-five volumes of the Transactions have been already published. They contain all that is best in medical science, research, and literature in the Irish School of Medicine.

The Dublin Microscopical Club.

By F. W. Moore, M.R.I.A.

The Dublin Microscopical Club was founded some sixty years ago by a number of men interested in science, and desirous of furthering microscopical study. The club was originally limited to twelve members, and there was a meeting of the club at the house of each member once a year. There were also a limited number of visiting members elected.

The work of the club was not confined to any one branch of science, zoologists, botanists, and geologists being equally interested in it. One of the rules stated that all objects exhibited must be connected with original work, or discovery, by the exhibitor, which greatly helped forward the objects of the club; and much valuable work was done and published by the members.

In March, 1898, alterations in the constitution of the club were made. The number of members was increased, visiting members were abolished, and, by kind permission of the Council of the Royal Dublin Society, the monthly meetings are held at Leinster House. The club meets there on the second Wednesday of each month, from October to May, inclusive, and much useful work is still done. Many important additions to the Irish microscopic flora and fauna have been exhibited for the first time, and publicity given to them in the proceedings of the club, which are now published in "The Irish Naturalist."

The Dublin Naturalists' Field Club.

By R. Lloyd Praeger, B.E., M.R.I.A.

The club was founded early in 1886 for the practical study of zoology, botany, and geology, chiefly in the province of Leinster. Its initiation was due to Professor A. C. Haddon, F.R.S., who became the first vice-president, Prof. E. Perceval Wright, M.D., occupying the presidential chair. The club made a successful start; and, with certain

fluctuations in its prosperity, has continued to fulfil with fair success the objects for which it was established; summer and winter excursions and winter evening meetings have been held regularly. The founding of the Irish Field Club Union in 1894 has brought it into contact with the sister clubs in Belfast, Cork, and Limerick, and joint excursions have had a useful and stimulating effect. The club was mainly instrumental in founding, in 1892, "The Irish Naturalist," in which its proceedings are regularly published. This little society serves as a useful training-ground for membership of the larger scientific societies of Dublin.

INDUSTRIES AND COMMERCE.

THE PORT OF DUBLIN.

By W. E. Adeney, D.Sc., F.I.C.

Dublin is situated on the Liffey, at the head of a bay six miles long and five and a half miles wide. Large quantities of sand, brought in by the sea, have accumulated in the bay, forming extensive strands, which are laid dry at low water for a distance of about two and a half miles seaward. The position of Dublin and of these strands will be understood from the map which illustrates this Handbook.

In 1707, the combined waters of the Liffey and Dodder flowed across the sands at low-water, dividing them into the North Bull and the South Bull. From its exposed position, the channel thus formed was subject to constant alteration in depth and direction; and this being the only channel by which vessels could reach the city, the early attempts to improve the harbour took the direction of providing a permanent and deep-water approach to the port. With this end in view, the Great South Wall was constructed, during the eighteenth century, to shelter the channel from southerly winds, and also to prevent the encroachment of sand.

Although the completion of the Great South Wall

accomplished to a great extent the object aimed at by its designers, portions of the channel up to the city were still very shallow; and attention was also drawn to a shoal beyond the extremity of the new wall, known as Dublin Bar. This bank stretched from the north side of the bay across the entrance to the harbour in the form of a hook. The deepest water for vessels was round the end of this hook; and across the bank, in a direct line out to sea, there was a depth of only from 5 to 6 feet at low water of spring-tides. At the beginning of the nineteenth century many eminent engineers and naval officers were consulted respecting further improvements. Captain Bligh recommended a wall along the north side of the channel; Sir Thomas Hyde Page proposed a similar wall, and the formation of an island on the Bar; while the proposal to construct an embankment or wall extending from the north shore towards Poolbeg emanated from the Corporation for preserving and improving the Port of Dublin. Mr. Rennie, at that time considered the highest authority on the improvement of harbours, prepared an elaborate scheme; but he predicted little likelihood of much improvement on the Bar. He expected an increased depth of 3 feet of water as a result of an estimated expenditure exceeding £655,000. To provide a better approach, he considered it essential to construct a ship-canal from some point on the adjacent coast where deep water might be obtained, and finally recommended the entrance to be made close to the present site of Kingstown Harbour. His estimate for this work was £489,734. From 1802 to 1812 the question of the improvement of the Bar appears to have been in abeyance. Probably Mr. Rennie's scheme, from the large expenditure it would have involved, and the smallness of the results anticipated, tended to deter the Government from advancing the necessary funds for any particular scheme.

About 1819, the Ballast Board found themselves in a position to carry out their own project of a wall or embankment from the Clontarf shore. Its object was to protect the Harbour on the north side from the encroachment of sand, to shelter it from northerly and easterly winds, and to direct the tidal and river waters in a fixed channel

across the Bar. Under the joint direction of Mr. Giles and Mr. Halpin, the engineer of the Ballast Board, the rubble embankment, known as the Great North Wall, was constructed.

It is about 9400 feet in length; of this, about 6000 feet, from its commencement at the Dollymount shore, is constructed to a height of 6 or 7 feet above high water, the remaining 3400 feet being carried up to half tide-level only. To quote from a paper communicated by Mr. J. P. Griffith to the Institution of Civil Engineers on "The Improvement of the Bar of Dublin Harbour by Artificial Scour,"[1] it is necessary to have a general knowledge of the currents in the bay fully to appreciate the value of the Great North Wall; "and for this purpose the most important fact to be borne in mind is, that on the north side of the bay, during the first half of the ebb, the tide runs westwards towards the Bar, and then southwards in the direction of Kingstown, while during the last half of the ebb and the whole of the flood, the tide sets eastwards past the Bailey. During the first half of the ebb, the tidal and river waters within the Great North and South Walls pass partly over the submerged portion of the northern embankment, and partly through the Harbour entrance between its termination and Poolbeg Lighthouse. The current out of the Harbour during this time is comparatively slack, and in no way interferes with the navigation of vessels in and out of the port. It is also probable that it produces little or no effect in deepening the Bar channel, but only joins the bay currents, and sets south towards Kingstown. As soon, however, as the lower portion of the northern wall is uncovered, the remainder of the tidal and river waters within the Harbour must pass through the contracted entrance at Poolbeg, which is only 1000 feet wide. The results are a great increase in the velocity of the current, which somewhat exceeds three miles per hour during spring-tides, and a marked impression on the Bar by the removal of sand. This sand-bearing stream joins the bay current, which by this time is setting eastwards, and ultimately

[1] Trans., vol. lviii., Part iv., 1878–79.

deposits on the North Bull a portion of the sand from the Bar, while the rest is carried into deep water.

"The tidal water entering on the flood comes from the south, bringing back some of that discharged on the first half of the previous ebb. It appears, however, that, except at neap-tides, but little of the water discharged during the second half of the ebb returns, in consequence of the current of the north side of the bay still setting east, and that the Harbour is thus safe from injury by the return of sand upon the flood-tide."

A deep-water channel extends from the river through the estuary in a practically straight line to the entrance at Poolbeg—a distance of five and a half miles, measured from the Custom House. The tidal portion of the river continues from this point to the Weir at Islandbridge—a distance of one and a half miles.

The South Wall runs parallel and quite close to the deep-water channel, leaving but a narrow strip of foreshore, the lower portion of which, below the old Pigeon House Harbour, is not more than 200 yards wide, and is only exposed at low spring-tides.

On the north side of the deep-water channel, a very considerable area of foreshore or slob-land exists, which is uncovered at low water. It is over a mile in width and nearly three in length.

The River Dodder joins the Liffey on its right bank, immediately above the estuary. A small river, the Tolka, flows directly on to the north-west corner of the estuary at Fairview.

The estuary within the walls, and to some distance eastwards beyond the Poolbeg and Bull Lighthouses, together with the tidal portions of the river, forms the Dublin Harbour.

New Quay Walls.

The old shipping quays were built in the early part of the nineteenth century, and were founded about low-water level. A length of about 7500 feet of these quays to the eastward of Butt Bridge has been rebuilt at a cost of

about £360,000. This enables some of the principal coasting and cross-Channel steamers to sail at fixed hours irrespective of the tide. A large portion of these reconstructed quays is on the south side of the river, and forms deep-water berths available for over-sea as well as for coasting vessels; and at the greater portion of these latter quays there is a depth of 22 feet alongside at low water.

North Quay Extension and Alexandra Basin.

New deep-water quays and a large tidal basin called the Alexandra Basin have been constructed on the north side of the river. These new quays have already added 40 per cent. to the length of the river-quays to the eastward of Butt Bridge. The quay-walls of the North Quay extension and Alexandra Basin have attracted much attention amongst engineers, owing to the manner in which they were constructed. They were built up to low-water level with gigantic blocks of masonry, each block weighing 350 tons, and over these blocks the upper portion of the walls was built by tidal work. The blocks were put together on a wharf, and when sufficiently hardened were lifted and conveyed to their destination in the quay-wall by a floating shears. The foundation for the blocks was first excavated by a steam-dredger to within 2 feet of the finished level, and the remainder of the excavation was taken out by men working in a large diving-bell, 20 feet square and 6½ feet high. Access was obtained to this chamber by a wrought-iron shaft and air-lock without lifting the bell. One of the most important features of this mode of construction is the absence of coffer-dams, staging, and pumping; and it has proved exceptionally economical. The whole of the machinery and appliances in this great work were designed by Dr. Bindon Stoney, LL.D., F.R.S., M.INST.C.E., the late Chief Engineer of the Dublin Port and Docks Board. The quays on the river side of the North Quay extension afford berthage of 22 feet at low water, while the berths along the quays inside the Alexandra Basin have a depth of 24 to 26 feet at low water. The Alexandra Basin is still unfinished.

The foregoing information on the Port of Dublin has been taken from an interesting paper which was read by Mr. John Purser Griffith, M.INST.C.E., Engineer to the Dublin Port and Docks Board, at the summer meeting of the forty-fourth session of the Institution of Naval Architects, June 26th, 1903.

THE RIVER AND ESTUARY FROM A SANITARY ASPECT.

The Liffey has, in common with many of our rivers, suffered severely from the introduction of modern methods of sanitation.

In the old days, before the era of water-carried sewage, the pollution caused by the reception of the slop-water was not sufficient to create a nuisance, or to constitute a menace to the health of the inhabitants.

It was in the year 1853 that attention was first called to the injury which arose from the pollution of the Liffey due to the discharge into its waters of the sewage of the community.

The late Mr. Park Neville, City Engineer, then referred to the complaints which had been made that the matters discharged into the river from the sewers rendered its bed foul, and gave rise to noxious exhalations.

At that time the city was dependent upon the canals and upon its wells for a water-supply; but when the Vartry waterworks were completed, and the citizens began to avail themselves of the advantages of a copious supply of water, the volume of sewage which was delivered into the river was very greatly increased.

The praiseworthy efforts of the medical officer of health in enforcing the provisions of the Public Health Acts, whilst they conferred incalculable benefits upon the community, had the effect of very greatly adding to the pollution of the Liffey.

Main Drainage of Dublin.

By W. Kaye-Parry, M.A., M.Inst.C.E.

Many schemes for the main drainage of Dublin were formulated from time to time by different engineers, and their relative merits were keenly criticized by the members of the municipal council and the citizens. The engineering difficulties attendant upon a work of this magnitude in a city so circumstanced as the capital of Ireland, although not insurmountable, were very considerable; and the vast capital outlay which any effective and complete system must involve made the Corporation hesitate for many years before finally deciding to embark upon the work. Meanwhile a great deal of valuable experience was being accumulated, derived from the costly schemes of a similar character which had been carried out in England. The Royal Commission on the Health of Dublin, which sat in 1879, focussed public attention upon the necessity for a comprehensive system of main drainage; but it was not until 1891 that any practical steps were taken to achieve the desired object.

At that time the late Right Hon. Joseph Meade, in his capacity as Lord Mayor of Dublin, was instrumental in forming a new Main Drainage Committee; and this Committee retained the services of Mr. George Chatterton, M.Inst.C.E., and instructed him to advise them.

Mr. Chatterton carefully considered the various proposals which had been submitted to the Council, and eventually recommended the Corporation to embark upon the great works which have recently been brought to a successful issue. They were put into operation at the commencement of 1907.

The new system of main drainage consists of two main intercepting sewers laid respectively along the north and south banks of the river Liffey. These intercepting sewers receive the discharges from all the city sewers which formerly delivered their contents into the river.

A third intercepting sewer is now in course of construction along the sea-road from Dollymount, through Clontarf and Fairview; and by means of a system of Shone ejectors, the sewage from this low-level sewer will be

lifted and delivered into the sewer on the north bank of the river. The sewage is carried under the bed of the river from the north to the south side by means of a siphon at Eden Quay. All the city sewage is thus conducted to one point at Burgh Quay. Here the main outfall sewer commences. It is eight feet in diameter, and about two miles in length. This low-level outfall sewer terminates at the pumping-station at Ringsend. At this point the whole of the sewage is lifted by a number of powerful pumps a height of twenty-three feet.

The sewage is pumped by means of four sets of vertical triple-expansion direct-acting engines, coupled to centrifugal pumps. This plant is capable of lifting sixty millions of gallons of sewage per day.

From the pumping-station a high-level outfall-sewer, eight feet in diameter, conveys the sewage by gravitation to the purification works.

Before the sewage leaves the pumping-station it is mixed with milk of lime to act as a precipitant.

The purification works consist of a series of tanks which have been constructed on the site of the old harbour which was attached to the Pigeon House Fort, which is close to the South Wall, and about two miles above the mouth of the harbour at Poolbeg.

The sewage, with its dose of milk of lime, is conducted into a channel communicating with a series of tanks in which it is allowed to rest for a short period to facilitate the deposition of the solid matters by precipitation. The supernatant liquid is drawn off by floating arms, delivered into an effluent channel, and eventually discharged into the estuary. The sludge is swept into a culvert, through which it flows into a low-level sludge-tank. It is then pumped into a high-level tank, from which it is discharged into the sludge-steamer "Shamrock," by which it is conveyed to sea, and emptied into the Irish Channel outside the Bay of Dublin. The steamer "Shamrock," which was specially designed for this service, was built by the Dublin Dockyard Company at a cost of £11,000.

The total cost of the Main Drainage and Disposal Works has exceeded half a million sterling.

EFFECT OF THE NEW MAIN DRAINAGE ON DUBLIN HARBOUR.

By W. E. Adeney, D.Sc., F.I.C.

By the autumn of the present year, 1908, the harbour will, it may well be anticipated, form an extremely instructive object-lesson to those interested in the disposal of sewage by discharge into tidal water-ways.

The new outfall works of the Corporation will then have been in operation for a sufficient time to have stamped, so to speak, their influence on the bed and waters of the harbour. There can be no doubt of one great remedy which they will effect. The former foul condition of the bed and surface-waters of the river area of the harbour will have passed away. It is not quite so certain, however, what will be the result on the harbour generally of the large volumes of sewage, from which the solids have only been partially separated by treatment with small doses of lime and subsequent subsidence, which are now being discharged from an entirely new point of outfall, at all states of the tide. The effect of such discharge, for example, upon the growth of the green sewage weed, *Ulva latissima*, or sea-lettuce, during summer seasons cannot be exactly estimated. Under the old condition of things this weed grew plentifully in different parts of the harbour, especially in the shallow portions on the north side of the deep channel ; and considerable quantities were deposited by tidal action along the Clontarf foreshore during the summer. These deposits underwent a more or less rapid putrefactive decomposition, and at times became very offensive from the formation of sulphuretted hydrogen.

The effects of the discharge from the new outfall-works upon the harbour generally will, it is believed, afford valuable information as regards the question of the relative influences on the growth of this weed of solid sewage matters and of liquid sewage matters, when both are discharged into waterways the tidal currents of which are strong, as in this harbour.

If the growth in the Dublin harbour has been due to solid sewage-matters deposited on its bed, rather than to the liquid sewage-matters which were mixed with its waters, a reduction in the growth of the weed may be expected as a result of removing the greater part of the solid matters from the Dublin sewage before it is discharged from the new outfall into the harbour.

If, on the other hand, the growth of this weed has been more encouraged by the liquid sewage matters, it is to be feared that the growth will be but little reduced.

It may be pointed out that this question is of very great importance at the present time, because upon its settlement depends—as Professor Letts of Belfast has shown by his valuable and exhaustive studies of the conditions of growth, and of the nature and properties of this weed—the selection of a suitable method of purification, to which sewage must be subjected before being discharged into long and narrow tidal waters, with sluggish currents, such as Belfast Lough, where the growth of this weed has become so luxuriant that it has caused a very grave nuisance and trouble.

There is a second main-drainage outfall about three quarters of a mile below the new Dublin outfall, and also situated close to the south wall. It is connected with the joint main-drainage system of the two townships of Rathmines and Pembroke, which is separate and distinct from the main-drainage system of Dublin. These two townships possess a joint population of 60,000. The sewage is untreated, with the exception that the heavier solids, such as gravel and road detritus, are removed from the sewage before it is discharged from the outfall by means of a system of catch-pits, built within the main sewers; and the sewage is largely diluted with sub-soil water, containing considerable quantities of nitrates. The discharge from this outfall is legally limited to the first five hours of the ebb tide. It has been in operation for the past twenty-seven years. This outfall is well worth a visit. It is exceptionally favourably situated, being only a mile above the debouchure of a well-defined river-channel into a bay where the natural currents carry everything away seaward at practically all states of the tide.

The condition of the bed and waters of the Dublin Harbour in 1890 was made the subject of a communication to the Institution of Civil Engineers, by W. Kaye-Parry, M.INST. C.E., and W. E. Adeney, D.SC., which was published under the title of "The Discharge of Sewage into a Tidal Estuary," in the Proceedings of that body, vol. cxlvii., Part I., 1902. A further description of the condition of the waters of the harbour will be found in Section 7B of the joint report by Drs. Letts and Adeney on "The Pollution of Estuaries and Tidal Waters," recently published by the Royal Commission on Sewage Disposal.

FISHERIES.

By E. A. Montmorency Morris, M.A.

In times long prior to history the coast inhabitants of Ireland utilized the products of the sea for subsistence, as may be gathered from the examination of shell-mounds frequently found close to where oysters, mussels, and cockles abound. The Christian hermits, who in the fifth and sixth centuries settled on remote islands off the coast, must have taken into account the fishing possibilities of their locations. Indeed, St. Enda of the Isles of Aran, definitely refers to the fishing in Galway Bay.

According to an interesting article by the Rev. W. S. Green, M.A., which appeared in "Ireland: Industrial and Agricultural," the Scandinavians, who for centuries prior to the Anglo-Norman conquest dwelt in Dublin and other coast towns of Ireland, carried on an over-sea trade in fish. But the earliest references to a great sea-fish trade are those dealing with the fishing off the west coast of Ireland by Spaniards in the fifteenth and sixteenth centuries. In the seventeenth century the Dutch, Swedes, and French had licences to use the Irish fisheries, and at the same time Scotch fishermen regularly caught herrings in Dublin Bay. With the opening of the nineteenth century, periods of prosperity, decline, and revival followed in rapid succession. The latter half of the eighteenth century was the great

period for bounties; various Acts were passed for establishing them, and vessels were built rather to catch the bounties than to catch the fish. In Ireland the bounties at first given for all deep-sea fish were subsequently restricted to fish for curing. This drove the boats that used to fish for local markets on the east coast to the west of Ireland, where fish were more abundant. The Skerries, Balbriggan, and Howth fishers went round the coast of Donegal, and as far as Mayo.

The great fishing districts of Ireland are off the south and west coasts, and, in recent years, off the coast of the county of Donegal. There are herring-fisheries off Howth about July, and there are other herring-fisheries on the east coast, but they are at a distance from Dublin. Thus there is a rather good herring-fishery ground in Dundalk Bay, and another off Courtown, County Wexford. At one time this part of the Irish Sea was famous for its herrings; then for a great many years the fishery declined; but recently it has shown some promise of revival. The principal fishing-harbours in the vicinity of Dublin are—Dublin, Kingstown, Howth, Skerries, and Balbriggan. At Kingstown, Balbriggan, and Skerries there are sailing-trawlers and herring-boats of considerable size. In Dublin there were formerly over sixty large sailing-trawlers; but the advent of steam has reduced the number of sailing-trawlers considerably, and a great deal of the industry is carried on by the large steam-trawlers, about ten in number, which make Dublin their head-quarters.

There is a haddock-fishery extending from Dundalk Bay southwards.

The greater part of the Irish Sea is a trawling-ground, and soles and plaice migrate within it according to season; but in the Irish Sea the stock of fish, particularly of soles, is declining.

Lobsters are found in considerable numbers where the coast is rocky, especially about the Skerries, Lough Shinny, and Lambay districts; and to a small extent a "prawn" fishery (see p. 179) is carried on.

With regard to inland fisheries, of course the great salmon-rivers of Ireland are those of the south and west;

but in the Dublin district salmon are found in the River Liffey, as the name Leixlip implies. Trout are found in many of the rivers and streams; and the Tolka, the Liffey, the Ward River, parts of the Dodder, and Broad Meadow Water, are favourites with anglers.

POTABLE WATER SUPPLIES.

Dublin and its surrounding townships and districts are fortunate in possessing two excellent public water supplies—the Vartry and the Glenn-na-Smól. The former supplies Dublin proper and all the neighbouring townships except Rathmines, which draws its supply from the Glenn-na-Smól (Glenasmole) source.

The Vartry Water Supply.

By Sir Charles A. Cameron, C.B., M.D.

The gathering ground embraces 34,890 acres. It is composed of Lower Silurian and Cambrian rocks, through which granite rises above the surface at a few spots. The Vartry river rises at the base of the great Sugar-loaf Mountain in the County of Wicklow, and, flowing in a southerly direction, enters the sea at Wicklow, after a course of nearly eighteen miles. The river is dammed at Roundwood village, in a valley, and converted into an artificial lake, about 700 feet above sea-level, and about twenty-three miles from Dublin. The reservoir contains, when full, 2,400,000,000 gallons, or 200 days' supply for Dublin. The greatest depth of the reservoir is 60 feet, and its average depth is 22 feet. The Corporation have recently acquired 500 additional acres, and are about to construct another reservoir, which will contain 1,259 million gallons, or 90 days' additional supply to the city's population of 300,000. Up to the present about £832,000 has been expended on the works, and when the new reservoir is completed the cost will be close on a million.

The water is soft and of light yellow colour. It has two degrees of hardness, and contains 2½ grains of solids

per gallon, of which 2 grains consist of mineral matters, nearly all potassium and sodium chlorides. It contains about 250 micro-organisms per cubic centimetre.

The Rathmines Urban District Council Waterworks at Glenn-na-Smól.

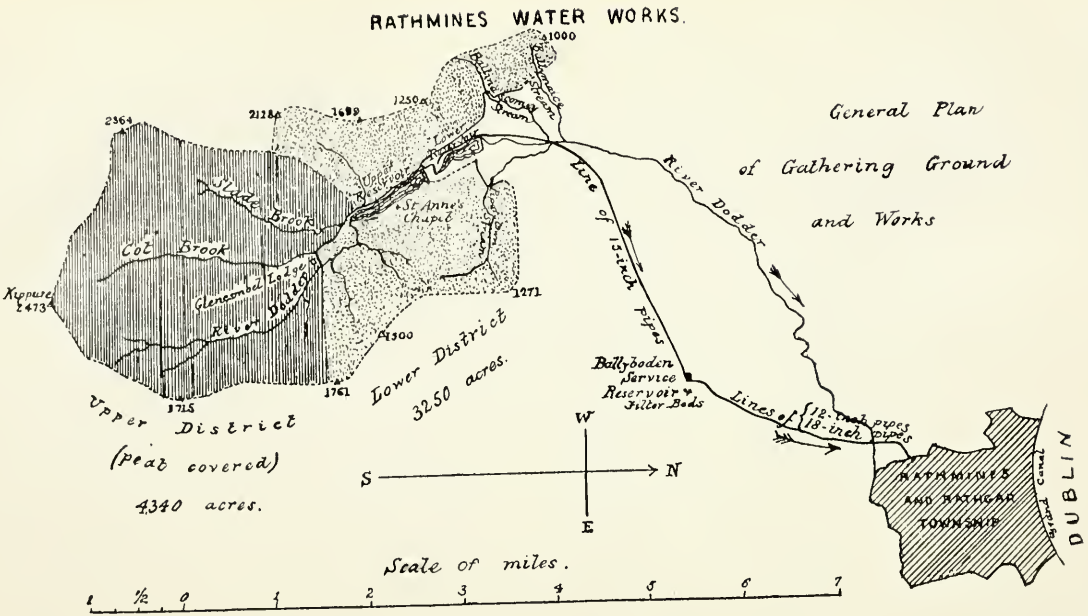
By F. P Dixon, M.Inst.C.E.

These works lie in the valley of Glenn-na-Smól (the Valley of the Thrushes), through which flows the river Dodder, together with its tributaries, the Cot and the Slade brooks, at a distance of nine miles from the General Post Office, Dublin, and seven miles from Rathmines. They were constructed in the years 1883–1887, from designs prepared by Messrs. Hassard and Tyrrell, of Westminster, for the purpose of supplying the mills situated on the river Dodder, as well as the inhabitants of the Rathmines district. The works consist of two impounding reservoirs—namely, an upper or clear-water reservoir, containing 360,000,000 gallons, the top-water level of which is 578 feet above Ordnance datum, and the lower or mill-owners' compensation reservoir, 156,000,000 gallons, with top-water 495 feet above Ordnance, together with catch-waters, gauge-basin, and duplicate measuring flumes for preferential supply to mill-owners. The reservoirs lie at the foot of Kippure (2,473 feet high), and the gathering-ground consists of an area of 4,340 acres of granite formation, covered with peat, and 3,250 acres free from peat, and partly of granitic, but principally of metamorphic and Silurian formation; and it is off the latter area that clear water is collected into the upper reservoir for drinking-purposes, the peaty water off the former area being passed by both reservoirs, partly in a constructed river course, and partly through 27-inch pipes.

This valley is visited periodically by very heavy floods; consequently the waste-weirs have been made 200 feet in length, in order to deal with the flood water. During the construction of the works, on two occasions, for a period of nineteen hours each, the amount of 3·80 and 3·68 inches of rain was registered; and since then—on

RATHMINES WATERWORKS—THE UPPER RESERVOIR.
Kippure in the distance.

RATHMINES WATERWORKS—THE LOWER RESERVOIR.



PLAN OF RATHMINES WATERWORKS.

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August 25th, 1905—the greatest rainfall experienced was 6·23 in 27¾ hours, of which 5 inches fell in 9 hours. On this occasion a depth of 4 feet of water was measured passing over the 200-feet waste-weir of the lower reservoir. Gauges are fixed at the head of the lower, or compensation, reservoir, so that when more than 1,500 cubic feet per minute is passing down the river-course, the surplus passes into the lower reservoir, whilst the 1,500 feet passes under the reservoir, by means of the 27-inch pipe, into the river below. Compensation water is also passed out of this reservoir into the river at the rate of 2,450,000 gallons per day for six days in the week. The works are designed also to provide 3,000,000 gallons per diem for township use. At the present date about half this amount is being used. The water can be taken off the upper reservoir at three different levels, and, after passing through a gauge-basin, is carried by a line of 15-inch pipes, 4½ miles in length, with two relief-pits on its course, to a set of filter-beds, and then into a service reservoir holding 12,000,000 gallons, distant about 2¾ miles from the township, at an altitude of 327 feet above Ordnance, and 175 feet above the highest point of the township. From this reservoir, after passing through copper-wire gauze screens, the water is measured by passing through a Deacon meter, and is then conveyed to the township by two lines of pipes, 18-inch and 12-inch in diameter.

The filter-beds mentioned consist of two with an area of 2,000 square yards, and two with an area of 4,000 square yards, making a total of 6,000 square yards of filtering-space, capable of filtering 3,000,000 gallons per 24 hours.

The filtering material is 3 feet in depth, ranging from fine sand to 3-inch stones.

The dirty sand is washed by being put through one of "Greenway's" patent hydraulic sand-washers.

The population supplied by water is about 41,000—39,000 being in the Rathmines Township, and 2,000 outside.

The township is divided into districts, each governed by a Deacon's waste-water meter; these have proved of great use in localizing and checking waste.

ELECTRICITY.

Dublin Corporation Electricity Supply.

By M. Ruddle, M.I.C.E., M.I.E.E.

The pioneer station of the Dublin Corporation in Fleet Street was designed to supply 10,000 lamps of 8 c.-p. each in use at one time for private consumers, and eighty-one arc lamps of 2,000 c.-p. each for the illumination of some of the principal streets, and the plant comprised three sets of steam-driven single-phase alternators—each of 150 k.w. capacity—feeding into the underground distributing mains at a pressure of 2,000 volts, this pressure being reduced to 100 volts by means of separate transformers fixed in each consumer's premises. The public-street lighting was effected from three sets of steam-driven direct-current dynamos, feeding at high pressure into the eighty-one arc lamps in three circuits. The total cost of this pioneer installation amounted to £37,000.

The supply from this station was first given in September, 1892, under the Corporation's Provisional Order; and applications from consumers came in so rapidly that in the winter of 1893 additional plant had to be installed, and further additions to the generating plant were made from time to time up to 1899, when plant to the total capacity of 900 k.w. was installed in the Fleet Street station.

In 1898 the old system of house-to-house transformers was abandoned, and the general distribution to the public was given from five sub-stations, where the pressure was transformed from 2,000 volts to 200 volts and distributed at that pressure to the network of consumers' supply-mains.

As the capacity of the Fleet Street site was now exhausted, the Corporation, in view of the rapidly increasing demand, decided to provide for a large extension of the system into other parts of the city, and to erect a new generating station on the most up-to-date plans on a site which had been taken over from the War Office for the purpose of the main drainage of the city. This site, known as the Pigeon House Fort, is situated on the south

bank of the river Liffey, three and a quarter miles from the centre of the city, and possesses a small harbour which allows of colliers discharging alongside the generating station.

After much discussion it was finally decided, on the advice of Mr. Robert Hammond, the consulting engineer, to adopt the three-phase system of generation and distribution for the general lighting and power-supply to private consumers, the Corporation of Dublin being the first to adopt this system in the Three Kingdoms.

The erection of the new station was commenced in 1901 and completed in 1903, when plant to the total capacity of 3,000 k.w., and having the effective supply-capacity of 2,000 k.w., was installed, generating energy on the three-phase system at a pressure of 5,000 volts between phases. The energy is transmitted at the same pressure through three trunk-feeders to the old generating-station at Fleet Street, which has been transformed into a general distribution-station for both the old and new systems of mains. From this point the transmission is continued at 5,000 volts to twenty new sub-stations distributed about the city, where by means of static transformers it is reduced in pressure to 200 volts for lighting-purposes and 346 volts for three-phase motors.

In Fleet Street are also placed the transformers which supply the original lighting area previously fed from the single-phase generating-plant in that place. These transformers reduce the pressure from 5,000 to 2,000 volts, at which pressure it is transmitted to the five old sub-stations and is there further reduced to 200 volts for lighting and power purposes.

The public-street lighting is also controlled at Fleet Street, the direct current supply to the 490 street-lamps now installed being given by motor generators which receive three-phase energy at 5,000 volts from the switchboard, and deliver direct current to the arc lighting switchboard at an average pressure of 1,100 volts for the twenty-three circuits radiating to the different parts of the city.

The Pigeon House generating-station commenced

supplying the new system of mains in July, 1903; and the pioneer generating-plant was finally shut down in September, 1903, when the entire supply to both new and old systems of mains was given by the Pigeon House, and has since been continued without intermission.

On January 1st, 1903, the maximum demand on the Fleet Street station was 763 k.w. On January 1st, 1904, the maximum demand at the Pigeon House was 1,600 k.w.; and it became imperative to make further additions to the generating-plant at once. Further extensions of mains to new districts were also called for; and the obligations of the supply to Clontarf under the Boundaries Act having also to be met, two additional trunk-feeders were laid down between the generating-station and Fleet Street, additional sub-stations were constructed in the city area and in Clontarf, and a large additional network of distributing-mains was laid down to meet the constantly increasing demand.

The lighting of the sea-front in Clontarf is by "Flame" arc lamps, placed on poles 30 feet high, which give a most effective illumination though spaced further apart than usual.

During the past five years the cost of production has steadily decreased, and has enabled the charges to the consumers to be correspondingly reduced. These rates vary according to the class of consumer from 5d. to 3d. per unit for lighting, and from $1\frac{3}{4}$d. to 1d. per unit for power-purposes.

Details of Plant at Generating-Station.

Coaling Arrangements.—Unloading by travelling grab direct from steamer into travelling conveyer, automatically weighed and delivered into coal-store and overhead bunkers. *Boiler-house.*—Four water-tube boilers, each of 10,000 lb. evaporative capacity per hour; chain grate stokers. Six Lancashire boilers (fitted with Bennis sprinkling stokers), each of normal evaporative capacity of 10,000 lb. per hour. Two of these are fitted with thermal storage vessels, increasing capacity to 14,000 lb. per hour. One Yarrow quick-steaming emergency boiler, hand-fired

and fitted with induced draft, giving an evaporation of 30,000 lb. per hour. Two sets Green's economizers. All boilers fitted with super-heaters except the Yarrow. *Engine Room.*—2 × 500 k.w. sets, and 2 × 1,000 k.w. sets vertical compound slow-speed condensing-engines coupled direct to Oerlikon three-phase alternators. 1 × 1,500 k.w. set, vertical Belliss condensing-engine, coupled direct to G. E. Co. three-phase alternator. 1 × 1,500 k.w. set, Richardson Westgarth steam turbine direct coupled to three-phase alternator. Total plan capacity, 6,000 k.w. Supply capacity with reserve, 4,500 k.w.

Distribution Plant.—Twenty-five sub-stations, total capacity, 4,000 k.w.

Street Lighting.—506 ten-ampere direct-current arc lamps; fifty 600-watt "Flame" arc lamps; 120 fifty-c.-p. "Osram" incandescent lamps. Total capital expenditure, £560,000.

Progress of Undertaking.

	1903.	1907.
Maximum load, k.w. ...	763	2,940
Consumers connected ...	350	1,530
Equivalent thirty-watt lamps	35,000	157,000
Average price received ...	5·7d.	3·3d.
Cost of generation and distribution ...	3d.	1·35d.
Total units sold ...	706,000	3,280,750
Lowest rates for power-supply	4d.	1d.

Electric Generating Plant at the Ringsend Power Station of the Dublin United Tramways Company.

By P. S. Sheardown, M.I.E.E.

The electric generating station of the Dublin United Tramways Co. is located with the frontage on the Ringsend Road, and within a few feet of the rear of the building is the quay wall of the Grand Canal Co.'s dock. The main buildings consist of a boiler-house and engine-room placed

side by side; the engine-room building is 182 feet long by 80 feet wide; 158 feet of this building is devoted to the machinery part of the engine-room proper; 24 feet at the rear end being devoted to stores, offices, &c.

The boiler-house is 134 feet long and 76 feet wide. Owing to the close proximity to the canal dock, an ample supply of water for condensing purposes is obtainable; and the dock is large enough to allow 400-ton cargoes of coal to be brought alongside from the Scotch colliery ports.

The coal-handling machinery consists of a steel frame hoisting-tower, equipped with a high-pressure two-cylinder hoisting-engine, hoisting-chains, coal-shovel, &c., capable of discharging coal at the rate of 40 tons per hour. The coal is delivered from the grab to a trolley mounted on rails, where the coal is weighed. The coal-trolley then runs by gravity and discharges the coal into the outer coal store, and is returned to the coal-tower by an ingenious automatic mechanism consisting of a pivoted weight which is raised by the momentum of the car on its outward journey. The coal is conveyed from the outer coal stores to the bunkers over the boiler-house by means of a Hunt conveyer consisting of 227 buckets, which are operated by an electric motor.

The boiler-house is at present equipped with twelve Babcock and Wilcox boilers, each of 2,530 square feet heating surface, arranged in six batteries of two boilers each, three batteries being arranged on each side of the boiler-house, the batteries on the opposite sides discharging their gases into two entirely separate flues and chimneys, with separate economizers in each flue. Each boiler is equipped with a Vickers mechanical stoker, the coal being fed into the hopper by gravity from the coal-bunkers over the boiler-house, a coal-weighing mechanism being installed, so that each charge of coal can be weighed by means of the Hunt weighing-apparatus. The boilers work with a steam pressure of 155 lb. per square inch. There is space left in the boiler-house for the installation of additional boilers when required.

The engine-room at present contains six Allis's vertical cross-compound open-type engines. Four of these engines

are direct-coupled to 550-k.w. b. t. h. 550-d. c. generators. One engine is directly coupled to a 550-k.w. 2,500-volt three-phase generator at twenty-five periods. The sixth engine has direct-coupled to it both a 550-k.w. d. c. machine and a 550-k. w. a. c. machine, both these machines being mounted between the cylinders. At the present time an addition is being made to the generating equipment by the erection of a 1,000-k.w. Willans turbine, coupled to a 1,000-k.w. Westinghouse 2,500-volt alternating-current generator.

The condensing plant for the reciprocating engines consists of three Wheeler condensers mounted over compound Blake & Knowles air- and circulating-pumps. The steam on its way from the engines to the condensers is passed through baffled-type oil-separators, and, after being condensed, is passed through a Davis-Perrett electrolytic filter in order to prevent any oil finding its way into the boilers with the feed-water. The boiler feed-pumps are of the Weir and Blake & Knowles type. The new turbine will have a separate condenser of Willans & Robinson's make, the air-pump being of the Edwards type, with a centrifugal circulating-pump, each operated by a separate motor.

The Dublin system consists of the routes operating through the city and the Rathmines and Pembroke Urban Districts, the furthest terminus of which is within 4 miles of the generating-station. The whole of this area is operated by direct current; but there are two routes—one running out to Dalkey on the south side of the Bay, and 9·1 miles from Nelson's Pillar, and the other extending round the north side of the Bay to Howth, which is 9·5 miles from the Pillar, which are operated through sub-stations supplied with alternating current at 2,500 volts. The switch-board at the power-station, therefore, consists of five d. c. generating-panels with nineteen d. c. feeder-panels, and, at present, two a. c. generator-panels and five a. c. feeder cable-panels. The power-station is also equipped with two 250-k.w. rotary-converters, with the necessary switch-board apparatus to enable these to be used either for converting d. c. to alternating current or *vice versa*.

There are at present three alternating-current sub-stations—one at Blackrock, half-way between Nelson's Pillar and the Dalkey Terminus, which is equipped with three 200-k.w. rotary converters, the small sub-station at Dalkey being equipped with three rotary converters, having an output of about 200 k.w. These machines are interesting, in that they were originally d. c. generators, operated by alternating motors, forming with them motor-generator sets. These were found to be inefficient, and slip-rings were connected to the armature winding, and a very much higher output is obtained from these machines than when running previously as d. c. generators.

The Clontarf sub-station operates the distant end of the Howth and Clontarf Line, and is equipped with a 250-k.w. motor-generator set, the motor being of the induction type, operating on 2,500 volts. There are also three small rotary-converters at this sub-station, which were originally the d. c. machines of motor-generator sets.

The cables throughout the system are of the paper-insulated lead-covered type laid in cement-lined ducts.

The Company possess 330 cars, which are being added to. At the present time the electrical equipment of each car consists of two 27-h.-p. motors; but the new long bogie-cars, with vestibule ends and covered tops, are each equipped with two 40-h.-p. motors.

GREAT SOUTHERN AND WESTERN RAILWAY LOCOMOTIVE, CARRIAGE, AND WAGON WORKS, INCHICORE.

By Hill C. Wallace.

Inchicore Works are situated about 1½ mile from Kingsbridge, the Dublin Terminus of the Great Southern and Western Railway, and have been in operation since the early part of 1846, previous to the opening of the line for traffic on the 4th August of that year. They have since steadily increased in size, now covering an area of 52 acres, upon which stand about 9 acres of shop buildings. In 1847 the number of men employed was about 250; there

are now 1,600. The bulk of the rolling-stock has been constructed, and all repairs are carried out, at these works; and in addition the various articles, such as lamps, barrows, &c., required for traffic and other purposes of the railway, are made and kept in repair. The rolling-stock consists of 331 engines, 234 tenders, 908 carriages, and 7,242 wagons.

In the paint-shop all carriages, engines, and tenders are painted, a small gas-engine being used for grinding colours. Connected with this is the trimming shop, where the carriages are upholstered; here also the vacuum-brake gear is fitted and kept in repair on the carriages.

The foundry supplies all the iron and brass castings required in the shops, as well as castings for signal and other work for the Permanent Way Department. Locomotive cylinders are cast in pairs, and axle-boxes, buffer-sockets, slide-valves, &c., are machine-moulded from standard patterns.

The locomotive smithy is 282 feet long, and 50 feet wide, and contains thirty-seven fires. As much work as possible is done by stamping and welding under the steam-hammer, a large number of standard dies and tools being used for this purpose. There are five small steam-hammers in the smithy, and a 50-cwt. steam-hammer in the adjoining forge, which also contains machinery for nut- and bolt-making, screwing- and tapping-machines, spring-tester, &c.

In the boiler-shop, hydraulic riveting is as far as possible employed, a powerful machine having recently been installed for this purpose. Two electric gantries are provided.

Close by, in the power-house, a high-speed engine and dynamo supply current for driving various machines, the boiler-shop gantries, and the fans for the foundry furnaces, &c. Steam is obtained from a refuse-fired locomotive boiler. An air-compressor feeds the numerous pneumatic drills and hammers in use in the erecting- and boiler-shops.

The sawmill and joinery contain the usual wood-working machinery. The scantling for wagons and carriages,

timber for bridges, signals, and station-works, and sleepers for the permanent way, are cut here. The latter are also grooved and creosoted.

At the gas-works, both coal- and oil-gas are made. The former is used in the shops, adjoining houses, and Kingsbridge terminus; the latter lights the greater number of the coaches, and supplies over 2,000,000 cubic feet of gas during the year.

Coal required for locomotives is brought by ship to the North Wall, loaded into wagons by the company's hydraulic cranes, run to the coal gantry at Inchicore, and dropped. Iron wagons with drop bottoms, up to twenty tons' capacity, are used.

In the carriage and wagon shop, carriages and wagons are built and repaired. The hydraulic lifting arrangements for carriages are worth notice. All carriage-wheels were formerly made on Mansell's pattern, but under the newest coaches cast steel is employed.

The wagon-shop smithy is 180 feet long by 43 feet wide, and contains twenty-three fires, and three small steam-hammers. The system of stamping and welding in dies is carried out as far as possible, wagon-hinges, &c., being finished direct from the hammer, without machining in the jaws.

There are two erecting-shops, one 286 feet long and 50 feet wide, with sixteen pits; the other 326 feet long by 50 feet wide, with nineteen pits. Rope-driven gantries are provided, and a rope-driven traverser divides and serves the pits in both shops. On one side of the erecting shops are the copper-smiths' shop and testing room, and on the other the brass shop. At right angles is the fitting- and machine-shop, 324 feet long by 50 feet wide. Four automatic capstan machines are employed in making firebox stays, cylinder-belts, &c.; and a large, electrically-driven planing-machine is also noteworthy. The adjoining tool-room contains several machines for making tools, dies, &c.

All the stock is built to templates and standard sizes, care being taken to have all parts interchangeable.

The running-shed has eight pits, and accommodates forty-eight engines.

Some 142 cottages adjoin the works, occupied by the company's workmen, and a dining-hall has been provided for the use of those who live at a distance. There are also reading-rooms, billiard-rooms, library, and dispensary.

The whole of these works are under the control of R. Coey, Esq., Locomotive Engineer to the Company.

ST. JAMES'S GATE BREWERY.

The following is based on the article published in "Ireland: Industrial and Agricultural," in the year 1902, and has been brought up to date, December, 1907, through the kindness of Messrs. Arthur Guinness, Son, & Co.

General Account.

The brewery, which is now that of Arthur Guinness, Son, & Co., Ltd., was probably founded early in the eighteenth century, and belonged to a certain Mr. Rainsford. From him it was purchased by Mr. Arthur Guinness in 1759. Up to the year 1825 the trade was almost entirely local. From 1825, however, the trade commenced to increase in Ireland and England, and about the year 1860 commenced the foreign trade, which has gradually spread to all quarters of the world.

The stout manufactured consists of four kinds, viz.: porter, which is chiefly used in Ireland for draught; extra stout, which is the article best known to the English public, but which is also largely used in Ireland; export stout, generally exported in wood; and foreign stout, which is specially brewed and stored for the requirements of the bottlers, chiefly in Dublin, Liverpool, and London, by whom it is exported.

The amount brewed is equivalent to 101,132,001 standard gallons a year, or 2 gallons per head of population in the United Kingdom; and the supply of raw materials requires the produce of 130,900 acres of barley and 1,000 acres of hops.

As regards the duty paid to the Excise, the amount

contributed by Messrs. A. Guinness, Son, & Co. in 1906 was £1,010,542, or £3,000 per working day, being more than double the amount paid by the next largest brewery in the United Kingdom, and equivalent to at least $\frac{1}{14}$ of the whole amount paid in the United Kingdom. The total number of staff and employees in 1907 was about 3,240; and, taking into account the families of the clerks and workmen, about 10,000 people are dependent on the brewery for their support.

As regards the materials—consisting solely of malt, hops, and water—the firm use Irish barley as far as possible, but a sufficient supply of Irish barley cannot be obtained, and, consequently, a considerable quantity has to be bought in Great Britain, and a small amount is imported from foreign countries. Like most brewers, the company make a large part of the malt they use, and the remainder required is made by various firms throughout the country, on commission, or is bought in the Irish, Scotch, and English markets. The hops are obtained from Kent and America. The third ingredient—namely, the water—is of a moderate degree of hardness, and is taken from filter-beds at the fifth and eighth locks of the Grand Canal. It contains about 30·5 per 100,000 of solids, as compared with 140–200 parts found in Burton water. The Vartry water, which forms the main supply for Dublin, is used chiefly for boilers and other purposes where a soft water is found useful; and the water for cooling purposes is drawn from the company's own well. The total amount of water used in a year by the brewery is as much as 600,000,000 gallons.

In 1860 the premises occupied by the brewery covered about four acres; but in proportion as its trade increased, the firm gradually acquired the ground adjacent to it in order to carry out the extensions required, so that by the present date the four acres have increased to over fifty. There are two breweries—the old and the new—the latter having been built, in 1879, as a 400-quarter plant, and subsequently extended to five times its original size—i.e., 2,000 quarters—in order to meet the exigencies of the trade.

There are three different levels in the Brewery premises,

all connected by a narrow-gauge railway. The first, or upper level, is about 60 feet above the river quay, and comprises the two breweries, the fermenting rooms, the vat-houses, the stables, and the malt and hop stores. The second, or middle level, contains the maltings, grains stores, a vat-house, and other buildings; while the third, or lower level, on the Victoria Quay, consists of the carpentry and cooperage, cask-washing sheds, racking and filling stores, as well as the platform on which the goods are loaded according to their destination on dray, boat, or railway.

The cooperage consists of three divisions, dressing-shop, making-shop, and repairing-shop, together with branding-rooms. Each cask is branded with its particular number and the name of the company before being put into trade. The number of new casks capable of being turned out is as many as 1,500 a week, and the life of each cask about ten years. Unlike other breweries, Messrs. Guinness have not adopted cask-making machinery, except for the purpose of sawing timber. The casks are practically entirely made by hand.

The firm owns 210 drays and floats, 171 horses, and 10 steamers, all in full use; and the principal railways in Ireland have connecting lines to the brewery. The steam-barges take casks from the quay which extends along the Liffey, and bring them down to the Channel steamers anchored at the North Wall, as well as to numerous vessels waiting at the mouth of the Liffey.

As regards the engineering side of the brewery, the following information may be of interest:—

Steam-Generating Plant.—The boiler installation at upper level consists of ten multi-tubular Lancashire boilers working at a pressure of 160 lb. above atmosphere and evaporating 10,000 lb. of water per hour per boiler. Each boiler is complete in itself, being fitted with mechanical stoker, fan, and motor for assisted draft, feed-pump and motor, and separate injector. A flue, common to all the boilers, runs along under the roof of the house and discharges into a steel, brick-lined chimney, 162 feet high, built on a steel gantry at the roof-level.

The boiler-house at the cooperage level is at present being extended. It contains four boilers of the same design as those on the upper level; and the extension consists of two similar boilers, but 12 inches larger in diameter than their fellows.

Electric Generating Station.—Immediately adjoining the upper boiler-house is the electric generating-station, to which steam is conveyed through a ring main. There are at present installed in the station two 500-k.w. high-pressure turbo-generators, one 250-k.w. high-pressure turbo-generator, one 250-k.w. low-pressure turbo-generator with surface condenser, all of Parsons' type, also two 120-k.w. generators, driven by high-pressure two-crank engines. All the dynamos are of the direct-current type, working at 420 volts across the outers of a three-wire system; two sets of 60-k.w. balancers, between outers and middle wire, and a switchboard, fitted on a gallery at the south end of the building, complete the station plant. The 250-k.w. low-pressure turbo is connected to a low-pressure steam system which is supplied from the exhausts of all the brewery engines. This low-pressure steam is used for heating liquors and buildings, and for other purposes, and during the summer months for drying grains. At certain seasons of the year there is a surplus back-pressure steam, and this is passed through the low-pressure turbo to a surface-condenser. Electricity is now generally used for light and power, except in some of the old buildings; the power is furnished by motors varying from one quarter to twenty-five horse-power, about 300 in number, aggregating over 1,800 horse-power. The total lighting load is equivalent to 16,000 lamps of eight-candle-power. Adjoining the electric station is the hydraulic pumping-station and accumulator.

Cooling Plant.—This plant is situated in No. 1 brewery storehouse immediately behind the electric generating-station, deals with water and brine cooling systems, and consists of two linde ammonia compression sets of about 150 horse-power each, one carbonic acid compression set of about 40 horse-power, one ether compression set of about 40 horse-power, and one Reece's ammonia absorption

machine. The work done annually amounts to 6×10^9 British thermal units.

Heat Interchanges.—The methods for preventing the waste of heat in the different processes of manufacture are not without interest. The products of combustion in the steam-boilers on their way to the chimney pass through an interchanger and heat the air which is to be passed through the furnaces. It may be mentioned that this system has been successfully worked in the brewery since 1891.

The feed-water for the boilers is first heated through interchangers by the condensed steam which is collected in the steam-traps, and which is returned through a system of return trap-mains to the boiler-house. As already mentioned, all engines and turbines exhaust into a low-pressure system at about 10 lb. pressure above the atmosphere; this steam is used for heating and drying purposes, and is the second agent in raising temperature of feed-water.

Water which has been passed through the first section of the refrigerators used for the cooling of wort is returned to the brew-house and passed over a series of trays in which it mixes with and condenses steam from the boiling-coppers, and whence at a temperature of 210 degrees Fahrenheit it flows into scald-receiving vessels. Water also passes through the back of the copper furnaces, cooling the bridges of the furnaces, and running on through the jackets of the chimneys from these furnaces takes up heat from the gases there, and finally flows over the trays above referred to, into the scald-receiving vessels.

Coal.—The total quantity of coal used for all purposes is over 40,000 tons a year.

Railways.—A system of narrow-gauge (22-inch) railways runs through the brewery; this is equipped with steam locomotives and wagons for malt, grains, casks, &c. There are twenty locos., and about 450 wagons, bogies, &c. Malt is conveyed in covered tip-wagons, while the cask traffic is carried on with bogie wagons. There are in all $7\frac{1}{2}$ miles of narrow-gauge railway. A branch of the Great Southern and Western Railway line enters the cooperage area; and this traffic is worked by means of broad-gauge haulage wagons. A narrow-gauge loco. is

hoisted into a haulage wagon, their combined weight being about twenty tons, and the loco. driving by means of its wheels through a $4\frac{1}{4}$ to 1 gear on to the main axles of the wagon is capable of dealing with the traffic. There is about 1 mile of broad-gauge line.

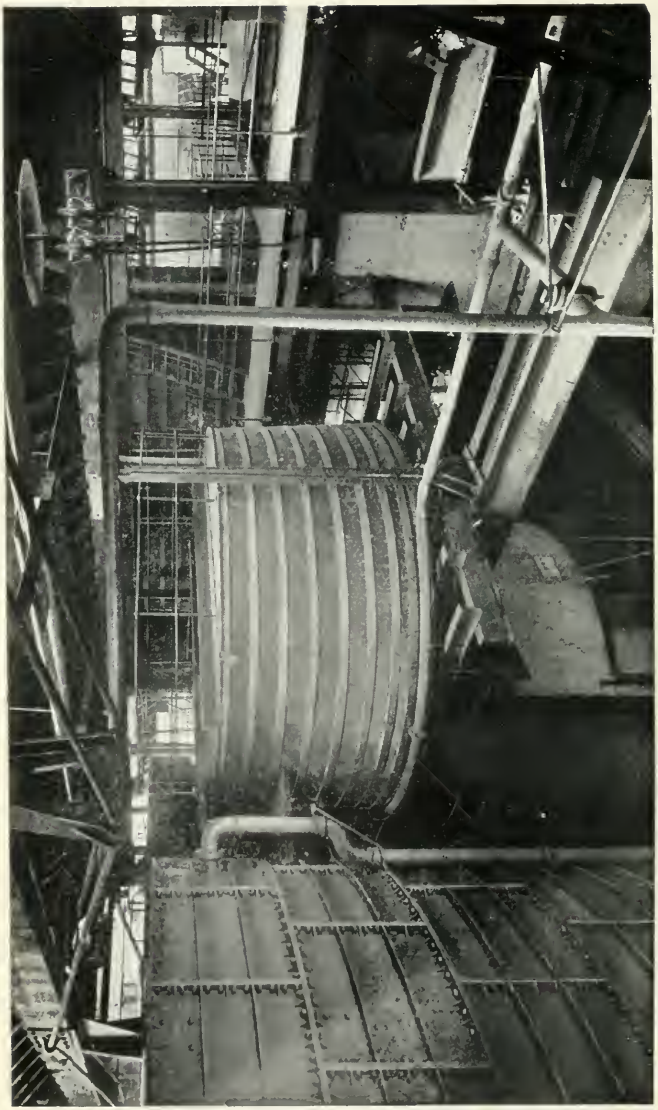
In order to have easy connexion between the different levels of the brewery, two tunnels were constructed. A narrow-gauge railway proceeds through a spiral tunnel, which passes in two and a half turns under James's Gate yard level to the mid level, at which point it passes under James's Street to Cooke's Lane. An incline carries the railway from here to the low level at the cooperage. The spiral tunnel is 20 yards in radius, and with its approaches about 470 yards long; it has a grade of 1 in 40. Alongside the railway tunnel under James's Street is the passenger tunnel (a cast-iron tube), which is reached by means of a stairway at James's Gate end, and finishes at Cooke's Lane level; it is 105 yards long.

Brewery Buildings.—The brewery buildings are now generally constructed in steel, the latest example of this being the new fermenting house in Market Street. This is 125 feet high, 170 feet long, and 151 feet wide; and the weight of the structural steel is about 3,650 tons.

The No. 2 Brewery is another example of steel construction.

Telephones.—An extensive system of telephones is installed throughout the brewery. There are at present over 280 instruments of all kinds; about 100 of these are on the National Telephone system, and connected through a sub-exchange in the brewery premises with the city exchange.

Fire Appliances.—At St. James's Gate level three sets of fire-engines work at a pressure of 100 lb. per square inch, and are connected to a system of fire-mains; this system is also used for washing purposes, so that the fire-engines are working continuously, night and day, and always available in case of fire. Two main fire-stations are provided, one at James's Gate level, and one at cooperage level. Fixed hydrants and hose are in readiness throughout the buildings, and ordinary ground-hydrants in the yards.



AN IRISH POT-STILL DISTILLERY.

Scientific Work.

Turning now to the scientific work carried on by the company in the two large laboratories attached to the brewery, one of which is chiefly devoted to analytical, and the other to research work; as a matter of routine every parcel of barley and malt coming into the brewery is analysed, a large portion of the hops is tested, and all materials are carefully examined for purity.

On the research side numerous problems have been attacked, and research on various chemical and biological lines is a permanent branch of brewery routine.

The scientific work of the brewery comprises experiments with a view to improving the cultivation of barley in Ireland, which have been undertaken in collaboration with the Department of Agriculture, a number of plots being distributed throughout the country.

The brewery is provided with an experimental malt-house and an experimental brewery; and in addition to other experiments these establishments malt and brew the produce of the experimental plots. The experimental brewery and malt-house have been adjusted to the size of the plots, and admit of about five quarters of barley being dealt with.

An experimental hop farm is also being worked in connexion with the scientific aspect of the brewery.

THE DISTILLING INDUSTRY.

By E. A. Montmorency Morris, M.A.

The distilling industry has now reached enormous dimensions in the United Kingdom, and it is one of the chief Irish industries. It is, however, only in comparatively recent times that distilling has attained to its present importance, although the art of separating alcoholic spirit from fermented liquors appears to have been known in the Far East from remote antiquity. Gradually a knowledge of the art travelled westward, and the word

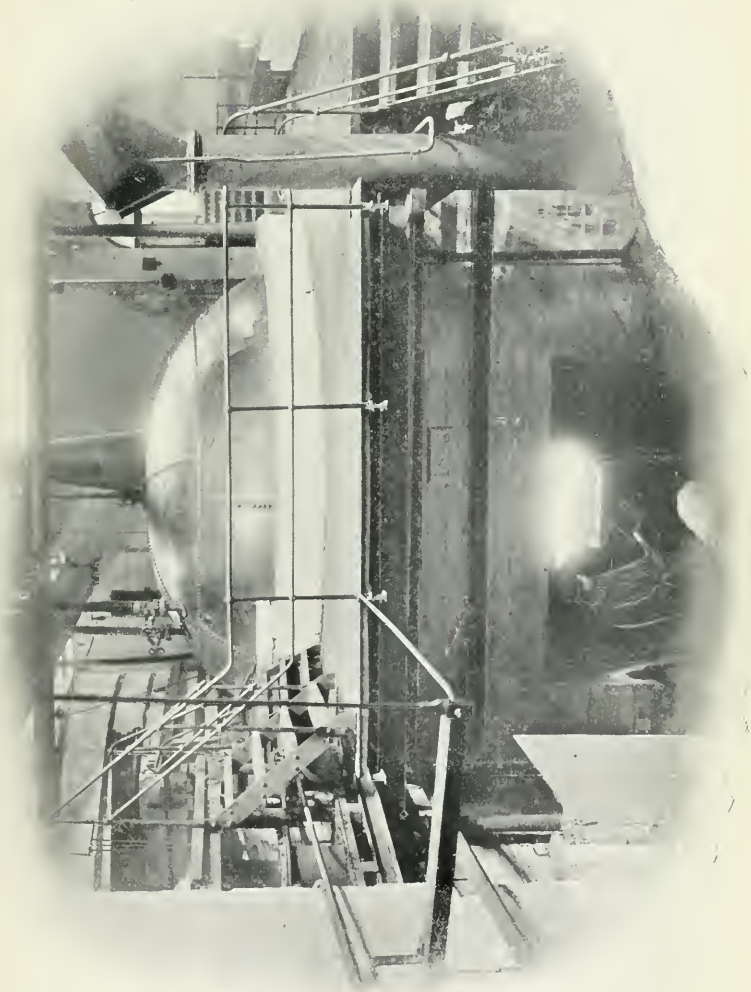
alcohol is supposed to indicate that a knowledge of the method of preparing alcoholic spirit came to western Europe, like much other chemical learning, through the Arabs. It was, however, left to a Frenchman, Arnauld de Villeneuve, a physician of the thirteenth century, to first write an explicit account of the intoxicating spirit obtained by the distillation of wine. He mentions it as a recent discovery, and considers it to be the universal panacea so long sought after in vain.

France was for some time the seat of the distilling industry of Europe, as her grapes afforded a constant supply of material for the distillation of brandy; but as grain became more plentiful, the industry of distilling spirits from corn developed in northern Europe.

It seems to be admitted that distilling was practised in Ireland at a period earlier than in Great Britain, or in any other part of north-western Europe. When Henry II, in the twelfth century, invaded Ireland, the people were observed to be in the habit of making and using a kind of alcoholic liquor called usquebaugh (water of life)—a term which is synonymous with the classical *aqua vitae*. A description of the virtues of usquebaugh and a recipe for making it are contained in the Red Book of Ossory; and it is known that the Irish were in the habit of distilling spirits from malt. The word "whiskey" is a corruption of usquebaugh. Dr. Johnson, in his famous dictionary, states that this word is "Irish or Erse word which signifies the water of life. It is a compounded, distilled spirit being drawn of aromatiks, and the Irish sort is particularly distinguished for its pleasant and mild flavour. The Highland sort is somewhat heavier, and by a corruption in Scotch they call it whiskey."

Even before the reign of Elizabeth the Irish distilling industry had assumed considerable proportions, and restrictions had at various times been imposed upon the manufacture and sale of spirits.

A statute was passed at Drogheda, in 1556, restricting the manufacture of whiskey—"a drink nothing profitable to be daily used and now universally made throughout this Realm, especially on the borders of the Irishry, whereby



AN IRISH POT-STILL.

much corn, grain, and other things are consumed." By the end of the sixteenth century many licensed distillers existed; and persons were nominated in each province who had the sole power of granting licences.

The industry of distilling spirits from grain had, even before the reign of Charles II, assumed proportions sufficiently great to make spirits productive of revenue; and after the Restoration in 1660, a permanent tax was imposed upon every gallon distilled.

A number of the most important distilleries in Ireland were started in the latter half of the eighteenth century. The Bushmills Distillery is said to be the oldest in Ireland, as in the year 1743 it was being worked by a band of smugglers, but in 1784 it was recognized as a legitimate distillery making about sixteen thousand gallons of whiskey per annum. A number of other distilleries were established about this time: thus the Brusna Distillery, Kilbeggan, was founded about 1750; the Thomas Street Distillery in Dublin was purchased by Mr. Peter Rowe in 1757, and the North Mall Distillery, in Cork, was erected by Mr. Wyse in 1778; whilst in Dublin the Bow Street Distillery, the John's Lane Distillery, and the Marrowbone Lane Distillery were all started before the end of the century. There can be no doubt that towards the end of the eighteenth century the distilling industry flourished exceedingly in Ireland, and the consumption of spirits so increased as to attract the attention of the Irish Parliament, which endeavoured to check the activity of the distillers by encouraging the brewing industry.

The nature and conditions of the Irish distilling industry have greatly changed since pre-Union times. The changes in the duty and regulations enforced by the Inland Revenue authorities have had a marked influence upon the fortunes of distilling, and the same forces that brought industrialization in many industries have had their effect upon distillers also. Many of the smaller establishments have ceased working, but the larger distilleries have enormously increased their output. The amount of spirits distilled is now three times as great as the quantity produced a century ago, though the number of distilleries at present

working is less than one-third of the number at work at the beginning of the nineteenth century.

There are now about thirty distilleries in Ireland, but some of these are mainly blending establishments. Consideration of space prevents mention being made of each distillery in Ireland; but a few words as to the date of foundation and situation of the more important Dublin distilleries may not be out of place. The best known distilleries in Dublin are those of John Jameson & Son, Ltd.; John Power & Son, Ltd.; The Dublin Distillers Co., Ltd.; The Distillers Co. (Phœnix Park Distillery); and the Dublin City Distillery Co. The two first-mentioned distilleries, viz., the Bow Street Distillery, owned by Messrs. John Jameson & Son, and the John's Lane Distillery, owned by Messrs. John Power & Son, date back to 1780 and 1791 respectively, and are both exclusively pot-still establishments. The Dublin Distillers Co. was formed by the amalgamation of three distinct distilleries, the Thomas Street Distillery, Marrowbone Lane Distillery, and the Dublin Whiskey Distillery, at Jones's Road. As already mentioned, the first two of these distilleries were erected in the eighteenth century, whilst the Jones's Road Distillery is quite modern, having been started as late as 1872.

Some idea of the extent of the distilling industry may be obtained from the Revenue Returns. It appears from these that over 14,000,000 gallons of whiskey are distilled annually. Of this quantity nearly 8,000,000 gallons valued at £2,140,500 are exported.

THE IRISH POPLIN INDUSTRY.

By E. A. Montmorency Morris, M.A.

The early history of poplin-making is unknown; indeed, the origin of the name itself is doubtful. For while some derive it from an old French verb, *se popiner*, "to deck oneself out," others associate the name with the town of Poperingen, where they say poplin was first made. Others again assert that the word comes from *Papeline*, which

name they say was given to a fabric of much the same character made at Avignon during the residence of the Popes in that city. In Ireland, however, its history presents few difficulties. Like linen-making and silk-weaving, it owes its origin here to the Edict of Nantes. Many Huguenots settled in Dublin; and in the year 1693 we hear of poplin-making in the "Liberties," which, as is well known, was at one time an important part of the city, but which, when the refugees took up their residence there, was already falling into decay. Such, however, was the energy of the Huguenots that the district became a hive of industry, and was soon too small for its inhabitants. New streets were built; and Spitalfields, the Coombe, Pimlico, and Weavers' Square were crowded with silk- and poplin-makers. As the names of the localities would suggest, many of the weavers came from England—where they had at first settled—because of the greater prosperity of the silk and poplin industry in Ireland. The poplin trade increased by leaps and bounds, and the "Liberties" and its surroundings became one of the most prosperous parts of the city.

In the year 1800 the invention of the Jacquard loom revolutionized the silk industry, and did much also to help poplin-making. At this time, however, the heavy import duty on the raw material was a great drawback to the trade. The duty was 7s. 7d. a pound on foreign "thrown silk," 4s. on raw Bengal silk, and 3s. 6d. a pound on all other kinds of raw silk. In 1826 this duty was much lessened; but it still affected the industry very adversely by encouraging the smuggling of foreign goods. When the duty was lessened, the firm of R. Atkinson & Co.—formed in 1820—seized the favourable moment; and as the fashion of the time favoured rich brocade dresses, for the making of which poplin is singularly suitable, they soon, by their enterprise, achieved a leading position. Constantly introducing new varieties of silk, fine woollen yarns for wefts, and ever studying new shades, textures, and designs, they took a leading place in the production of this artistic Irish material.

It may be mentioned here that the handloom (much

improved, of course) is still used in their new factory, as they find it best adapted to the production of their rich goods.

Poplin is a fabric composed of worsted made from the finest description of wool and silk in combination. The fabric is so woven that the surface is altogether pure silk, while firmness is given to the material by the wool in the interior. Poplin is of three kinds—single, double, and "terry." The first two are so alike that few can tell them apart, the difference being in the quality of the silk used in the warp. The third is corded, and is the kind that is most generally associated with the idea of Irish poplin. The various processes of making require great skill and watchfulness, which is perhaps one of the reasons for some of the peculiar customs which still exist amongst poplin workers. For instance, while most industries are open to all who wish to engage in them, the Dublin poplin-makers refuse to allow anyone who has not served a seven years' apprenticeship, or who is not the eldest son of a poplin-maker, to work as a poplin-weaver.

Though most of the silk used in poplin-making is of foreign manufacture, the Dublin weavers succeed in treating it in such a way as to make Irish poplin a distinct fabric. Indeed, though poplin is made both in France and at Norwich, no makers but the Irish seem to be able to produce the softness of texture and brilliance of colouring that are so characteristic of the best poplin. The beauty of the colour of Irish poplin has been attributed by some to a peculiarity of the Dublin water; but it is much more likely that it is due to the knowledge and skill of the Irish maker. Though poplin was at first almost exclusively made in the homes of the workers, and though even still home weaving exists to some extent, most of the poplin is made in factories. The principal factories are those of Messrs. Atkinson, Pim, Fry, and Elliott. Both Messrs. Pim and Messrs. Atkinson are large manufacturers.

Though almost everyone admires poplin, the trade cannot be said at present to be a very large one. Many people consider poplin very expensive; but it should be remembered that it is almost everlasting, and in this sense is

highly economical. Black poplin is excellent for mourning, the dark shades being more intense than those produced in silk. It must, of course, be acknowledged that poplin cannot, from the peculiar nature of the material, be so variously treated in the matter of pattern and range of ornament as silk can; nor can all the varied "fabric effects" of modern silk-weaving, foulards, &c., be obtained in poplin. None the less it is very beautiful material, everlasting in wear, and really cheap.

THE IRISH ART COMPANIONS.

By E. A. Montmorency Morris, M.A.

There is one Irish policy about which everybody is agreed, namely, the development of Irish industries; and this is the policy of the Irish Art Companions. In 1904 they set to work, taking a house, a workshop, and show-room at Nos. 27 and 28 Clare Street, Dublin. They saw tens of thousands of pounds going each year from Ireland to France and Germany for ecclesiastical statuary—Irish money going away to buy foreign material, to subsidize foreign art education, to pay the wages of workmen, and to swell the traffic returns of foreign ships and railways, whilst at home there were excellent brains and hands starving for want of encouragement.

Ireland in the eighteenth century was celebrated for her plaster-work. The ceilings and cornices of many of the city and country mansions testify to its excellence. But the last plaster-maker in Dublin disappeared from the Dublin Directory after 1864; and from that time until the establishment of the Irish Art Companions little plaster-making, if any, was carried on in Dublin. Now the Irish Art Companions make their own plaster from local gypsum. This plaster they cast into sacred or secular statuary, bronzing or tinting the statues to suit the tastes of their clients.

Some of their models are from fine old Italian works of art, such as the great life-sized crucifix made by the

Companions for Westminster Cathedral. This is a replica of the bronzed crucifix by Donatello over the high altar at Padua.

Others are the works of local artists, notably Mr. Joseph M. Carré, Mrs. Vanston, and Miss Gwendolen Herbert.

Besides the crafts of modelling and casting, the Companions make rosary-beads and other articles from horn; and for this purpose they have allied with themselves Mr. Albert Mitchell, the son of the last of many Irish by-gone comb-makers. It is a matter of regret to think that in Dublin alone, about the year 1820, there were some 700 comb-workers, whilst there are very few now. The efforts of the Companions have done something to revive this industry; and the future of the trade is in the hands of the Irish people themselves.

Another department of the work of the Art Companions which calls for notice is their large show-room in Clare Street. This is not only an ordinary shop, in which they keep their own productions for sale, but it is a free market for workers all over the country. Into this depôt any worker may bring lace, crochet, embroidery, home-spuns, wood-work, or metal-work, and place the objects on exhibition absolutely free of all charge, only a small percentage being charged in the case of sale, to pay rent and maintenance. In this way many small workers and struggling industries have been helped, and fair prices obtained.

The Companions also deal with English customers, and organize sales in private houses all over England, as well as sending goods to English bazaars.

BISCUIT-MAKING IN DUBLIN.

By E. A. Montmorency Morris, M.A.

In the year 1851 the late Mr. William B. Jacob decided to add the manufacture of biscuits to an already extensive bread bakery and flour mill in Waterford. The success of the undertaking resulted in a few years in the transfer of

the business to Dublin, and the concentration of all the energies of the firm upon the development of the biscuit trade.

The building up of the industry entailed not alone the training of a complete staff of workers, but the continual addition of new plant and the improvement of that already in use.

The leading aims from the beginning were to make quality the first consideration, to keep the factory up-to-date by purchasing the most improved machinery, and to cultivate a spirit of harmony amongst the workers.

Extensive depôts have been specially built in London, Liverpool, and Manchester, so as to ensure the prompt delivery of the goods throughout England. During the past few years, too, the firm have given much attention to the development of the foreign trade.

In many ways the organization of the factory shows unusual care. On every floor are laid the rails of a tiny tram-line. Up and down are wheeled miniature waggons which convey the biscuits and tins from one department to another until they are finally placed in the large stock-rooms. In the last of these rooms there are arrangements for packing the biscuits into "skips" for conveyance to the various depôts. These "skips," which hold a very large number of tins, resemble small furniture vans, and they are so constructed that they can be easily lifted by derricks placed on the lorries, and then despatched by steamer or rail to their various destinations.

The manufacture of rich cakes forms an important element in the work of the factory.

A tour of the factory would be incomplete without a visit to the power-houses, from which is derived an available motive-force of 1,000 h. p., for the greater part electric.

The department for making tins is quite a factory in itself: rows of intricate machines are to be seen by which the workers are enabled deftly and rapidly to convert sheets of tin into neatly finished boxes ready for packing.

In the employment of this firm there are more than 2,000 persons. Of these a large number are young women

and girls. Dining-rooms worked on the most healthy and economic lines are provided. For instance, in one of their large buildings the whole of the top floor forms a huge dining-room capable of seating 500 girls. In this dining-room books, magazines, and a piano are provided; and over the dining-room is a flat-roofed garden where in fine weather the girls can enjoy fresh air.

In connexion with the workers there is a large choral society, which meets in the buildings after working hours for practice under an able musical conductor. Last year three choirs of these workers competed in the Feis Ceoil—the Irish National Musical Festival—and they won the first and second prizes in the section for working choirs. There is a drill class for girls held during the winter months, and it is largely attended. The firm pays the fees for a number of its employés at the City Technical Schools in connexion with classes for certain trades, and also for teaching sewing, cooking, &c.

There is a St. John Ambulance Association brigade, in which both men and girls are instructed in "first aid to the injured."

MANUFACTURE OF AERATED WATERS.

By E. A. Montmorency Morris, M.A.

Ireland has long been celebrated for the richness and purity of its mineral-water resources. This, no doubt, is due to the recommendations of the product of the Irish springs by medical specialists. There are several aerated-water manufacturers in Dublin; but a short account of Messrs. Cantrell & Cochrane's business must stand for all. The foundation of this firm was laid in Belfast in 1852 by Dr. Cantrell, who subsequently was joined in partnership by the late Sir Henry Cochrane. For many years the output of this firm held a monopoly in Ireland.

It is said that Messrs. Cantrell & Cochrane have on the site of their premises in Dublin "St. Patrick's Well," the waters of which in olden times were supposed to possess the most extraordinary curative properties.

Nassau Street and Nassau Place, where the works are situated, derive their names from one of the sub-titles of William III. Before his coming Nassau Street was known as "St. Patrick's Well Lane," because it led to the famous holy well of the national saint.

Besides the firm's works in Dublin and Belfast, they have depôts in London, Liverpool, and Glasgow, and numerous agencies throughout the United Kingdom.

PRINTING.

By E. A. Montmorency Morris, M.A.

The printing and paper trades have always been important in Dublin, and at present they constitute a considerable industry. The more notable printing firms are Messrs. Alexander Thom & Co., Messrs. James Walker & Co., Messrs. Cherry and Smalldridge, and Messrs. Hely, Ltd.

The old firm of Messrs. Alexander Thom & Co. was established in 1824 by Alexander Thom, and has grown to be one of the largest businesses in Dublin, and it now employs hundreds of hands. Mr. Thom held the position, by Letters Patent, of Queen's Printer, and editor, printer, and publisher of the *Dublin Gazette*, the official publication of the Irish Government. Letters Patent were also granted to his successors. In 1887 the firm was converted into a limited company; and in 1890 it was reconstructed so as to include the firms of Sealy, Bryers, & Walker, and Sullivan Brothers. The former of these houses has made a considerable reputation as publishers of Irish books; while Sullivan Brothers are the publishers of a well-known series of high-class school books.

The encouragement afforded to artists by the lithographic method of faithfully reproducing their work for the public, had a wonderful effect in creating changes in design, and in evolving a more effective display than was possible with the old colour prints.

The practical adoption of lithography for colour work only commenced in the year 1865 with the invention of the

"Huguet" lithographic machine. Messrs. James Walker & Co., of the Jones's Road Colour-Printing Works, were amongst the first half-dozen colour-printers who introduced these machines into the United Kingdom, and the firm was the pioneer in Ireland of the colour-printing industry. Since 1865 there have been many changes in the machinery used, though the bulk of colour-printing is still produced by the lithographic process. The latest lithographic machines are what are known as the aluminium rotary machines. These machines embody in their structure the last words in mechanical progress. Under the old system each print was passed by a cylinder over a flat stone—a process which entailed a complete forward and backward traverse of the stone for every sheet run through. In the new rotary machine the metal plate which takes the place of the stone is bent round a cylinder, and in each rotary motion of the latter a print is made.

The name of Helys, Ltd., is perhaps most often associated in the public mind with the retail stationery business, and not unnaturally so, for the large warerooms in Dame Street, where this business is carried on, are perfect hives of industry. But though the public is most familiar with the retail side of the business, it is the wholesale and manufacturing side that forms the backbone of the firm's trade. Helys, Ltd., produce large quantities of commercial stationery, bill-heads, ledgers, and works of this kind, aided by the latest American labour-saving equipment.

The scientific printing done in Dublin is to a considerable extent the work of the Dublin University Press (Ponsonby & Gibbs), who turn out the publications of the Royal Irish Academy, Royal Dublin Society, Royal Society of Antiquaries, and many scientific text-books. Their work includes much printing in the Irish, Greek, and other characters, and also mathematical work of great intricacy, contracted Latin and Old English, and other printing requiring high technical skill.

GREENVILLE TOBACCO FACTORY.

By Marcus Goodbody.

Messrs. T. P. & R. Goodbody commenced the manufacture of tobacco in the form of what is now known as "Irish Roll" during the year 1843, at their factory in Tullamore, King's County.

The original "Roll" was manufactured right through by hand-labour. The tobacco leaf was moistened by hand, and prepared for working much in the same manner as at the present time; but the spinning machine consisted of a long table with a wooden bobbin fixed at one end. This bobbin was made to revolve by hand; a rope of tobacco being formed and rolled into shape by the operating spinner, with two assistants to hand the wrapper and filler. At a later date labour-saving machines were put on the market, which enabled one spinner with the same number of assistants to turn out nearly fifteen times the quantity in the same time.

The manufacture of "Primrose Cigarettes" was commenced in the year 1882. This cigarette appears to have been the first manufactured in Ireland, and till the advent of the 3d. packet of machine-made cigarettes was the leading brand; even at the present day it commands a considerable sale.

In 1886 the factory at Tullamore, except the snuff factory and offices, was burnt down; and the firm transferred the operations which had been carried on in the destroyed portions of their old factory to the one now at work at Greenville, Dublin.

In 1898 it was decided to extend the manufacture of cigarettes by hand; the old system of table-rolling being superseded by the push method, the latter method being much quicker, besides turning out a cleaner cigarette, as very little paste is used in making the papers.

Another extension was in the direction of cigar-manufacture. In 1891 the firm of John Garnett & Co., cigar-manufacturers, Manchester, was taken over; the cigar-

makers and all accessories to the trade being transferred to Greenville, where cigar-making in Ireland was for the first time brought to a successful issue.

The first process in the manufacture of roll tobacco takes place in a large room known as the casing-room. Here the leaf is opened from the hogsheads, shaken up and moistened, in order to allow of the leaf being handled. This process is known as "casing." The leaf passes from the casing- to the stripping-room, where the large stalk is removed from the centre of the leaf. It is next conveyed to the spinning-room, where some twenty spinning-machines form the leaf into ropes of tobacco, and coil them on bobbins. These bobbins when full are passed on to the turning-off room. Here the rope of tobacco is uncoiled from the bobbins, and formed on a machine into the shape of a roll, fastened together with pegs and reeds. In this state it is wrapped in cloths and sent to the cording-room, where a steel-cored rope is wound round the outside of the roll to prevent it from losing its shape when under pressure.

Plug tobacco is manufactured in a different way; each stick of plug being pressed in a special moulding-machine to a certain shape, after which it gets a leaf-wrapper right round, and a number of bars are placed between plates in a large press. The pressing-floor has an area of almost 3,800 square feet; it contains six finishing presses, in which the plug tobacco is subjected to a pressure of two tons, and also thirty roll-presses, each with a capacity of ninety-six rolls.

Leaving the hard-pressed tobacco department, we pass to the fancy tobacco cutting-room, where the brighter classes of leaf are all dealt with, mixtures blended and flakes pressed. The different tobaccos are cut by power-machines, which can be regulated to some twenty different cuts.

The cigarette and cigar rooms have seating accommodation for some 220 girls.

THE FERTILIZER INDUSTRY.

By Joseph Milne.

As might be expected in a country so largely dependent upon agriculture, the manufacture of fertilizers is an important industry in Dublin. The factories of W. & H. M. Goulding, Ltd., and Morgan Mooney & Co., Ltd., are among the largest in the United Kingdom. There are also the Dublin and Wicklow Manure Co., Ltd., Paul & Vincent, and Richardson & Fletcher, turning out per annum an aggregate of 100,000 tons of chemical manures.

Bones, bruised or broken, were probably the first artificial manure used; but about the beginning of the nineteenth century it was found that fineness of division rendered bones more easily assimilated by plants. This fine division was chemically attained when Liebig introduced the treatment of ground bones with sulphuric acid.

Large quantities of bones collected throughout Ireland, after having their valuable grease extracted, are ground and dissolved by sulphuric acid, and sold as bone-manures. But the supply of bones falls far short of the requirements of modern agriculture; and the enormous deposits of tribasic phosphate of lime in the United States and Northern Africa, though of little value as manure in their natural state, are converted into superphosphate by the action of sulphuric acid, whereby the tricalcic phosphate, which is insoluble, is converted into mono-calcic phosphate, which is soluble, and therefore readily available to plants.

Upon this conversion from the insoluble form to a soluble state has been built up this chemical industry, which, in these factories, transforms upwards of 50,000 tons of raw phosphates into available plant-foods.

The demand for these fertilizers in Ireland has grown rapidly within the last few years, largely owing to the work of the Department of Agriculture and Technical Instruction in instituting, through County Councils and under the supervision of their instructors, a series of experimental

plots throughout Ireland, showing the beneficial results obtainable by their use, by increasing the yield to a value far in excess of the actual cost of the fertilizers employed.

In these experiments, confirmed now by several years' experience, it has been shown that the application to meadow hay of superphosphate, nitrogen compounds, and potash means an increased crop equal to a profit of about £1 per acre after deducting the cost of the manure.

Similarly in the case of the potato crop, so largely grown in Ireland, it has been clearly shown that, on land growing an average crop of 3 tons 12 cwt. per acre without manures, the yield can be increased to over 10 tons per acre at a cost of about £4 15s. for manures, giving an estimated profit, after paying for the manures, of £8 10s. per statute acre.

In the growth of oats and barley a profit of 30s. per acre is shown from the use of these chemical fertilizers. In mangolds there is a gain of £6 10s. per acre ; in turnips a yield of 25 tons per acre can be secured, as against 4½ tons without manure.

The increased crops which the soil of Ireland may be made to yield under proper cultivation, and with the liberal use of these fertilizers, can scarcely be realized. The consumption of artificial manures is growing year by year, and is only limited by the ability of the farmer to purchase them. The Irish farmer, as a general rule, unfortunately labours under the disadvantage of insufficient capital to enable him to cultivate his land intensively, and to obtain maximum crops ; but signs are not wanting that, under the guidance of the Department, Irish agriculture will rapidly advance, and in that advance not the least of the contributing forces will be the assistance rendered by the increased and intelligent use of fertilizers such as are produced at these factories. The factories themselves are equipped with all modern improvements. The basis of the business—the manufacture of sulphuric acid—is carried on on a large scale, about 1,000 tons of sulphuric acid being produced weekly. The acid plants at these works are thoroughly up-to-date, and well worth a visit by anyone interested.

The acid is produced from pyrites imported from Spain, the residue, after burning off the sulphur, being reshipped to England, where the copper contained in the cinders is extracted.

The phosphate of lime, which arrives from Africa and America in cargoes of 4,000 tons or upwards, is ground in specially constructed mills to an impalpable powder before being treated and dissolved by the action of sulphuric acid. The resulting mass after maturing is withdrawn from the dissolving-pits and pulverized to a fine powder, either for application to the land by itself, or in conjunction with nitrogen compounds and potash, which are mixed with the superphosphates by the manufacturers in the proportions which experiment and experience have proved to be most efficacious for the different crops for which they are intended.

The fertilizer industry in Dublin employs upwards of 1,000 men; while other similar factories in Belfast, Cork, Drogheda, Londonderry, and Waterford give employment to an equal number of workmen.

The importance of this fertilizer industry to Dublin, and to the country at large, is not, perhaps, realized as fully as it deserves; and a visit to one of these extensive factories will prove a revelation as to the extent and importance of these great factories engaged in the preparation of the food of plants.

IMPORTS AND EXPORTS OF DUBLIN.

By E. A. Montmorency Morris, M.A., M.R.I.A.

In a limited space it is impossible to go fully into the details of the trades and industries carried on in Dublin and its vicinity. Dublin has been for many centuries a chief port and distributing centre for the whole of Ireland; and the following statement, based on the figures in the "Report on the Trade in Imports and Exports at Irish

Ports" (Cd. 4126, 1908), will give some idea of the importance and variety of the trade of Dublin:—

Imports.

Commodity.	*Quantity.*
Ales	85,893 brls.
Candles	27,710 cwts.
Cement	40,957 tons.
Chemicals, drugs, &c.	194,386 cwts.
China, earthenware, and raw materials therefor	507,904 ,,
Coal	1,105,331 tons.
Cocoa	1,888,992 lb.
Fish	105,495 cwts.
Foreign spirits	241,286 galls.
Fruits and vegetables	460,494 cwts.
Glass and glassware	181,329 ,,
Grain, flour, and feeding-stuffs	6,836,582 ,,
Hides, skins, and leather, including boots and shoes	120,515 ,,
Machinery	5,847 tons.
Meat, including bacon	547,491 cwts.
Oils, including petroleum and paraffin	10,000,000 galls.
Paper and printed matter	386,245 cwts.
Seeds, including flax seed	83,728 ,,
Soap	41,665 ,,
Sugar, and manufactures thereof	765,044 ,,
Textile goods, including drapery and apparel	412,953 ,,
Tobacco	2,945,495 lb.
Wine	843,134 galls.
Wood, timber, and manufactures thereof	105,000 tons.

Exports.

Commodity.	*Quantity.*
Animals, including horses	893,588
Eggs	1,992,078 gt. hdrds.
Fish	170,353 cwts.

EXPORTS—*continued.*

Commodity.	*Quantity.*
Grain, flour, and feeding-stuffs ...	395,136 cwts.
Hides, skins, leather, and manufactures thereof	98,485 ,,
Meat, including bacon, poultry, and game	314,458 ,,
Paper and printed matter	69,877 ,,
Porter	555,110 hhds.
Textiles and textile materials ...	143,612 cwts.
Tobacco	491,187 lb.
Whiskey, etc.	1,937,867 gals.
Wood, timber, and manufactures thereof	48,335 tons.
Yeast	27,540 cwts.

AGRICULTURE.

AGRICULTURE IN THE DUBLIN DISTRICT.

BY PROFESSOR JAMES WILSON, M.A., B.SC.

The agriculture of Dublin and the counties around it is determined mainly by their geographical position and by the agricultural policy of the country as a whole. Just as every large town is encircled by dairy-farms and market-gardens, so also is the city itself; and just as the abundant stable and other litter from a large city compels intensive cultivation and luxuriant crops in its immediate neighbourhood, so there are certain areas north-east and south-west of the city, and within carting distance, in which are grown magnificent crops of grain, potatoes, roots, and fodder. But the great metropolitan area outside these limits is a vast collecting-ground for the Irish cattle that are eventually sent across the Irish Channel. In modern times, more especially since the introduction of railways and steamboats, the tendency of the agriculturist has been to specialize: to grow the crops most favoured by his soil, climate, and commercial position. Thus the east of England and Scotland has specialized in grain and roots, while the west, with its moister climate and uneven surface, has specialized in pasture and meadow. Thus, also, the east, compelled to convert its unmarketable straw and roots into something

else, turns to the west for young cattle and sheep to be converted into beef and mutton, while the west turns its unmarketable pasture into milk or its products, and, lacking roots and fodder to fatten its young stock, sends them eastwards to be fattened.

Ireland, under partly similar conditions, has fallen into the same productive groove as the west of England and Scotland, but with this difference that, while turnips and straw and the consumption of imported feeding-stuffs have been creeping gradually westwards in England and Scotland, and the number of young stock sent east to be fattened has been gradually diminishing, no such movement has taken place in Ireland. The result has been that, while eastern farmers have looked more and more to Ireland for their "stores," Ireland has set herself more and more to meet the demand.

The production of the Irish store-cattle begins in the west and in more uneven and less fertile land north and south of the central plain. There the calves are born and reared upon that part of the milk that is not turned into butter in the farmer's house or in the creamery. As yearlings they are sold to graziers in the creamery districts or in the less fertile parts of the central plain. As two-year-olds they move to the more fertile lands converging eastwards in the direction of Dublin, which is the centre from which they are exported to England.

Thus the bulk of the pasture of the great metropolitan area is grazed by two-year-old bullocks, drawn originally from the dairy-farming districts outside the central plain. The vast majority of these store-cattle are exported in autumn to the fattening centres in the east of England; but, with the assistance of cotton-cake and other feeding-stuffs, a certain proportion is fattened for some of the English markets. Some idea of the importance of the cattle industry in the Dublin district may be gathered from the fact that of the 841,973 cattle of all ages and kinds exported to Britain in 1907, 332,995 passed through Dublin port. Within the Dublin area, there are many pure-bred herds of Short-horn, Aberdeen-Angus, Hereford, and Kerry cattle. Since the advent of the Department of

Agriculture and Technical Instruction for Ireland, an impulse has been given to the breeding of pure-bred cattle and other stock. In connexion with their schemes for improving the stock of the country, high-class herds of pure-bred Short-horns and Yorkshire pigs are kept at the Albert Agricultural College, Glasnevin.

Agriculture in the County of Dublin.

By J. W. M'Kay, A.R.C.SC.I.

The amount of tillage in this county is very much less than might be expected from its proximity to such a large consuming-centre as the city of Dublin. It is estimated that in round numbers there is an area of 200,000 acres available for tillage; of this only about 40,000 acres is cultivated; a further 30,000 acres is occupied by permanent meadow, and the remainder is devoted to pasture. For a distance of two or three miles beyond the city-boundary the cultivable land is mainly occupied by market-gardens and dairy-farms. A further distance of six to eight miles beyond this area includes the greater part of the tillage of the county. The soil here is naturally deep and strong, and, as large quantities of manure and refuse of various descriptions are easily obtainable from the city, it is in a high state of fertility, and the general style of farming is of a high class. Oats, potatoes, and wheat are the most important crops grown, giving yields equal to, if not greater than, those obtained in any other part of the country. A narrow strip of tilled land extends along the sea-coast for the length of the county, and, with this exception, practically the whole of the remainder is inpastured by two- and three-year-old cattle bought in western and southern fairs during March and April.

The dairying trade is a very important one in County Dublin; there are about 18,000 cows in the county, and many of these are in the hands of city dairymen, who grow little or none of the food used. Most of them have grazing farms in the immediate neighbourhood of the city, and to these the cattle are turned out during the summer. The pasture is of excellent quality, as it has been lavishly

manured time after time, so that little extra food is required to maintain the flow of milk during the summer. In the winter-time these cattle are fed in yards adjoining the owners' distributing-shops. The fodder and roots required are purchased in the market, and quantities of by-products from the breweries and distilleries of the city are used along with these. A common method adopted by dairymen is to contract with a farmer to supply litter, and remove the manure at a certain rate per cow, so that the farmer in a tillage-district keeps very little live stock, beyond the horses required for the working of his farm, tills practically the whole of his lands, sells off almost all the crops, and brings back manure from the city in the carts that have taken his produce to market.

The co-operative movement, which in many other parts of Ireland has exercised so beneficial an effect on the farming industry, never succeeded in gaining a footing in the metropolitan county; and probably in no part of Ireland are the people less inclined to unite in this way. The only attempt at co-operation is a small society established by the Rush farmers for the purchase of seed-potatoes for the early potato-growing industry.

Near Rush, Messrs. Hogg & Robertson have established a bulb-farm on soil formed of wind-blown sand, closely resembling that within the dunes of Holland; and the early potatoes above referred to are grown on the same quality of land.

Agriculture in the County of Meath.

By Neil Leitch, B.Sc.

Meath lies to the north and north-west of County Dublin, and within easy reach of the city itself. Except at the extreme north-west end of the county, which is of an uneven surface, and a few heights such as Skryne, the famous old hills of Tara and Slane, and the hill of Ward above Athboy, the county may be described as flat. It is well watered by the rivers Boyne and Blackwater, the former draining the south, and the latter the northern and western areas. These rivers join at Navan, and flow together towards the sea at Drogheda.

On the whole, the county is well wooded and the climate is mild, though in the centre it is very depressing—a feature due, no doubt, to the level nature of the country, the prevalence of woods, and the amount of land under grass.

The soils vary greatly, from light gravelly land in the south of Trim to, in the northern portion, cold clay (boulder-clay). The central part, however, has soils of a good heavy loamy texture, lying on a limestone basis, and naturally adapted for grazing. Indeed, there is little soil in the county that could be described as poor.

Strangers coming by either railway to Meath, but especially by the Midland, are at once struck by the large tract of untilled land, and the comparatively small amount of tillage. Many causes may be put forward to account for this, but the greatest and most important of these is that the land is suitable for grazing.

There is no possible doubt that some of the finest grazing land in Ireland lies in Meath, though there is a good tract of land which is only moderate grazing-land at present which, if put under a proper system of tillage for a few years, would in the course of time, given suitable treatment, develop into sound grazing land. The best grazing districts are around Navan, Wilkinstown, Nobber, Carlanstown, Kells, Athboy, and from Trim, grading off towards the inferior lands in the south-eastern end. On the outskirts of the county the land is lighter and poorer, and more suitable for tillage. Little tillage is carried on, and what there is, is not of a very up-to-date standard. There is too much hand-labour, and too little horse-labour, to make it efficient and profitable.

The principal source from which the majority of farmers derive a living is cattle and cattle-grazing. The system on which cattle are grazed is known as "the eleven months." Where a farmer has a grass farm, he puts it, or part of it, into the auctioneer's hands, and it is then let for grazing cattle for eleven months. The cattle are bought in neighbouring counties, and put on to graze by the man who takes the land. During the early part of the year they receive a daily foddering of hay, in most cases during the months of February and March, when grass is at its worst

here. These cattle generally range from eighteen months to two or two and a half years, and occupy the land till October and November, when they are removed and sold by "private bargain" in the open fairs throughout the county, for exportation across the Channel, where they are house-fed. From some of the best grazing districts, early beef, and especially heifer-beef, is put on the market during the latter part of June and the first week of July, these cattle getting a little hand-feeding previously.

Very little cattle-raising is done, most of the store-cattle being, as stated above, purchased in the neighbouring counties.

As previously mentioned, little tillage is carried on, and this only on the outskirts. In the centre, small patches may be seen bordering on bogs, etc. The chief crops raised are oats, potatoes, turnips, and mangels, and first-crop hay. Unfortunately no definite system of tillage is carried on, many farmers having only one and the same field constantly under cultivation for years, without changing to another. This they do, they say, because it is more easily "laboured."

The difficulty of procuring efficient labour, the tall-growing open hedges wasting good grazing land for yards into the fields on either side, and the ditches in many cases not properly cleaned, are clearly consequences of the general grazing system.

Dairying is practically unknown. Co-operative dairy-societies do not exist. Stall-feeding is hardly thought of, and what cattle are stall-fed are as a rule those that could not be sold in the fairs. Feeding consists of turnips or mangels, bruised oats, and hay. No value for feeding is put on straw. It is no uncommon sight to see ricks of straw standing untouched in late spring as they were left in November at threshing time.

There are a few co-operative societies in the county, but they only exist for selling seeds and manure. Any products the farmers have are sold in the open market, and one great drawback to their receiving a good price is that they never think of grading their produce. If co-operative societies existed to which sales could be made, farmers would receive a sound education in this respect.

Agriculture in the County of Kildare.

By Thomas Wade.

The main line from Dublin to Cork divides Kildare into two fairly equal sections which differ not only geographically but agriculturally. The northern portion is devoted chiefly to live-stock farming, being largely in grass, while the southern end is occupied chiefly by tillage. The traveller's attention is drawn to the wide, flat stretch of country that begins to open out as the county is entered. It marks the commencement of the central drift-covered plain. The soils in the northern portion are derived principally from the boulder-clays, and in the south from the limestone-gravels.

The size of the farms varies considerably, ranging from a few acres to holdings of 300 acres and over, a considerable number being of about 100 acres. Most of the land is now owned by the occupiers, having been purchased under the various Land Acts. The change in ownership has had a marked effect in improving the system of farming.

In the south of the county the land is farmed on a four-course rotation, varied in some cases by one of five or six years, by the leaving of the land in grass for more than one year.

Barley forms the staple crop in the tillage districts. The grain is generally plump and of good quality. It is converted into malt in Athy and neighbouring towns. The only other feature of importance in the tillage districts is the production of beef in winter by stall-feeding; Kildare is the principal county in Ireland for stall-fed beef-cattle. Turnips and mangels are in consequence extensively grown. Crops of twenty-five tons and thirty-five tons respectively, on an average, are easy of production. Latterly the disease phoma has caused much loss amongst these crops locally. In the central portion of the county the growth of hay and of oats is of much importance, the Curragh, the headquarters of Irish racing and thoroughbred horse-breeding, being there situated. The limestone-gravel soils appear to be suited in an eminent degree for the production of horses of stamina and quality; and recently some

notable English breeders have taken stud farms in Kildare. Clovers and other members of the Leguminosæ are often very conspicuous in the grass lands of better quality. The richest of these are devoted to summer-fattening of cattle. In sheltered and well-favoured places it is not uncommon for cattle that have been wintered outside on hay and grass to be fat by the end of May without the aid of cake- or hand-feeding. On such lands two lots of cattle are easily fattened during the summer. The herbage on much of these lands seems to tend towards fattening the ordinary Short-horn milch-cattle rather than to stimulating them to milk-production. At all events, dairying is not practised to any extent, the young cattle for the feeder and the grazier being purchased in the dairying counties of the south. The breeding of pure-bred stock is practised by a few. The county, in the Straffan herd, boasts two distinctions in this direction, i.e. the largest herd of pure-bred Short-horns in the British Isles; and a breed—the Dexter Short-horn—which is a miniature Short-horn perfect in shape and symmetry, but combining the hardiness and milking qualities of the Dexter. At Carton, the seat of the Duke of Leinster, and at Ard Caien, Naas, there are herds of pure Kerries and Dexters.

After supplying fuel for centuries, there still remains a vast area of bog (the Bog of Allen). As the bog is used up and the turf-cutting bank recedes, the area cleared is enclosed. Levelling, draining, and years of spade-labour gradually reduce the vegetable débris to a degree of firmness. Crops of potatoes and rye are taken for a few years, and eventually, as the ground becomes firmer, horse-labour is introduced, and that amount of cultivable land may be said to have been added to the earth's surface. Hundreds of acres of this "cut-away" bog are now in cultivation and bearing useful crops.

The conditions of farming do not lend themselves to co-operation—at all events in its productive form. In other directions farmers are enterprising and up-to-date. The County Council and the County Agricultural Committee have set an example to all public bodies by establishing what are in essence the nucleus of public forests—in this

case County Council woods. The land, some 170 acres, in several divisions in different parts of the county, has been acquired either by free gift or purchase, and is either already under existing timber, or has been planted, under expert advice and management, with the most suitable and useful trees for timber purposes.

Agriculture in the County of Wicklow.

By A. Nolan.

The county of Wicklow comprises an area of 500,178 acres, of which, in 1907, 85,968 were under farm-crops, 247,385 in pasture, 19,004 in plantations, 146,731 in waste bog, mountain, &c., and 1000 under water. The surface is much diversified and highly picturesque, rising in the interior into mountain groups, intersected by deep valleys; it declines to the sea on the east, and to the general level of the central plain on the west. In the arable portions of the mountain districts, the soil, which rests on granite, is shallow and light; and although not very fertile, with careful husbandry it produces moderate crops of oats, potatoes, and turnips. The higher hills are covered with heath and turf, and afford good pasturage for sheep. The soil on the declivities overlies slate, and varies in character from light clay for the greater part to heavy clay in a few small areas some distance from the seaboard; when properly treated, it affords excellent crops of all kinds. In some of the valleys approaching the sea, the soil is of an alluvial character and naturally fertile.

The climate in those parts of the county in which the best portions of the arable land are situated is mild and equable, and highly favourable to up-to-date agricultural pursuits.

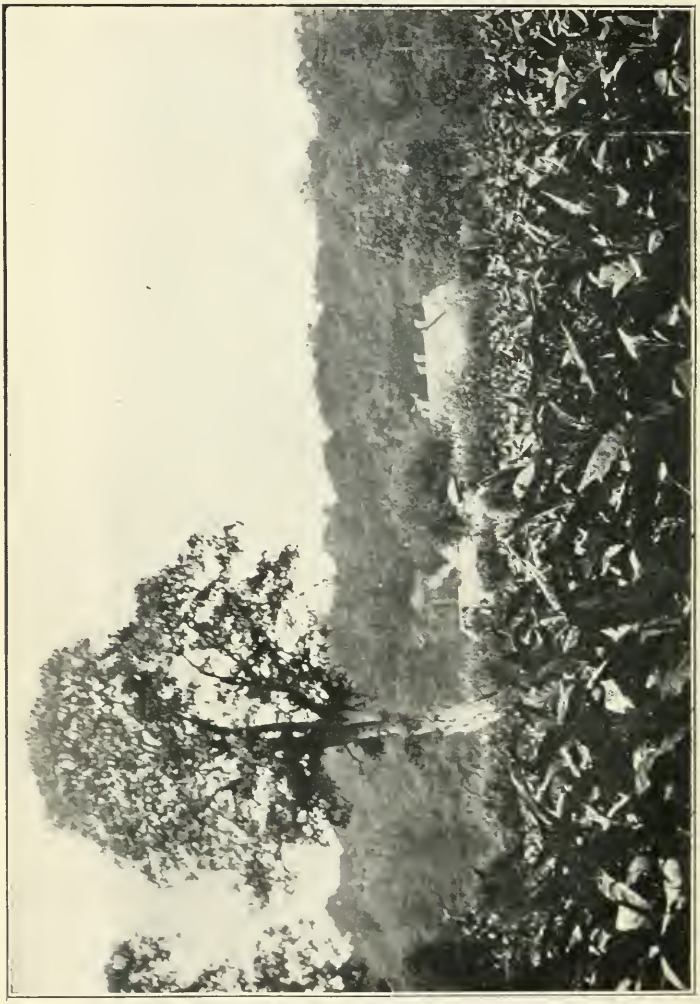
Broadly speaking, the systems of farming pursued may be classified as follows:—

I.—Dairying, stock-raising, and tillage.
II.—Stock-raising and tillage.
III.—Sheep-raising.

Systems I. and II. are followed in the valleys and on

the declivities, the former by men holding, say, 150 acres down, and the latter by those whose holdings exceed 150 acres. Farmers who adopt system II. stock their land with young cattle which they purchase in the local fairs, and which they in turn dispose of as fat beasts or forward stores. A large proportion of the milk produced on the farms adjacent to the railway between Newcastle and Arklow is disposed of in Dublin. The only creamery in the county is situated mid-way between Wicklow and Arklow; it is on a co-operative basis, and fairly successful; but it would be much more prosperous if it received a full supply of milk all the year round, instead of doing so only in summer as at present. Winter-dairying can hardly be said to exist in the county, except on a few isolated farms; and its absence is mainly due to the fact that farmers do not grow sufficient suitable foods, such as mangels and cabbage, for their cows in winter. Cream-separators have been introduced on a few farms during 1907.

Sheep-raising, extensively practised on the mountain-farms, has proved very profitable during the past few years. The variety of sheep kept is known to farmers throughout the country as the "Wicklow Mountain Breed." It was originally produced by crossing the sheep of the Wicklow hills with the Cheviot breed. It possesses the good qualities of the latter, which it surpasses in point of size and adaptability to the lands over which it ranges. These sheep are much sought after by graziers in other parts of the country on account of their hardiness, the excellence of their mutton, and their good nursing qualities. No fixed system of cropping is adopted. As a rule, one or two crops of oats are taken after grass (wheat and barley are very little grown), then a green crop, followed by oats, with clover and grass seeds, after which one or two crops of hay are taken; and the land is then grazed for three or more years, according to the size of the farm and the quality of the herbage it produces. Occasionally turnips and potatoes follow grass. Thanks to the teaching of the Department of Agriculture, and the great stimulus given by the Land Act of 1903, farmers are making commendable efforts to improve their holdings in every direction. More



A FIELD OF TOBACCO AT RANDALSTOWN, CO. MEATH.

attention is now given to the preservation and application of farmyard manure, a larger and more judicious use is made of artificial fertilizers, tillage operations are performed in a more skilful and thorough manner, greater care is exercised in the selection of seeds, and potato-spraying is practised more or less extensively. The quality of the live-stock kept has been improved to a considerable extent in recent years.

There is no general system of agricultural co-operation in existence; but an agricultural co-operative society has been recently established at Tinahely. There are three agricultural credit societies in the county, and these are doing good work.

Tobacco-growing in Ireland.

By J. R. Campbell, B.Sc.

Experiments in the growing of tobacco, under the supervision of the Department of Agriculture and Technical Instruction, have been in progress during the past eight years. In the first three years the experiments were, for the most part, conducted on small plots widely distributed; and the curing of the leaf was conducted under great disadvantages. In the year 1904 it was decided to carry out experiments on a more extensive scale, in order that the commercial possibilities of the crop might be adequately tested. To effect this object, it was necessary that provision for curing the leaf should be made at each experimental centre, as well as for the planting of a considerable area with tobacco. In the year mentioned tobacco was grown on twenty acres. The number of centres and the area under tobacco have subsequently increased; and during last year (1907) the experiments were carried on at eleven centres in seven counties, viz., Louth, Meath, King's County, Kilkenny, Wexford, Cork, and Limerick, the total area cropped being almost 100 acres. The work is being continued on the same scale during the current year.

The period for which the large-scale experiments were authorized was originally limited to five years. It has

been, however, extended to ten years, and will terminate in 1913.

So far, it has been demonstrated that the tobacco plant grows exceptionally well in several districts in Ireland on soils which are typical of large areas throughout the country. All classes of tobacco have been grown with a notable uniformity of success. The greater part of the area available has hitherto been cropped with the commoner classes of tobacco, as these varieties are produced most easily, and are suitable for trial by inexperienced growers. Several of the more skilful growers are, however, making plantations of the finer kinds of leaf.

The conditions under which tobacco is grown in Ireland have no exact counterpart in any country where the crop is already a staple; and the hasty adoption—without modification—of the practice of any foreign country could not but result in failure. Much work has already been done in adapting recognized methods to Irish conditions; and constant efforts are being made towards the simplification of the processes and the reduction of expenses.

Improvements in the methods of cultivating and curing are being rapidly introduced as the growers acquire more intimate knowledge of the requirements of the crop and increased skill in handling it. The work is, therefore, in a transition stage; and the results already obtained cannot be regarded as affording grounds for a final conclusion as to the average cost of production or the net return to the grower.

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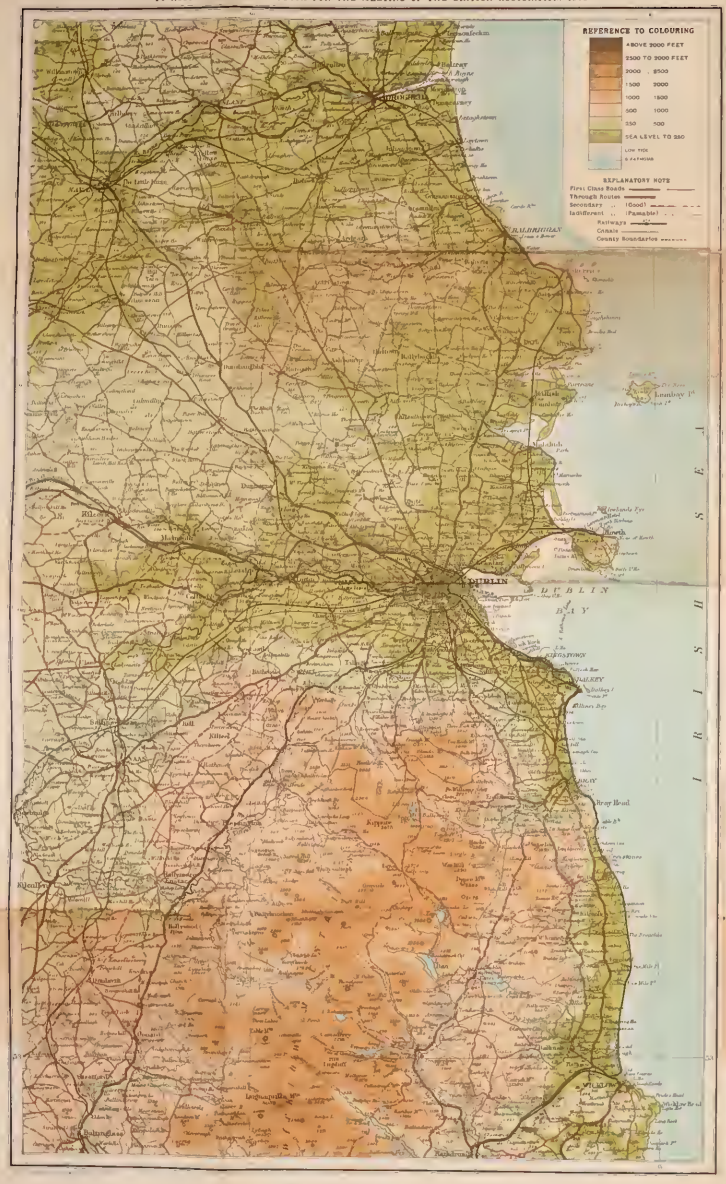
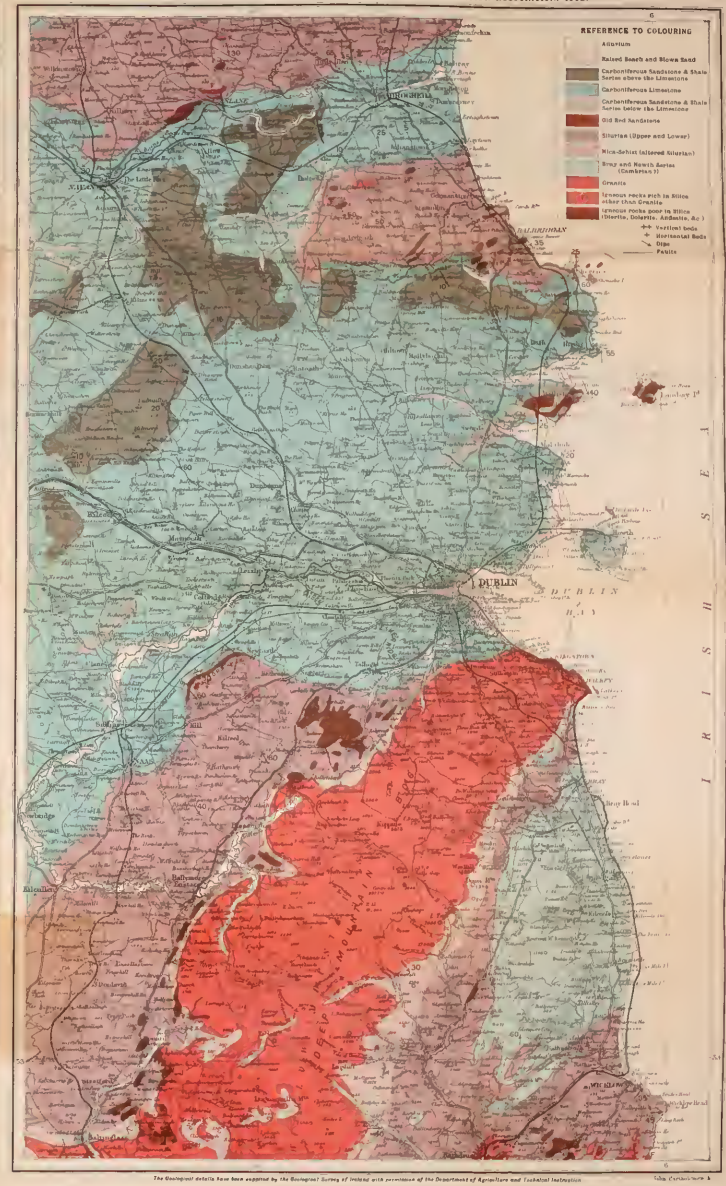
PHYSICAL AND TOPOGRAPHICAL MAP OF THE COUNTRY AROUND DUBLIN

TO ACCOMPANY THE HANDBOOK FOR THE MEETING OF THE BRITISH ASSOCIATION, 1908



GEOLOGICAL MAP OF THE COUNTRY AROUND DUBLIN

TO ACCOMPANY THE HANDBOOK FOR THE MEETING OF THE BRITISH ASSOCIATION, 1908.



The Geological details have been supplied by the Geological Survey of Ireland with permission of the Department of Agriculture and Technical Instruction