IRELAND

Industrial and Agricultural

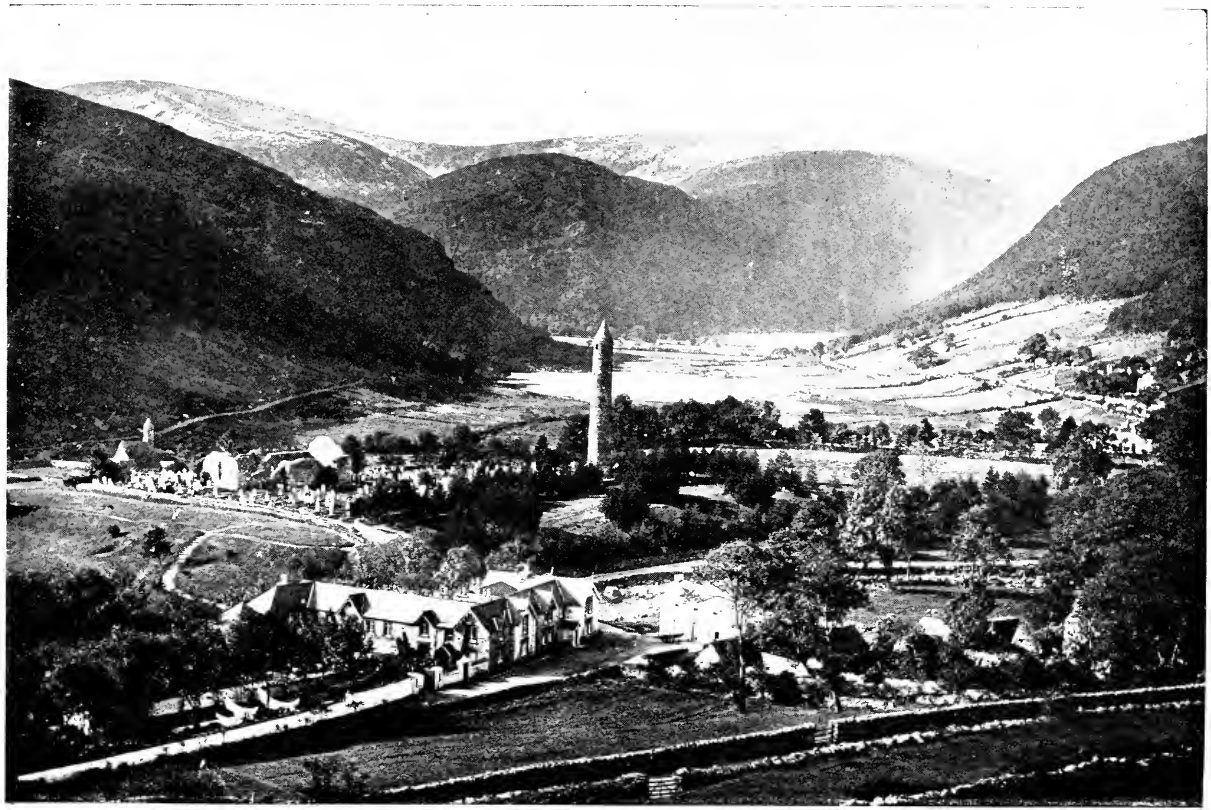

FIG. I. GLENDALOUGH, CO. WICKLOW. GRANITE OF LEINSTER CHAIN WITH ORDOVICIAN FOOTHILLS.

DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND

DUBLIN · CORK · BELFAST

1902

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EDITOR'S PREFACE.

IN January, 1901, the Department of Agriculture and Technical Instruction for Ireland decided to take part in the Glasgow International Exhibition, 1901, by erecting an Irish Pavilion in the Grounds, and displaying therein a representative selection of the characteristic products of Irish Industry. It was arranged, at the same date, that an official handbook dealing with Ireland's chief economic resources should be prepared in connection with the Department's Exhibit at Glasgow. This work was entrusted to my charge, and the original issue of what has now grown to be a very full and comprehensive account of Ireland's economic resources, was issued in June, 1901.

A word as to its scope. It was thought well to take the opportunity afforded by the publication of such a work to make it something more—indeed, something other—than an ordinary guide to the Irish Pavilion. The book opens with a description of the general geological and physiographic features of the country, followed by articles on the climate, flora and fauna of Ireland. An analysis of the economic distribution of the population is then given, preliminary to an account of the internal means of communication, and the banking facilities of the country. The next Section is devoted to agricultural and technical education and art instruction. As leading up to the functions of the State Departments in regard to agriculture and industry, an account is given of the splendid work done by some of the great voluntary associations of Ireland in developing the material resources of the country. Two chapters are occupied with a necessarily curtailed analysis of the work of the Congested Districts Board, and the powers and constitution of the Department of Agriculture and Technical Instruction for Ireland. The principal institutions of Science and Art, which have now passed under the control of the Department, are briefly described. Special articles deal with agriculture, live stock, sea and inland fisheries, shipbuilding, the linen industry, the modern Irish lace industry, and the Art and Cottage industries of Ireland. The articles to which no names are attached in the Table of Contents were, with one or two exceptions, prepared by the Editor, or compiled in the Statistics and Intelligence Branch.

The present issue of IRELAND; INDUSTRIAL AND AGRICULTURAL, is

more than a new edition; it is practically a new book. No fewer than 250 pages of entirely fresh matter have been added; quite a dozen of the original articles have been re-written, and considerably amplified, and every contribution has been revised and, as far as possible, brought up to date. In addition a full Index has been appended. The new contributions include articles on the brewing and distilling industries; the bacon-curing industry; the milling industry; the leather and tanning industry; the Derry shirt-making industry; Irish canals; the Royal Agricultural Improvement Society of Ireland, and the North-West Agricultural Association. The book is still, no doubt, imperfect, if considered as a complete survey of Ireland's economic resources; but, within its necessary limits, it presents, perhaps, a fuller and a fairer statement of the actual industrial position of this country than is contained in any other single volume. It is hoped, therefore, that, for several years to come, IRELAND; INDUSTRIAL AND AGRICULTURAL, may serve as a useful book of reference, which, if it does not always fully satisfy intelligent curiosity, will at least stimulate thought and suggest lines of enquiry. Economic Ireland is still a *terra incognita* to too large a number, even of Irishmen. The material resources of this country have, in turn, been unduly exaggerated and underrated. An unreasoning optimism, and an equally thoughtless pessimism have, too often, been substituted for the calm observation and consideration of facts quite accessible to scientific tests. In the following pages will be found what is believed to be an unbiassed account of Ireland's Economic and Industrial position at the dawn of the twentieth century, with some statement of the historical events that have led up to that position. Such a narrative is essential to any serious study of the "Irish Problem"—but, needless to say, it does not compass the whole of that problem. Issues, vital to its full consideration—the question of land tenure, for example—have, of necessity, been omitted from the present volume, for reasons that ought to be obvious. Such issues, however, are precisely those least likely to be overlooked in this country, or in Great Britain, and are those, also, on which a very large amount of information is already easily available in other publications. On the other hand, the matters—vital ones, too, to the progress of Ireland—discussed in this work, deal with questions on many of which full and trustworthy information has not hitherto been generally accessible, and in regard to which, public opinion is not yet sufficiently enlightened.

The Editor has again to thank the following for permission to use, for the purposes of illustration, certain blocks of which they held the copyright:—The SECRETARY, Board of Education, London; The Arts and Crafts Society of Ireland; Messrs. WITHERBY AND SON, the publishers of *Knowledge*; Messrs. CHARLES GRIFFIN AND CO., the publishers of

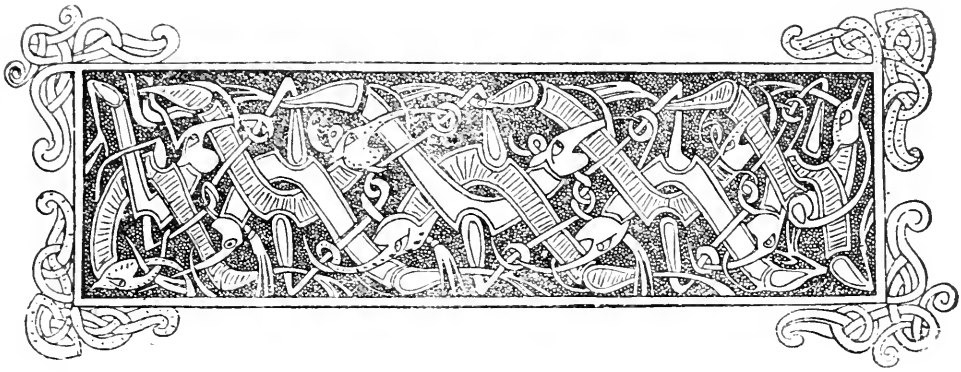
Professor Grenville Cole's *Open Air Studies in Geology*; Messrs. GUY AND Co., of Limerick and Cork, and the publishers of the *Irish Naturalist*. Miss MITCHELL has prepared the Index.

Messrs. BROWNE AND NOLAN, Limited, of Nassau-street, have printed and published this revised edition in accordance with the terms of a special agreement with the Department of Agriculture and Technical Instruction for Ireland. Its Typographical and other merits—the work is printed on a specially made Irish paper—are the best evidence of the care and taste which that firm have brought to the enterprise. In the literary preparation of the volume, and in the arduous work of proof reading, Mr. THOMAS BUTLER, a Staff Officer in the Statistics and Intelligence Branch, and Messrs. WALTER E. CALLAN (who is a joint author of the important article on "The Brewing Industry"), and ERNEST A. MORRIS, two other members of my staff, have given me valuable assistance. It is unnecessary to add that without the unstinted and invaluable aid of my colleagues in the Department, and the other contributors, this work would not have been possible.

WILLIAM P. COYNE,

Superintendent of Statistics and Intelligence Branch,
Department of Agriculture and Technical Instruction for Ireland.

June, 1902.



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THE TOPOGRAPHY AND GEOLOGY OF IRELAND.

IRELAND, lying on the western rim of the great Eurasian continent, occupies a position of extreme geological interest. The line along which a large body of water meets with continental land is now recognised as one of instability and unrest. It has long been obvious that the breakers are wearing away the rocks at one point, while at another they are depositing beds of shingle and fine sand. But, at the same time, the very floor of the ocean is rising or falling with the slow movements of the crust; the ocean is thus forced to recede before the elevation of a new coast-line, or is allowed, by subsidence, to creep in upon the land. Each movement, this way or that, leaves its record in the rocks. The masses that are already solid become crumpled together like a cloth; old marine deposits are forced up to form the outposts of a continent, until we find the shells entombed in them lying thousands of feet above the sea; or the land surface, carved by rain and rivers, sinks beyond the reach of the destroying agents, and is gently buried beneath sheets of sediment in the ocean. The resistance or yielding of the border-lands that protect a continent often determines the fate of the continent itself. The rocks of Ireland thus record the main features of the history of Western Europe.

The present outline of the country is, geologically speaking, of modern date. The island rises, in fact, from the continental plateau, and is essentially a part of Europe. The line marking a depth of 100 fathoms upon the Admiralty charts runs from Norway, outside the Shetlands and the Outer Hebrides, keeps west of the Irish coast by 25 to 100 miles, and then passes down southward until it almost touches Spain. Beyond this line, the depths increase rapidly, as we reach true oceanic waters. Only 100 miles west of Co. Mayo, we find a depth of 1,000 fathoms, and 300 miles west of Co. Kerry we have the abyssal depth of 2,700 fathoms, or more than 16,000 feet. On the east, the channel between Ireland and Scotland is, at one point, only thirteen miles wide; and at Wexford it is only some fifty miles across to Wales. Between Stranraer and Larne, there is a singular depression, reaching down to 140 fathoms (840 feet); but this is quite local, and the sea between Ireland and Great Britain is rarely deeper than seventy fathoms. The small granite hills of Killiney, in Co. Dublin, could be cut off at the sea level and pushed across from Kingstown to Holyhead, without their summits ever becoming covered by the waves. On the other side of England, the broad North Sea, except for one channel that reaches down to 300 fathoms close against the Norwegian coast, is similarly a mere film of water on the submerged plateau, and is rarely fifty fathoms deep. The connexion of Ireland with the continental mass is further emphasised when we note the outline of its coast. On the east, it is fairly smooth, with few conspicuous inlets; on the west the sea runs up by a number of long valleys into the land. This is the essential feature of the indented western coast of Scotland, and of the corresponding coast of Norway; in fact, the edge

of Europe possesses the same characters from Bantry Bay to the North Cape.

In general surface Ireland may be described as basin-shaped. The traveller will be struck by the mountainous appearance of the coast. Journeying westward from Holyhead, he may see from afar the blue line of the Wicklow Mountains, rising 2,000 to 3,000 feet above the sea. As he approaches Dublin, the details become clear; the rounded bosses of Killiney, the bold promontories of Howth and Bray, the broken masses of the foothills above Enniskerry, are only a foreground for that great granite moorland, which extends for seventy miles into the south. At Greenore he meets a still more picturesque coast, the huge domes of the Mourne Mountains contrasting with the rugged Carlingford ridge, above the quiet water that stretches up to Newry. At Belfast the rim of the country is presented to him in the form of long black scraps, terraced and forbidding, the edges of the high plateaux that spread from Carrickfergus away to Limavady. If our traveller passes westward, and rounds the coast of Donegal and Mayo, he views walls of rock at times 2,000 feet in height, the noblest cliffs in all the British Isles; he then encounters rugged Connemara, and the high limestone terraces of northern Clare. Farther south, peak after peak, range after range, bars him out from the interior of the country, culminating in the grey and cloud-capped masses that look down on Bantry Bay.

Surely this Ireland must be a land of mountains. Yet the same traveller may cross from Dublin to Galway, a distance of 115 miles, without encountering a genuine hill upon the way. He may pass, again, from Dundalk to Mallow, and will feel himself in a great plain, above which a few ranges rise, quite unimportant when compared with the extent of brown bog and level meadow land. The highlands of Ireland are, in fact, massed upon its margin; while the central area is a broad depression, in which numerous bogs and lakes have gathered. There is thus no well-defined watershed in the country, with rivers radiating from it. It seems much a matter of chance whether a stream rising in one of the central counties should run into the Irish Channel or the Atlantic. The plain is, in fact, a sort of gathering ground for the waters that trickle from the surrounding hills, and for the sand and gravel that they wash down.

It is well known that definite mountain-ranges result from the crumpling together of rocks in the earth's crust, and that this crumpling has been repeated after very long intervals of time. M. Bertrand and Professor Suess have shown us how the main folds in Europe can be grouped into four series, each of which has probably some representative in Ireland. By its very mode of occurrence on the spherical surface of the earth, an upward fold, called by geologists an *anticlinal*, is accompanied by a downward fold, styled a *synclinal*; and commonly a number of anticlinals and synclinals occur together, giving us a *contorted series* (Fig. 2). The results of earth movements are complicated by actual fracturing of the crust; and the rise of one region usually implies the breaking up and falling in of another. When we examine the mountain chains in detail, it by no means follows that the crests of ridges are formed by individual anticlinals. Where the rocks are brought up from below in the crowns of the folds are such as resist the atmospheric agents, while softer beds lie in the synclinals, the rise and fall of the weathered surface may correspond fairly with the underlying folds. This is beautifully exemplified throughout the south of Ireland. Commonly, however, the surface ridges give us little clue to the precise type of fold that underlies them. A synclinal of resisting rock, like

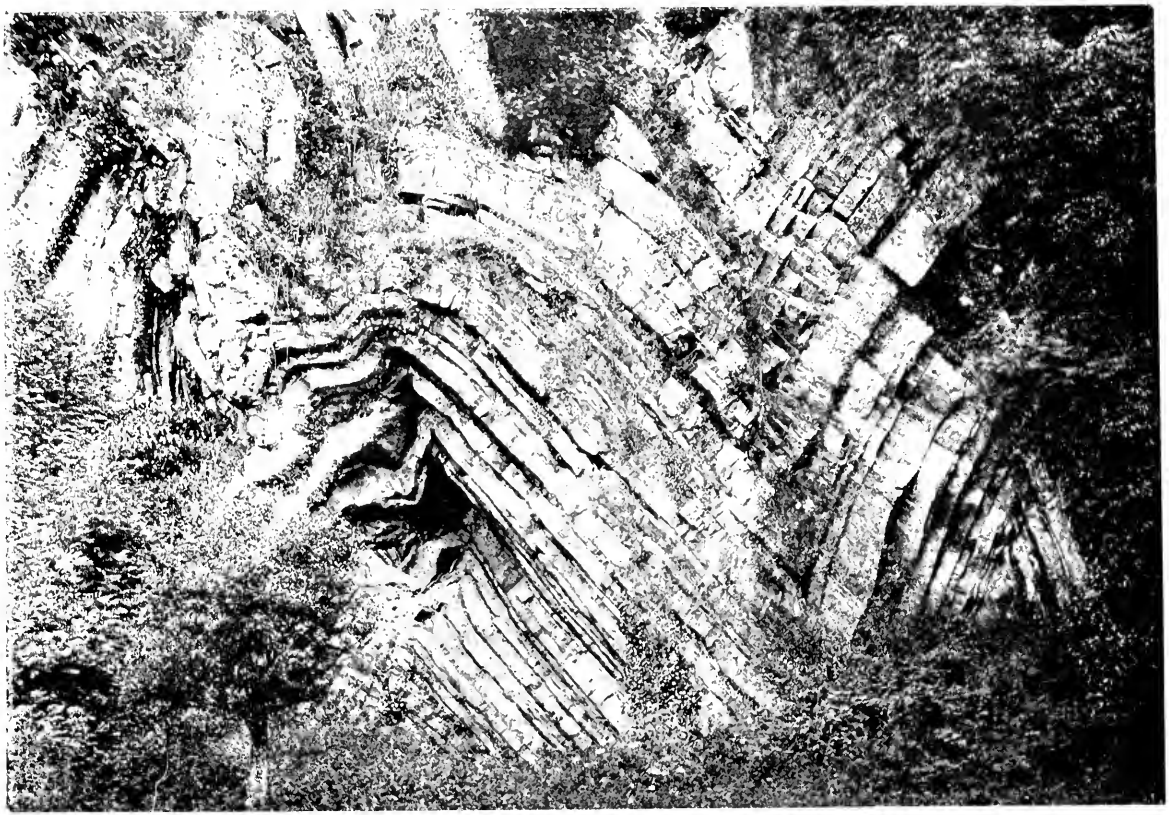

FIG. II. FOLDS IN CARBONIFEROUS LIMESTONE, BEAUPARC, CO. MEATH.

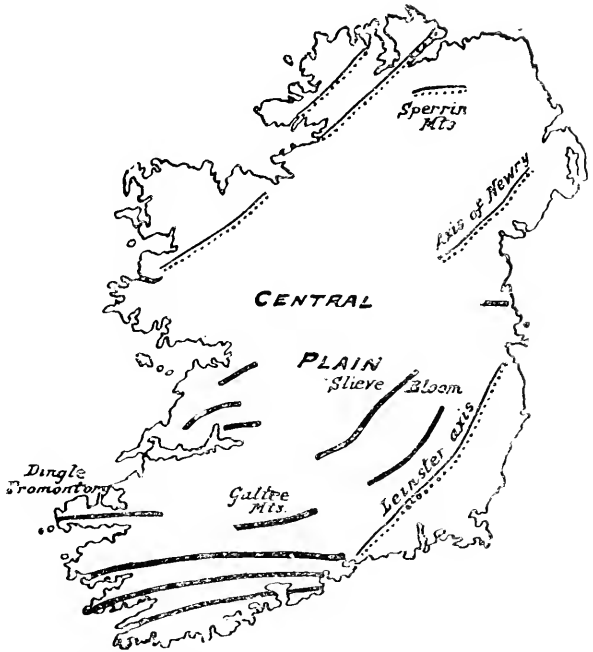

FIG. III. STRUCTURAL LINES OF IRELAND. DOTTED LINES TREND OF CALEDONIAN FOLDS; THICK LINES TREND OF HERCYNIAN FOLDS.

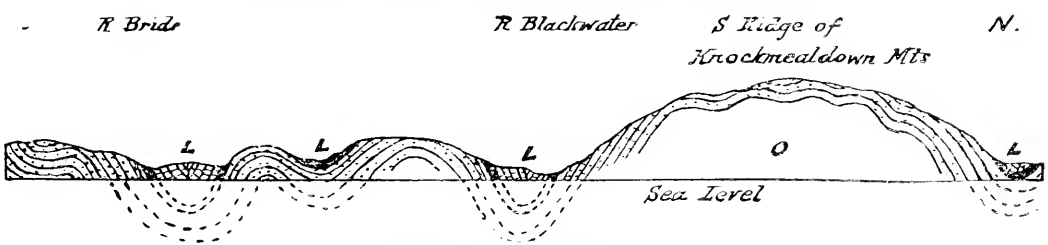

FIG. IV. SECTION OF FOLDS IN S. IRELAND.

Length, 9¾ miles; vertical scale, 4½ times the horizontal.
L, Carboniferous Limestone in synclinals; *O*. Anticlinal Ridges of Old Red Sandstone.

[After Mr. A. B. WYNNE,

the coal-measures of Kilkenny, may be left standing out as a highland, while an anticlinal, fractured at the top and exposed to rapid denudation, may be the first mass to be worn away. The general trend of mountain ranges, however, is determined by the directions of the axes of their folds.

Before the existence of the Cambrian fauna, which is the first well-marked assemblage of life-forms upon the globe, the still older crust had become locally crushed and folded, giving rise to the "Huronian" system of mountain chains. The sediments laid down in periods earlier than the Cambrian were thus converted into gleaming mica-schists and hard flinty quartzites; limestones became altered into crystalline marbles, and volcanic rocks into tough and dark amphibolites. Molten masses oozed into these from below, baking and often dissolving them, and giving rise, when consolidation took place to granites, and, more especially, to the striped and streaky type of granite known as gneiss. These materials formed the hills and shores against which the Cambrian strata were laid down. In Ireland, there are but few traces of these "Huronian" chains. Yet they existed, and probably underlie part of the north-western highlands. Their gnarled and twisted rocks are clearly visible in Western Sutherland and the Outer Hebrides, and this axis, if continued southward, should reappear in Donegal and Mayo. But, as we shall see later, the existing features of these areas owe most of their characters to the later "Caledonian" folding.

Blocks of crumpled and gneissic rocks, however, are found included in Tyrone in the granites that are connected with the "Caledonian" folds. Clearly, then, an ancient gneissic floor existed where Ireland now is, and became broken up and involved in all the later movements. A great part of the tumbled uplands of the county of Londonderry, from Limavady westward, and almost the whole of Donegal, are composed of crystalline rocks which are the oldest in the country. Mayo and Connemara also continue the same series, until it is lost to sight under Galway Bay. These romantic highlands, now carved out into peaks and ridges, with little lakes nestling in their hollows, carry us back to a time when Ireland, as we know it, had no separate existence, and formed a region on the edge of a great continent stretching north towards the pole.

North-West Highlands.

We do not know if any "Cambrian" rocks were laid down in the Irish area, or if it remained in that period above the sea. Possibly the slates and quartzites of Howth and Bray, and their southern representatives in the lower land near Wexford, belong to the same period as the Cambrian slates of Wales. The Great Sugarloaf, in Co. Wicklow, owes its beautiful form to the uptilting of a bed of altered sandstone (quartzite) belonging to this early series; the hard rock forms the peak, and its debris are showered, like a crown of snow, upon the slopes. The broken surface of Bray Head and of the promontory of Howth is due to the resistance of masses of similar quartzite among the more easily weathered slates and shales.

Bray Head Area.

The "Ordovician" or "Lower Silurian" strata were deposited almost continuously over the Irish area, followed by the *Gotlandian* (*Upper Silurian* of the Geological Survey maps). The edge of the northern continent must have dipped beneath the sea, and sands and muds were washed down from it, while beds of limestone, due to the growth of shell-fish and corals, accumulated off its shores. Such limestones are traceable in the Chair of Kildare, and at Portrane, near Dublin, full of Ordovician fossils

The more ordinary muddy sediments are now found in the foothills of the Leinster chain, and also in a broad area stretching from Drogheda and Cavan to Belfast Lough.

At the close of Silurian times, the subterranean forces began their work again in Europe. Volcanic eruptions had already indicated a considerable amount of unrest. Off Portrane, a cone had been reared, spouting out its lavas and ashes into the sea in which the corals grew—an interesting precursor of the conditions that prevail in the Pacific of to-day. The neck of this volcano, cold and crystalline, now forms Lambay Island; and the famous green "Lambay porphyry" is the mass that last consolidated in the vent. In Kerry again, we have a unique little volcano, of Gotlandian age, which has left its lavas and banks of agglomerate in the cliffs of the Dingle promontory. Then the wrinkling of the crust set in. A series of huge folds were formed, with axes running north-east and south-west. Sometimes these were pressed over obliquely, and became broken through, while one part moved over another along surfaces of sliding known as thrust-planes. Old rocks, that ought to have been comfortably buried down below, were thus brought to the surface, and became piled on others of far later date. The Huronian chains were in part remoulded, and fragments of them were worked up into these new *Caledonian chains*. The latter take their name from the Grampian region, which was conspicuously involved in these disturbances at the close of Silurian times. Thus some of the leading lines of Ireland became early impressed upon our area. The north-east and south-west "Caledonian" trend, the trend of the axes in Scandinavia and in Scotland, is clearly seen in the structure of Donegal and the Ox Mountains, in the axis from Cavan to Belfast, and notably in the Leinster chain. The folding was accompanied by the uprise of molten granite from below. This hot igneous rock, squeezed upward by the earth pressures, filled the arches of the anticlinals, inch by inch, as they were formed. It attacked its surroundings, melting mass after mass from the walls, absorbing them into its substance, and sending insidious offshoots into the adjacent shales and sandstones. The sedimentary rocks forming the arches thus became baked and crystalline, and in places are bound to the invading granite by a network of interlacing veins. As the weather worked down against the uprising chains, the coating of sediments was often worn away, and the granite, now cold and hard, was exposed as a moorland in the midst.

Portrane and Lambay Island.

The backbone of Leinster, running south-west from Dalkey to the junction of the Barrow and the Nore, a distance of seventy miles, was thus formed by the Caledonian movements. On its flanks, Ordovician, and, perhaps, Gotlandian, strata, rise in contorted masses, consisting of dark shales for the most part, and easily cut into by the rivers that flow from the central axis. Picturesque ravines and valleys, like those of the upper Liffey, with woods and old demesnes along them, mark this region on the east or west. In Wicklow, similar features, including the Glen of the Downs and the Devil's Glen, have been carved out of the older strata of the Bray series, which have also become involved in the flanks of the chain. As a contrast to this varied country, the high moors of Dublin, Wicklow, and Carlow, stretch in a uniform series of great domes, heather-clad and impressive in their vastness, where the granite core comes to light along the axis of the chain.

The Leinster Chain.

This rock, with its broad even joints and powdery products of weathering, gives rise in the course of ages to round-backed hills, with few conspicuous peaks, and with valleys smoothed by crumbling débris. The contrast between its characters and those of the stratified masses round it is well seen at the Upper Lake of Glendalough (Fig. 1), where the sheer walls of shale and schist abut on the spurs of Lugnaquilla.

The Axis of Newry.

In the corresponding axis of Newry, granite has similarly welled up, and at Castlewellan it is seen to be stuck full of fragments derived from its stratified neighbours. The whole Newry granite probably owes its darkened character to the material absorbed by it; and the inclusions in it are often completely altered and crystalline, and are penetrated on a microscopic scale by the granite that attacked them. The Ordovician and Gotlandian rocks of Louth, Monaghan, and Down, form a broken country of small and frequent hills, with one of the most irregular surfaces to be found in Ireland.

East Tyrone.

As already hinted, the west and north-west highlands were certainly refolded in Caledonian times. Old knots of gneiss, like that of East Tyrone, had the younger masses pressed against them, and formed "eyes" round which the Caledonian earth-waves flowed. Granite veins traversed them, becoming especially conspicuous in the counties of Mayo and Donegal. It is often difficult to distinguish between the older Huronian granites and the new, throughout this mingled region of the West. But

The Ox Mountains.

the trend of the Ox Mountains, with their granite core, invading the schists and amphibolites, and running from Castlebar to Sligo, and the lines of fold and fracture in Donegal, such as the great glen from Gweebarra Bay to Sheep Haven, are clearly due to

Highlands of Donegal and Mayo.

the Caledonian system of movements. At the same time, the Gotlandian beds were uplifted high and dry in Mayo, and have since been carved out into the noble masses of Muilrea and Ben Gorm, which look down on Killary Harbour. The quartzite cone of Croagh Patrick is now known to belong to the same series of strata, which have thus contributed largely to the rugged scenery of the west.

This uplift at the close of Gotlandian times formed a continental area on which detritus began to gather, while the great lakes spread across the hollows. The sea still lay to the south-east across Devonshire and Belgium; but the Irish and Scotch areas were included in the land. The weather soon laid hold of the Caledonian masses, and rolled down sand and pebbles from them into the lakes. Under the burden of débris thus poured into them, the lake floors sank, as those of Eastern Africa have done since the time of their formation, and thousands of feet of freshwater strata were thus enabled to accumulate. This was the origin of the *Old Red Sandstone*, laid down in the *Devonian* period.

The boundaries of the old lakes are nowadays difficult to determine. The sandstone and conglomerate that form a hilly land between Lough Erne and Pomeroy may have been at one time continuous with corresponding beds in Southern Scotland. The great masses of the south of Ireland may have been connected on the east with the Devonian estuary of Hereford and Wales. In any case, the lake deposits extended far and wide across

our area, and their sandy nature has contributed markedly to the scenic features of the south.

The continental region again sank, and the sea flowed gently in, every year farther and farther, across the borders of the lakes. The *Carboniferous* period dawned. The Caledonian ridges remained long above the level of the waves, in the form of promontories and islands. The sea thus stole round the Leinster Chain, washed, and finally submerged the isles of Bray and Howth, and Lambay, and spread far to westward, dominating even the stubborn hills of Donegal. Patches of Carboniferous sandstone, laid down on the ancient shore, still cap some of the Caledonian masses in the West. The submergence was here less marked, however, and the coal-beds of Ballycastle, in county Antrim, occurring in the lowest Carboniferous strata, show that a coast, with its accompanying forests and deltas, was near at hand upon the north.

Ballycastle Coal.

The Carboniferous sea was an extensive one—a veritable ocean. Marine life was abundant in it, and foraminifera, corals, and shell-fish of all kinds, formed vast thicknesses of limestone on its floor. Here and there, the muds washed in from the relics of the Caledonian mass rendered the water turbid, and gave rise to the black shaly limestone locally known as calp. Elsewhere, even up to the shore-line, the deposits were remarkable for their purity. It is possible that no great rivers were scouring the adjacent land. The sea-floor went on sinking, the limestone grew in thickness, and to this day it forms the most continuous and most characteristic of all the Irish deposits.

The period closed with a general uplift, as gentle as that which had admitted the sea across the lakes. On the flats and deltas thus formed, the forests of the Coal Measures grew; and there is little doubt that at one time they extended far across Ireland. Tree-ferns, and giant club-mosses and horse-tails, the familiar vegetation of that remote epoch, clothed the Leinster Chain, spread westward into Kerry, and sheltered among the Caledonian ribs of Donegal. Very little of the coal that was formed by the decay of all these forests has, however, been left to Ireland. The new wrinklings of the crust wrought havoc with this valuable material (Fig. 2).

With the close of the Carboniferous period, the third important epoch of earth-movement in Europe gave us the *Hercynian* folds, so named from the region of the forest-ranges in Western Germany. The general trend of their axes is from west to east. The floor of Belgium, of southern England and Wales, and of southern Ireland, became crumpled from south to north like a cloth pushed back across a table. As the slowly heaving earth-waves met the Caledonian masses, some deviation from the general trend took place, usually producing a conformity with the direction of the earlier axes. Thus, in England, the recoil from the tough old masses of Westmoreland and Wales drove the axis of the Pennine Chain into a north and south direction, perpendicular to that of the southern folds, which are seen in Wales and under London. In Waterford, Cork, and Kerry, the east and west trend is distinct and unimpeded; but the Hercynian anticlinal from Limerick to Portarlington, including the Slieve Bloom Mountains, follows the direction of the far older Leinster Chain. Away, again, in the north-west, it is probable that the antique core of the Ox Mountains served to direct the course of the earth-wave which rose against its slopes in Hercynian times.

Mountain ridges of Southern Ireland.

The crumpling of Cork and Kerry was of immense significance to the scenery of southern Ireland. The crests of the anticlinals were at first formed of Coal Measures, of Carboniferous Limestone, and, in places, of Carboniferous Slate. These rocks were stripped off by weathering, and the Old Red Sandstone lay revealed below (Fig. 4).

The action of the atmosphere was hereupon greatly retarded, while it could still carve away at the softer and often soluble strata that occupied the synclinal folds. Hence the anticlinals weathered out as ridges, running east and west, and the synclinals were worked down into valleys. The structure of the whole south is as simple as that of the Jura Range, when we take a broad survey of that classic area.

The beds are, however, so compressed together as to be often overfolded; and numerous minor wrinkles accompany the main and obvious ones. In the eastern area, the prevailing structure is evidenced by the courses of the Bandon River, the Lee, the Bride, the Upper Blackwater, and the lower portion of the Suir. All these rivers run east along synclinal hollows, which are mostly still filled by Carboniferous Limestone. West of the watershed that passes through the Boggeragh and Derrynasaggart Mountains, the streams run similarly along synclinals to the Atlantic; but their former valleys have been largely invaded by the sea, owing to subsidence of the coast in comparatively recent times.

Courses of Rivers in Southern Ireland.

The courses of the rivers in southern Ireland at the present day are thus clearly dependent on the direction of the Hercynian folds. But some of them, like the Lee and the Blackwater, seem at last to defy the anticlinal and synclinal axes, by turning abruptly south and cutting across them. Professor Jukes long ago supplied the explanation of this bending of the streams at right angles to what appears to be their proper course. The earliest drainage from the mass that was upheaved at the close of the Carboniferous times gave us a system of streams running north and south. The general wearing down of the surface by denudation, in long subsequent times, carved out the systems of east-and-west valleys in the synclinals, and in these the tributaries of the main streams ran. But certain southward-running streams, having got the start, and working down the steep slope of the country, kept ahead of the tributaries, and maintained their own valleys at a lower level. Hence, although these tributaries spread farther and farther back, and became in time the most important portions of the rivers, their waters were still turned south where they joined the original gorges. As Professor Davis shows us, moreover, only the more active of the southward-running streams would cut their way down at a sufficient rate. While the valleys grew deeper along the synclinals, some of the tributaries would altogether fail to get into their original main streams; the latter would be, as it were, "beheaded," and would dwindle, while their former tributaries would swell the volume of the nearest successful primary stream.

Hence the rivers of southern Ireland, and, indeed, of Ireland generally, are older than the present form of the surface. General denudation has lowered and widened their valleys in some places, leaving other parts of the adjacent country standing at a higher level; and the rivers seem to cut across mountain-ridges, because the hard rocks of these ridges have resisted denudation, while the gathering-ground of the rivers, up stream, has been more rapidly worn down.

The original Hercynian mass was far more continuous than the present ridges, which have been carved out by ages and ages of denudation. We

have pointed out that the Old Red Sandstone, where now exposed, once bore upon its back the thick mass of Carboniferous Limestone, and this in turn was covered by the Coal Measures. The loss of the latter is surely atoned for by the magnificent mountain-scenery to which the Old Red Sandstone has given rise. The Reeks of Kerry, the brown and purple masses of Killarney, the bare and grey rock-walls that look down on so many romantic valleys of the west, result from the exposure of the lake deposits of Devonian times. The terraced structure of the original stratification, bed upon bed, is characteristic of these mountain-sides, and is nowhere more clearly seen than in the neighbourhood of Derrynane and Waterville. On the east, the anticlinal ridges are more rounded and broad-backed; but fine craggy combes occur in the Galtees and in the Comeraghs, and the Old Red Sandstone country is still given over to moor and heather. (Fig. 5).

Mountains of Kerry.

The contrast between the scenery of the Old Red Sandstone and that of the easily denuded Carboniferous strata is finely revealed around Killarney. The Upper Lake lies among the mountains; the Lower Lake, with its flat northern shores and its low islets, lies on Carboniferous Limestone, and reminds one of the features of the central plain.

Killarney.

In the Dingle Promontory, a great unconformity separates two divisions of the Old Red Sandstone. The earth-movements disturbed the lower beds during the course of the Devonian period, and the later strata were laid down across their upturned edges. Were these movements belated relics of the Caledonian folding, or precursors of the Hercynian? At various points we meet with evidence of this kind, showing that the crust is never really at rest, although we mark out certain epochs of calm, and others marked by strenuous folding.

The Coal Measures still remain spread across the country from Killarney to Galway Bay, but are unproductive from a mining point of view. They have been swept off eastern Limerick and from most of Tipperary; in the mountains round Lough Derg and in the Galtees, even the Old Red Sandstone has been cut through, and the Gotlandian and Ordovician rocks have come to light. But a broad synclinal lies between the joint Slieve Bloom and Devil's-Bit Range and the Leinster Chain: and in the centre of this the high Kilkenny Coal-field stands. The Barrow on the east, and the Nore on the west, have cut out valleys which limit the intervening mass of Coal Measures; from either stream, the ground rises to the plateau of Castlecomer, in a series of scarps which remind one of those of Yorkshire, or of the edges of the similar synclinal coal-field of the Forest of Dean. The coal is anthracite, but has long been mined for local purposes.

The Kilkenny Coal-field.

On the west of the Coal Measures of this area, where the head-waters of the Suir and the Nore have exposed the Carboniferous Limestone, the country is a fairly level and plain-like region, in which the rivers wander. When, indeed, we round the coal-field at Stradbally, we look out over the true plain of Kildare, where brown bogs gather in the hollows, the haunt of plovers and nestling gulls, and where green demesnes and broad meadows speak of the fertility of the soil. Here there is no rapid repetition of sandstone ridges and softer pastoral synclinals; on the other hand, one vast and shallow synclinal stretches from the Slieve Bloom Range to the Ox

FIG. V. PASS OF BALLYBEAMAGH, CO. KERRY. SCENERY OF THE OLD RED SANDSTONE.

FIG. VI. ON THE GREAT CENTRAL LIMESTONE PLAIN OF IRELAND, NEAR BALLINASLOE, CO. GALWAY.

The Central Plain.

Mountains and Donegal Bay. The scenery partakes, in consequence, of the underlying geological monotony; the features of the cramped southern synclinals are here spread out over the half of Ireland (Fig. 6).

Yet the landscape is soft and pleasing, tender in its tints of green and brown; here and there the view is bounded by far blue hills, which lie always on the horizon, and which retain the same distant air throughout the journey of a summer day. Long ridges and heaps of gravel, the familiar "green hills," are the only elevations near at hand. The great cumulus clouds that throw their shadows across the plain seem an essential portion of the landscape; the heavens and the earth here meet in a unity unknown amongst the sterner mountains. The sun shines out upon the white waters of a lake, fringed, perhaps, with a belt of larches or Scotch firs. The edge of the lake seems quite an accidental boundary, and the stones, when the water sinks sufficiently low, are seen to be excavated by solution into fantastic forms along the shores.

Lough Corrib.

Lough Corrib itself, with its low and flat-topped islands, is only a watery region of the plain. The eastern part of Lough Mask belongs, similarly, to the limestone area, while the ancient Silurian rocks rise in sudden dignity on its western shore.

Clew Bay.

Clew Bay, dotted with islets, is merely another lake of the Carboniferous Limestone region, into which the sea has become admitted in comparatively recent times.

The great and shallow synclinal which thus provides such uniformity of feature is split into two on the north-east by the old Caledonian axis of Newry, which runs in reality from Co. Longford to the coast near Strangford Lough. Hence, in this region, a tumbled and rougher country intervenes between the grazing-grounds of Meath and the lowlands of Lough Erne. The road from Dublin to Belturbet provides a characteristic traverse of the old floor of Ireland, which here again rises to the light of day, the watershed occurring in an almost highland landscape at Cross Keys.

The Shannon.

The Shannon, after its first rapid drop from Cuilcagh, a scarp of Upper Carboniferous Sandstone in Fermanagh, becomes essentially a river of the plain. It wanders south through the broad limestone country, in an independent and unbounded fashion, now and again expanding into lakes, which are enlarged by the actual solution of their shores. At the south end of Lough Derg, it cuts across the local anticlines, amid mountain-scenery at Killaloe; but it then winds again over ledges of limestone to Castleconnell and the Atlantic. The Erne is a river of the same class, in which the lake-feature has become predominant. Lough Oughter, with its abundant islands, is really only a network of branches of the stream. Upper Lough Erne is little more; the wanderings of the river, in materials so easily removed, have here made it assume the aspect of a lake, the islets remaining as relics of its former banks. Lower Lough Erne possesses bolder features; but here we are in an area of more complex geological structure. On the south-west, bold masses of Carboniferous sandstone, and even the Coal Measure cappings of Arigna and Lough Allen, have escaped the general denudation.

Arigna Coal-field.

The out-liers of coal-bearing strata on these hills are a melancholy reminder of the amount that has been washed away from the great plain to southward. The Carboniferous Limestone also has here been lifted into prominence, and inland cliffs and scarps

are weathered out of it, forming superb features in the landscapes north of Sligo.

The whole of the limestone region is marked, as in other countries, by the disappearance and reappearance of streams, which often run for long distances underground, and by the prevalence of caves produced by solution along these subterranean waterways.

Tyrone Coal-field.

At Dungannon, south-west of Lough Neagh, in a country where the limestone surface is more irregular than in the south, a patch of Coal Measures, containing ordinary household coal, has by good fortune been preserved. It is in part covered by later deposits, and forms an unexpected region of mining industry, close to the moors of Tyrone and Londonderry, where the Caledonian chains, and even still older ridges, come to light.

The Hercynian folding lifted the Carboniferous beds to a fatal height upon these north-west highlands, and only outliers remain to show their former extent. From Dungannon to Lough Foyle, however, a fairly continuous band of sandstones represents the shore deposits of the old Carboniferous sea. As already mentioned, coal occurs in these strata away to the north at Ballycastle.

It must not be supposed that the Coal Measures were removed during a definite part of one geological period. Denudation, starting on the Hercynian chains, has been checked here and there for a time, and has then got to work again on the old surface of attack. The sum-total of the vicissitudes of the Irish region shows a large balance on the side of denudation.

After the great uplift at the close of Carboniferous times, the *Permian* sea flowed in upon the north, as it did over the corresponding English area. Then the *Triassic* period set in; and continental land, by a new swing upward, spread away for some 900 miles to the south-east. On its surface, deserts and shallow lakes occurred, the latter often drying up, and depositing layers of gypsum and rock-salt. Thus the conditions in Triassic Ireland were much like those of Utah at the present day. The gypsum of Kingscourt and the Belfast district, and the rock-salt now mined near Carrickfergus, show that deposits were laid down, comparable to those of Cheshire. The conglomerates of the same period have given a name to Red Bay, in Co. Antrim, where the red soil, when ploughed, reminds one of eastern Devonshire. From Portadown to Magilligan Point at the entry of Lough Foyle, these soft Triassic sandstones are traceable above the Carboniferous deposits. Yet they lie more often on the Carboniferous Limestone and the Lower Carboniferous Sandstone than on the Coal Measures, thus proving how far the denudation that accompanied the Hercynian upheaval had already stripped away the coal.

Rock-Salt of Carrickfergus.

Ireland was still destined to be denuded, rather than to be compensated for her previous losses. The Rhaetic and Jurassic sea, which stretched in again from the south-east, met with a shore in the ancient hills of Donegal. The downward dip of the area only allowed of the deposition of Liassic strata; while the continued subsidence in England, on the other hand, produced the well-known oolitic limestones of Bath and Portland, which are famous among building stones. The thin Irish representatives of the *Jurassic* system, the Lias clays of Co. Antrim, have a curious effect upon the landscape. Though little noticeable in themselves, they produce catastrophic landslips along the coast. The mass of chalk and basalt deposited

on them in later times squeezes out the clays and shales. The chalk, moreover, is permeated by water, and this accumulates on the clays below, providing a lubricated surface for a landslide. The coast road of Co. Antrim thus suffers at many spots from the movement of the cliffs above it, notably near Garron Point; and picturesque fallen masses and "undercliffs" result. The village of Straidkilly, on the heights, is noted for the shifting and warping of its buildings, as the ground slips beneath them. Precisely similar phenomena, in the same systems of strata, occur on the coast of Dorsetshire near Lyme Regis.

Landslips on the Coast Road of Co. Antrim.

At Portrush, the Lias is baked into a flinty porcellanous mass by the intrusion of basalt into it from below during the Eocene eruptions. It is well seen upon the north shore, close against the town, and still retains traces of ammonites and other fossils.

Lias of Portrush.

The long period of denudation during Jurassic times was followed by a subsidence, of the north at any rate, during the latter half of the *Cretaceous* period. Conglomerates and sandstones, true shore-deposits, herald the sea's return. How far the waters spread over central Ireland is quite uncertain, for Cretaceous beds are only preserved under the great outpouring of basalt that covers almost the whole county of Antrim. The White Limestone, representing the Chalk of England, is about one-tenth as thick as that of Norfolk, but was deposited in fairly deep water towards the close. The ocean spread westward, as is seen by the odd little outlier of chalk on the northern summit of Slieve Gallion, in Londonderry, now lifted 1,400 feet above the sea. The white cliffs near Portrush, and the beautiful band of white rocks, now coming down to the coast road, now receding far up in the hills, which stretches from Red Bay to Moira in Co. Down, belong to the pure oceanic deposits of the Cretaceous period. The contrast of this gleaming layer, now quarried for lime, with the grim black basalt crags above, is one of the most delightful in the country. Just south-east of Fair Head, above the wooded hollow of Murlough Bay, the chalk forms the summit of the cliff, with a band of coarse conglomerate under it; the latter was the shore-deposit, laid down when the land sank in mid-Cretaceous times. Beneath this are the far earlier continental layers of the red Triassic sandstone, reposing in turn on a floor of ancient metamorphic rocks, which were probably folded and crumpled by both the Huronian and the Caledonian earth-movements. The Carboniferous sandstone and the Eocene basalts close at hand complete this "picture in little" of the many changes that the Irish area has undergone.

White Limestone of Co. Antrim.

Murlough Bay.

The Cretaceous ocean passed away in turn from north-west Europe. The former ooze of the sea-bottom was uplifted as consolidated beds of chalk. The skeletons of siliceous sponges, and other similar remains, had by this time become altered and re-deposited in the mass as bands and lumps of flint. The weather scoured away the soft limestone, and left the almost insoluble flints as pebbles on the surface. Hence chalk downs were formed, comparable to those of Surrey and Sussex, and flint gravels accumulated in their combes and hollows, as they do in the Home Counties of England at the present day.

On this occasion, the movements were fraught with more serious consequences than the mere uplift of a continental margin. As they continued,

the chalk strata of Yorkshire became contorted, and those of Dorsetshire were in places set vertically on end. The Irish region was cracked across by numerous fissures, mostly running north-west and south-east, and molten lava oozed up these passages, and established a multitude of volcanic cones upon the surface. Sheet after sheet of lava was poured out across the undulating downs, filling up the hollows, burying the beds of gravel, and uniting with one another to form continuous and stratified layers. Little occurred in the way of explosive action. Here and there, as at Carrick-a-rede, a volcanic neck remains to us, choked with fragments of lava and chalk, torn off by the more violent eruptions; but on the whole the action was continuous and steady, until the broad land-area, from the Faroe Isles to Fermanagh, was covered with basalt, and was converted into a region of plateaux.

The Plateaux of Co. Antrim.

The cracks up which the lava welled are seen as dykes at the present day, the "whinstone dykes" of the northern peasantry, and stand out conspicuously across the white quarries of the chalk. The chalk is baked and rendered crystalline by contact with them, and is also compacted by the pressure of the mass of lava above; hence it has been justly styled the "White Limestone," in opposition to the soft English Chalk. The gravels above are reddened, and form a marked zone along the irregular surface of contact between the lava and the limestone (Fig. 7).

Occasionally, a more massive intrusion has taken place, and the great knot of lava has had its effect upon the modern landscape. The huge crag of Slemish, where St. Patrick tended his master's sheep, is the one true mountain of Co. Antrim, and towers above the plateaux by reason of its toughness and resistance. It is formed of dolerite, a completely crystalline type of basalt, and was doubtless the neck of one of the later volcanoes. Fair Head is similarly made of intrusive dolerite, and the crystals of augite and felspar in some of the veins traversing it are an inch or more in length. This coarse mass has given rise to a superb cliff that faces the northern ocean, and its vertical joints, produced as it cooled, enable the frost and other agents to throw down enormous blocks on to the talus at its foot, and to keep the main crag sheer and imposing.

Slemish.

Fair Head.

The jointing is here, indeed, actually columnar; and these regular shrinkage cracks, so characteristic of cooling lava, impart in many places an effect of titanic architecture to the cliff-walls of the Antrim coast. In successive tiers, the columns stand above one another, like those of some Roman amphitheatre. The bottom of each lava-flow cooled slowly, and the columns are there regular and well formed; the upper part cooled more rapidly, in contact with the variable currents of the air; and thus each great flow became divided into two layers, a basal one with well developed columns, and an upper one more rubbly and irregular. The next lava-flow spread over the older one, and the process of cooling was repeated. Here we have the secret of the alternation of columnar layers and duller bands at Pleaskin Head, and of the beautiful structure of the Giant's Causeway, which is the basal portion of a flow that is traceable at a far higher level up the cliff. The connexion between Staffa, an offshoot of the Mull volcano, and the Giant's Causeway, is, of course, mythical, except

Columnar Basalts.

The Giant's Causeway.

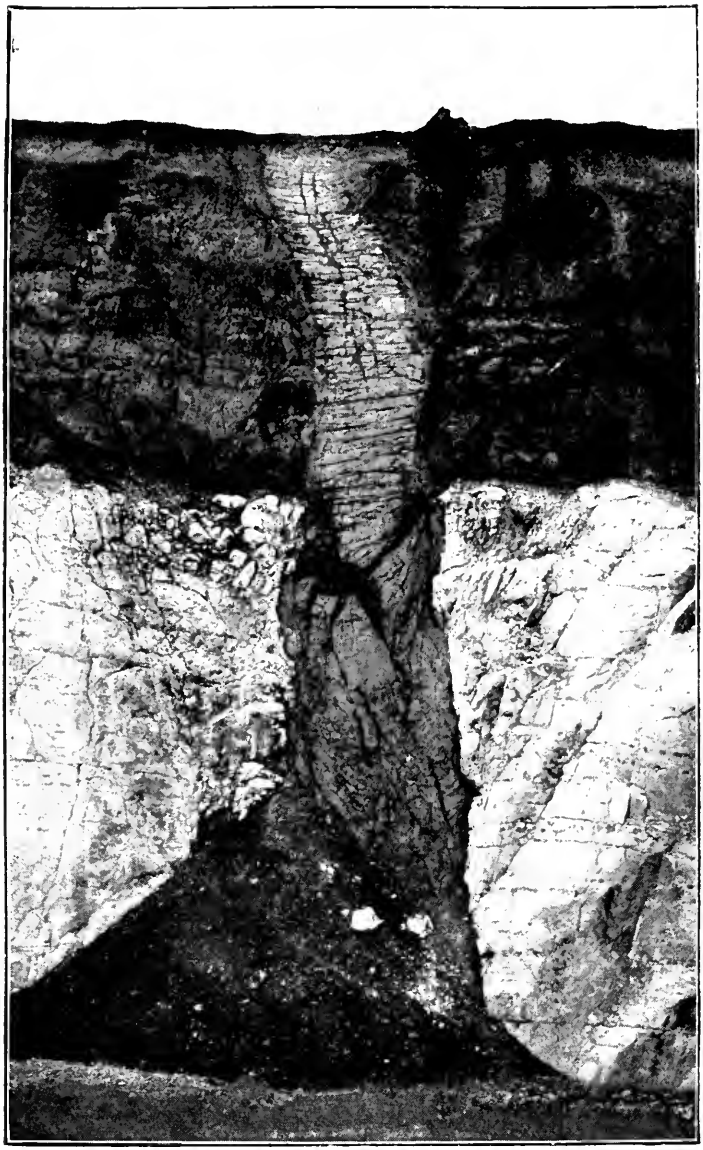

FIG. VII. DYKE, CUTTING CHALK AND BASALTIC LAVAS, CAVE HILL, BELFAST.

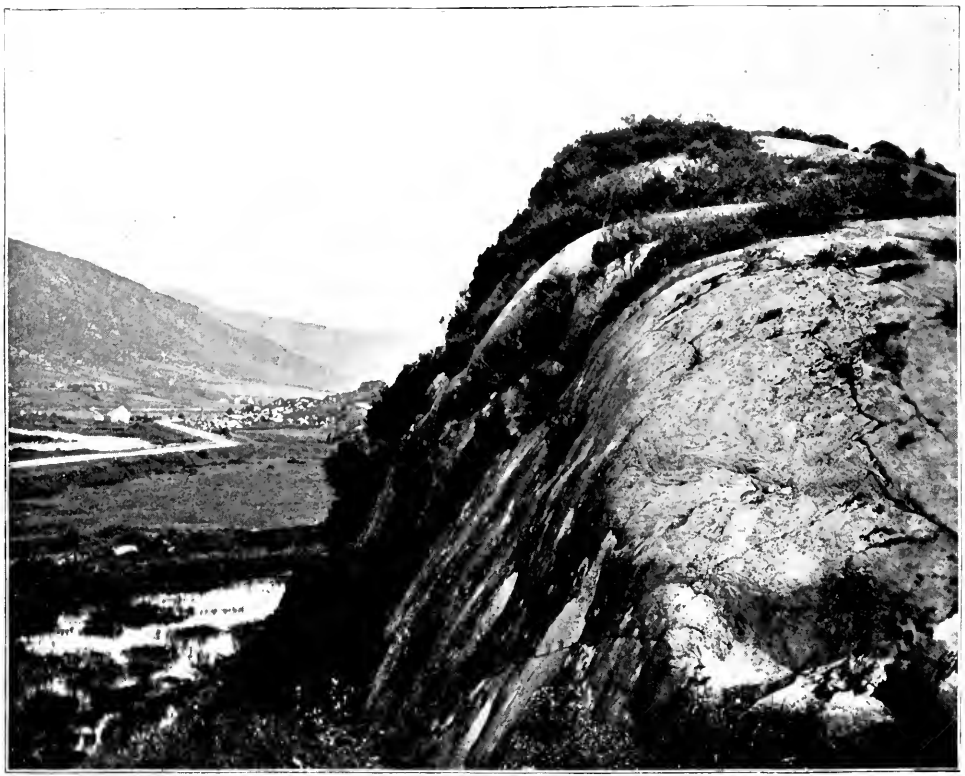

FIG. VIII. ICE-WORN ROCK, LOO BRIDGE, CO. KERRY.

in so far as both masses were poured out during the same geological epoch.

At Pleaskin Head and the Causeway, a red layer among the basalts easily attracts the eye. This is one of the bands of iron-ore which occur here and there in the basaltic region. They mark an incident that occurred about the middle of the volcanic epoch, when matters were calmer for a time, and when lakes accumulated in the hollows of the lava-flows. The waters entering them were highly charged with iron salts, brought into solution from the decomposing basalts round about, and the beds of more or less nodular ore consist of the insoluble products, which were deposited as these salts broke up on oxidation.

These stratified iron-ores are mined in Glenariff; and another still more valuable material is associated with them. The destruction of the lavas, and especially of the rhyolites which are about to be described, set free, as occasionally happens, a certain amount of aluminium in the form of a hydrate. This gives us a clayey substance, which is often mixed with true clay (hydrous aluminium silicate). This material accumulated in the lake-basins as a fine grey mud, and is known as bauxite, an important commercial source of aluminium.

While the eruptions of basalt were quiescent, a completely different type of lava, the highly silicious rhyolite, welled up here and there, and produced a white and almost granitic rock that is quarried in the dome-like hill of Tardree. Near at hand, on Sandy Braes, natural glass (Obsidian) was produced by the rapid cooling of these lavas.

The Mourne Mountains.

The main interest, however, of these sporadic outbursts of rhyolite lies in their probable connexion with the Mourne Mountains. This handsome group of granite peaks, north of Carlingford Lough, is known to be of later origin than the adjacent "Caledonian" granite of Newry. The Mournes owe their boldness of detail, and their frequent craggy crests and walls, to their comparative youth (Fig. 10). Yet, when viewed from a distance, as from the Great Northern Railway above Newry, they show the domed and rounded character which we associate with denuded granite chains. The Mourne granite cuts across an earlier series of basalt dykes, which abound upon the coast of Down; it is itself traversed by a later series. At Carlingford similar granite invades the black and rugged mass of dolerite that forms the ridge between Dundalk and Greenore. This dolerite cuts the Carboniferous Limestone. The granite of Mull and Skye, again, is post-Cretaceous, and is of the same type as that of the Mourne Mountains. The chemical composition of these granites corresponds to that of the rhyolites of Tardree. Here are the facts that lead geologists to the interesting conclusion that the Mourne granite was intruded as a molten mass after the first basaltic eruptions had taken place in Ireland, but before the outpouring of the later basaltic series. It is, as it were, the deep-seated mass, the solidified caldron, of which the rhyolites of Tardree were the surface-manifestations.

What, then, was the age of these great eruptions, which have added, on the one hand, the high plateaux of Antrim and Londonderry, and on the other the glorious summits of the Mournes, to the varied scenery of north-east Ireland? During the lacustrine epoch, marked by the iron-ores, numerous plants were washed down into the clays. Mr. Starkie Gardner has determined these as belonging to the Eocene period, during which the

London Clay and other marine deposits were quietly accumulating in the south of England. Hence, the volcanoes of Antrim are of *Eocene* age, and and may have extended into the next period, the *Oligocene*. They were the forerunners of tremendous changes in the physical geography of Europe.

For, soon after the Irish outbreak, the ridges of the Pyrenees and the Juras appeared above the level of the sea; the Alps themselves followed, and the great Carpathian ring, accompanied by volcanic eruptions of their own. The Balkans, the Caucasus, the Himalayas, date from the same epoch of unrest; and the disturbances in the Scotch and Irish areas, on the edge of the old northern continent, may be said to mark the opening of the *Alpine* movements, which have built up the continents of to-day.

Moreover, the cessation of eruption in Ireland was accompanied by the breaking up of the northern land. The lava-plateaux cracked and subsided, and, as Sir Archibald Geikie shows us, now lie in great part on the floor of the north-east Atlantic. The basin of Lough Neagh was produced by a settlement of this kind, while the basalt on either hand remained high on the hills of Antrim and Slieve Gallion. The edge of Europe was now in process of formation; Ireland was, as it were, detached on the north and west from its ancient allegiance, and was tacked on to the new continent, still in its birth-throes, on the east.

Even now, Ireland was not an Island. Through *Miocene* and *Pliocene* times it remained an integral part of Europe. Animals found their way into it which could not have swum or flown across the sea, but which necessarily wandered in upon dry land. Considering the antiquity of its own land-surface, Ireland may have nourished some forms of mammalian life before they could gain a foothold in Europe; but the strange epoch of cold in the northern hemisphere, known as the Ice-age, probably drove most of them eastward and southward. When they returned, in happier times, they still entered the Irish area on dry land. But a gradual subsidence was taking place, and Ireland was at last converted into an island on the European edge. Mammals continued to enter England, whereby the fauna of that country became richer than that of Ireland. In turn, by marine excavation, as well as by subsidence, Britain was cut off also, by the formation of the Straits of Dover and the shallow North Sea basin, and its fauna remains, therefore, limited in comparison with that of continental Europe.

The Glacial Epoch.

During the Ice-age, or the *Glacial epoch*, the mountain-rim of Ireland was probably far higher than it is now. The glaciers that gathered on it have everywhere scored the surface of the rocks. The lower grounds of Kerry and Connemara, and even some thousands of feet of barren mountain-wall, have been moulded into the smooth round forms that are known as *roches moutonnées*, from their resemblance to the mammillations of a lawyer's wig (Fig. 8). Between Kenmare and Glengariff, these features are fully as evident as in the classic region of North Wales. Snow, compressed into a huge flat glacier, accumulated in the basin of the plain, which, as we have seen, was first marked out by the antique Hercynian folding, and which now served as the receptacle for all the débris of the mountains. The glaciers brought down, especially in their lower layers, abundant blocks and pebbles picked up in their passage from the hills; the streams running under the broad ice-sheet of the lowlands washed these materials along their courses, and piled them up in their groove-like channels under the ice. When at last the temperate climate was restored, and the

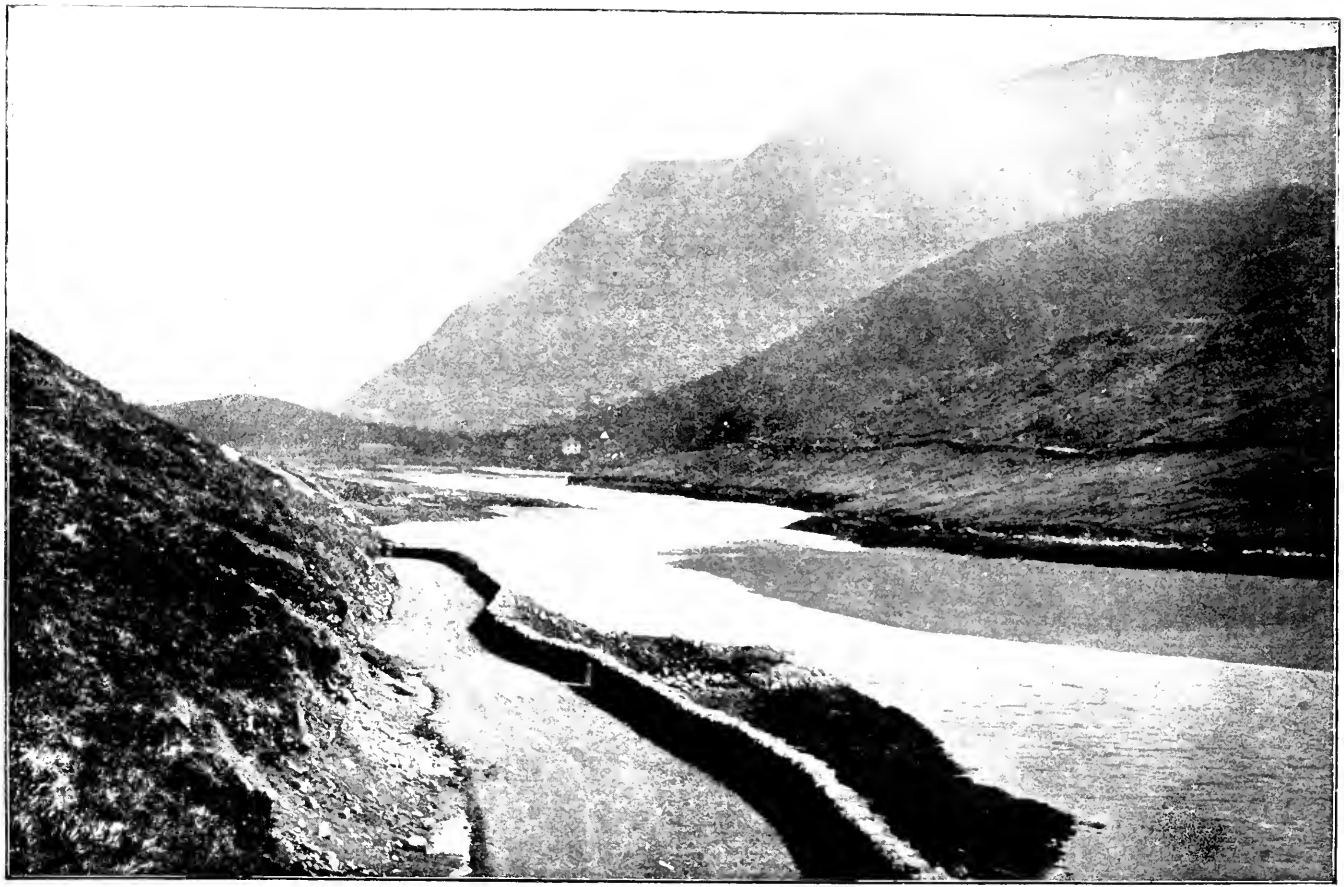

FIG. IX. HEAD OF KILLARY HARBOUR, FJORD AND VALLEY OF THE WESTERN HIGHLANDS OF IRELAND.

FIG. X. GRANITE PINNACLES NEAR SLIEVE DONARD, MOURNE MOUNTAINS.

The Eskers. ice slowly melted, these channels were recorded by chains of gravel, the well-known "eskers," or "green-hills," which rise in wonderful freshness above the level of the plain.

The ice-age left the plain encumbered with glacial sands and gravels, and the valleys in the mountains were often choked, like Glencullen in Co. Dublin, with similar materials, through which the streams now cut their way. The abundant scratched blocks in these deposits show how the stones were once pressed against one another, and were pushed into the lowlands under the weight of solid ice.

The Irish Channel, as we have seen above, was formed since the glacial epoch, and was at one time even wider than it is at present. Clays were deposited on its shore, full of modern marine shells, which are now again lifted above the sea, and which form, to take one instance, the foundations of Belfast. The sickle-shaped promontory of Larne, whence the steamers start for Scotland, has been lifted some twenty feet since man himself came into the country.

Clays of Belfast.

During these comparatively recent oscillations, now one way, now another, the whole western edge of Europe dipped sufficiently below the water to allow the sea to flood the western valleys. These had long been occupied by ice, and no débris could thus gather in their floors. They offered, as they sank and as the glaciers melted, clean and clear inlets by which the sea could penetrate the land. The fjords of Norway are the most notable example, running in places 100 miles into the hills. Those of Scotland and Ireland originated in the same epoch of depression. Hence one of the most delightful features of the west, the narrow Killary Harbour (Fig. 9), ten miles long and half-a-mile wide, is a true example of a fjord. Dingle Bay, the Kenmare inlet, Bantry Bay, and many others, are also submerged valleys; it is hard to believe that we view the waters of the Atlantic, lapping gently at high tide against the wild flowers on the shore. Galway Bay and Clew Bay present the features of ordinary wide-mouthed areas of submergence, such as are styled "rias" on the Spanish coast; the sharp northern edge of the former, running east and west, suggests a fracture in the solid crust, with subsidence on its southern side. It is noteworthy that this line, when continued eastward, coincides with one of the lowest areas of the plain, the region between Galway town and Dublin.

The Western Fjords.

The lowering of the east coast, attendant on the separation of Ireland from Britain, similarly produced rias or fjords. The Norse invaders saw in them a reminder of their own indented coast, and the names of Waterford and Wexford, Carlingford and Strangford, connect geology with history. The north coast also has its submerged valleys, in the long inlets of Lough Swilly and Lough Foyle.

Ireland, then, as we know her, this land of crag and glen, of lake and plain, owes the rich contrasts of her scenery to a long and complex series of events. Yet the main structural lines of the country were impressed upon it very early in its history. The Caledonian folding determined the heights of Donegal and the long backbone of Leinster; the Hercynian folding marked out the parallel ranges of the south, and, dying away to northward, settled the broad reaches of the central plain. The Mournes and the Antrim plateaux are the only recent features, and even they, somewhat proudly, can claim precedence of the Alps.

Lastly, it is clear that the natural incorporation of Ireland in the British Isles, and, through them, with Europe, has profoundly influenced her history. Her insular position laid her open to attack from a variety of nations, in times when it was far easier to travel by sea than to court the dangers and difficulties of the land. The early pre-Celtic inhabitants were thus invaded, possibly by men of a central European race. A dominant tribe, which arose ultimately, and which was known as the Scots, occupied the plain, and ruled the country from the centre, as the Magyars now rule Hungary. The expansion and enterprise of the Scots enabled them to found a colony in Galloway, and their descendants gave a name to Scotland. In the ninth century, the Irish coasts were in turn harassed by Norwegians, commonly spoken of as Danes, who seized a number of the ports, including Dublin and Limerick. They maintained communications from one settlement to another, and commerce sprang up in the shelter of the rias and the fjords. The value of these harbours was later realised by the freebooting Normans, who were, after all, distant relations of the Scandinavians. The royal authority planted castles to guard the entries of the ports, and to keep the towns in Norman hands. The mountainous nature, however, of the rim of Ireland allowed descents on these strongholds to be easily made on the part of native tribes; while the forests and bog-land of the central plain prevented its settlement by the limited body of colonists, even as late as Elizabethan times. To this day the western mountains of Ireland mark the region where the old language is mostly spoken, while it prevailed quite recently in the corresponding highlands on the east. Throughout the country, the townlands still bear characteristic Gaelic names, which often suggest some natural feature of the landscape.

In this brief attempt to trace the influence of the physical structure of Ireland upon her history, our survey of the country well may end. It may be that one should be born a peasant among the purple hills of Connaught to know to the full the enduring fascination of the land. But to all of us it may be given to stand in some great meadow of the midland, and to hear the plovers calling, and to see the plain melt, as it were, against a soft and cloud-filled air; or to view from some high brown moorland the streamlets starting on their courses, and far below, in the precipiced combe, the gleaming of a rock-girt lake; or, again, at evening, to rest amid the crescent of the sand-hills, our ears filled with a murmur of Atlantic waves, and to catch far off, against the gold of sunset, some glimpses of the fortunate isles.

IRISH MINERALS AND BUILDING STONES.

It will be clear from the foregoing general description of the geology of Ireland that the country depends largely for its coal supply upon outside sources, notably on Scotland as regards the northern counties, and on Lancashire as regards the centre and the south. The many schemes for utilising peat as fuel on a commercial scale have not met with much success, confronted as they are by the nearness of the coalfields across the narrow channel on the east. The absence of native coal in most districts has checked the formation of industrial centres in Ireland; and even the metallic ores raised from time to time have been sent for smelting to Ayrshire or South Wales. The attention of the working population has thus become more and more directed to agriculture; and the introduction of steam machinery into almost every trade has still further emphasised the difference between the economic conditions that prevail in the Midlands of Ireland and those of industrial England. This question, however, has obviously two sides to it; and a population compelled to seek prosperity from the soil may perhaps be regarded as after all more fortunate than one which, year by year, becomes more closely crowded into towns. The utilisation of water-power for the production of electricity, and the employment of the electric furnace in metallurgy, may open new possibilities for Ireland; but at present her metallic ores remain in large part unproductive, and her coal is raised somewhat sporadically, owing to the readiness with which fuel can be imported from the richer seams in Britain.

Coal.

It is obvious, however, that improved means of carriage from the mines to the main lines of railway may do much towards promoting a local use of Irish coal. There have been, for the past few years, twenty-four mines at work in the various coalfields, employing a total of nearly one thousand persons. Professor Hull's estimate, in 1881, of the "net tonnage available for use" in the Irish coalfields gave 182,280,000 tons of coal. About 125,000 tons are now raised annually, or little more than the figure recorded twenty years ago. The output of Scotland, with her rich coal-basins between Ayr and the Firth of Forth, is about 30,000,000 tons per annum, the amount having been nearly doubled in five-and-twenty years. Like that of South Wales, the coal of Ireland is very largely anthracitic, that is to say, it is not a brightly burning coal. The northern coalfields of Lough Allen and Eastern Tyrone produce, however, what is called bituminous coal, and the same is true of the limited Ballycastle and Carrickmacross areas. The great Kilkenny field, and all its southern companions, produce anthracite alone. This type of coal in Ireland contains from 80 to 90 per cent of carbon, the ash being, in these extreme varieties respectively, 9.8 and 3.7 per cent. Sulphur is occasionally present in undesirable quantity, but in other seams is practically absent.

The Irish coalfields have been reported on fully by Sir R. Griffith, Sir Robert Kane, and the officers of the Geological Survey, and offer, in most cases, a field for patient exploration rather than for speculation. Thus the

favourably situated and productive coal-bearing strata in the Lough Allen (Arigna) area* are in the form of outliers on the tops of mountains of moderate height. The beds can be traced along fairly horizontal outcrops, and the strata below the Millstone Grit series are unproductive. Here, then, deep mining will reveal no further source of coal. At Ballycastle, however, the coal occurs in lower Carboniferous Sandstone, the "Calciferous Sandstone" series of Scotland, accompanied by layers of clay-ironstone. This ironstone has been calcined on the spot, and exported for smelting in Scotland. The coal-bearing strata are exposed on the steep slopes and cliffs above the shore, both west and east of the bold dolerite promontory of Fair Head. They are mined by tunnelling into the face of the rock; and the dip causes the beds in some places to fall rapidly as they are traced inland. The degree of folding undergone by the beds being unknown as we pass south across the country, trial borings may possibly reach the same strata in convenient positions away from the sea-shore. The floor of ancient schists on which the beds were deposited comes to the surface, however, only two miles from the coast, both on the west and on the south, and thus no great thickness of coal-bearing strata can be anticipated as we proceed inland. We are here, in fact, limited by our position low down in the Carboniferous system, and far below the true Coal-Measures, which cannot therefore be struck by boring.

Here and there, in the undulating country between Lough Neagh and Lough Foyle, it is just possible that coal of the Ballycastle type occurs; but its existence in commercial quantities is extremely doubtful. Three hundred years ago, as Mr. G. H. Kinahan records, ironstone nodules were smelted in Drumard, near Draperstown, and they may be seen among the sandstones and shaly beds in some of the stream-banks of that locality. But none of the valleys that traverse these strata seems to have exposed a bed of coal to view.

The Tyrone coalfield has more promise, and provides some opportunity for a prospector. The surface of Coal-Measures exposed is small, and is definitely bounded by lower and unproductive beds upon the west. But, on the east, the coal-bearing strata run under the Triassic Sandstone, and may possibly be preserved by this covering for some distance towards Lough Neagh. Considering, however, that the Trias rests on Carboniferous Limestone in the valley of the Lagan, and also immediately south of Dungannon, great denudation must have occurred during what has been termed the Hercynian uplift. The Coal-Measures of Dungannon and Coalisland are not at all likely to extend beneath Lough Neagh. Locally, they must be regarded as rich, the Annagher seam being nine feet thick, and other seams running from two feet to five feet thick.

Efforts have been made to strike these beds on the east side of the lake; one boring was put down the neck of an Eocene volcano, the rhyolite that choked the vent being mistaken for a Carboniferous Sandstone, although its true character had been noted by geologists sixty years before the attempt was made. Another boring was made near Carrickfergus, and resulted in the fortunate discovery of rock-salt. Only by pure good luck can patches of Coal Measures, if such exist, be struck by borings put down through the superincumbent rocks in County Antrim. The black Silurian shales of Strangford Lough have been mistaken for Coal-Measures; but a

* For analyses, &c., of coal of this area, see R. J. Cruise, Journ. R. Geol. Soc. Ireland, vol. xiii. (1873), p. 144, and L. Studdert, *ibid.*, p. 146.

very slight acquaintance with the fossils of that locality will prevent the repetition of so futile a speculation.

The coal that is often mentioned in the County of Cavan has a somewhat curious history. Part of the Lough Allen coalfield lies within the county; and true coal exists, in a limited amount, in a patch of Coal-Measures lying just beyond the eastern border. But curiously enough, bands of anthracite are here and there traceable in County Cavan in the Silurian strata, and were favourably reported on by Mr. J. I. Whitty in 1854.* The seam was in places four feet thick, and trial shafts were put down near Kilnaleck. The beds are, however, almost vertical, and the anthracite is much broken by masses of shale. Seeing that the strata are, at the latest, of Llandovery age, and that no plants likely to form coal existed at so remote an epoch, the continuity of the deposit is most improbable. It may, indeed, be, like the graphite of Bavaria and Ceylon, entirely of mineral origin. Near Ballyjamesduff, the beds seem impregnated with quartz and anthracite, while iron-ores occur at hand in the same series. Mr. Whitty's report seems to have been over-sanguine as to the value of the material as a fuel.

The Kilkenny coalfield, with its seams of anthracite, has its commercial centre in Castlecomer, and occupies a high synclinal basin, like the Forest of Dean in England.† Means of transport are still in a backward state; the upper and thicker seams have become already exhausted; and the coal as a rule contains a deleterious amount of sulphur, in the form of iron pyrites. It is possible, however, that the anthracite of Leinster may come into further use for commercial purposes, when better communications are established between the coalfield and the limestone plain. Already, 180 persons are employed at the Jarrow colliery alone.

The Coal-Measures of North Kerry and Clare cover a large area, but contain only a few thin coals. The iron ore associated with them was formerly smelted, especially in the seventeenth century. Mr. G. H. Kinahan, in his essay on Irish Mining, gives no ground for hope that this region will ever become productive. Anthracite occurs also in North-west Cork, and has been worked recently; but the spots where development may be best expected are in Tyrone, and on the hill-sides near Lough Allen. In the latter region, the associated clay-iron stone has always been highly spoken of.

Bog Iron Ore.

Bog iron ore, the limonitic deposit of existing bogs and stagnant pools, occurs where the waters of the locality are or have been well charged with salts of iron. This material has been found of use in the purification of gas, for which purpose it is exported from the County of Donegal, and from Mountrath in Queen's County. 4,321 tons of bog ore were raised in 1899. Ochre, for paint, is raised in County Wicklow, in connection with the Ovoca mines.

Antrim Iron Ores.

The only other iron ores regularly worked in Ireland in recent years are those formed in the lakes of Eocene times, and found interbedded among the Antrim basalts. The official reports of the Inspectors of Mines record no "iron-stone" as raised in connection with the coal mines in Ireland during 1900, but 102,941 tons of iron ore are recorded from the metalliferous mines. Practically the whole output, say 100,000 tons, may be annually credited to County Antrim.

* Journ. Geol. Soc. Dublin, vol. vi., p. 187.

† For details of coals, see G. H. Kinahan, Journ. R. Geol. Soc. I., vol. vii (1886), p. 20.

These stratified iron ores of northern Ireland have been described in detail by Mr. Philip Argall,* who was inclined, however, to refer them to volcanic mud-flows, rather than to the products of weathering of the earlier basalts. The richest ore is pisolitic, like that deposited in some recent lakes, and is at times a bright red earthy hæmatite, at times brown and limonitic, at times, again, black and magnetic, with about 10 per cent. of titanium dioxide. The black type of ore, according to published analyses, consists largely of dark hæmatite; but some of the granules are formed of magnetite, and even show polarity. The beds are worked between Glenarm and Broughshane, and the actual ore is often a foot in thickness.†

Bauxite.

Intercalated among these interesting strata is bauxite, a hydrous aluminium oxide, associated with some pale clay, and giving at times 57 per cent. of alumina on analysis. The Irish bauxite is worked, under the name of "alum clay," for the manufacture of alum, and was for a time used as a commercial source of the metal aluminium. It occurs both in the Glenarm district and near Ballintoy. Mr. Kinahan states that the alum industry commenced in 1874, and that beds were worked "more especially near Ballintoy." In 1898, 12,402 tons of bauxite were raised, valued at nearly £3,000; this fell to 5,779 tons in 1900. Antrim furnishes the only record for this material in the United Kingdom.

The mining of other metalliferous ores in Ireland depends very largely upon the fluctuation of prices in the trades directly concerned.

Copper.

Copper, which is practically all in the form of Copper Pyrites, was at one time very profitable, the ore being sent to Swansea and Lancashire to be smelted. Chalcosine or Red-ruthite (sometimes called in Ireland "grey copper ore," a term usually applied to Tetrahedrite), and Malachite, the green carbonate, were also worked on a limited scale. From 1840 to 1843, the annual output of the Ballymurtagh Mine in County Wicklow averaged nearly 6,000 tons of copper ore, while the whole output of copper ore for Ireland in 1899 is recorded as only 533 tons. Development is proceeding in some of the old mining districts of the south, such as the Allihies mine, in County Cork; but the raising of copper ore has long been confined to County Wicklow. In both these counties further prospecting is now in progress.

Mr. Argall‡ described the "ancient and recent mining operations" of East Ovoca in 1879; but the best historical accounts of the whole area are to be found in Sir R. Kane's work and in Mr. Kinahan's "Economic Geology." The occurrence of iron pyrites (pyrite) with the copper ore, often in preponderating amount, has led to the same mines being worked for iron, copper, and sulphur, according to the requirements of the day. The pyrite is known as "sulphur ore," and forms the bulk of the material raised at the present time, the output amounting to 2,411 tons in 1899, and 2,434 tons in 1900.

The south of Ireland was in former times essentially a copper-producing district, and the success of the mines at Knockmahon and Bonmahon, in County Waterford, and of the Allihies mine west of Berehaven, in County

* Journ. R. Geol. Soc. I., vol. vi. (1881), p. 98.

† See Mem. Geol. Survey to Sheet 20 (1886), pp. 12-16 and 28-31. Bauxite is touched on in the same Memoir; but its more important application is of later date than 1886.

‡ Journ. R. Geol. Soc. I., vol. v., p. 150. See also report by Sir Warington Smyth, Records of the School of Mines, vol. i. (1853), p. 370.

Cork, encouraged a considerable amount of speculation. Here, again, copper pyrites is the prevailing ore. Mr. Kinahan points out that the Bonmahon group of mines was well exploited from 1824 down to the dismantling of the works in 1880; but veins and pockets may yet be struck in the south of Ireland which will provide material of equal value to that of the worked-out undertakings. Some of the ultimately successful areas were abandoned or sold by previous owners because the first years of work were discouraging.

Copper pyrites has been sporadically mined in many other parts of Ireland. Even at the sea-inlet of Loughshinny, south of Skerries, in County Dublin, adits exist in the Upper Carboniferous shales, from which, as Kane says, ore was "raised from time to time."

Lead, Silver, and Zinc.

Lead and zinc are commonly raised together, the two sulphides, Galena and Blende, being the prevalent Irish ores. Fine crystals of Cerussite (lead carbonate) have been obtained from the mines of Glenmalure in County Wicklow; while Smithsonite (zinc carbonate) occurs, as a product of replacement of limestone, in the Silvermines works near Nenagh.* As is well known, silver is a common accessory in galena, and the argentiferous ore was worked at Silvermines even in the seventeenth century. The richness of this lode makes further prospecting advisable, both in west Tipperary and in Clare.

Galena was recently raised, to the extent of 30 to 40 tons per annum, in County Wicklow, the ore in Glendasan giving 8 to 10 ounces of silver to the ton.† Smelting is still carried on at Ballycorus, in the south of County Dublin; but the ore is imported, and the old workings in the Ordovician shales, like so many lead-veins in Ireland, are regarded as now unprofitable. Galena was also formerly worked in the southern part of County Monaghan, and this area may yet deserve careful prospecting. While a great number of occurrences of galena have been recorded from the Carboniferous Limestone area, it cannot be said that this ore is limited in Ireland to any particular formation.

Gold.

The abundance of pre-historic gold ornaments in Ireland has suggested that the metal was of local origin; and this is by no means unlikely, despite the barter and commerce that went on in Europe, even in the remote period when these articles were fashioned. The metal, however, was doubtless alluvial, and had accumulated in the gravels of Wicklow, and perhaps of Donegal, for untold ages before man came into the country. When its use and value became discovered, the deposits doubtless were rapidly worked out, and the centuries that have since elapsed have seen only a trivial amount of denudation and accumulation, compared with the long epochs that went before. Hence in Ireland, as in Peru, latter-day gold-mining has been of little importance, and the material may be sought with most success in the tombs and hidden treasuries of prehistoric chieftains.

The Croghan Kinshelagh and Ovoca districts in the County of Wicklow have, however, produced considerable quantities of gold from alluvial workings during the last hundred years or so; and it was the opinion of Mr. Gerrard

* Jukes, Journ. Geol. Soc. Dublin, vol. x. (1863), p. 12. Apjohn records also electric calamine (*ibid.*, vol. viii., p. 157); and Wynne has given a general description of the Silvermines district (*ibid.*, vol. viii., p. 244).

† The Luganure lodes are described by Sir Warington Smyth (Records of the School of Mines, vol. i. (1853), p. 353; see also Haughton, Journ. G. S. Dublin, vol. vi., p. 168).

A. Kinahan* that the deposits were by no means exhausted. Mr. E. St. John Lyburn, A.R.C.Sc.I., in a paper presented to the Royal Dublin Society in 1901, has proved, by a large number of assays, the general poverty of the Wicklow rocks in gold; but at the same time he supports Mr. G. A. Kinahan's view that many of the gravels remain unexplored, especially in their deeper layers, or on the shelves above the present streams.† Mr. Gerrard A. Kinahan's paper contains an excellent account of the history of gold-working in County Wicklow, whereby it appears that the value of the metal raised only occasionally exceeded the cost of mining. Probably, the really profitable transactions were those of the peasantry, who from time to time stored up a little gold, which they had washed out by the most primitive means, and brought it for sale to the jewellers in Dublin. It is currently reported that this practice still continues. The gravels to the north and north-east of Croghan Kinshelagh were worked by Government from 1796 to 1803, when the operations were finally abandoned. Various companies have examined the deposits since that date, finding gold, it is true, but not with sufficient uniformity.

Tin.

The occurrence of Cassiterite (in the form of stream-tin), with its constant associate wolfram, in the auriferous gravels of Croghan Kinshelagh, has also excited curiosity. This instance, and the finding of a small quantity of tin ore in a lead-vein at Dalkey, are the only authenticated records of cassiterite in Ireland. In County Wicklow the original vein has not been discovered.

Rock-salt.

Among minerals which are not metallic in the popular sense, Rock-Salt deserves the most prominent mention. The well-known beds near Carrickfergus, in County Antrim, were discovered in 1850, when the Triassic clays and sandstones were being pierced in the hope of finding coal. The site offered, in reality, only a very small chance for the coal-prospectors; but the borings proved the existence of deposits of rock-salt comparable with those of Cheshire. One of the beds at the Duncrue mine was actually eighty feet in thickness. The records show that 32,113 tons of salt were raised from this limited area in the east of Antrim in 1900, with 11,081 tons obtained in addition from brine.

Gypsum.

While the Gypsum associated with the same strata near Belfast is mostly in thin veins, this mineral has been worked, for the preparation of Plaster of Paris, from a much thicker mass in the Triassic outlier near Carrickmacross.

Barytes.

Barytes, another white salt, occurs in veins in many places, as in the Ordovician strata of the coast of County Dublin; but in County Cork it is of unusual mass and abundance.‡ Near Bantry, a vein is found from ten to fifteen feet thick; and a remarkable lode, like the infilling of a chimney, thirty feet long and fifteen feet wide, also occurs. Barytes is mined at Mount Gabriel, near Schull, at Duneen Bay, Clonakilty, and also at Gleniff near Bundoran. 3,278 tons of barytes were raised in Ireland in 1899, and 3,626 tons in 1900. The material, it may be observed, is mined to a yet

* "On the Mode of Occurrence and Winning of Gold in Ireland," Journ. R. Geol. Soc. I. vol. vi. (1882), p. 156, and also in Sci. Proc. R. Dublin Soc., vol. iii. (1883), p. 263.

† Sci. Proc. R. Dublin Soc., vol. ix (1901), p. 426. See also a paper by Mr. George H. Kinahan, *ibid.*, vol. iv. (1885), p. 39.

‡ See E. T. Hardman, "On the Barytes Mines near Bantry," Journ. R. Geol. Soc. I., vol. v. (1878), p. 99.

larger extent in each of the counties of Northumberland, Durham, and Staffordshire, and is clearly of commercial interest.

Steatite.

The soft magnesium silicate, Steatite, a massive form of talc, occurs here and there in good veins, but is often mixed with harder minerals, which destroy its utility. At Crohy Head, and Gartan, however, in the County of Donegal, considerable and good beds occur among the ancient metamorphic rocks.

While Ireland cannot claim especial richness as a mineral country, she is essentially a stone country, and quarries have been opened everywhere for building purposes and for road-metal, even through the sands and gravels of the plain. Naturally, limestone is the chief substance excavated; and the frequent deficiencies of the Irish roads are due to the general use of Carboniferous limestone as a metalling. The country possess excellent igneous rocks, which should be imported into all districts where they are required. In this matter, the growing practice of England, and of many foreign states, notably Saxony,* is strongly to be commended, seeing that good roads are far more economical to maintain than bad ones, and that they give an impetus to activity and intercommunication such as no main line of railway can bring about. In Ireland, far more than in England, the roads perform the functions of branch lines—witness those numerous stations named after roads, and situated miles away from the towns which they are meant to serve. When the selection of proper road-metal is seriously considered in rural districts in Ireland, the country itself will be fully able to cope with the demand.

Clays.

The clays used for bricks have been mostly derived from the Glacial drift-deposits, where these are not too highly charged with limestone débris. The Triassic clay of Kingscourt has produced good results, while the carboniferous fire-clays are raised in connection with some of the coalfields, notably near Dungannon. These ancient shales, when crushed, yield bricks capable of resisting a high temperature, provided that they are not too ferruginous. The Ordovician shales are similarly utilised at Waterford. Numerous clays suitable for ordinary red and brown glazed ware exist throughout the country. The clay of the Lagan valley near Belfast, and that on the north side of the Ovoca at Arklow, are used for terracotta.

True porcelain-clay, or kaolin, does not appear to occur in Ireland, though it might have been expected as a product of decay from the granite areas. The materials mentioned under this head by Mr. Kinahan are really artificially crushed felspathic rocks, without the composition of true kaolin. The famous pottery of Belleek, in County Fermanagh, was thus formerly made from the crushed alkali-felspars of the granite on the north shore of Lough Erne. The material used is still a felspar, but is imported.

Kieselguhr.

The diatomaceous earth which has accumulated in such purity near Toome, in County Antrim, where the Bann flows out of Lough Neagh, is now worked for various purposes, under the usual commercial name of "kieselguhr."

Irish slates have suffered, from a business point of view, through the

* See O. Hermann, "Steinbruchindustrie und Steinbruchgeologie" (1899), p. 351, where an analysis is made of the Saxon highways, proving that the limestones and soft rocks that form 40 per cent. of the surface of Saxony are *nowhere* employed upon the public roads.

Slate.

proximity of the enormous supplies of Llanberis and Ffestiniog, in N. Wales. A local use has, however, been found for many slates occurring in inland or western localities. The quarries in Ordovician strata in Clashnasmuth townland, six miles from Carrick-on-Suir, have a sound reputation, some of the material being selected, on account of its green colour, for special decorative effect. Similar slate is raised not far away in County Kilkenny, from quarries at Kilmoganny. Near Killaloe, again, roofing slates are raised. The firm tough slate of Valentia Island, in County Kerry, is suitable for flags and slabs, which are obtained there of an unusual size. Slates are also raised from the Carboniferous Slate series west of Clonakilty in County Cork.

Flags.

The fine-grained bedded sandstones of Upper Carboniferous age in Ireland are at times extremely tough and durable. The dark flags of south-west Clare, and the similar slabs raised in County Kilkenny, and sold as "Carlow Flags," have been, in consequence, widely used for paving. Good flagstones are also recorded from the Lough Allen area.

Sandstone.

The best Irish sandstones for use in architectural work in towns, and some of the finest in texture in the British Isles, occur in the Carboniferous system in the Counties of Donegal and Fermanagh. The stone of Mount Charles in Donegal, though of course not so easily worked as limestone, is capable of receiving a sharp edge, and of being used for moulded work of a delicacy unusual in this class of material. While the soft Triassic sandstones, like those of Scrabo, in County Down, are not suitable for monumental work in the smoky atmosphere of towns, and while much of the Old Red Sandstone of the south must be put aside on account of its coarseness of grain, the Carboniferous sandstones may receive more and more attention as time goes on, and may be found worthy of export to the manufacturing cities of England.

Limestone and Marble.

There is no lack of good grey Carboniferous limestone in the broad central Irish area, and much has been done with this material, both for massive structures and for decoration. The shaly varieties, black through included mud-particles, and locally known as "calp," are to be avoided for all but common walls, since they weather out unequally along the planes of stratification. The opposite type, uniform and fine-grained, is seen in the grey limestones of Roscommon, in which excellent carved work has been effected, and which are practically marbles, utilised as building stones.

The Carboniferous limestones become occasionally dolomitic, the change being, as usual, marked by the introduction of iron as well as magnesium. The rock, in consequence, becomes brownish on oxidation, sometimes in flecks and patches. This variegated colouration enhances the effect of certain varieties, and makes them serviceable as ornamental marbles.

The black marbles of Ireland have long been famous. They are Carboniferous limestones coloured by a small percentage of graphitic carbon, and have been quarried mostly near the cities of Galway (Menlo) and Kilkenny (Archer's Grove). The Menlo rock provides pure black stone, while the white sections of fossil brachiopods afford a striking feature amid the black ground of the marble of Kilkenny.

Other marbles that have achieved marked success for decorative work

are the red varieties of County Cork. The rock of Little Island is the richest in colour, showing, on polished surfaces, a brecciated structure, with flowing lines and veins. It has been largely used for columns and the panelling of walls. Red marbles, merging into grey with pink calcite veins, are quarried in the same county at Midleton and near Fermoy. These are all of Carboniferous age, and possess a beauty similar to that of the Devonian marbles of the Plymouth area.

The white and grey marbles of the County of Donegal have been examined by prospectors from time to time. Many are true calciphyres, containing silicates developed in them; or they possess numerous micaceous partings, which hinder their use in large blocks, owing to the planes of weakness thus established. There is, however, a possibility of raising stones of sufficient size in the deeper parts of certain quarries. It must be borne in mind, however, that the metamorphic action and earth-stresses that have affected the whole County of Donegal have converted almost every material alike into schistose masses traversed by an immense number of joint-planes.

The absolutely unique green marble of Connemara has been much sought after for decorative use. It varies greatly in texture and colour, and is mineralogically unsuited for out-door work; but its very irregularity and its banded structure render it one of the noblest of indoor ornamental stones. Under the name of "Irish Green," yellow-green stones from Ballynahinch, and magnificently tinted and striped masses from Lissoughter, have been sent to all parts of the world. In common with other well-known types of Irish marble, this material is finely displayed in the decorative work of the Museum of Science and Art and the National Library in Dublin. It owes its special colouring to the serpentine which permeates it in knotty bands and curving layers. This mineral has doubtless arisen from the alteration of olivine; and the rock probably at one time resembled the banded olivine-marbles that are produced by the contact of lava and limestone in the volcanic vent of Vesuvius.

Granite.

The great demand for ornamental stone that will resist atmospheric influences in industrial cities has drawn especial attention to granite and allied igneous rocks. Granite has long been used as a building material in Ireland; the grey muscovite-granites of the Leinster chain thus furnish the basement-courses of hundreds of unpretentious houses, which are continued upwards in ordinary red brick. Polished granite, however, has proved itself to be the handsomest and most durable material for city work. The transformation of London façades in the last thirty years testifies to the prevalent tendency among architects and the merchant-princes whom they serve. In London, which is naturally the purchasing centre towards which Ireland must chiefly look, the grey granite of Aberdeen, the red and uniformly grained granite of Peterhead, and the speckled porphyritic red granite of Shap, have been used with a repetition that has almost begun to pall. Swedish and other granites have been introduced to give variety, and many among these importations are granites only in the liberal and commercial acceptance of the term. The fine-grained grey granites of the Newry axis, quarried at Altnaveigh, Moor, Goraghwood, Bessbrook, and other places, have successfully held their own in the London market; but rich stores of red and variegated granite remain still practically undeveloped in the west of Ireland. Notable among these are the Galway granites, now quarried at Shantallow. Besides a compact chocolate-red and speckled type, porphyritic granites occur, with red felspar in a ground of

mingled green and red. The green colouration, being largely due to epidote, implies, in this case, a general hardening, and not a softening of the mass. These handsome rocks, like those of Mayo and Donegal, lie near the coast, whence cheap carriage might be available.

The granites of Donegal have been worked from time to time, and a company is at present engaged on those around Dungloe. The rocks here offer great variety of colour, a consideration of much importance, seeing how often red and grey stones are used in the same public building. The granite of Tamney, Milford, is also being worked by another company.

The importance of the granite industry, even in its present position, may be gathered from the fact that 165 persons are employed in the County of Wicklow alone in extracting granite for ordinary building work, fifty of these being at the Ballyknockan quarry, near Blessington. More than 100 men are employed in one of the Newry quarries, and fifty in each of several others.

Dolerites.

Finally, among stones which pass in the trade as granites, but which have a very different chemical composition, the handsome dark-green dolerite of Rostrevor may be cited, which is often used for tombstones. The tough altered dolerite or fine-grained dolerite, of Arklow provides employment for 180 persons, being famous as a material for paving setts.

Conclusion.

In the foregoing sketch of the mineral resources and building stones of Ireland, many interesting materials may have been passed over, which may in time prove to have commercial importance. But enough has been said to assure the reader that the popular notions as to the vast mineral wealth of Ireland, or her hidden coal-fields, waiting only for development, are myths unworthy of a serious and reflective age. If mining of metallic ores is to be established or revived in any district, it will only be possible through scientific enterprise, on carefully considered economic principles, and, above all, through the hard and continuous work of all concerned. It is possible, after all, that a ploughshare and a spade made of imported iron, and a home-bred peasant to guide them, may yet prove the best means of utilising the mineral wealth of Ireland, which ages of denudation have taught us to look for in the soil.

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Ballynahinch, Co. Galway.

THE SOILS OF IRELAND.

Through the writings of Boate, M'Cullogh, Young, Wakefield, Kane, Griffith, and other acknowledged authorities on matters concerning land, agricultural enquirers are familiar with much that has to be said upon the present subject. The fertility of Irish soils has long been recognised—as a general characteristic, perhaps, sometimes over-estimated. It is probable that the favourable reputation they possess is largely due to the humidity of our climate—which imparts to the vegetation of the Emerald Isle its proverbial verdure—as well as to the circumstances which are to be described.

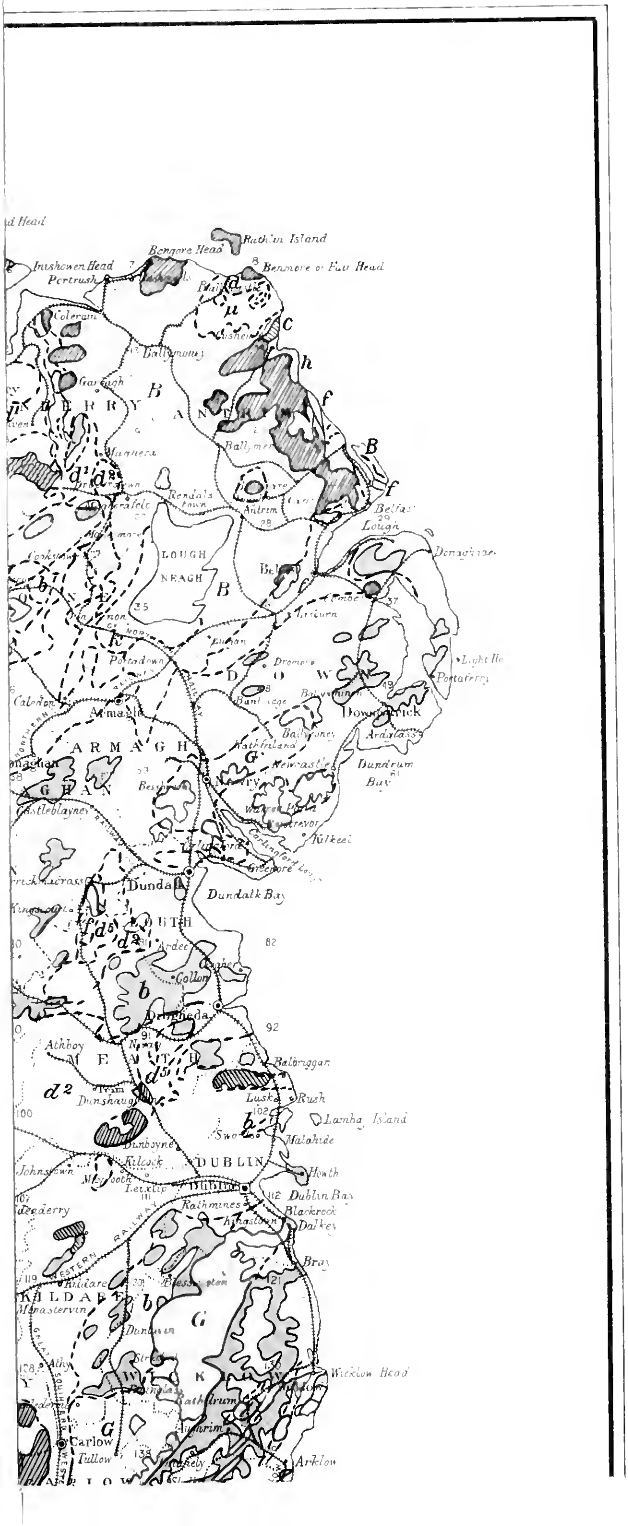
Situated as Ireland is, upon the outskirts of the European Continent, and exposed to the moisture-laden breezes directly reaching it from the Atlantic, the island in some respects suffers from, if in other respects it profits by, the undiminished effects of their humidity. Frequent late springs and damp harvests, with heavy rainfall, particularly in the hilly regions, causing waste of fertilising ingredients in the soils, are amongst the evil effects attendant upon the position of the island. As a set-off against those drawbacks there are the modifying influences of the Gulf Stream, producing a more equable and milder climate than other countries in the same latitude enjoy. These circumstances are moreover conducive to a much prolonged period of vegetable growth, and to the rearing of healthy stock.

The following figures as to the aggregate areas of grass land and arable soil, woodlands, peat bogs, and waste land for 1900 and 1901, are taken from returns issued by the Statistics and Intelligence Branch of the Department of Agriculture and Technical Instruction for Ireland.

Provinces.		Total Area under Crops (including Meadow and Clover).	Grass.	Fallow.	Woods and Plantations.	Turf Bog Marsh, Barren Mountain Land, Water, Roads, Fences, &c.	Total.
		Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Leinster	1900	1,239,535	2,777,666	3,302	95,040	729,283	4,844,826
	1901	1,228,725	2,792,880	3,577	95,447	724,197	
Munster	1900	1,200,166	3,280,034	2,889	106,951	1,359,220	5,949,260
	1901	1,188,857	3,291,199	2,535	105,411	1,361,258	
Ulster	1900	1,594,738	2,403,655	4,923	57,980	1,261,038	5,322,334
	1901	1,587,643	2,415,753	3,813	57,080	1,258,045	
Connaught	1900	624,293	2,102,017	1,475	51,677	1,437,462	4,216,924
	1901	625,826	2,077,406	961	51,803	1,460,928	
Total	1900	4,658,732	10,563,372	12,589	311,648	4,787,003	20,333,344
	1901	4,631,051	10,577,238	10,886	309,741	4,804,428	

Tabulated in another way, the distribution of areas runs thus:—

Above the 2,000 feet contour, 82 square miles; between 2,000 feet and 1,000 feet contour, 1,590 square miles; between 1,000 feet and 500 feet contour, 5,797 square miles; between 500 feet and 250 feet



Rathlin Island
Bengore Head
Benmore or Fair Head
Inishowen Head
Portrush
Coleraine
Ballymoney
Garvagh
Ballymena
Randalstown
Antrim
Belfast Lough
Donaghadee
LOUGH NEAGH
Magherafelt
Cookstown
Lisburn
Lurgan
Portadown
Caledon
Armagh
ARMAGH
Dromore
Ballynahinch
Downpatrick
Ardglass
Portaferry
Rathfriland
Newcastle
Dundrum Bay
Castleblayney
Kilkeel
Carlingford Lough
Greenore
Dundalk
Dundalk Bay
Ardee
Collon
Drogheda
Athboy
Trim
Balbriggan
Lusk
Rush
Lambay Island
Malahide
Dunboyne
Kilcock
Maynooth
Leixlip
DUBLIN
Howth
Dublin Bay
Rathmines
Blackrock
Dalkey
Bray
Kildare
Monasterevin
Dunlavin
Athy
Wicklow Head
Rathdrum
Aughrim
Carlow
Tullow
Arklow

GEOLOGICAL MAP

OF

IRELAND

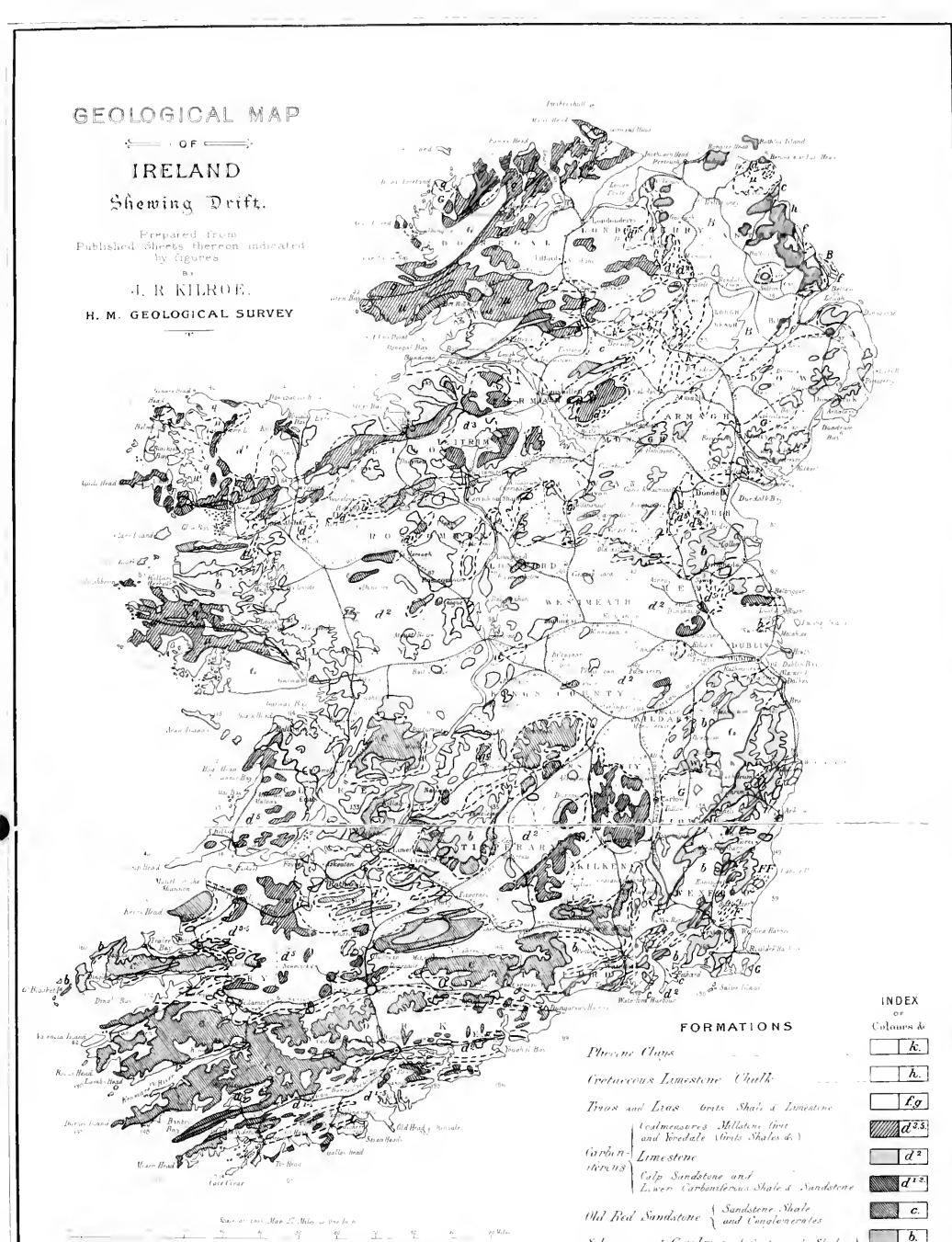
Shewing Drift.

Prepared from
Published Sheets thereon indicated
by figures

By

J. R. KILROE.

H. M. GEOLOGICAL SURVEY



NOTE – Drift areas (including peat bogs) uncoloured
Concealed rock boundaries dotted lines
Letters indicate rock formations according to Index

INDEX
OF
Colours &

FORMATIONS

Pliocene Clays		*k.*
Cretaceous Limestone Chalk		*h.*
Trias and Lias	*Grits Shale & Limestone*	*f.g*
Carboniferous	*Coalmeasures Millstone Grit and Yoredale Grits Shales &.)*	*d³.s.*
	Limestone	*d²*
	Calp Sandstone and Lower Carboniferous Shale & Sandstone	*d¹.²*
Old Red Sandstone	*Sandstone Shale and Conglomerates*	*c.*
Silurian and Cambrian	*(Grits and Shales)*	*b.*
Metamorphic Rocks	*Quartzite Mica-schist*	*u.q.*
Acid Igneous Rocks	*(Granite, Felsite &.)*	*G.F*
Basic " "	*(Basalte, Dolerite &.)*	*B.D.*

contour, 11,797 square miles; between 250 feet and sea-level, 13,242 square miles.

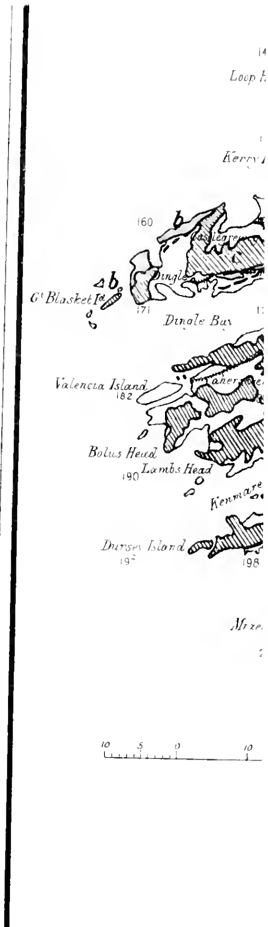
It is thus seen that well-nigh half the area of Ireland would probably lie below the 300 feet contour line, and is thus favourably situated for the mechanical operations of farming, which become more laborious with the increase of declivities, while these, as well as unfavourable climatic conditions, are dependent upon the increase of elevation.

Referring to the arable and grass land, there are several areas where high-class fattening pasturage prevails, such as the Golden Vein, on the confines of Tipperary, Limerick, and Cork; East Leinster, including parts of Meath, Dublin, and Kildare; and the Valley of the Lagan, including parts of Antrim, Down, and Armagh. Against this, there are many parts where the land is naturally poor, and where, because cultivated by the poorer classes of tenantry, it has, through bad tillage and over-cropping, run down below the condition which would be normal under circumstances of fair soil-treatment. Beyond these exceptional regions there is a large proportionate area of the country which presents a fairly high average quality of land, varied, however, by the intervention of peat expanses, badly drained clay tracts, and stony ground, which are of low value; and by alluvial flats, many of which show soils of good quality.

The varieties of land have been classified somewhat as follows:—

1. Finishing and fattening land.	This land bears a thick sole of succulent grass interspersed with clovers.
2. Lowland pasture, first quality, suitable for dairying.	This varies from land bearing mixed herbage to pasture on shallow, clayey, and moory soils.
3. Lowland pasture, second quality.	Indifferently drained land, bearing rushy and coarse herbage.
4. Mountain pasture.	Mixed green and shrubby pasture, with furze, heather, and rocky portions.
5. Wastes.	Unreclaimed cutaway bog, red bog, and mountain top.

Throughout the country, in what is now pasture land, there are indications of the extensive tillage which it once could boast—a somewhat melancholy reminder of its lessened population, and of the correspondingly great drop in the prices of cereals, and some other agricultural products. Even so late as 1870, the area under rotation crops, including clover, meadow, and fallow, was 5,659,796 acres; at present it is 4,641,937 acres. The unlevelled ridges or "lazy beds" to be met with in the grass land in many places, also remind one of the wasteful character of husbandry in vogue in the first part of the nineteenth century, when "beton" fires dissipated the organic matter of old leas, and with it the valuable store of nitrogenous compounds with which years of herbage-growth had enriched the sod. They were days of innocence as regards the prudence of, rather, we may say, the necessity for rigid conservation of the fertilizing ingredients in soils. It is now becoming better known that if burning renders mineral substances, particularly potash compounds in the sod more easily soluble and available to plants, this, in the case of clay leas is at the expense of other beneficial ingredients: in the case of a plentiful depth of moory soil, the loss of organic matter, including nitrogen, is not felt. On the profit side of the soil account, it is doubtful if


160
Gt Blasket Id
Dingle
171
Dingle Bay
Valencia Island
182
Bolus Head
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Lambs Head
Dursey Island
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farmers yet fully realise the gain which would accrue from giving clovers and other leguminous crops a larger place in their rotations. It is now well known that such crops have the peculiar faculty of appropriating, through the agency of micro-organisms (which generally inhabit soils, and colonize in warts upon the roots of leguminous plants), free nitrogen, which exists in the atmosphere in unlimited quantities, and finds its way into the pores of

Specimens of Clover Plants; the larger plant exhibiting Root Warts.

the soil. The accompanying illustration* shows two clover plants: one grown in soil devoid of micro-organisms, the other, of much larger size, under the same circumstances of cultivation, grown in soil to which micro-organic earth had been added. The latter exhibits the root warts, which formed at once the abodes and laboratories of the microscopic beings.

The saving to the farmer's purse, in a lessened necessity for the purchase

* Reproduced from Salfeld's "*Bodenimpfung*," with the permission of Dr. Salfeld's publisher, M. Heinsius Nachfolger, of Leipzig.

of nitrates and salts of ammonia, which would accrue from the cultivation of leguminous crops, is the best argument for his consideration of this branch of science.

Nor have Irish soils suffered only through the dissipation of nitrogenous compounds, for every barrel of wheat, barley, oats, and other cereal taken to the market, every load of hay and straw sold, to be exported or utilised in and near towns, every animal driven off the land, every gallon of milk used elsewhere than on the farm, robs the soil of a proportion of lime, phosphate, potash, magnesia, and other mineral substances, so essential to the maintenance of fertility. It is a somewhat amazing fact that after centuries of such loss as must in the ways mentioned have been incurred, not to speak of the still greater waste, perhaps, through the drenching of soils in wet weather, and the carrying off by drainage, streams, and rivers, of thousands of tons of the substances mentioned, that the soils of this country should have retained any reputation for fertility. The source of waste last referred to is so great, even in France—a much drier country than Ireland —that M. Risler,* in his *Géologie Agricole*, while enforcing his advice as to the necessity for irrigation, gave it as his opinion that, if this were adequately practised, the wealth of the country would be *doubled*. So great is the drain upon the phosphates, particularly it may be said, in the store-cattle feeding portions of Ireland, that Sir R. Kane questioned whether the store of these valuable substances would not, sooner or later, become exhausted. There is no doubt that this would be the case, were it not that the soils become renovated by fresh supplies from beneath, in the case of land where, as over much of the limestone area, the necessity for artificial supplies is not greatly felt, though the soils are often shallow.

The varieties of soils being practically innumerable, resort must be had to some system of classification, and with it to some means of representation, so as to bring into relief points of comparison between soil and soil—chiefly as regards quality and ascertainable deficiencies; although quality, the chief thing with which practical men are concerned, is a comparative rather than an absolute term, and is dependent upon a multiplicity of conditions. Geological maps to some extent serve the needed purpose; they fix the localities of rocks whence the soils are derived, and thus afford clues to soil qualities, and an intelligible basis of effective classification.

Throughout wide areas in Ireland, the rock is covered with detritus not wholly derived from the solid mass immediately beneath; and both this covering and the solid rock, are concealed in many places by more recent deposits of alluvium, bog, blown sands, etc. There are, however, many areas of importance chiefly in the hilly tracts, where locally formed clay soils are found. Throughout the central plain, and in Connaught, where limestone appears here and there in the low ground, this rock is covered with a scanty soil, proverbially rich. It is well suited to store-feeding pasturage, in consequence of the quantity of lime and lime phosphates which are set free by solution, and are taken up in extra quantity by the grass and meadow hay.

The soil yielded by the disintegration of the limestone varies in physical character, from light yellowish brown tenacious clay loam, to a brown friable sandy loam, according as the limestone contains little or much admixture of sand, or beds of sandstone. Some of the best feeding land of Connaught is of the former character—the strong clay containing a fair proportion of potash as well as phosphates.

* Director of the *Institut Agronomique*, Paris.

Limestone land usually affords the necessary conditions for percolation and drainage; but in the extensive flats of central Ireland, natural facilities for drainage are wanting, and, as a consequence, much of the country is covered with peat, as in the great Bog of Allen, and with peaty alluvium, as found along the chief rivers draining that region—the Shannon, Barrow, etc. Much of these flat lands has been reclaimed, work rendered feasible by the extensive schemes of Arterial Drainage carried out in the first half of the last century; and much more might be brought under profitable cultivation.

The hills of Old Red Sandstone which form most of the Counties of Cork, and Waterford; and parts of Kerry, Clare, Limerick, Tipperary, Kilkenny, Mayo, and Tyrone, are flanked by accumulations of local detritus, which yields sandy loams well suited for tillage and dairying. A considerable difference in fertility is noticeable between these soils in Cork, Waterford, etc., and the Old Red soils of Tyrone, which is probably attributable to a less quantity of lime in the Tyrone soils, than in those of the former counties.

The areas of Silurian rocks which dot the geological maps in Meath, Queen's County, Tipperary, Clare, Kilkenny, and Waterford, are clothed with soils which vary from sandy to clay loams—being in part derived from slate and grit, and in part from slate without grit bands. These rocks throughout are calcareous, and the soils in consequence—probably not very deficient in potash—show a fair covering of herbage. They are, to a large extent, used for dairying, and are suitable for this industry: near Castle Otway, in Tipperary, these Silurian soils rank high, even in comparison with the rich limestone soils of the Golden Vein and about Nenagh. The late Colonel Spaight, of Derry Castle by Lough Derg, informed the writer that he fattened small three year old cattle on his land, where Silurian calcareous slate is the prevailing rock.

The Silurian rocks of Down, Cavan, Louth, Armagh, and Monaghan, Mayo, and south-east Ireland, yield sandy and stony loams which are poor in natural resource, and therefore make poor pasture land: being very deficient in lime as an ameliorative (though possibly there may be sufficient of this substance to serve as plant food), percolation is bad, and artificial drainage usually required. Happily facilities for this are not wanting, for the weathering of these rocks has produced an uneven surface—undulating ground—with good fall.

The locally formed soils which scantily cover the schists of Donegal, Mayo, and West Galway are very uninviting, unless where relieved by bands which here and there traverse the areas, marking the presence of partially concealed beds of limestone, or "dykes" of basalt or of felsite. The soils usually contain an admixture of peaty matter which renders cultivation less difficult and more profitable; where this is wanting, the shallow soils are stony and contain a trifling proportion of clay. Even where a considerable depth of schist detritus occurs, as in the case of accumulations of locally formed drift, the soils capping these accumulations are in their natural state only a few inches deep. Under artificial treatment—to be more explicit, through long continued cultivation of a good type—the soils around Derry, Raphoe, and Dunnamanagh have become deepened and enriched, so that they are now by no means indifferent receptacles for manures, nor unresponsive.

The granites of Donegal, Down, Leinster, Mayo, and Galway usually form ground which lies above the limit of profitable cultivation. In Galway and around Dungloe in Donegal, its elevation is not great, but it forms ground

very uninviting to the agriculturist, for the most part peat-covered. The soils, when worth describing (as in the southern parts of Carlow and on the slopes of the granitic masses), are gray sandy loams, naturally very deficient in lime and phosphates, but they contain potash and some soda resulting from the decomposition of the felspathic constituents of granite. Throughout east Waterford and Wexford gray loams are common, resulting from the decay of felsites; like the soils formed from granite these contain supplies of alkalis, but are deficient in lime.

In Antrim and east Londonderry, basalt, the prevailing rock, yields red pulverulent loams, contrasting strongly with the soils formed from granite, in that they contain lime and phosphate-yielding ingredients, and in being deficient in potash. Though the fertilising constituents in these soils are yielded up slowly, the soils are frequently extremely rich.

Were the soils throughout Ireland such as have been formed from the rocks immediately underlying them, an ordinary geological map would indicate, with a fair degree of precision, the nature and contents of the former; but this is not found to be the case except in the circumstances mentioned on a previous page. The supervention of glacial conditions in the country, in the remote past, has resulted in transplacements to a greater or less extent, of soil-forming materials, which obscure the relations between the soils and the several rock formations. These circumstances, though in some instances operating adversely, are found in a far greater degree to have worked beneficially to the agricultural interest: there has been a mingling of components drawn from various sources which is generally conducive to fertility; and in the distribution of drifts carried from the central plain, hundreds of square miles have been covered with valuable limestone detritus, thus imparting to hundreds of thousands of acres a degree of fertility which otherwise they would not possess.

Regarding the beneficial effects of mingling of soil components there is little question that the richness of alluvial and drift soils of the Golden Vein is attributable to detrital contributions from the Silurian and Red Sandstone rocks of the Keeper Hills, and from the felsites, basalts, etc., of the Limerick basin, mingling with the materials derived from the rich limestone of the country. The rich soils of Meath, North Kildare, and Dublin consist chiefly of limestone detritus interspersed with contributions from sandstones, granites, and other potash-yielding rocks; and the Lagan Valley, clothed with drift, owes its well-known fertility to glacially formed mixtures of components drawn from basalt, and red marl on the one side, and Silurian grits and slate on the other, added to decomposed New Red Sandstone—the prevailing rock of the valley. The soils of the barony of Forth and of other parts of Wexford, owe their fertility to transported limestone detritus; and similarly the best barley soils of Cork, Carlow, Queen's County, Louth, etc. are of drift origin.

The distribution of drifts may be judged from the accompanying small map, prepared with a view to showing the ground covered with those deposits—not all limestone detritus, however. The materials and mixtures are well-nigh infinite in variety; to represent even a fair classification of them and of soils formed from them, as well as directly from the solid rock, where no drifted materials occur, would demand a large scale detailed map. In the production of such a map for agricultural purposes, while noting in a general way the local nature of the drifts, especially as regards sub-soils, I think a double system of classification could be adopted, with appropriate colouring and other map indications, in which, as regards texture, sands and gravels, brick clays, and the intermediate varieties, sandy loams, loams, and

clay loams, would be noted; and, as regards chemical resources, distinctions would be indicated between lime soils, highly calcareous, and non-calcareous soils, and those strongly potassic. The former or *physical* distinctions, might be indicated respectively by the following letters, viz.:—*s* (sands and gravels); *cl* (brick clays); *ls*, *l*, *lc* (the principal varieties of loam). Tabulated, the chemical indications, also, might appear as follows:—

Classification of Soils according to their Chemical Properties.

Distinction.	Symbol.	Description and Origin.
Lime Salts ..	C^s.	Those obviously formed from limestone drift and shallow soils resting on limestone. They will probably contain a quantity of phosphate in easily available form for plants.
Highly Calcareous	C_2.	Drift Soils derived from calcareous rocks, where limestone detritus is noticeable in the subsoil; and soils formed directly from disintegrating basic igneous rocks. They will probably contain some phosphate.
Calcareous ..	C_1.	Those derived from calcareous rocks, and drift soils in cases where the deeper subsoils graduate downward into limestone boulder clays and gravels. Phosphates, if present here, probably occur in forms not readily available to plants.
Non-calcareous ..	C_0.	Those derived from non-calcareous rocks.
Potassic Soils ..	K.	Soils derived from acid igneous rocks—granite, felsite, &c.

Such a classification as this would place experiments in manuring upon a sound, because scientific basis; for it will be apparent to any thoughtful person that the results obtained from the use of certain manures upon soils—say, of the first and fourth kinds named above—must necessarily differ; and that without a recognition of the distinctions pointed out, the results should prove misleading and worthless as a means of testing or illustrating the comparative value of manures. The results obtained may just as well prove the differences of *soils*, in different places, as the different degrees of suitability of various schemes of manuring, to certain crops. It may be conceded that crops do not all draw alike upon the chemical constituents of soils—upon this fact partly the principle of rotation cropping depends—and that certain artificial supplies are suggested by the special requirements of particular crops. It is, nevertheless, rational to suppose that the deficiencies and natural resources of soils are amongst the chief points to be considered in prescribing and adopting suitable manures. Some £300,000 worth of mineral manures is employed in Ireland; such are used with substantial profit in many cases, but with recorded loss in others—to the extent, sometimes, of £2 an acre. To obviate waste some such classification as that above proposed, and soil maps prepared accordingly, would seem to be necessary economic desiderata.

It has been fully established by experiments conducted at Rothamsted, that the influence of certain mineral substances in soils, upon the character

of vegetation and quantity of produce borne is very marked; it is not enough, therefore, to know whether the soils are loams, clay loams, or sandy loams, etc. Geological circumstances determine in a fairly accurate way the chemical resources of the soils, which are not manifest to ordinary observers, but which may with advantage be studied, in connection with the quantity and quality of herbage which the land produces, and may be made to produce.

It has been found that certain parts of Ireland, determined by geological circumstances yield a superior quality of butter, as compared with other parts—circumstances of manufacture being equal;* more concentration of effort, upon dairying, therefore, in such localities, as indicated by soil maps, would obviously be attended with good results.

Pastures clothing soils rich in phosphates are best adapted to horse-breeding, where strength of bone and constitution are especially demanded; the necessity for a good supply of lime and phosphate is also requisite in the rearing of young horned stock. Soil, therefore, naturally rich in these ingredients would be especially suitable to these branches of stock-raising.

A good supply of potash in soils is necessary for the growth of the best samples of malting barley, and generally in promoting maturity in cereals. Means of selecting the most suitable localities for the former crop, and indicating the deficiencies in soils, where the crop is grown, would, therefore, be of obvious value to farmers.

In a brief account of Irish soils such as the present, it would manifestly be impossible to do more than summarise certain features which they present, and suggest means by which readers who are especially interested, might be made acquainted with such characters and conditions as render soils valuable or the contrary. The writer is well aware that much remains to be said, both as regards the soils themselves and the means of their improvement—whether moory soils, alluvial deposits, sand tracts, intakes, etc., which occupy large areas in the aggregate, but to none of which special attention can here be given. Before concluding, reference might be made to the strips and wide tracts of alluvial soils which margin the streams and rivers, in order to call attention to the peculiar advantage attaching to the occasional saturation of such soils with the lime-charged drainage waters flowing over the limestone rock, and from limestone drifts. These waters always carry traces of phosphates as well as lime, which add much to their enriching properties: and their value in this respect, equally serves as an illustration of the benefits accruing from, and an argument for the more extended use of, irrigation, too much neglected in this country.

Of the large areas of peat and moory soils met with throughout Ireland, much might profitably be reclaimed. Reclamation undertaken on an extended scale has occasionally been attempted, with discouraging results. On the margins of peat bogs, however, where the transference of clay and gravel for top-dressing would not be costly, and lime is easily procurable, it has been successfully carried out, and "cut-away" bogs in many places could easily be brought under profitable cultivation. Limestone gravel and clayey drifts would be especially suitable for the purposes; disintegrating granite has been used effectively in North-west Donegal, and the detritus of Old Red Sandstone in the region of Dunmanway, in Cork.

Shell gravel and "coralline sand" exist at various points along the coast of Ireland, and these substances would be invaluable in reclamation.

* See article in *Farmer's Gazette*, issue of 10th December, 1898, and editorial comments in issues of 17th December and 14th January following.

THE CLIMATE OF IRELAND.

All who are concerned in the material interests of Ireland realize what an important place circumstances of climate hold in connection with the prosperity of the country. No class can appreciate better than agriculturists, the manner in which their industry is affected by the characteristic features of our climate;—to wit, fickleness and unusual humidity, with a degree of mildness in temperature, which surpasses that of other countries of the same latitude. Taken in conjunction, these characteristics are not unfavourable to health, and are particularly suited to the stock-feeding branches of our main industry. Crop-raising, especially in the case of cereals, is affected by both humidity and the frequency of weather changes; notwithstanding this, a high degree of success in cultivation was realized before prices were brought down to their present level; and the climate did not hinder the successful growth of wheat, though, perhaps, this is the crop which is most sensitive to its unfavourable influences.

There can be little doubt that the clearing away of forests, the lessening of water areas, and the carrying out of extensive schemes of arterial drainage, in the first half of the last century, have tended to bring about changes in the climatic conditions. These have been, probably, more in the way of greater drought and increased light and heat in summer, and greater cold in winter, than in the alteration of the mean annual temperature of the island*: but even if alteration in the former respects have taken place, it must have been to a very slight degree, as it would be over-ridden by the effects of much stronger outside influences, which no changes within would affect, and which have operated uniformly, probably, for many centuries. One great disadvantage attendant upon the clearing of forests is the lack of the shelter which their presence would afford, an element of no mean importance where stock feeding in the open is so much practised as it is in Ireland.

We may, at the outset, distinguish between *climate* and *weather*. The former is chiefly dependent upon the geographical position of our island with reference to latitude; and, relatively, to the neighbouring Continent of Europe, as well as in a less degree, upon the altitude of its mountain groups. The weather, on the other hand, depends upon the seasons and the changeability of the wind direction, or, in more scientific language, the movements of aerial currents. It is impossible to draw a hard-and-fast line between conditions which constitute climate, and those which constitute weather; they are both dependent upon natural laws which mutually interact, and

* The importance of such considerations in regard to climate is emphasised by an instance given by Mr. John Knox Laughton, M.A., F.R.A.S., who points out "that a mere knowledge of the mean temperature of a place gives little or no idea of its climate, or of the forms of life—animal or vegetable—for which it is fitted. The mean temperature for the year is almost the same in the Hebrides, and on the north shore of the Caspian, or of the Sea of Aral; but there are perhaps no places, between which a comparison can be made at all, where the climate is so different."

these may be briefly reviewed here in so far as they affect Ireland, under the following heads, viz. :—

Temperature.
- Latitude.
- The Gulf Stream.
- Configuration of the ground.
- Aspect.
- Relation of temperatures of air and soil.

Aerial currents.
- Atmospheric moisture.
- Vapour condensation.
- Cloud, fog, dew, mist, rain.
- Wet and dry winds.
- Rainfall.
- Weather prognostication.

TEMPERATURE.

Latitude.

Every reader is likely to be aware of the manner in which the temperature of Ireland is affected by its position as regards *latitude*. It will guard against exaggerated estimates of the extent to which the local temperatures of the north and south of the country differ, to say that while 3,700 miles intervene between the Frigid and Torrid Zones—between the regions of arctic cold and tropical heat—the length of this island is only 270 miles, or one fourteenth of the former distance.

The temperatures of north and south, in regard to latitude, are of course the direct results of the sun's heating power; but though this be recognised, the amounts cannot be known by observation independently of the effects of other heat-applying agencies—the Gulf Stream, warm air currents, vapour condensation, etc. Observed temperatures involve the existence and co-operation of all these, and show about 4° F. for the January mean; 2°.5 F. for August; and 3°.3 F. for the year, in favour of the south.

The Gulf Stream.

The Gulf Stream is a potent agency in influencing temperature. This vast body of water, issuing from the Gulf of Mexico, flows north-eastward past Florida, into the North Atlantic Ocean. It continues its course across the ocean, with an average temperature of 65 F.,* dividing into two branches, a north-easterly, which flows past the British Isles, and an eastward branch flowing towards the coasts of France. Parts of both branches strike the S.W. coast of Ireland and flow northward; and part of the eastward branch, turning northward in the Bay of Biscay, flows up to the English and St. George's Channels, and towards the Irish coast. The heating effect upon the British Isles is such that the mean winter temperature of Ireland is 20° F. higher than that of places on the same parallels of latitude in America and West Russia. The body of water also being so great, is productive of uniformity in temperature; so much so that the mean summer temperature of Ireland is some 5° F. to 10° F. lower than that of east Prussia. The amount of caloric which the Gulf Stream possesses, and can

* "Meteorology, Practical and Applied," (p. 314), by Dr. J. W. Moore, now Sir J. W. Moore.

impart to the atmosphere in our latitudes, may be inferred from the following note given by Marié Davy, from observations made by Captain Duchesne in crossing the Atlantic from New York to France in 1865*:—

The effect of the Gulf Stream upon the local temperatures in Ireland is such that the isothermals crossing the island from east to west, decline from the parallels of latitude, in accordance with the following observations, viz.:—The mean temperature for the year at Dublin is about 1°.4 F. less than at Westport; for January it is 2°.7 F. less; and for August 1°.4 F. greater.

Day.	Hour.	N. Lat.	Air Temp.	Sea Temp.	Diff.
10 November	9 a.m.	40°.10′	8° C. (46°.4 F.)	11° C. (51°.8 F.)	5°.4 F.
11 ,,	4 a.m.	40°.16′	5° C. (41°.0 F.)	14° C. (57°.2 F.)	15°.2 F.
11 ,,	8 p.m.	40°.23′	4° C. (39°.2 F.)	15° C. (59°.0 F.)	19°.8 F.
12 ,,	9 a.m.	40°.56′	4° C. (39°.2 F.)	21° C. (69°.8 F.)	30°.6 F.
12 ,,	noon	41°.05′	5° C. (41°.0 F.)	21° C. (69°.8 F.)	28°.8 F.
				Average difference	20°.1 F.

Configuration of the Ground.

Amongst the conditions contributory to the general character of the climate of the island, as well as to variation in local temperature, is the configuration of the surface. If 300 feet above the sea level be taken as the general level of the lower parts of the country, about half its area lies above this elevation; and every additional 100 feet above 300 perceptibly lessens the value of land, because of the effect of altitude upon temperature. This was fully recognised by Sir R. Griffith.† In consequence of the effect referred to, the mean temperature at 500 feet elevation near Dublin, would be about equal to that at the sea-level at Londonderry or Moville. The temperature falls approximately one degree F. for every 250 to 300 feet rise, in our latitude. The higher ground of the mountain groups, moreover, tends to modify the direction and force of winds; it produces condensation of vapour reaching Ireland from the Ocean, which greatly affects the temperature of the hilly regions, and adjacent low-lying areas; and it partially drains the aerial currents of moisture, so that the precipitation (rain) on the lee side of the hills, is not so great as it otherwise would be.

Aspect.

Every farmer knows the advantage of a southern aspect for his early seed bed in spring. The sun at the Equinox is only some 36° above the horizon at noon, in our latitude. Its heating power at this season, therefore, as well as being lessened by sending its rays obliquely through the moist atmosphere, is greatly diffused on level surfaces, and almost *nil* on northern slopes. Concentration of the sun's heat and light therefore, which is so desirable, can only be secured by arranging that beds bearing seeds and plants, shall be presented to it at as great an angle as convenient.

The following Table, prepared from data given in the Monthly Summaries of the Meteorological Office, sets forth the number of hours of, and percentage of possible, bright sunshine in the three growing months, March, April, and May, at the only Irish stations which record it: for the sake of comparison the records at two English stations are added.

* "Meteorologie Generale," p. 145.

† "Guide to the Principles of Land Valuation," (Ponsonby, Dublin), p. 164.

Hours of Bright Sunshine for 1901, and Average of 20 Years, with Percentage in each case.

	MARCH.				APRIL.				MAY.			
	Hours of B. S. for Month, 1901.	Hours of B. S. Average.	Per Cent. for 1901.	Per Cent. Average.	Hours of B. S. for Month, 1901.	Hours of B. S. Average.	Per Cent. for 1901.	Per Cent. Average.	Hours of B. S. for Month, 1901.	Hours of B. S. Average.	Per Cent. for 1901.	Per Cent. Average.
Markree	108.4	105.2	30	29	178.8	145 8	43	35	271.0	188.5	55	38
Armagh	89.3	103.1	25	28	172 1	140.7	41	34	254.1	184.6	52	38
Dublin	140 6	123.8	39	34	192.6	162.4	46	39	276.7	212.4	57	44
Parsonstown ..	116.4	110.8	32	30	199	151.1	48	46	268.4	185.0	55	38
Valentia	120.1	132.3	33	36	172 2	163.9	42	40	292.2	210.7	61	44
Llandudno . ..	121.8	110.3	33	30	181.3	152.6	43	35	294.9	201.0	61	41
Cambridge	77.4	125.3	21	34	220.4	157.6	53	38	253	203.1	52	42

Relations of Temperatures of Air and Soil.

Badly drained land and retentive geological Formations have not only a cooling effect on the air in immediate contact with them, but through the diffusion of the chilliness have a material effect upon the island as a whole. This is a subject which may well repay full consideration; for the circumstances of cause and effect act and react. A damp atmosphere hinders the heating effects of the sun upon the land; and damp cold soils and rock Formations, on the other hand, cause dampness of the atmosphere.

Prof. Seeley, F.R.S., classifies rocks and superficial deposits (sands, gravels, etc.) as follows, according to the effects which they severally have upon local climate*:—

Pebble beds, Sands, and Sandstones; dry, bracing atmosphere.
Limestone; though usually well-drained, is overhung by steamy atmosphere in summer.
Clay Slates; damp and cool atmosphere.
Crystalline Rocks; do.

The extensive tracts of bog and alluvium in the centre of Ireland have a lowering effect upon local temperature, and no doubt also have an effect to some extent upon the general climate of the island. Reclamation of moory soils, and even drainage of these and other water-logged surface deposits, would tend to alleviate this disadvantage. Wollny proved by an elaborate series of experiments carried out at Munich in 1890, 1892, and 1893, that top-dressing peat-soil, not to speak of the well-known advantage of thorough draining, had the effect of raising its temperature, particularly when the top-dressing was *mingled* with the uppermost layer of peat; and this both in upland moor soils (*Hochmoorboden*) and lowland (*Niederungsmoorboden*).†

AERIAL CURRENTS.

Many elements combine to produce variation in the direction and pressure of winds in the Irish region. Amongst them may be reckoned land and sea.

* Sir J. W. Moore, "Meteorology, Practical and Applied," p. 35.
† *Forschungen a. d. Geb. d. Agriculturphysik* for 1894, pp. 245 *et seq.*

bre zes, experienced morning and evening under certain circumstances. Anti-trade winds also, which set from the S.W. and W.S.W. in our latitudes (Trade winds prevailing between 9° N. and 30° N.) may, as was held by Dr. Buchan, act a certain part in producing variability in wind direction. The most influential factors, however, in causing change are the winds eddying in cyclonic systems which reach Europe from the Atlantic, sometimes in comparatively rapid succession.

The origin of these storms is a subject of much debate upon which we need not enter. They are by many believed to cross the Atlantic from shore to shore. Prof. Loomis, an able authority, maintains that they undergo modification after leaving the American coast region, which of course interferes somewhat with calculations as to the time and place at which they may reach Europe.* The popular belief is that these points may be accurately foretold; and it is worth noting that calculations in this respect are frequently verified.

It is, however, a fact generally accepted, that after traversing a great distance across the Atlantic, these storms usually reach the European region a little to the north of the British Isles, Ireland experiencing brushes of the skirts of the vast aerial eddies in their easterly progress. Occasionally they cross the British area, and cause a greater amount of meteorological disturbance than usual. A peculiarity of these circular storms is that they rotate, looked at downward, in a direction contrary to the hands of a watch, north of the Equator. The centres are marked by reduced barometic readings, the pressure of the atmosphere being there particularly low; and the pressure increases outward towards the margins of the eddies, where it is approximately normal. As the storm passes over a locality therefore, the barometer rapidly falls till the place is reached by the centre of the cyclone, after which the barometer rises. And, as regard wind directions experienced while the storm moves onward, if the centre passes to the north of Ireland, in the way most usual, the direction of the wind will be perhaps first S., then S.W., and then W.—the change, or *veering* as it is called, being "with the sun." If it takes a more southerly course, and crosses Ireland, the winds will change "against the sun," *backing*, as it is called, with a falling barometer, a condition which will be followed by a repetition of the storm, and a rising barometer.

By carefully mapping simultaneous barometric observations at many places, and connecting the places of equal indicated atmospheric pressure over large areas, the connecting lines (*isobars* as they are called), form irregular concentric circles around the centres of the cyclones, and by comparing the positions of these circles from day to day, or more frequently, the progress of the storm may be made apparent by means of maps. There are also circles, obtainable in a similar way, surrounding points on these weather charts where the barometer stands very high. These points are the centres of "anticyclonic systems," around which winds circulate at rates not at all so rapid, and in an opposite direction to that uniformly observed in cyclones; the anticyclone circulates according to the hands of a watch.

In summarising data for the preparation of a cyclone map from the Weekly Records of the Meteorological Office, the present writer found that

* The subject is discussed in a most interesting manner by M. Marié Davy in his *Météorologie Générale*, pp. 223 to 234. Mr. R. H. Scott, F.R.S., treats the matter as one of doctors differing, and perhaps wisely confines himself in his work on "Weather Charts and Storm Warnings" to the simple questions of their existence, movements, effects, and characteristics.

31 depression-centres crossed the British area during the past two years, 1900 and 1901, distributed according to the following Table :—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1900		0			2			3			3	
1901		5			3			4			5	

from which it will be perceived that cyclones have been much more prevalent in the winter half year. Disturbance was caused in the British area by some twenty other cyclones, which crossed by the north-west, east, and south. It was also found that the compass of the storms varied in diameter from 200 to 2,400 miles; and that, while most came from the west, some twenty-five appear to have developed in the western European area, between parallels of 47 and 65, and meridians 12 W. and 5 E. of Greenwich, and some thirteen broke up within the same area.

With respect to the commonly accepted "Equinoctial Gales," Mr. Rupert Smith, from records for 26 years, ascertained that "cyclonic winds occur with greatest frequency and force, some two weeks before the Spring Equinox, and three weeks after the Autumn Equinox."

From these circumstances it will be seen that winds in the Irish region may well greatly vary both in direction and force. Dr. Lloyd, in his report on the Meteorology of Ireland,* has given a Table setting forth the directions of wind, which shows that westerly winds are on the whole more than twice as prevalent as easterly, throughout the year; that the most frequent are those from the S.W., W., and N.W.; that the least frequent are east winds; and that south winds are the most prevalent after the westerly.

Atmospheric Moisture.

Air takes up moisture at all temperatures, and becomes highly charged when moving over sheets of water, marshes, and peat bogs. It is, however, seldom charged to the full extent that it will bear—it is seldom *saturated*. The less moisture it contains, the greater its drying power, or hygroscopic capacity, and the less is its "relative humidity." This term, given in Meteorological Tables, may be explained as the percentage of vapour in the air to that which is necessary for its saturation. The greater the relative humidity, the better it is for agriculturists at times when, as in May and June, in Ireland, herbage is likely to suffer from drought through lack of disturbance in atmospheric conditions, such as is usually attended by rain. The average relative humidity for the year, reckoned upon monthly averages for sixteen Irish Stations,† as given by Dr Lloyd, was as high as 87 per cent. for the year 1851.

* Transactions of the Royal Irish Academy, vol. xxii., pp. 440–442.

† It is not satisfactory to notice that while progress in meteorological, as in other scientific observations, marks the present day, Ireland should be far behind, if it does not, even in some particulars, show absolute as well as relative retrogression.

While England and Wales have 47 Stations of the First and Second Order, and Scotland 25, Ireland has only 8—*five* outside of Dublin. Of Telegraph Reporting Stations connected with the Meteorological Office, for preparation of Weekly Weather Reports, bearing upon Agricultural and Sanitary matters, England has eleven or twelve, Scotland seven, Ireland five—the countries being divided into *six*, *three*, and *two* Districts respectively. In Rainfall Stations Ireland unfortunately shows the same strong disparity, it has but 146, against 249 in Scotland, and 2,802 in England and Wales. The United States is divided into eleven Districts, and has 77 Stations, recording temperature and rainfall, all linked together by means of the most elaborate system of telegraphic communication.

Vapour Condensation.

From observations on evaporation during two consecutive years, Mr. James Price, C.E., found that at Dublin and Galway it amounted to 26 inches; while at Cavan, where the soils are retentive, and in the vicinity of which sheets of water and tracts of peat abound, the evaporation was only 13 inches. These circumstances are referred to by Sir J. William Moore,* who further points out that though the rainfall at Galway is greater than at Cavan, the habitual comparative dryness of the former, and of Clare, renders their local climate preferable to that of Cavan, being more bracing.

On page 354 of his work,† Sir J. W. Moore gives a Table setting forth the results of observations from 1865 to 1887, upon the temperature, humidity, cloudiness, rainfall, etc., at Dublin, a portion of which is here borrowed:—

Month	Temperature			Relative Humidity	Per cent. of Cloud
	Mean	Max.	Min.		
	°	°	°		
January	41.3	45.3	37.3	85.4	64
February	43.0	47.2	38.8	84.9	66
March	43.3	48.2	38.3	81.9	60
April	47.8	53.6	42.0	79.6	56
May	51.9	58.2	45.5	75.9	55
June	57.8	64.3	51.3	76.8	60
July	60.8	67.2	54.4	78.0	62
August	59.8	65.9	53.7	81.9	58
September	55.8	61.4	50.2	84.3	56
October	49.8	54.6	44.9	85.5	59
November	44.5	48.7	40.3	85.9	62
December	41.1	45.1	37.1	85.7	61
	°	°	°		
Annual Means ..	49.8	55.0	44.6	82.2	60

At night, when the air cools down—through contact with the earth, itself cooled by radiation—a temperature is reached at which the air can no longer retain its vapour in invisible form (for the warmer air is, the greater is its capacity for vapour); the vapour then condenses, and becomes visible as fog, which rests on vegetation and soil as dew, or in extreme cases of cooling as hoar frost. The temperature at which fog begins to form is called the *dew point*, also given in Meteorological Tables. At the dew point the condensation of vapour causes a release of latent heat, which tends to preserve the layer of air in contact with vegetation from extreme cooling—an important consideration in early spring. We may say then that the higher the dew point is, the less likelihood there is of injury from frost. These circumstances exhibit the bearing of meteorological data upon the prospects of Irish farming.

Fog, Cloud, Mist, Rain.

Happily the lowland parts of Ireland are not so cold as commonly to produce vapour condensation, except at night; but this often takes place during the day around the colder mountain-tops and along the flanks of hills, and affords a familiar index of humidity, and forewarning of probable mist and rain. The fogs which hang about such situations, have a baneful influence upon

* "Meteorology, Practical and Applied," pp. 184, 185. † *Op. cit.*, pp. 184, 185.

the agriculture of hilly districts. They hinder the passage of the sun's light and heat, which otherwise would counteract the cooling effects of air descending from the hillsides into the valleys, and to the land margining the hills; with the results of late springs, late and damp harvests and other disadvantages.

The meeting of currents of air in the higher regions of the atmosphere, one cold and probably dry, the other warm and damp, will, when they coalesce, if the latter be sufficiently humid, result in the condensation of the contained moisture, which will form cloud and possibly give rain. The currents, too, before meeting may contain sufficient cloud to indicate their directions, and render it possible to forecast the result.

Sir J. W. Moore, M.D., etc., has given in his work on Meteorology (p. 221), an excellent classification of clouds, to which attention is here directed. Some accompany *fine*, and some *bad* weather.

Amongst the former are—*Cirrus* or "mare's tail;" *Alto-cumulus*; *Cumulus* or "wool-pack;" and amongst the latter are *Cirro-stratus* or "sheet-cloud;" *Alto-stratus* or "ground fog;" and *Cumulo-nimbus* or "rain cloud." The altitudes of clouds range from about 9,000 metres (nearly 10,000 yards in the case of Cirrus) to some 2,000 yards in the case of "fog banks."

Wet and Dry Winds.

The insular position of Ireland exposes it in a special way to the influence of damp winds off the ocean, the prevalent ones in this region, as we have seen, being those from the westward and southward. Those from the north and east, though not always dry winds, are usually so.

Rainfall.

The meteorological element which tells perhaps most upon Irish farming is precipitation—rain. Not that the rainfall is excessive, but its occurrence is so precarious that the best attempts at forecasting, based upon past experiences, however well systematised, are often foiled. Only in the east of England—with a rainfall of less than 25 inches—is there a region distinctly drier than any part of Ireland. The general rainfall of the centre of England (25 to 30 inches) equals that of the centre of Ireland. In Cumberland, Westmoreland, Wales, and N. W. Scotland some recorded precipitations are greater than in the wettest part of Ireland, which is at Mangerton (118.8 inches in 1900). The wettest region in Ireland comprises the hilly districts along the west coast from Cork to Donegal (about 50 to 75 inches), extending inland so as to include the Waterford and Tipperary Hills (about 40 ins.) The hilly district of Wicklow and South Dublin is distinctly wetter than Middle and North Dublin; and that of the Mourne Mountains, though on the east Coast, is also a wet region in comparison with other parts of the County Down.

That weekly and monthly averages are serviceable in agriculture, there can be little doubt. Indeed the general consensus of opinion is to this effect, judging from the number of stations at which records of rainfall are kept even in Ireland (146—see previous footnote p. 41). The manner in which records of rainfall, temperature, etc., may be made to serve their natural purpose has been admirably worked out in America: allusion is made to this point at the conclusion. An obvious use to which Symons' Tables of British Rainfall may be put, is that of classifying various regions in Ireland according to the annual amount of precipitation. The records

* Symons' Rainfall Map, "Modern Meteorology," p. 141.

would justify a more detailed classification of localities according to average monthly rainfall than any now existing; and a meteorological scheme of classifying localities, still more likely to be helpful to agriculture, might be devised upon a basis in which the bearing of other elements would be recognised, conjointly with rainfall.

Weather Prognostication.

With such a degree of variability in the weather as is experienced in Ireland, a system of prognostication, similar to that adopted and applied in America, would be invaluable; but what has already come before the reader will show how different are the conditions of the problem in the two countries. In America, with its immense continental area, storms may arise, run their course, and cease, within the region reached by the splendid system of telegraphic communication organised by the States Agricultural Department. In Ireland, on the other hand, the disturbing forces originate in, and approach these islands mostly from the west. Hence one is prepared to hear so high an authority as Mr. R. H. Scott, late Secretary of the Meteorological Office in London, confess that weather prognostication in these countries is attended with prodigious difficulties. Regarded in their simplest elements, Mr. Scott says ("Weather Charts and Storm Warnings," p. 61), concerning the approach and characteristics of cyclonic storms:—

"The phenomena belonging to the front of the system are—*Cirrus* clouds or 'mare's tails' in the sky, south-easterly winds, great rise of the *thermometer*, and excessive dampness. The sky becomes gradually overcast, followed by mist and rain. The *barometer* falls persistently, while 'scud' begins to drift from the southward. The barometer continues to fall, the wind *veering* from S. to S.W., rain falling. As soon as the wind passes the S.W., and draws to W. or N.W., the *barometer* begins to rise with a sudden jump, and the temperature falls, with very heavy showers of rain, possibly turning to hail, connected with and following which, the air becomes drier and the sky clears."

Notwithstanding recognised difficulties in forming reliable forecasts in Ireland, there is no doubt that patient, steady, and systematic use of the barometer and thermometer, with close observation of such phenomena as the forms and movements of clouds, would reward those whose care it is to combat or forestall the unfavourable weather conditions which assail us. If these observations were supplemented by some others collected, say, at a few stations along the western seaboard, used conjointly with information received from many quarters at the Meteorological Office in London, put in suitable form for transmission at a subsidiary office in Dublin, and despatched by wire to country parts, there is little doubt that material help could by such means be given to farmers in the harvest season. The help would be especially valuable in barley growing districts. This crop, an important asset in the country, is particularly liable to injury by bad harvesting; and even ten or twelve hours of warning would admit of the reaped crop being secured against danger.

Elaborate as are the arrangements, and suitable the circumstances, for the prognostication of weather changes in the wide area of the United States, this application of Meteorology is not the only practical one to justify—in so far as agricultural matters are concerned—the large expenditure of public money upon the science in that country. There are besides notes upon agricultural operations and crop prospects, recorded weekly,

concurrently with the state of the weather in each of the districts; and comparisons of the latter with average conditions, founded upon many years' observation. This is an application of the science which might, with advantage, lend itself to the same purposes in Ireland, where prognostication cannot be practised as satisfactorily as might be wished, because of our geographical situation. Quarterly Reports of rainfall are issued, and comparisons with the averages drawn, for north and south of Ireland, by the Meteorological Office; but these are much too general to serve any practical ends—the districts even are larger than districts in England. If the best possible averages were made out for districts in Ireland, defined by their presenting fairly distinct meteorological characteristics, and reports of current observations made from week to week in spring and summer, to compare with averages, and connect with crop conditions and agricultural operations, the results would be highly useful—if only in remedying the tendency to procrastination in spring preparations and sowing; a sounder basis of harvest anticipations than at present exists, would be afforded; method and exactitude would be induced; and habits of observation begotten, which could not fail in many respects to prove beneficial to the country, especially to the farming community.

Enniskerry, Co. Wicklow, with view of Sugar Loaf Mountain.

THE FLORA OF IRELAND.

To a British botanist nothing can be more enjoyable than his first view of the typical Irish plants to be found in Connemara, in Counties Kerry, Cork, or Donegal. With the salmon-smugglers' friend, the beautiful Irish Spurge, in profusion along the coast, the royal fern forming hedges on the earth banks dividing fields, every pool, it may be, containing *Lobelia Dortmanni*, the Pipewort, with possibilities of the Quill-wort and the Pill-wort, the botanist may search for *Naias flexilis*, rare heaths, Saxifrages, the filmy ferns, orchids, or other characteristic rarities. Fortunately, he may go well armed with the recently published second edition of the *Cybele Hibernica*, which gives a general account of the distribution of Irish flowering plants and ferns, and embodies the work of the authors of the first edition, the late Dr. D. Moore and A. G. More; of the editors of the second edition, N. Colgan and R. W. Scully; and the late Professors C. C. Babington, J. H. Balfour; J. T. Mackey, W. Wade, I. Carroll; of S. A. Stewart, T. Chandlee, R. M. Barrington, R. Ll. Praeger, H. C. Hart, R. A. Phillips, and many others.

The introduction to the *Cybele Hibernica* contains a discussion of the chief features of the Irish flowering plants, and of the physical causes combining to produce these features. Just as the English Flora (1,480 species), may be regarded as an incomplete Continental one, so may the Irish Phanerogamic Flora (1,019 species), be considered as an incomplete English one. The Irish Flora consists largely of English migrants, and would have been still more English in character had not Ireland incontinently separated itself by the sinking of the difference (in land) between itself and Ireland in the Irish Sea. Owing to the warm, moisture-laden, south-western winds, the sedges, rushes, ferns, etc., are more abundant in the west, to which region *Sibthorpia europæa*, *Microcala filiformis*, and *Saxifraga Geum* are confined. A few species found in the west and south-west are true Hibernians, being absent from Great Britain, and include the London Pride, the Strawberry tree, and several fine heaths in Connemara. This distribution is brought out in an accompanying map, showing the twelve well-known districts into which Ireland has been botanically divided.

The publication, in 1901, by the Royal Irish Academy of the "Irish Topographical Botany," by R. Lloyd Praeger* (*Proc.* R.I.A., third series, vol. 7, 1901) usefully supplements the *Cybele Hibernica*, and gives, as far as is known, a detailed list of the distribution of the flowering plants and ferns in the forty botanical divisions into which Ireland has been divided by Praeger. The book contains a valuable introduction and several maps, and is intended to show the actual state of the Flora as ascertained during the preceding five years. As the names of authorities for earlier records when these have been confirmed during the past five years, disappear, the last person to see or record any particular species being the authority quoted,

* During the past few years some 5,000 specimens, illustrative of this work have been obtained for the herbarium in the Department's Museum in Dublin.

readers must turn to the *Cybele Hibernica* for the first records of the pioneers of the last century. Praeger has found the "types" of distribution of H. C. Watson unsuited to the Flora of Ireland and proposes accordingly, in a paper now at press, to replace them by the following :—

1. GENERAL	Plants occurring throughout Ireland.
2. CENTRAL	Plants occurring in the Central Plain, (mostly *calcicole*).
3. MARGINAL	Plants occurring near the coasts and on the hills bordering the sea, (*calcifuge*).
4. ULTONIAN	Plants occurring in Ulster.
5. LAGENIAN	Plants occurring in Leinster.
6. MUMONIAN	Plants occurring in Munster.
7. CONNACIAN	Plants occurring in Connaught.

The Killarney Fern (*Trichomanes radicans*), so plentiful fifty years ago as to be used for bedding for cattle, is now almost exterminated. The Maiden-hair Fern (*Adiantum Capillus-Veneris*) occurs along the west coast from County Clare northwards, and is quite a feature in the fissures of the limestone rocks of the Arran Islands, (Galway Bay). Many other interesting ferns are to be found in the S.W. and other districts.

The Flora of Ireland, as might be expected from the humidity of the climate, is rich in mosses and liverworts. Of the 830 species which grow in the British Isles, 540 or about two-thirds are found in Ireland. Alpine species are not abundant or remarkable, but the S.W. of Ireland, especially County Kerry, contains an interesting group of species which is characteristic of the S.W. of Europe and some of which are found also in the West Indies and South America.

The liverworts (*Hepaticae*) of Ireland number 170 species; some 43 species and many varieties having been recorded, mainly by the efforts of D. M'Ardle of the Royal Botanic Gardens, Glasnevin, since the publication of the late Dr. D. Moore's paper in the *Proceedings* of the Royal Irish Academy (Ser. 2, Vol. 2, 1876). Counties Cork and Kerry are especially rich in liverworts, no less than 129 species having been recently recorded from the Dingle promontory by D. M'Ardle (*Proc. R.I.A.*, Ser. 3, Vol. 6, No. 3, 1901).

Dr. Spruce, the explorer of the Amazon and the Andes, states that, "when gathering mosses and *Hepaticae* (liverworts) on the slopes of the Andes, he was reminded of the Kerry Mountains whose cryptogamic vegetation is the nearest approach in Europe to that of the tropical mountains."

This is especially true of the Hepatics or Scale Mosses, a group which is better represented in Kerry in number of species, in abundance and in luxuriance of growth, than in any other portion of the Kingdom, or indeed of Europe.

Tortula hibernica, Mitt.; *Daltonia splachnoides*, Hook., and Tayl.; *Hypnum canariense*, Mitt.; and *Hypnum circinale*, Hook., are mosses confined in the British Isles to the S.W. of Ireland, while a large number of Hepatics are found in this district only in the British Isles, or confined entirely to it, such as *Leieunea flava*, Nees.; *L. diversiloba*, Spruce; *L. Holtii*, Spruce; *Radula Holtii*, Spruce; *Bazyania Pearsoni*, Stephani; *Cephalozia hibernica*, Spruce; and *Plagiochila exigua*, Tayl.

Ditrichum vaginans, Sull., a moss, has only been met with in County Antrim in the British Isles.

Other rare and interesting species which grow in S.W. Ireland and form a

connecting link between the moss and liverwort Flora of Ireland and that of the S.W. coast of England, the Atlantic Islands, and West Indies are *Hookeria laetevirens*, Hook., and Tayl.; *Jubula Hutchinsiae*, Hook.; *Radula voluta*, Tayl.; and *Dumortiera hirsuta*, var., *irrigua*, Tayl.; the three last-named being liverworts.

Scapania nimbosa, Tayl., also a liverwort, has only been found on Brandon Mountain (Co. Kerry), and in one locality on the West coast of Scotland.

Of other rare British species of mosses found in Ireland may be mentioned: *Bartramidula Wilsoni*, B. and S.; *Leptodontium recurvifolium*, Lindb.; *Hypnum micans*, Wils.; *H. demissum*, Wils.; *Glyphomitrium Daviesii*, Brid.; and *Grimmia conferta*, var., *pruinosa*, Braith.; the two latter species being abundant on the crumbling basaltic rocks of County Antrim.

The rarer Irish Hepaticae are:—*Lejeunea microscopica*, Tayl.; *Radula Carringtonii*, Jack.; *Clasmatocolea cuneifolia*, Hook.; and *Acrobolbus Wilsoni*, Nees.

The beautiful liverwort, *Plagiochila ambagiosa*, Mitten., found early in the last century by Miss Hutchins of Bantry, has not been re-discovered. The Rev. C. H. Waddell, M.A., of Saintfield, Co. Down, founder of the British Moss Exchange Club, has supplied particulars as to the mosses and the more important moss literature:—

DAWSON, TURNER, *Muscologiae Hibernicae Spicilegium*, 1804.
TAYLOR, in Mackay's *Flora Hibernica*, 1836.
MOORE, D., "Synopsis of Mosses of Ireland, 1872" (*Proc. R.I.A.*).
MOORE, D., "Irish Hepaticæ, 1876" (*Proc. R.I.A.*, ser. 2, vol. 2.).*
STEWART AND CORRY, *Flora of N.E. of Ireland*, 1888, and *Supplement*, 1895.
LETT, *Mosses of Mourne Mountains*, 1889.

The writer in the "Irish Peat Question" (*Economic Procs. R.D.S.*) gives a key for the recognition of the species of the peat-moss, *Sphagnum*, found in Ireland.

The *Phycologia Britannica* of the late W. H. Harvey, the Professor of Botany to the Royal Dublin Society (a chair now continued in the Royal College of Science, Dublin), and in Trinity College, Dublin, is still the standard work in English on British Marine Algae. Harvey gives an illustrated account of 360 species, without special reference to their distribution in Ireland. In 1890 the "Revised List of British Marine Algæ" (*Annals of Botany*) by Holmes and Batters, gave a list of 560 (now 700) species, of which 230 are recorded as occurring in Irish waters. Harvey's invaluable collections of marine algae are preserved in the Trinity College Herbarium, Dublin, under the charge of Prof. E. P. Wright, M.D., who has himself described several species, new to science, in Ireland. It was the writer's intention to bring our knowledge of the Irish weeds to the level of that in Great Britain, but the claims of economic botany (peat, osiers, plant-diseases, etc.), have intervened and stopped the work. With the help of several former students—Miss R. Hensman more especially, H. Hanna, M.A., and Miss M. C. Knowles—reports on various groups of algæ have appeared during the past ten years. Thus the Brown Algæ (Irish Phæophyceæ, *Procs. R.I.A.*, 3rd ser. vol. 5, No. 3, 1899), now number 113, 40

* Dr. Moore's collections of mosses and liverworts are preserved in the Herbarium of the Science and Art Museum, Dublin.

having been added in this list. The calcareous Red Algæ, of great economic value, in Bantry Bay, on the Connemara and other coasts ("A List of Irish Corallinaceæ," *Proc. R.D.S.*, vol. 9, 1899) now number some 35 species —22 being additions. The perforating or shell-boring algæ, discovered in France by Bornet, are now known to occur on all the Irish coasts, (e.g., *Gomontia, Hyella, Mastigocoleus, Conchocelis,* "Some Shell-boring Algæ," *Nat. Science,* vol. 5, 1894).

Unfortunately Isaac Carroll's collections were mostly destroyed by the fire in Queen's College, Cork, some years ago, but the collections made by Miss A. Ball, from Youghal, etc., and many of Miss Hutchins' plants are preserved in the Dublin Museum.

Ireland is rich in freshwater algæ. Up to the year 1892, 900 species and varieties had been recorded, mainly through the efforts of W. Archer, F.R.S., the pioneer in their study, who for twenty years devoted himself to the algal flora, more especially of Counties Dublin and Wicklow, with occasional visits to the west of Ireland. The Rev. E. O'Meara similarly devoted himself to the Diatomaceæ. Since 1892 W. West, F.L.S., helped by his son Professor West, has visited Ireland several times, partly under the auspices of the Fauna and Flora Committee of the Royal Irish Academy, and has added 400 species and 200 varieties to the known algal flora, so that there is now recorded for Ireland no less than 1,500 species and varieties. Of this total three-eighths are Desmids (Cosmarium, etc.), and one quarter, Diatoms. Connemara, Wicklow, and the counties of the S.W. appear to be richest in fresh-water algæ. Many species new to science have been described from Ireland, some of which have since been found in other countries. Some of the species are of an "Atlantic" type, being confined to the West of Ireland, Wales, N.W. Scotland, and Scandinavia.

I am indebted to Mr. West for the accompanying lists.

Some of the rare species of Ireland not recorded elsewhere :—

Staurastrum Archerii, S. verticillatum, S. Donardense, S. subgracillimum, S. coniculatum v. spinigerum, S. Gatniense, S. latiusculum, S. barbaricum, S. jaculiferum, S. trachyconeum, S. curvatum, S. pelagicum, S. pungens, S. hibernicum, S. subpygmaeum, S. natator, S. pseudosebaldi v. duacense, S. Arnellii v. spiniferum; Cylindrocystis obesa; Arthrodesmus tripinnatus, A. elegans; Cosmarium perpusillum, C. subdanicum, C. synthlibomenum, C. obcuneatum, C. hibernicum, C. quadridentatum; Xanthidium subhastiferum, X. apiculiferum; Spondylosium ellipticum; Sphaerozosma granulatum v. trigranulatum; Zygnema momoniense, Golenkinia paucispinosa; Crucigenia Tetrapedia, C. pulchra; Chodatella breviseta; Calothrix parietina v. hibernicum; Polycistis elongata; Anabaena orthogona.

The following are amongst those Irish Species that have been found but rarely elsewhere :—

Cosmarium tenue, C. Scencdesmus, C. Reinschii, C. tuberculatus, C. nasutum, C. perforatum, C. goniodes, C. sphaeroideum, C. sportella; Cosmodadium bonstrictum, C. subramosum; Arthrodesmus tenuissimus, A. pluinus; Pleurotaenium nobile, P. nodosum; Docidium dilatatum; Mesotaenium murificum; Cylindrocystis minutissima; Staurastrum elongatum, S. cornitum, S. naamense, S. Manfeldtii, S. scabrum, S. Brebissonii, S. megalonotum, S. monticulosum, S. eristatum, S. oligacanthum, S. megacanthum, S. polytrichum, S. spongiosum v. perfidum, S. amoenum,

S. granulosum, S. sinense, S. dispar; Hyalotheca undulata; Sphaerozosma Archerii, S. secedeno; Spondylosium pulcheltum, S. tetragonum, S. Pygmaeum; Micrasterias pinnatifida, M. furcata; Euastrum pictum, E. Turnerii, E. pyramidatum; Spirotaenia parvula, S. trabeculata, S. ienerrima; Closterium directum, C. Archerianum, C. toxon; Penium morreanum, P. exiguum, P. adelochondrum; Xanthidium Smithii; Gonatonema Hirnii, E. longicolle; Gongrosira Sclerococcus, G. viridis; Trentepohlia calamicola.

The Characeæ, the most highly organised of freshwater algæ, are listed in the *Irish Naturalist* (1895), by the brothers Grove, and the writer published in the same periodical a general account of the group and a key for the recognition of the species found in Ireland.

In spite of the economic importance of the fungi as causes of some very destructive diseases, and of their fascination as a field study, no group has received less attention in Ireland. This neglect is partly due to the great difficulty in preserving the larger forms for reference and examination beyond a few hours after collection, and to the scarcity of botanists in Ireland for the investigation of the microscopic forms. The first serious attempt to prepare a comprehensive list of Irish fungi was made by Greenwood Pim, in the Guide Book of the British Association Meeting in Dublin in 1878, where 478 species are recorded, (See also *Procs. R.D.S.*, 1878), followed by a Supplement comprising 60 species, in the *Procs. R.I.A.*, in 1883. In 1893, Greenwood Pim and Prof. E. J. M'Weeney, M.D., published a paper in the *Irish Naturalist* (vol. 2, pp. 245-257), in which 270 additional species are recorded. In 1898 these lists were consolidated and added to, giving 830 species, to serve as a guide to the British Mycological Society, which, during its week's visit to Dublin, added in their list of 430 species (*Irish Naturalist*, vol. 7, p. 286), 160 species to the previous records. This Society made the Museum its headquarters and gave a large number of specimens to it. Thus, for the Counties of Dublin and Wicklow, about 1,000 species of fungi have been observed, some new to science, or to the British Flora, or very rare in Great Britain.

The Rev. H. W. Lett, M.A., gives a list of some 580 names in the *Procs. Belfast Field Club* for the year 1886, of species found in Down, Antrim, Armagh, and Cavan.

Greenwood Pim published a preliminary note on the fungi of Glengarriff and Killarney in the *Procs. R.I.A.*, 1885.

The rest of Ireland is practically a blank so far as our knowledge of systematic mycology is concerned, and a rich harvest awaits the fungologist who will devote himself to the investigation of the fungi of Counties Cork, Kerry, of Connemara, and other regions in Ireland.

I am indebted to G. Pim for the following list of the new or rarer species of fungi in Ireland:—

Octaviania asterosperma, Vitt.; *Cyathus striatus*, Hoffm.; *C. vernicosus*, D.C.; *Mutinus* (*Phallus*) *caninus*, Fr.; *Polyporus giganteus*, Fr.; *P. wynnei*; *Fistulina hepatica*, Fr.; *Marasmius hudsoni*, P.; *Amanita strobiliformis*, Vitt.; *Ustilago vaillantii*, Tul.; *Saprolegnia philomukes*, W.G.S.; *Papulospora sepedonioides*, Preuss.; *Botrytis dichotoma*, Ca.; *Ramularia rapae*, Pim.; *Echinobotryum atrum*, Ca.; *Myxotrichum chartarum*, Kze.; *M. deflexum*, Bk.; *Tetraploa aristata*, B. and Br.; *Pimia parasitica*, Grove; *Isaria fuciformis*, Bk.; *Morchella elata*, Br.; *Tricospora crossipe*; *Vibrissea truncorum*, Fr.; *Stagonospora pini*, Grove.

And to Professor M'Weeney for the following: –

Gyrodon rubellus, McW.; *Nyctalis parasitica*, Fr.; *Clonostachys araucaria*, Ca.; *Stysanus ulmariae*, McW.; *Tilletia rauwenhofii*, F. v. W.; *Plasmopara pygmaea*; de By.; *P. densa*, de By.; *Peronospora arborescens*, Bk.; *P. affinis*, Schroet; *P. trifoliorum*, de By.; *P. grisea*, Ung.; *P. lamii*, de By.; *P. Schleideni*, Ung.; *P. alliorum* (Cooke and Massee); *P. sordida*, Bk.; *Gymnoascus reesii*, Baran.; *Thecospora bifida*, Hark.; *Ophionectria paludosa*, Sacc.; *Acrospermum graminum*, Lib.; *Hypomyces aurantius*, Tul.; *H. lateritius*, Tul.; *Hypocopra maxima; Phyllachora podagraria*, Roth.; *Dothidea ribesia; Sordaria coprophila; Cordyceps militaris*, Fr.; *C. ditmari; Peziza subumbrina*, Boud.; *P. brunneoatra*, Desm.; *Geopyxis ammophila; Sclerotinia sclerotiorum*, Massee; *vibrissea Guernisaci*, Crouan; *V. margarita*, White; *Cicinnobolus cesatii; Phoma betae*, Frank; *Mycetozoa:—Trichia serotina, T. chrysosperma; Arcyrea cinerea; Comatricha Friesiana*, de By.; *Diderma cyanescens; Didymium squamosum, D. squamulosum; Physarum leucopus*, Rost.; *Plasmodiophora brassicae*, Wor.; *Chlorosplenium* (*Helotium*) *aeruginosum* and *Aecidium grossulariae*, occur abundantly in fruit in Ireland, a rare occurrence in England or Scotland.

Dr. M'Weeney sends me the following notes on the Bacteria of Ireland:—

"The results of the parasitism of bacteria on men and animals are of enormous economic importance. The common saprophytes occur in Ireland with the same frequency as they do elsewhere. Amongst species characterised by some remarkable property may be mentioned the fluorescent bacilli, both the liquifying and the non-liquifying forms of which abound in water. *Bacillus prodigiosus* occurs, though very seldom, in the air, and I have lately isolated an allied species *Bacterium Kilicnse* (Fischer and Breunig), from the water of a well at Dungarvan, Co. Waterford. It produces a gorgeous red pigment. On the other hand, out of the many hundreds of water analyses I have made, I have never encountered *B. violaceus*. Turning to the parasitic (disease-producing) species, by far the most destructive to human life is *Mycobacterium Tuberculosis*, L. and N., which is now usually classed amongst the lower Hyphomycetes. Cattle suffer severely from bovine tuberculosis, and I have also met with the avian variety amongst pheasants on an estate near Arklow, County Wicklow. Its ally, the leprosy bacillus (*Mycobacterium Leprae*, L. and N.), is no longer found in Ireland, save occasionally in imported lepers. This was not the case during the Middle Ages when leprosy was endemic in Ireland. It has left its trace in a few place-names like *Leopardstown*, where there was formerly a hospital for *lepers*. The 'acid fast,' pseudo-tubercle bacilli found lately in milk, butter, on Timothy grass, etc., on the Continent, are not known to occur in Ireland. *Actinomyces* is not a common parasite here. A few cases have been recorded in the ox. Only two instances of human *Actinomycosis* have occurred so far as I am aware, one having been observed by Dr. Dargan, on a patient in St. Vincent's Hospital. *Corynebacterium Diphtheriæ* (L. and N.) was very rare in Ireland some twelve years ago, but is steadily on the increase, especially in towns along the east coast whither it has probably been introduced from England. A closely allied but non-pathogenic form, occurs in the epidermis of calves. My attention was first drawn to it in the analysis of vaccine lymph. A detailed account of the distribution of the disease-producing bacilli would be out of place here. I

may add that the *B. typhosus* is universally distributed, and that three years ago *B. intracellularis meningitidis* made its appearance in the Dublin District and gave rise to a severe outbreak of cerebro-spinal meningitis."

Several extremely rare European Lichens are known to occur in Ireland. Of these *Gomphillus* and *Melaspilea* have been found in only one other British station, and *Sirosiphon* and *Pycnothelia* have not been found in any other locality in the United Kingdom.

The most interesting lichens are two tropical species which in Europe are confined to Ireland—*Leptogidium dendriscum*, a native of Brazil, Isle of Bourbon, and New Caledonia; and *Glyphis labyrinthica*, a native of Guyana, Amazon, and Ceylon, have been gathered at Killarney in the great sheltered damp hollow, only a few feet above the sea-level, which lies midway between the summit of Carrantual and Mangerton, the highest mountains in Ireland, whereon the arctic *Cetraria islandica* (Iceland Moss) has its only Irish habitats. In Connaught, *Parmelia saxatilis*, *Lecanora parella*, and *Lecanora tartarea*, but especially the first-named, are used in the process of dyeing the home-spun woollen yarns of the inhabitants.

Irish lichenology suffered a heavy loss in the accidental death of Admiral Jones, whose large collection of lichens is preserved in the Botanical division of the Science and Art Museum in Dublin. The Rev. H. W. Lett, who mentions 89 species of lichens in his paper entitled "Report on the Mosses and Lichens of the Mourne Mountains District" (*Proc. R.I.A.*, ser. 3, vol. 1, 1889), has supplied the following particulars of the more important literature. At the present moment no one is actively engaged in the study of Irish lichens.

J. T. MACKAY, *Flora Hibernica*, Part 2 (1836), contains descriptions by Dr. Taylor of 300 species, chiefly from the S.W. and N.E.

ISAAC CARROLL, "Contributions to Irish Lichens," in the *Proc.* of the Dublin Univ. Zool. and Biological Association, 1859, vol. 1, pp. 268-276, Plates, 29-31).

ADMIRAL JONES, "Report on the progress made in collecting Irish lichens, with a list of those presented to the Dublin Natural Society, May, 1864; also an Index List in *Proc.* Dublin Natural History Society, vol. 4, pp. 114-149 (1865), which comprises 349 species.

ADMIRAL JONES, "Report on the progress made in collecting Irish Lichens," in *Proc.* Dublin Natural History Society, vol. 4, pp. 280-290 (1866), which adds 56 species to previous list.

REV. W. LEIGHTON, *Lichen Flora of Great Britain and Ireland and the Channel Islands*, 3rd edit. (1879), gives Irish records for 770 of the species and varieties described—principally from the S.W., N.E., Dublin, Wicklow, and Galway.

GREENWOOD PIM, "List of the Lichens of Counties Dublin and Wicklow," in *Proc. R.D.S.*, New Series, vol. 1 (1878), which includes 150 species.

It must be a matter of surprise that so much excellent work has been done when it is remembered that Botany has hitherto received no encouragement either in the elementary schools or in the boys' secondary (or intermediate) schools of the country, and that in the girls' secondary schools it has been treated as a polite accomplishment, largely taught and altogether examined theoretically.

THE ANIMALS OF IRELAND.

The extreme western outpost of the great Euro-Asiatic continent, Ireland possesses a fauna that, although comparatively poor, is highly interesting. Ireland is doubtless a "continental island," which at no very distant geological period formed part of a far-stretching land-mass,* and its animal inhabitants must, for the most part, have made their way thither over land-connections now submerged beneath the waters of the sea. Situated far to the west, the island is poor in species as compared with Great Britain, and still poorer as compared with continental Europe. Most of the Irish animals are identical with British species; but many creatures that are familiar to the English naturalist are absent from Ireland. On the other hand, many ancient forms of life, unknown or restricted to very narrow limits in Great Britain and the nearer parts of the Continent, have been preserved in Ireland, and it is the presence of these that makes the fauna of the country so interesting a study. One well-marked group, which shows a likeness to the inhabitants of Scandinavia and the Arctic regions, may be characterised as the Northern or "Arctic Fauna." Another group, showing affinity to the denizens of south-western Europe and the Mediterranean shores, is often distinguished as the "Lusitanian Fauna."

VERTEBRATES.

Mammals.

The best-known class of animals—the Mammals—yield good illustration of the poverty and the interest of the Irish fauna. Several familiar beasts—the Fox, the Badger, and the Otter, for example—occur throughout the country, as in Great Britain. But of the order—the Carnivores—to which these belong, the Weasel and Polecat are unknown in Ireland, although the Stoat is common, and of some interest, since its Irish race differs constantly from the British in the relative extent of its dark and pale markings. Wolves formerly abounded in Ireland, where they were not exterminated until the eighteenth century. The former presence of Bears in the country is shown by the discovery of their remains in cave-deposits, but they seem to have become extinct before the historic period. The Irish Bear has been regarded as identical with the Grizzly (*Ursus horribilis*) of North America; no remains of the great Cave Bear (*Ursus spelæus*) that inhabited Great Britain and Central Europe during Pleistocene times have been found in Ireland.

Turning to the Insectivores we find the Hedgehog common everywhere as in Great Britain, while the Mole is quite absent, and only one Shrew, the "Lesser" (*Sorex pygmæus*) out of the three British species occurs. Simi-

* A. R. Wallace. "Island Life." London, 1892.

larly, Ireland has but seven of the fifteen British Bats. Of the two surviving British species of Deer—the Red Deer and the Roebuck—Ireland has only the former, now confined to the protected areas in County Kerry. But the Reindeer formerly inhabited the country, and the remains of the extinct Giant Deer (*Cervus giganteus*) occur so abundantly in the marls beneath the Irish peat-bogs that the animal is commonly known as the "Irish Elk," though its remains, as preserved on the Continent, in Great Britain, and in the Isle of Man, show that it must have travelled westward from southern Europe or Western Asia. The only species of Elephant known to have inhabited Ireland in former times is the Mammoth, whose bones have been found in the County Waterford cave deposits.

Among the Rodents both the Black and Brown Rats occur, and a dark, fine-coated variety of the latter species was described by Thompson as distinct under the name of *Mus hibernicus*. But Ireland possesses only two of the four British Mice, and not a solitary representative of the Voles. The Irish Hare is not the familiar animal (*Lepus europæus*) of the British lowlands, but the Varying Hare (*L. variabilis*) of the Scottish highlands, which, on the Continent, is confined to northern and Alpine regions. In Ireland this animal—a typical example of the Arctic fauna—occurs both on the hills and in the plain; owing to the mild climate, it only occasionally assumes the white winter coat so appropriate in those northern and mountain haunts to which (except in Ireland) it is now restricted by the competition of its newer rival.

The absence of so many British Mammals shows, without doubt, that the land-connections between Ireland and Great Britain must have broken down before the latter country became separated from the Continent. Ireland is, therefore, the older of the two islands. Dr. Scharff * has recently shown that those British Mammals ("Eastern" or "Siberian" fauna) absent from Ireland migrated from Siberia across the central European plain in Pleistocene times, reaching Great Britain too late to continue their progress farther to the west. It is remarkable that (excepting only the Grizzly Bear) all the living and extinct Mammals of Ireland inhabit, or did inhabit, Scotland. This fact led Professor Leith Adams† to infer that they entered Ireland by a northern land-connection. But Dr. Scharff believes that—except in the case of the Reindeer and the Varying Hare, evidently northern species—the track of all these animals can be traced by their fossil remains westward through southern Europe. He concludes from this that they entered Ireland from the south and passed thence northwards into Scotland. We see, therefore, how the peculiarities of the Irish fauna bear on fascinating problems of ancient geography.

Birds.

Ireland affords an excellent field for the study of many Birds that are restricted as breeding species to the more remote parts of Great Britain. The Ring Ouzel and the Dipper, for example, breed in suitable localities throughout Ireland, while the Raven and the Chough still nest in most of the western counties, the latter bird being often found in numbers along the sea-cliffs. The unpopular Hooded Crow is widespread and common, but the Carrion Crow is almost unknown.

Among birds of prey, the Golden Eagle still lingers as a breeding species

* R. F. Scharff. "The History of the European Fauna." London, 1899.

† A. L. Adams. "Report on the History of Irish Fossil Mammals." *Proc. R.I.A.* (2), iii., 1878.

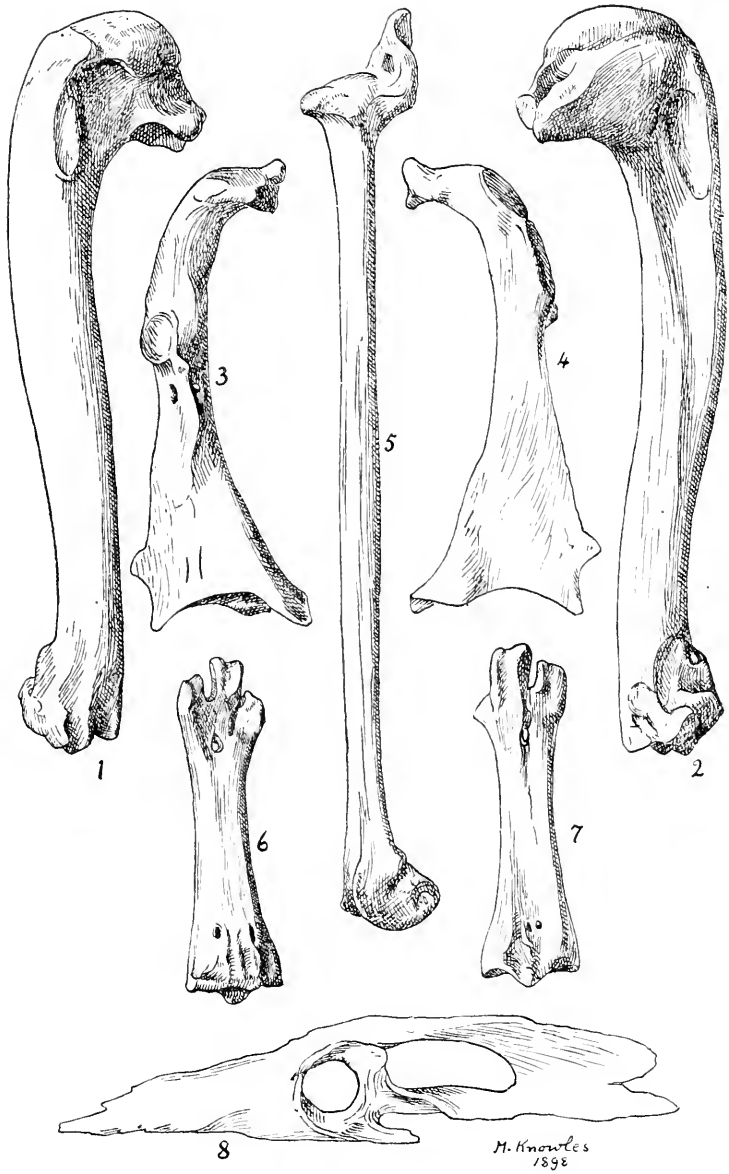


FIG. 1.—Bones of Great Auk from Kitchen-Middens, Co. Waterford.

1, 2.—Left Humerus. 3, 4.—Left Coracoid. 5.—Right Tibia.

6, 7.—Right Metataral. 8.—Pelvis.

Natural size.—From Ussher, *Irish Nat.*, vol. viii.

in the remoter parts of Counties Mayo and Donegal, while the Peregrine Falcon nests on sea-cliffs and mountains throughout the country. The rocky coasts of Ireland afford numerous breeding places for sea-birds; Black-headed Gulls nest in large colonies on the midland bogs.

As with the Mammals, so several familiar English Birds—the Nightingale, the Reed Warbler, and the Tawny Owl, for example—are quite unknown in Ireland. On the other hand, several birds are extending their range as breeding-species through the country, as the Stock-dove, the Tree-sparrow, and the Crossbill. The Magpie, now common throughout Ireland, furnishes an excellent example of the rapid spread of a modern immigrant, as the bird is known to have invaded the country so recently as 1684, when a small flock landed in County Wexford. A very interesting example of the southern range in Ireland of a typically northern animal is furnished by the Red-breasted Merganser, which nests in many counties, including Kerry, although its breeding-range in Great Britain is confined to Scotland, and on the Continent to northern and Arctic localities. Recent discoveries by Messrs. Ussher* and Knowles of remains of the Great Auk† in kitchen-middens on the Antrim and Waterford coasts prove that this interesting northern bird ranged farther south in Ireland than elsewhere in Europe, and was used as food by pre-historic Man.

Much valuable information obtained from birds observed at lighthouses and lightships around the Irish coasts has been recently collected by Mr. Barrington, who has been able to throw considerable light on the paths taken by the various species on their migrations.‡

Reptiles and Amphibians.

The only Reptile native in Ireland is the Brown Lizard (*Lacerta vivipara*) which is locally spread over the country. The absence of Snakes from the island is well known, and is doubtless due to the same cause as the absence of the Eastern group of Mammals described above. Of the Amphibians, the Common Frog is abundant and widespread, though according to tradition it is an introduced animal; and only a single species (*Molge vulgaris*) of the three British Newts is known to inhabit Ireland. The most interesting Irish Amphibian is the Natterjack Toad, which is confined to a small area in County Kerry along the shores of Dingle Bay. It is, doubtless, a member of the old Lusitanian fauna, as it is abundant in south-western Europe, but very scarce and local in southern Britain and Central Europe.

Fishes.

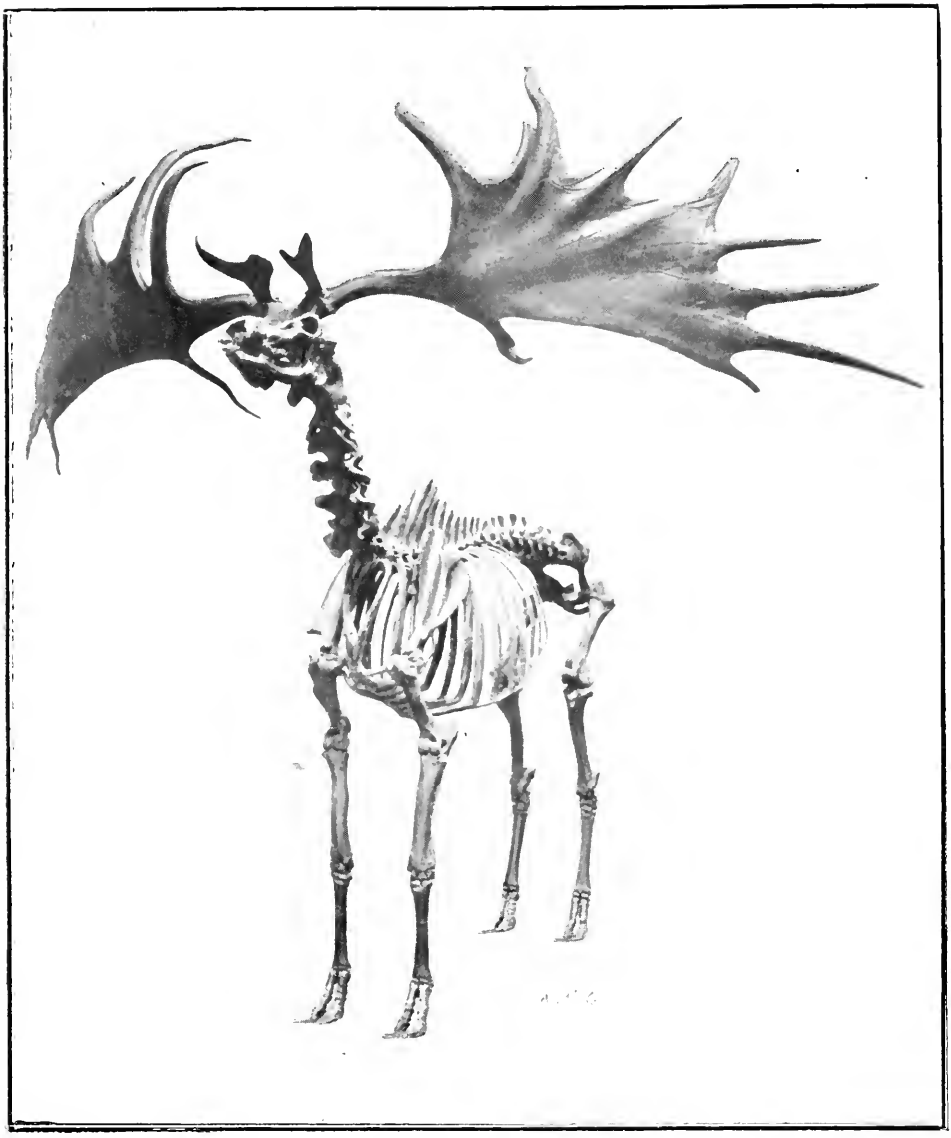
Attention may be called to two features of the Irish fish-fauna. Beyond the hundred-fathom line off the west coast several deep-sea fishes have been dredged which are, of course, unknown in the shallow channels between Ireland and England, or England and the Continent. This deep-sea fauna off the western Irish coast shows a remarkable mingling of northern and southern forms. Arctic and Scandinavian species like *Macrurus rupestris*, and the Portuguese deep-sea shark *Centrophorus squamosus*, occur together off the coast of County Mayo.§

* R. J. Ussher and R. Warren. "The Birds of Ireland." London, 1900. A. G. More. "A List of Irish Birds. Dublin, 1890.

† See illustration on preceding page.

‡ R. M. Barrington. "The Migration of Birds as observed at Irish Lighthouses and Lightships." London and Dublin, 1900.

§ E. W. L. Holt and W. L. Calderwood. "Survey of Fishing Grounds, West Coast of Ireland. Report on the Rarer Fishes." *Trans. R. Dub. Soc.* (2), v., no. ix., 1895.



SKELETON OF THE EXTINCT GIANT DEER ("CERVUS GIGANTEUS") COMMONLY KNOWN AS THE "IRISH ELK."

SEA-URCHINS IN ROCK-POOLS AT BUNDORAN, CO. DONEGAL.

The other point of interest is furnished by the Irish freshwater fishes. There are distinct species or races—such as the Gillaroo Trout (*Salmo stomachicus*) of Lough Neagh and the Shannon and Connemara lakes; Cole's Charr (*S. Colei*) confined to Lough Eask, County Donegal, and Lough Dan, County Wicklow; and the Pollan (*Coregonus pollan*) of Lough Neagh and Lough Erne*—which, though only found in Ireland, are closely related to forms inhabiting the freshwaters of Great Britain. An ancient freshwater home for the ancestors of these allied fishes may probably be looked for in a former lake and river valley occupying the bed of the present Irish Sea.

INVERTEBRATES.

In this brief sketch it is only possible to indicate a few of the more interesting features of the Irish invertebrate animals, as illustrated by some of the groups that have received a fair amount of attention from naturalists.

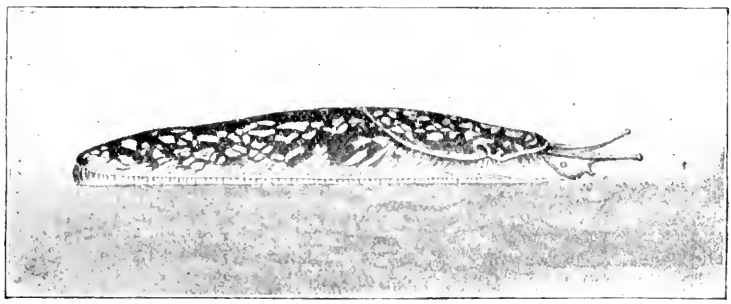


FIG. 2.—The Kerry Spotted Slug (*Geomalacus maculosus*).

Natural size.—From Scharff, *Irish Nat.* vol. vii.

Molluscs.† The most characteristic member of the ancient Lusitanian fauna is the Spotted Slug (*Geomalacus maculosus*) which inhabits a considerable tract of country in western Kerry and Cork, notably in the neighbourhood of Kenmare. It is found nowhere else in the British Islands, and is quite unknown in Central Europe, but reappears in north-western Spain and Portugal. Its range, therefore, recalls that of the characteristic western Irish plants. The colours of this interesting slug harmonise closely with the lichen-covered rocks on which it lives; in dry weather it retires into deep crevices.

Several other Irish molluscs, though less restricted in their range than Geomalacus, clearly belong to the same faunistic group. That prettily-marked Snail *Helix pisana*, for example, which inhabits the eastern coast of Ireland from Rush, County Dublin, northwards to Drogheda, and reappears on the opposite shore of St. George's Channel in South Wales and Cornwall,

* W. Thompson. "The Natural History of Ireland." London, 1849-56.

† R. F. Scharff. "The Irish Land and Freshwater Mollusca." *Irish Nat.*, vol. i., 1892. A. R. Nichols. "A List of the Marine Mollusca of Ireland." *Proc. R. I. Acad.* (3), vol. v., 1900.

is found on the Continent only in southern France and around the Mediterranean shores. It ranges also to the Atlantic islands—Madeira and Azores—suggesting the possible extension of the ancient continent far to the west. The markedly discontinuous and restricted range of these Lusitanian species shows clearly that they are the most ancient section of our fauna, and there can be little doubt that they came into our area as long ago as the Miocene (middle Tertiary) period of geologists.

Insects.*

The poverty of the Irish Butterfly fauna recalls that of the mammalian, many familiar English Butterflies—*Vanessa polychloros*, *Limenitis sibylla*, and *Apatura iris*, for example, being quite unknown. One of the most interesting of Irish Butterflies is *Erebia epiphron*—the "Mountain Ringlet"—which inhabits some of the western mountain ranges—Croagh Patrick, Nephin Beg, and the hills near Sligo. The "Irish Burnet" Moth (*Zygæna pilosellæ* var. *nubigena*) is abundant in the limestone districts of Counties Galway and Clare; for many years it was unknown elsewhere in the British Isles, but its range has now been traced into western Scotland (near Oban) and Wales. The dark form (*Barrettii*) of the south European *Dianthœcia luteago* inhabits the cliffs of Howth, County Dublin

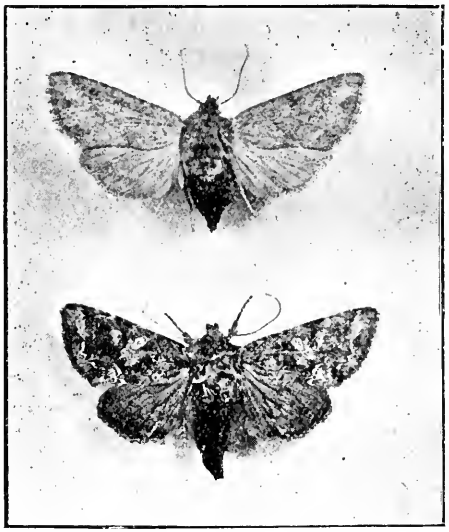


Fig. 3.—*Dianthœcia luteago*, Continental type (upper figure), and its Irish variety, *Barrettii* (lower figure). Slightly enlarged.

(now very sparsely), County Waterford, and County Cork; this form has in recent years been found also in Wales, Devon, and Cornwall. These insects may perhaps belong to a southern faunistic group somewhat less

* W. F. de V. Kane. "A Catalogue of the Lepidoptera of Ireland." *Entomologist*, vols. xxvi.-xxxiv., 1893-1901. W. F. Johnson and J. N. Halbert. "A List of the Beetles of Ireland," *Proc. R. I. Acad.* (3), vol. vi., 1902. A. H. Haliday. Papers on Irish Diptera and Hymenoptera in *Entom. Mag.*, vols. i.-v., 1833-8.

ancient than the true Lusitanians, but they are doubtless very old inhabitants of our area, in some part of which they must probably have survived the severe conditions of the Pleistocene "Ice Age."

A marked characteristic of Irish Moths is their tendency to assume dark varietal forms. This is well illustrated by the almost jet-black races of *Epunda lutulenta* which occur near Sligo. In this character the Irish moths resemble those of the Scottish highlands, and the moisture of the climate may very probably be regarded as the cause.

The mingling of the ancient northern and southern faunas in Ireland is very markedly shown by the Beetles. There are species like *Carabus clathratus*, confined in Great Britain to the northern half of the island, but ranging in Ireland to the far south-west. Still more remarkable is *Pelophila borealis* (fig 4)—a small black Ground-beetle found by lake-shores in the

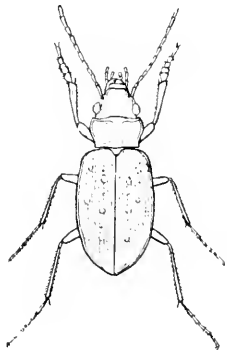


FIG. 4.

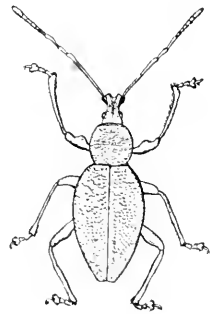


FIG. 5.

FIG. 4.—Arctic Ground-beetle (*Pelophila borealis*), Co. Armagh.

FIG. 5.—Pyrenean Weevil (*Otiorrhynchus auropunctatus*), Co. Dublin. Magnified 3 times.

western half of Ireland from north to south, but confined in Great Britain to the Orkneys, and on the Continent to fairly high northern latitudes. In contrast to these we have such south-western species as the weevil *Mesites Tardyi*, spread throughout Ireland in wooded districts, though restricted to a few scattered localities in western Britain (Clyde area, Devonshire); and another weevil *Otiorrhynchus auropunctatus* (fig. 5) ranging in the north and east of Ireland from Donegal to Wicklow, but known elsewhere only in the districts of the Pyrenees and the Auvergne.

Spiders, Millipedes, and Crustacea.

Similar characteristics are shown by other related groups. The common Dublin house-spider (*Tegenaria hibernica*), for example, quite unknown in Great Britain, is nearly related to a Pyrenean species.* A millipede (*Polydesmus gallicus*), generally distributed in Ireland, seems absent from Great Britain, but reappears in south-western Europe and the Atlantic Islands.† Turning to the Crustacea,‡ we have in the small

* G. H. Carpenter. "A List of the Spiders of Ireland." *Proc. R. I. Acad.* (3), vol. v., 1898.

† R. I. Pocock. "Notes upon some Irish Myriopoda." *Irish Nat.*, vol. ii., 1893.

‡ W. T. Calman. "On Deep-sea Crustacea from the South-west of Ireland." *Trans. R.I.A.*, vol. xxxi., 1896. E. W. L. Holt and W. I. Beaumont. "Report on the Crustacea Schizopoda of Ireland." *Trans. R. D. Soc.* (2), vol. vii., 1900.

shrimp-like Schizopod, *Mysis relicta*, of Lough Neagh, one of the most interesting of Irish animals. Inhabiting freshwaters in Ireland, Sweden, Norway, Russia, and North America, it nevertheless belongs to a marine genus, and is still living in the Baltic; its distribution indicates, therefore, a former extension of the sea over a great part of north-western Europe. No detailed reference to marine Crustacea is possible in this sketch, but several forms of much interest have been dredged from deep water off the west coast.

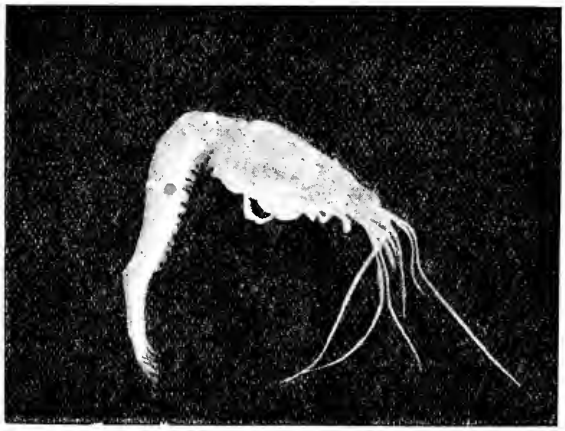


FIG. 6.—*Mysis relicta*, Lough Neagh. Twice natural size.

Worms.*

Two south European Earthworms (*Allolobophora Georgii* and *A. veneta*) have been discovered in Ireland in recent years. Of the interesting but obscure group of the Land Planarians, in addition to the common European and British *Rhynchodemus terrestris*, Ireland possesses a species—*R. Scharffi*—which has not yet been found elsewhere.

Echinoderms.

Noteworthy among Irish shore-hunting Echinoderms is the Purple Sea-urchin (*Strongylocentotus lividus*) which may be found in numbers along the west coast northwards to Donegal, the specimens resting in the cup-shaped hollows that they excavate in the rocks. This species ranges in Ireland much farther north than elsewhere, for in Great Britain it is found only in the south-west, and on the continental coasts from France southwards. In the deep water to the west, northern and southern forms mingle in the Irish marine area.† Among the northern species the handsome scarlet sea-cucumber *Holothuria tremula* and the starfish *Pontaster tenuispinis* are noteworthy. The steep submarine slope beyond the 100 fathom line, where such specimens are dredged, suggests irresistibly the western shore of an old continent stretching from north to south.

* H. Friend. Papers on Irish Earthworms. *Irish Nat.*, vols. i.-iv., 1892-5. R. F. Scharff. "The Irish Land Planarians." *Irish Nat.*, vol. ix., 1900.

†A. C. Haddon and W. S. Green. "Second Report on the Marine Fauna of S.W. Ireland." *Proc. R. I. Acad.* (3), vol. i., 1889.

Sponges.*

Among the lower forms of life, reference must be made to the recent discovery by Dr. Hanitsch of three North American species of freshwater sponges—*Ephydatia crateriformis*, *Tubella pennsylvanica*, and *Heteromeyenia Ryderi*—hitherto unknown in Europe, in various lakes in the west of Ireland. This discovery shows that the peculiar assemblage of North American plants inhabiting western Ireland are accompanied by animals—albeit lowly ones—of the same distributional group. Little doubt can be entertained that these American forms, with their distribution east of the Atlantic so greatly restricted, are older than the animals of the ordinary Northern type with a wide circumpolar range. They support the theory of an ancient land-connection to the north of the Atlantic by means of which many of the Arctic species common to Europe and North America were able to make their way between the two continents.

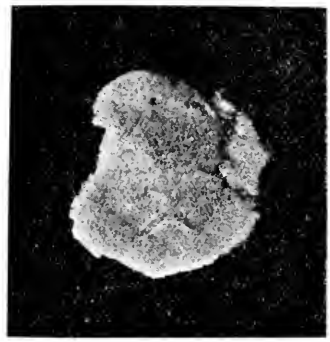


FIG. 7.—American Freshwater Sponge (*Heteromeyenia Ryderi*), Co. Kerry. Natural size.

FIG. 8.—Spicules and amphidiscs of *H. Ryderi*. Magnified 200 times. After Hanitsch, *Irish Nat.*, vol. iv.

The remains of this old continental coast, connecting Scandinavia with Scotland, and Scotland with Ireland, probably lasted until the Pleistocene "Ice Age" had passed away. Across it passed the latest of those animals that journeyed to Ireland overland. The fact that it broke down before so many of the British animals could make their way thither explains the poverty and interest of the Irish fauna. For, had the newer eastern group

* R. Hanitsch. "The Freshwater Sponges of Ireland." *Irish Nat.*, vol. iv., 1895.

been able to invade Ireland, it is unlikely that the many ancient forms of life could have survived there, to delight the naturalist of to-day.

ECONOMIC ZOOLOGY.

The peculiarities of Ireland and its animal inhabitants are not without influence on the practical life of the farmer. He may congratulate himself, for example, that such members of the Eastern fauna as the vegetable-feeding Voles—which in British and Continental localities have been known to increase and multiply to a veritable plague—are absent from Ireland. The Hedgehog is certainly a more desirable insect-eater than the absent Mole, since the latter feeds largely on the valuable earthworms, and disturbs agricultural land by his underground journeys. The House-sparrow, the only bird perhaps that is an almost unmitigated enemy to the farmer, seems, at least in the remoter parts of Ireland, to be less numerously represented than in Great Britain.

The damp climate of Ireland is especially favourable to the rapid multiplication of Slugs and Snails, and much damage to green vegetable produce is due to the hungry appetites of these molluscs. The small slug *Agriolimax agrestis* is perhaps the chief offender. Garden plants are often destroyed by Woodlice, which are unusually numerous in Ireland, especially the species *Porcellio scaber* and *Oniscus asellus*.

But as in most countries, the most serious ravages to farm crops are due to Insects.* That characteristically Irish crop, the Potato, suffers comparatively little from insect pests, though every dry summer many large caterpillars of the "Death's-head" Moth (*Acherontia atropos*) may be found feeding, usually by night, on the foliage. Beans and Peas are often attacked by their characteristic black and green Aphids, and the imported seeds for these crops contain too often the destructive beetles of the genus Bruchus. The Mangold and Beet crops are especially subject to insect-ravages in Ireland; the white fleshy maggots of the Mangold Fly (*Pegomyia betæ*) mine the tissues of the leaves, the caterpillars of the "Silver Y" Moth (*Plusia gamma*) feed openly on the foliage, while the grubs of the Black Carrion Beetle (*Silpha opaca*) eat up young plants. The carrot is often injured by the root-feeding maggot of the Fly *Psila rosæ*, while Celery-leaves are mined by the grub of *Acidia heraclei*. Cabbages and Turnips are attacked above-ground by the caterpillars of the White Butterflies, and the irrepressible Flea-beetles ("Fly"), and underground by the "surface" caterpillars of Agrotid Moths, and the maggots of *Phorbia brassicæ* and other Root-Flies.

Corn crops and pasture lands suffer greatly from the "leather-jacket" grubs of Crane-flies, and the Wire-worm grubs of Click-beetles. The moist, imperfectly drained soil in many parts of the country is especially favourable to Crane-flies. As in Great Britain *Agriotes obscurus* and *A. lineatus* are common Click-beetles; but the most abundant and destructive of these insects in Ireland seems to be *Athous hæmorrhoidalis*. Cockchafer grubs are sometimes injurious, and in certain summers the smaller Chafer *Phyllopertha horticola* multiplies to such an extent in the western counties as to

* G. H. Carpenter. Reports on Economic Entomology in *Reports of R. Dub. Soc.*, 1891-1900.

become a serious plague. The absence of trees in many districts of Ireland entails scarcity of many insect-eating birds, and a consequent alarming increase in the numbers of insects. On the other hand, the numerous sea-birds in the maritime counties often do great service to the farmer by devouring grubs as they follow the plough.

Among the insects affecting fruit trees, the most prevalent are the "American Blight" on the Apple, and the grubs of the Sawflies (*Nematus ribesii* and *Eriocampoides limacina*) of the Gooseberry and Pear respectively. The extension of Fir-plantations in Ireland has been followed by a spread of the characteristic pine-insects. The great pine Sawfly (*Sirex gigas*) is now established throughout Ireland, but the accompanying beetles —the weevil *Hylobius abietis*, and the bark-borers *Hylurgus piniperda* and various species of *Hylastes*—are more destructive. Among insects which injure other forest trees, the bark beetle of the Ash (*Hylesinus fraxini*), and the caterpillar of the "Hornet-clearwing" Moth (*Trochilium crabroniformis*) which burrow in the wood of Willow and Poplars may be mentioned as especially noteworthy. The "Lusitanian" weevil *Mesites Tardyi* is often common enough to injure seriously the timber of Beech and Holly.

In a grazing country like Ireland, the maggots of the Warble-fly (*Hypoderma bovis*) feeding beneath the skin of cattle, often cause great suffering to the beasts and loss to their owners. The allied Bot-fly of the Horse *Gastrophilus equi*), whose maggots feed in the lining of the stomach, is also too common. The Sheep Bot-fly (*Oestrus ovis*) occurs in Ireland, but far more injurious to flocks is the Sheep Flesh-fly (*Lucilia sericata*) whose maggots live parasitically on the skin and even in the flesh of neglected sheep. The usual parasitic Lice and Mites of the domestic animals are prevalent in Ireland, and the voracious grass Tick (*Ixodes reduvius*) is especally abundant in the western counties.

Although insect ravages to crops and stock may be less serious in Ireland than in countries with a richer fauna, the subject has received less attention than it deserves from Irish agriculturists. The most effective means for destroying injurious insects are found to vary with different localities, and careful observations and experiments as to the special needs of Ireland in this respect would probably lead to valuable results. That very important branch of Economic Zoology—Fisheries—is fully dealt with in another section of this work. It is certain that the study of the animal life of Ireland and its surrounding seas has a most direct bearing on the welfare and prosperity of its people.

THE ECONOMIC DISTRIBUTION OF POPULATION IN IRELAND.

[*** *In the year 1886 Mr. Charles Booth, the well-known Economist and Statistician, read a paper before the Royal Statistical Society of London on "The Occupations of the People of the United Kingdom." The section of that paper devoted to the analysis of the economic distribution of the people of Ireland is given below as being at once an authoritative and able review of the industrial position of this country. The figures for 1891 were prepared by Mr. Booth for the Royal Commission appointed to inquire into the Financial Relations between Great Britain and Ireland.*—EDITOR.]

The following are Mr. Booth's observations in reference to Ireland:—

The picture of the industrial development of England since 1851, and her apparent position in 1881, is, on the whole, one which may be regarded with satisfaction. Nor could any changes since 1881 seriously affect this result. Every line of it shows vitality and an innate power of meeting changes of circumstances, which seems to give promise of continued prosperity.

The growth of the population of Scotland (6¾, 9¾, and 11½ per cent. for the three decades, 1851-1881) has been slower than that of England (12, 13, and 14½ per cent.), and the proportions engaged in each main division of industry are somewhat different, but the points of similarity are much more noticeable than the points of difference. . . . We see a similar falling-off in the proportion connected with agriculture, a similar constancy in those connected with building and manufacture, and a similar increase under other heads.

The figures show that the two countries share each other's fortune, and make the union of feeling between them easy to understand.

But it is far different with the sister island.

If the picture given of the condition of agriculture in England and Scotland is gloomy, that of the whole condition of Ireland is much more so, and needs a treatment far more exhaustive than can here be pretended to.

In adopting the method already employed for England and Scotland, it must be remembered that, in place of increasing, the whole population has decreased. The amount of this decrease from 1841 to 1881 is three millions out of eight millions of persons, and is made up as follows:—

From 1841 to 1851, ...	1,623,000	3,000,000*
„ 1851 to 1861, ...	753,000	
„ 1861 to 1871, ...	386,000	
„ 1871 to 1881, ...	238,000	

The general picture at each period stands as under: 1841 is taken as the starting-point, because it is necessary to begin from before the famine of

* The preceding increase of population had been:—

From 1821 to 1831, ...	965,000
From 1831 to 1841, . ..	408,000

1846-47, and the returns of 1841 for Ireland appear to be sufficiently correct :—

TABLE A.—Showing Occupations of the People of Ireland by Per-centage.

Occupations.	1841.		1851.		1861.		1871.		1881.		1891.*	
Agriculture, &c., ..	50.9		48.4		42.9		40.7		41.1		43.7	
Fishing, ...	0.2	51.3	0.4	49.2	0.3	43.6	0.4	41.4	0.5	42.0	.5	44.4
Mining, ...	0.2		0.4		0.4		0.3		0.4		.2	
Building, ...	2.0		2.0		2.4		2.2		2.4		2.6	
Manufacture, ..	27.3	29.3	22.8	24.8	20.7	23.1	19.5	21.7	16.0	18.4	17.8	20.4
Transport, ...	0.5		1.4		1.8		2.1		2.2		2.6	
Dealing, ...	2.6	3.1	3.6	5.0	4.1	5.9	4.6	6.7	4.8	7.0	5.4	8.0
Industrial Service, ..	—	1.2	—	2.3	—	7.5	—	7.5	—	6.7	—	6.6
Industry, ..	—	84.9	—	81.3	—	80.1	—	77.3	—	74.1	—	79.4
Public and Professional Service.	‡1.6	15.1	2.2	18.7	3.7	19.9	4.3	22.7	5.0	25.9	5.8	20.6
Domestic Service, ..	9.4		‡9.4		13.3		15.2		18.0		12.2	
Others, ...	4.1		7.1		2.9		3.2		2.9		2.6	
	—	100.0	—	100.0	—	100.0	—	100.0	—	100.0	—	100.0

* Of those engaged in productive industry (or agriculture, fishing, mining, building, and manufacture, although in actual numbers there has been a decline of 76,000 in the 10 years, the proportion to the total of those employed shows an apparent increase from 60.4 in 1881 to 64.8 in 1891. This increase is, however, in reality mainly due to the changed method (already noted) of enumerating those engaged in domestic work, which, by transferring a great body of women from the occupied to the unoccupied class, has reduced domestic service by 6 per cent., and has correspondingly increased the proportion of the other occupied classes.

With dependents apportioned to each class, the following are the figures :

TABLE B.—Showing Means of Support of the People of Ireland by Per-centage (Estimate).

Occupations.	1841.		1851.		1861.		1871.		1881.	
Agriculture, &c., ...	62.1		55.7		51.1		48.7		49.5	
Fishing, ...	0.3	62.7	0.5	56.7	0.4	53.0	0.5	49.6	0.6	50.5
Mining, ...	0.3		0.5		0.5		0.4		0.4	
Building, ...	2.8		2.6		3.3		3.2		3.4	
Manufacture, ...	18.3	21.1	16.2	18.8	15.2	18.5	14.3	17.5	12.4	15.8
Transport, ...	0.8		1.9		2.4		2.8		2.9	
Dealing, ...	2.4	3.2	3.3	5.2	3.9	6.3	4.4	7.2	4.5	7.4
Industrial Service, ...	—	1.6	—	3.0	—	8.0	—	8.9	—	8.2
Industry, ...	—	88.6	—	83.7	—	85.8	—	83.2	—	81.9
Public and Professional Service, ..	†1.8		2.5		4.6		5.1		6.0	
Domestic Service, ...	4.2	11.4	‡4.4	16.3	6.4	14.2	7.6	16.8	8.8	18.1
Others, ...	5.4		9.4		3.2		4.1		3.3	
	—	100.0	—	100.0	—	100.0	—	100.0	—	100.0

† Army and Navy were omitted from the Census of Ireland in 1841 and 1851.

‡ It is probable that domestic service should be 1 per cent. more in this year, and farm service (agriculture) 1 per cent. less. The returns point to confusion in this respect.

The numbers employed in agriculture have decreased since 1841 by 858,000, out of a total of 1,844,000, and those who may perhaps be counted

as supported by agriculture by 2½ out of five millions. Nor is this all, for these reductions being proportionately greater than those for the whole population, the percentage employed in or supported by agriculture has decreased as well as the total numbers.

The land in England and Scotland employs as many, and probably supports nearly as many, as it did in 1841, and meanwhile other productive industries support the bulk of our great increase of population. In Ireland, on the other hand, not only does the land fail to support half of those it once in some fashion maintained, but other productive industries (*e.g.*, building and manufacture) are even worse off, and, like agriculture, show it both in numbers and per-centage; those engaged in building and manufacture (taken together) being 10.9 less in per-centage, as well as 626,000 fewer in number, than in 1841.

It is when taken together that these facts appear so serious as evidence of decadence. It might be well that fewer people, or that a smaller proportion of the population, should attempt to obtain a living from the land; and, on the other hand, the abandonment of industries for which the country has no advantages might be no loss, whether accompanied by a general loss of population or not; and, although a painful process, a general reduction in numbers of population by death and emigration may finally conduce to the benefit of those who remain; but if all these things happen at once—if a reduced population finds less work to do per man—it is hard to obtain any encouragement from the figures. The best that can be hoped is that some ultimate advantage may lie at the end of a road not yet all trodden.

Nevertheless, the view is commonly held that in general well-being Ireland has enormously improved since the famine. No evidence of this improvement is to be found in the occupation returns, which, on the contrary, point to a demoralisation of industry likely to be the cause, as well as consequence, of poverty and waning trade, and certain to be the source of political discontent. I know that figures may be, and are, drawn from bank deposits and other returns which seem to tell a different story. I shall not attempt to reconcile this conflict of evidence. To do so would be beyond the scope of this paper. I can only state the conclusions to which the census returns point.

There may be much that is delusive in the rather golden picture of the industrial condition of England and Scotland that has been given; the tide may have turned since 1881, or even before, and the number of the unemployed or partly employed in each trade, whose lack of employment is not considered in our occupation returns, may make the reality very different; but in the picture of desolation which the Irish figures afford, there seems little room for delusion. When industries decay, those who have been supported by them cling to their employment as long as possible, and what in England *may* have happened, that the numbers given include many who no longer find a living in what they profess to do, has certainly occurred in Ireland. In such a case the facts are assuredly worse than the figures disclose.

The subject may be taken from another side. It will be seen that the percentage of the Irish population actually returned as engaged in productive industry (or agriculture, fishing, mining, building, and manufacture) has

fallen from 80.6 per cent. in 1841 to 60.4 per cent. in 1881, or progressively thus :—

1841.	1851.	1861.	1871.	1881.
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
80.6	74.0	66.7	63.1	60.4

the percentage of those otherwise engaged having risen in proportion from about 20 per cent. to about 40 per cent. I shall try to show what proportion of this increase in non-producers offers any compensation. It is divided thus :—

	Per cent.
Increase in Transport	1.7
„ Dealing	2.2
„ Industrial Service	5.5
„ Public and Professional Service ...	3.4
„ Domestic Service	8.6
„ Property Owning	0.6
	22.0
Decrease in Indefinite	1.8
	20.2

The increase under Transport is connected with improvements in commercial system, and is not to be objected to. Of that under Public and Professional Service, which is very considerable, it is impossible to say much without entering upon ground more political than economical. The items in detail are as follow :—

—	1841.	1881.
	Per cent.	Per cent.
Administration, ...	6,000, or 0.2	11,000, or 0.5
Army and Navy, ...	*— —	40,000 „ 1.7
Police and Prisons, ...	11,000 „ 0.3	18,000 „ 0.8
Law, ...	5,000 „ 0.1	5,000 „ 0.2
Medicine, ...	7,000 „ 0.2	7,000 „ 0.3
Art and Amusement, ...	4,000 „ 0.1	3,000 „ 0.1
Literature and Science, .. .	— —	1,000 „ —
Education, ...	17,000 „ 0.5	22,000 „ 1.0
Religion, ...	7,000 „ 0.2	14,000 „ 0.6
	57,000 „ 1.6	121,000 „ 5.0

* The soldiers in Ireland were omitted from the Census, 1841.

We may compare these with the parallel figures for Scotland, which are as follows:—

—	1841.	1881.
	Per cent.	Per cent.
Administration, ...	4,000, or 0.4	10,000, or 0.6
Army and Navy, ...	5,000 ,, 0.5	8,000 ,, 0.5
Police and Prisons, .. .	2,000 ,, 0.2	4,000 ,, 0.2
Law, ...	6,000 ,, 0.5	7,000 ,, 0.5
Medicine, ...	6,000 ,, 0.5	10,000 ,, 0.6
Art and Amusement, ...	2,000 ,, 0.2	5,000 ,, 0.3
Literature and Science, ...	— —	1,000 ,, —
Education, ...	7,000 ,, 0.6	19,000 ,, 1.1
Religion, ...	3,000 ,, 0.3	6,000 ,, 0.4
	35,000 ,, 3.2	70,000 ,, 4.2

The increase in Ireland, though large, does not (if the Army and Navy be omitted) bring the per-centage for 1881 so high as that of Scotland, or by any means so high as in England, and, except for the item of Police and Prisons, there is not much to be objected to.

It is otherwise with the increases under all the other heads. It is impossible to account satisfactorily for the increase which is to be found in the numbers as well as per-centage of the dealers—those who live by buying and selling. This increase cannot be traced to any improved system of distribution, nor can we account for it, as we may in England and Scotland, by the fact that increasing production or greater wealth increase the volume to be distributed, and that our foreign trade has made of Great Britain a shop to which all the world come to buy. It seems evident that the multiplying of this class in Ireland can only be taken as a sign of want of more useful employment.

In *Industrial Service* the commercial portion of the class was 12,000 in 1841, and 16,000 in 1881; an increase which, like that in Transport, may be satisfactory, as pointing to improvement of system, but this is not so with the main increase in this class—that of general labourers, from 31,000 in 1841, to 144,000 in 1881.

These labourers (who no doubt to some extent belong to the agricultural class) can hardly be added to the ranks of productive industry. They take their origin from the destitute class who appear in the return of 1851 (after the famine) as "indefinite," and who, dropping out of this unnamed position, appear in 1861, and continue in 1871 and 1881, as "general labourers." It is true that this class is, relatively, almost as considerable in England and Scotland as in Ireland, but there is a great difference in the fact that in the former countries they have always been a numerous order connected with

the manufacturing and building industries, whereas in Ireland they have no such basis of support, and sprang into existence, not from any need of their services, but as the outcome of agriculture and industrial distress and charitable doles on an enormous scale.

Domestic Service has risen with a steady progression from 9.4 per cent. in 1841, to 18.0 per cent. in 1881. It may perhaps be reasonable that the loss of a large poor population should increase the proportion, to the whole, of those classes who can afford to keep servants; but this would not account for the large positive increase in the total number of servants (85,000), nor for the extraordinary fact that the proportion of servants to population in so poor a country as Ireland is considerably higher than it is in England, and as much as 3¼ per cent. higher (comparing the per-centage) than it is in Scotland. And it must be remembered that it was not so in 1841, when the percentage for Ireland was much less than for England and Scotland. The figures are as follows, taking the proportions first to be employed, and second to the whole population:—

	On the Employed.		On the whole Population.	
	1841.	1881.	1841.	1881.
	Per cent.	Per cent.	Per cent.	Per cent.
England, ...	16.2	15.7	6.8	7.1
Scotland, ...	12.2	11.1	5.2	4.9
Ireland, ...	9.4	18.0	4.2	8.2

What is the explanation of these remarkable figures? It would be simplest to show that they are incorrect, but apart from some difference in the method of tabulation (alluded to in the Census Report for 1881, but not specified), I have found no loophole of escape, and the comparison of successive decades shows how gradually the position of Ireland was reversed, from being the most economical to being the most extravagant in Domestic Service. The only explanation that suggests itself is that servants are more numerous where poverty makes service cheap.*

The slight increase in the per-centage under Property Owning would also be unobjectionable, if any conclusion could be fairly drawn from the figures, but, as we have already seen in the case of England, the returns under this head are entirely delusive.

Against these increases has to be set off a decrease in the Indefinite class, which is returned as 122,000 in 1841, against 38,000 in 1881.

* The total number of persons engaged in domestic service was reduced from about 426,000 in the Irish Census of 1881 to about 255,000 in that of 1891. This was due in great part to the removal in 1891 from the heading of "Others engaged in service" of females, who were in the Census of 1881 to the number of about 139,000, placed under that description. These women were returned as "housekeepers," but were really wives or other near relatives of heads of houses. In the Census of 1891, they were mostly included in Order 24 the "Indefinite and Non-Productive Class." (Irish Census Report, 1891, Part II., p. 23). B. H. H.

To bring the figures roughly together, so as to show what portion of the increase of non-producers may be satisfactory or not unreasonable, and what portion must, as I think, be considered unsatisfactory, I submit the following table. The difference in condition and industrial utility between the small dealers and general labourers and the undefined class is probably very slight, and for this purpose they may be counted together :—

TABLE C.—Showing Transfer of Employed from Productive to Non-Productive Industry between 1841 and 1881.

——	Per cent.	——	Per cent.	Per cent.
Decrease in those employed directly in productive industry	20.2	Increase in those employed by non-productive industry :—		
		(Satisfactory or not unreasonable)—		
		Transport, ..	1.7	6.1
		Commercial Class,	0.4	
		Public and Professional Service	3.4	
		Property Owning,	0.6	
		Unsatisfactory—		
		Domestic Service,	8.6	14.1
		Dealing and general labour (less decrease in Indefinite class)	5.5	
	20.2			20.2

Although this calculation must be accepted with very great reserve, it may yet give us a fair idea of the extent to which Ireland, besides its great decrease in numbers, has also deteriorated in the quality of work performed by those who remain. It shows us that since 1841 more than 14 per cent. of the employed population have been transferred from direct production to occupations which can at best add little to the wealth of the community.

In confirmation of this, if we turn to the details of those who figure under the head of Manufacture, we find only one occupation which has increased considerably in per-centage, while on the whole there has been so great a decrease ; this is under the heading Dress ; and going into further detail we find that in Dress it is the shirtmakers only who have increased in numbers, viz., from 47,300 to 71,000 ; so that once more it is only in the last refuge of destitute women that we find any increase.

A detailed review of productive industry in Ireland, to which we will now return, will show us more closely where the falling off has occurred.

The decrease in those employed in *Agriculture*, though affecting each

branch, shows itself, of course, mainly in the labourers and farm servants, which have fallen from 1,326,000 in 1841, to 329,000 in 1881, or 75.2 per cent. The decrease in farmers, from 471,000 to 442,000, is only 6.2. The figures in regard to those engaged about animals, which show a large decrease, are fallacious, because a great number of persons who were in the earlier census classed as herds, have in 1881 been counted with farm servants, which would tend to make the truth as to the farm servants even worse than appears.

Fishing and *Mining* are small industries in Ireland. The former has increased from 9,000 to 11,000, or from 0.2 per cent. to 0.5 per cent. of the employed population; mining has fluctuated considerably at each decade, but ultimately shows a slight falling off in bulk. In per-centage, however, it has risen from 0.2 per cent. to 0.4 per cent.

In 1841 there were 72,000 persons occupied in *Building*; in 1881 there were but 56,000; nevertheless the per-centage to the total employed population has increased by 0.4 per cent.

The total employed in *Manufacture* has dropped from 989,000 to 379,000 (or 61.7 per cent.), and the per-centage to the whole occupied population from 27.3 per cent. to 16 per cent. Machinery and tool making employ a very much smaller proportion of workers than do these trades in England and Scotland, but the numbers have risen slightly, and now form 0.2 per cent of the employed. The way in which Ireland has failed to share in the growing prosperity of the other portions of the kingdom is, however, strikingly exemplified in these trades, for whilst the great development of machinery during the last 40 years has enabled England and Scotland combined to add nearly 200,000 to their number of workers in this branch, Ireland during the same period has found a new opening in this direction for barely 1,000 persons. This will be found to throw a cross light on our next point (textile fabrics), where more strongly than elsewhere we find the evidence of industrial decay.

It appears that in 1841, 696,000 persons were enumerated as employed in textile and dyeing industries. Since then the decline has been startling, to 424,000 in 1851, 275,000 in 1861, 218,000 in 1871, and finally to 130,000 in 1881. In the meantime England, starting with only 604,000 in 1841, has progressed to 962,000 in 1881. These figures include spinning, and it is to the loss of this hand industry, which passed to English machinery, that the reduction is largely to be traced. There is no body of women similar to the Irish spinners to be found in the English returns of 1841, though there is a large number of women weavers who fall away later. It may be that domestic spinning existed in England and was not returned at all; or it may be that a larger share of this industry fell to Ireland. At any rate, we have the singular fact that in 1841 Ireland returns more workers in this section (textiles) than England, but in 1881 not one-seventh of the number. If the spinning industry was spread over the country, and an aid to every family whose men only were needed on the land, it would go some way to explain a wreck of prosperity.

The figures for textile manufacture show a very general decline, to which even flax and linen cannot be considered exceptions.

The detailed facts as to the textile industries of Ireland are as follows:—

(In thousands and decimals of a thousand.)

Occupations.	1841.	1851.	1861.	1871.	1881.	1891.
Woollen cloth manufacture, ..	80.7	45.9	16.6	20.4	7.1	6.3
Worsted and stuff manufacture, ..	0.1	0.1	0.1	.01	0.1	0.1
Flannel manufacture, ...	23.0	—	—	—	—	—
Carpet and rug manufacture, ..	—	0.3	0.1	0.1	0.1	—
Woollen knitters, ...	—	35.6	19.7	—	—	.2
Others, in wool, ...	—	—	—	—	0.3	—
Cotton and cotton goods manufacture,	6.0	16.1	9.8	7.0	3.9	2.3
Silk and silk goods manufacture, ..	0.6	0.6	0.5	0.8	0.6	.3
Ribbon manufacture, ...	0.2	0.1	—	—	—	—
Crape, gauze, shawls, and fancy goods (textile) manufacture	0.9	64.0	41.7	18.5	8.1	3.8
Weavers, spinners, and factory hands (undefined)	441.0	86.0	101.6	103.3	24.0	7.4
Flax, linen, and Damask manufacture,*	135.3	124.9	73.8	55.6	79.1	88.7
Canvas and sailcloth manufacture, ..	—	0.2	0.2	—	0.1	—
Sacking and bag manufacture, ..	—	—	0.1	0.2	0.2	.3
Hemp, jute, and cocoa-fibre manufacture	—	—	—	—	0.4	.3
Rope, twine, and cord-makers, ..	1.1	1.3	.1	1.0	0.9	1.0
Net makers, ...	1.1	0.9	0.4	0.4	0.2	.1
Mat makers, ...	0.2	0.2	0.3	0.1	0.2	.1
Lace manufacture, .. .	1.8	2.2	1.5	1.0	0.7	.6
Embroiderers, ...	—	41.4	3.9	5.6	1.5	4.2
Thread manufacture, ...	0.2	0.1	0.4	0.4	0 2	1.1
Tape manufacture, ...	—	—	—	—	0.2	.1
Trimming manufacture, ...	—	0.1	—	0.9	0.1	.1
Artificial flower makers and others, ..	—	—	—	—	0.5	—
Dyeing, ...	3.8	3.7	3.3	2.2	1.5	1.0
Total of textiles and dyeing, .	696.0	423.7	275.1	217.6	130.0	118.0

* The apparent increase, under the heading of "Flax and linen," between 1871 and 1881 is negatived by the striking decrease in "weavers, spinners, and factory hands (undefined)," of whom a large proportion must have been employed in the flax and linen industries.

THE RAILWAYS OF IRELAND.

Shortly after 1834, when the first railway in Ireland—the line from Dublin to Kingstown—was opened, and before any other line was commenced, a Royal Commission was appointed for the purpose of considering, with a view to developing the resources of the country, a general system of railways for Ireland, and the best methods of directing the growth of this new means of transit so that the greatest advantage might be obtained by the smallest outlay. After an elaborate survey the Commission reported that the circumstances of Ireland were entirely different from those of England, and that it could not be expected that the volume of traffic would induce private companies to duplicate the trunk lines of the country. Accordingly, the Commission reported in favour of State assistance, and in the same year resolutions to the following effect were carried in the House of Commons:—

1. "That the Irish Railways should be constructed with money supplied by the British Treasury, and that they should be under State control."

2. "That the revenue from the lines should be applied—1st, in their maintenance; 2nd, in the payment of 3½ per cent. on their cost; 3rd, in repayment of the cost by instalments of 1½ per cent.; 4th, in reducing the rates of carriage."

However, in the words of the official record, "The question of Government interference was subsequently dropped, and private companies were allowed to proceed as in England and in Scotland." One of the chief features of the Irish Railway System that thus came into existence was the great number of small companies which sprang up, and though a considerable portion of the smaller railways have been absorbed by the great trunk lines, the three thousand odd miles of Irish railways—a mileage not exceeding by much that of a single English line, the Great Western—are controlled by nearly thirty companies, each with its own directors and salaried officials. State purchase of the railways has been not infrequently advocated as preferable to either competition or amalgamation; but any consideration of the merits of these rival schemes is necessarily outside the limitations of this article.

There are a few features which distinguish Irish railways very markedly from English. In the first place, shortly after railway activity commenced to operate in Ireland, the population began to decrease—and this decrease has since continued—so that Irish companies, instead of being almost overwhelmed, like the English railways, with traffic produced by the unforeseen growth of large towns, have had to face the opposite difficulty of paying their way in a country which becomes more and more deserted as time goes on. This fact should always be borne in mind by the critical examiner of Irish railways.

In one respect, in the matter of gauge, the railways of Ireland enjoy an immense advantage over those of Great Britain. The first railway in Ireland was constructed by a company formed in 1831 to connect Dublin with Kingstown. This line, six miles in length, was opened for traffic in 1834, and for several years was the only railway in the country, and before

any of the great lines were laid sufficient experience had already been gained to show that the standard narrow gauge of 4 feet 8½ inches which had been adopted in England was too small. "The Irish have always shown a wise liberality in their ideas as to what was a suitable gauge for their railways, and the Ulster line was originally laid out on a very large scale, with a space between the rails only ten inches less than that adopted by Brunel on the Great Western. The traffic, however, was far from requiring any such accommodation, and in 1849 the company felt compelled to abandon the great width of track with which they had started and to bring their line into conformity with the others which were springing up all over the country. Since that date the Irish railways have used for main line work the uniform gauge of 5 feet 3 inches."* It is worth noting in this respect that the Dundalk, Newry and Greenore Company, though situated in the Great Northern country, is worked by the London and North Western in connection with the steamers between Holyhead and Greenore, and the English Company, which supplies for the purpose engines and carriages of its ordinary standard patterns, has to adapt them to the Irish wider gauge. Owing to this difference in gauge there is always the possibility, remote though it may appear at present, that at some future time Ireland may be far in advance of the rest of the kingdom in railway development.

There were in the year 1900, according to the Board of Trade returns, seventeen principal railway companies in Ireland, and as many as thirty-two subordinate lines, which were either leased to or otherwise controlled by the former. The position of the chief lines, so far as mileage receipts and expenditure are concerned, is given in the following statement, compiled from the official returns just referred to:—

TABLE showing certain Particulars as to MILEAGE, RECEIPTS, and EXPENDITURE of Irish Railways in the Year 1900.†

NAME OF COMPANY.	Length of Line, 1900.	Total Receipts from all sources of Traffic.	Total Working Expenditure.	Proportion per cent. of Expenditure to Receipts.
	Miles.	£	£	
Ballycastle	16	5,270	3,867	73
Belfast and Co. Down	76	137,938	80,277	58
Belfast and Northern Counties ..	249	318,918	201,564	63
Cork and Macroom	25	17,254	10,560	61
Cork, Bandon, and South Coast ..	94	79,997	49,259	62
Cork, Blackrock, and Passage ..	6	19,116	16,505	86
Donegal Railway	90	27,461	17,589	64
Dublin, Wicklow, and Wexford ..	144	275,115	181,389	66
Dundalk, Newry, and Greenore ..	26	17,838	22,196	124
Great Northern of Ireland	528	911,549	502,566	55
Great Southern and Western of Ireland	730	1,041,943	616,339	59
Listowel and Ballybunion	9	2,184	2,195	101
Londonderry and Lough Swilly ..	31	21,562	11,732	54
Midland Great Western of Ireland ..	538	586,891	323,082	55
Sligo, Leitrim, and Northern Counties	43	24,647	16,741	68
Waterford and Tramore	7	6,829	3,251	48
Waterford, Limerick, and Western ..	342	251,723	151,298	60

* *Saturday Review.* Much information has been derived from a valuable series of articles in the *Saturday Review* upon Irish Railway Development.

† This Table does not include the Light Railways authorised under the Tramways (Ireland) Acts, 1860 to 1883, with the exception of four small lines worked by the chief lines, and included in the figures of the Table. The lines thus included are—"The Athenry and Tuam Extension to Claremorris," the "Ballinrobe and Claremorris," the "Loughrea and Attymon," and the "Mitchelstown and Fermoy" Light Railways.

The following comparative statements show how Irish railways stand as contrasted with those of the other countries of the United Kingdom. It will be seen from the second statement that the cost of construction of the Irish railways, as indicated by the amount of paid-up capital, has been remarkably low when compared with the cost of those of either England or Scotland; in fact, the average cost per mile is less than one-fourth of the cost in Great Britain.

I.

	Length of Lines open 31st December, 1900.	Total Receipts, 1900.	Total Expenditure, 1900.	Proportion of Expenditure to Receipts.	Population according to Census of 1901 (unrevised figures).
	Miles.	£	£	Per Cent.	
England & Wales	15,187	89,392,501	55,882,810	63	32,525,716
Scotland	3,485	11,603,010	6,584,215	57	4,471,957
Ireland	3,183	3,806,347	2,276,495	60	4,456,546
Total for United Kingdom	21,855	104,801,858	64,743,520	62	41,454,219

II.

	Share Capital, 1900.	Loans and Debentures, 1900.	Total Paid-up Capital, 1900.
	£	£	£
England and Wales	781,934,150	313,107,907	1,095,042,057
Scotland	123,307,777	39,031,155	162,338,932
Ireland	31,890,768	13,402,322	45,293,090
Total for United Kingdom ..	937,132,695	365,541,384	1,302,674,079

It will be seen that, though the net receipts are much lower in Ireland than in Great Britain, yet owing to the much smaller cost of construction, the average dividend for Irish railways is higher than that in England or Scotland. It is of interest to note that the ordinary capital of constructed lines in Ireland upon which no dividends were paid in 1900 was £2,532,826, whilst in the same year dividends were paid on the ordinary capital of Irish railways as follows:—

Not exceeding 2 per cent.,				...	£411,164
Above 2 and not exceeding 4 per cent.,				...	2,370,000
„ 4	„	5	„	...	5,452,020
„ 5	„	6	„	...	1,288,903
„ 6	„	7	„	...	3,657,730
„ 7	„	10	„	...	350,000

The country north of Dublin is served chiefly by two large railways, the Great Northern and the Belfast and Northern Counties, the former of which connects the metropolis with the two most important places in the north of Ireland—Belfast and Londonderry—whilst the latter forms another connection between these two latter centres of industry and the adjoining

districts. The Great Northern, as at present constituted, is the result of the amalgamation of a large number of separate undertakings. Even the main line was built in three distinct pieces. The Ulster Company, once famous for its broad gauge, was incorporated in 1839 to connect Belfast and Portadown. Shortly afterwards another company was formed to build a line between Dublin and Drogheda, a distance of thirty-two miles, and the gap between Portadown and Drogheda remained until considerably later, when the Dublin and Belfast Junction Company completed the communication between Dublin and Belfast, a distance of 113 miles, which remained until 1875 under the control of three separate companies. A series of amalgamations then took place, out of which, on 1st April, 1876, the present company emerged. It has in the last quarter of a century absorbed a number of smaller lines, notably, the Portadown and Omagh and the Enniskillen, Bundoran and Sligo railways. The main line is along the east coast between Dublin and Belfast, and there are two main branches from Dublin to Londonderry in the north, and to Bundoran in the west, whilst the connection between Belfast and Londonderry, via Portadown, is only a little longer than the route of the Belfast and Northern Counties. The trains have been considerably improved of late, and the rolling stock is now very good, breakfast and dining cars, and, on one journey, sleeping cars, have been introduced, and the locomotives used for the important trains strongly resemble those of the London and South Western. The Belfast and Northern Counties Railway has grown out of a small company incorporated in 1845 to connect Belfast and Ballymena by a narrow gauge line. It now serves the whole of the north-east of Ireland, connecting different places in Londonderry, Tyrone, and Antrim with Belfast, and has 249 miles of lines. In addition to Belfast and Dublin these two northern railways connect a number of ports which have a considerable cross-channel traffic, notably, Larne, Greenore, Dundalk, Drogheda, and Newry.

The Dublin, Wicklow and Wexford serves the eastern counties of Ireland, running southward from Harcourt-street via Bray to New Ross, for though the Company was originally incorporated in 1846 as the Waterford, Wexford, Wicklow and Dublin, it has not yet got as far as Waterford; but it will probably soon be extended there in connection with the Fishguard and Rosslare scheme. It now works, under a long lease, the line between Kingstown and Dublin, which has been already alluded to as the first railway built in Ireland, and which cost upwards of £63,000 a mile. As this line has been extended to Bray, the Company has thus two distinct approaches into Dublin, one along the coast via Kingstown, and the other inland to Harcourt-street. No other railway in the United Kingdom can show its passengers such splendid sea views. From Merrion, midway between Dublin and Kingstown, it runs along the sea front for over twenty-five miles to the town of Wicklow, and except for two miles of tunnel between Kingstown and Dalkey it is never more than a few yards from the sea shore. This line is more dependent on short distance traffic than any other Irish railway. Its other Dublin terminus, Westland-row, is the headquarters of the City of Dublin Junction Railway, a short urban line worked by the Dublin, Wicklow and Wexford, which connects together all the railways running into Dublin.

The Midland Great Western Company has the second largest mileage in Ireland, and serves the whole of the central part of the country from Dublin across to the Atlantic. The Company was originally started in 1845 to

connect Mullingar with Dublin; but extensions were soon made to Athlone and Galway, and in 1851 the through service from sea to sea was established. A number of small local lines have been since absorbed, and the Company works several of the light railways which have been built in recent years in the West, whilst the Irish Government has given considerable subsidies in order to induce the Company to make extensions of its main line to several of the poorer outlying districts where the traffic returns for some time could hardly be sufficient to justify, from a solely commercial point of view, these extensions. The Royal Canal, one of the two great Irish waterways, which runs from Dublin westward to the Shannon, was acquired by the Midland and Great Western Railway at an early stage of the Railway's career. The Company paid over a quarter of a million for the Canal, which runs alongside the railway up to Mullingar, and it is obliged to maintain the navigation, and is not allowed to vary the tolls without the consent of the Lord Lieutenant. Broadstone, the Dublin depot of the Company, is considered to be the handsomest railway terminus in Ireland, and though the rolling stock is hardly modern, it is only fair to remember that the Company does not serve any flourishing business centres like Belfast and Cork; things would probably have been very different on this line had the attempt to establish a good system of steamship communication between Galway and North America proved successful.

The Great Southern and Western Railway has grown out of the undertaking of a Company formed in 1844 to connect Cork and Dublin by rail. The mileage has increased in the usual way by the construction of branches and the absorption of smaller companies, until this railway now extends from Dublin to Valentia in the extreme south-west, to Waterford in the south-east, and to Athlone in the centre of the country. By far the most important amalgamations it has effected are those in connection with the Fishguard and Rosslare undertakings. A few years ago the English Great Western Company commenced a small branch from a few miles east of Milford to Fishguard, a harbour on Cardigan Bay. In 1893 and 1895 respectively powers were obtained to build harbours at Fishguard and Rosslare (a point on the south-eastern coast of Ireland a few miles north of Wexford), and to run cross-channel steamers between these two points. The Waterford, Dungarvan, and Lismore Railway, which runs across Co. Waterford, and which could be made, by two short extensions, to complete the new route between England and Ireland was purchased. At this stage the Great Southern and Western and the English Great Western Companies joined hands and got a Bill passed giving them a general joint interest and joint control of the new route and of the various works connected with it, whilst in the year 1900 the former Company obtained the consent of Parliament to an amalgamation scheme which included the absorption of the Waterford and Central Ireland Railway and the Waterford, Limerick and Western Railways. This latter Railway was an important line running from Tuam, in the north of Galway, through Limerick to Waterford, and by this amalgamation the Great Southern and Western—already the largest Company in Ireland—brought its mileage up to over a thousand miles. This amalgamation has a more than local importance, for when the Fishguard and Rosslare scheme is complete there will be a route open between London and Queenstown via Paddington, Fishguard, and Rosslare, which will be shorter than the present journey from Euston via Holyhead and Dublin—a very important consideration, especially as regards the American

mails. A curious feature is that these two competing routes will be worked in Ireland by the one Company—the Great Southern and Western. The locomotives and rolling stock have been greatly improved of late, possibly in view of the danger of American passengers deserting the Irish route in favour of Southampton or Plymouth.

A noticeable feature of all the Irish railways mentioned is the attention they devote to the tourist traffic. Thus the northern railways offer special facilities for transit to Carlingford Lough, the Giant's Causeway, and Portrush; the Dublin, Wicklow and Wexford exploit the famous Wicklow scenery; the Midland Great Western carry large numbers to Achill and the district about Recess, whilst the Great Southern and Western have special services to Killarney, and besides offering cheap fares the Companies have of late built a number of hotels where the accommodation was previously bad or insufficient. The following figures, taken from the latest Banking and Railway Statistics, issued by the Department of Agriculture and Technical Instruction for Ireland, will help to show the present position of Irish Railways as compared with thirty years ago:—

Irish Railway Receipts per Mile for Passenger and Goods Traffic in 1871 compared with 1900.

Kind of Traffic.	Receipts per Mile.		Increase.
	1871.	1900.	
	£	£	
Passenger Traffic ..	630	639	Increase, £9. or 1.4 per cent.
All Goods Traffic ..	489	534	Increase of £45, or 9.2 per cent.
Merchandise ..	367	377	Increase of £10, or 2.7 per cent.
Live Stock ..	92	97	Increase of £5, or 5.4 per cent.
Minerals	29	61	Increase of £32, or 110.3 per cent.
Total Receipts from all sources of Traffic	1,143	1,196	Increase of £53, or 4.6 per cent.

Gross Receipts of Irish Railways in 1871 compared with 1900.

Kind of Traffic.	Total Receipts.		Increase.
	1871.	1900.	
	£	£	
Passenger Traffic (including excess Luggage, Mails, &c).	1,252,530	2,034,717	£782,187, or 62.4 per cent.
Passengers alone (including Season Ticket Holders).	1,070,730	1,591,819	£521,089, or 48.7 per cent.
All Goods Traffic	971,149	1,698,909	£727,760, or 74.9 per cent.
Merchandise	729,816	1,198,534	£468,718, or 64.2 per cent.
Live Stock	183,306	307,165	£123,859, or 67.6 per cent.
Minerals	58,027	193,210	£135,183, or 233.0 per cent.
Total Receipts from all sources of Traffic.	2,272,386	3,806,347	£1,533,961, or 67.5 per cent.

Another aspect of the development of the traffic of the Irish Railway systems is shown in the following statements.

A.—Statement showing the Passenger Traffic, arranged according to Classes, on Irish Railways in the years 1871, 1891, and 1900.

Year.	No. of Passengers.	Per-centage of Passengers in each Class.			No. of Journeys per Head of Population.	No. of Passengers per Mile of Lines open.
		1st.	2nd.	3rd.		
1871	15,547,934	12.5	27.8	59.7	2.9	7,821
1891	22,202,258	6.8	18.9	74.3	4.7	7,755
1900	27,649,815	5.4	14.2	80.4	6.2 Estimated Population	8,687

B.—Statement showing the Goods Traffic on Irish Railways in the years 1871 and 1900.

Year.	Mileage of Lines open.	Gross Tonnage Carried.		Tons carried per Mile of Lines open.	
		General Merchandise.	Minerals.	General Merchandise.	Minerals.
1871	1,988	2,441,289	472,326	1,228	238
1900	3,183	3,637,834	1,513,476	1,143	475

The decline in First and Second Class passenger traffic, and the increase in Third Class passenger traffic are remarkable. In regard to the column in the Statement A. showing the "Number of Passengers per Mile of Lines open," it ought to be borne in mind that the mileage of Irish railways increased between 1871 and 1900 from 1,988 in the former year to 3,183 in the latter, while on the other hand, the population decreased in the same period from 5,412,377 in 1871 to an estimated population of 4,466,326 in 1900. In fact, the column showing the "Number of Journeys per head of Population" gives the more correct idea of the expansion of the Passenger Traffic on Irish railways at the different periods.

Still more instructive, perhaps, is the following comparison, in certain particulars, of the English Great Western system with the entire railway system of this country. The comparison would be more satisfactory if an estimate of the population of the districts of England and Wales served by the Great Western had been available; but as it stands the contrast is sufficiently striking:—

—	Length of Lines open on 31st December, 1900.	Total Passengers conveyed (exclusive of Season and Periodical Tickets).	Goods Traffic.	No. of Miles travelled by Trains.	No. of Passengers per Mile of Lines open.	Total Receipts.	
						Passenger Traffic.	Goods Traffic.
	Miles.		Tons.			£	£
All Irish Railways (including Light Railways)	3,183	27,649,815	5,151,310	17,268,796	8,687	2,034,717	1,698,909
Great Western of England	2,627	80,944,483	37,500,510	46,415,184	30,813	5,165,067	5,698,049

It may be noted that of the 3,183 miles of the Irish railway systems 2,557 are single lines, and only 626 double (or more) lines, while in the case of the Great Western of England the proportions are as follows:—single lines, 1,270; double (or more) lines, 1,357.

In regard to the very important question of rates, the following Statements prepared from the Board of Trade returns deserve study. In the year 1900 the average rate per ton, irrespective of the distance hauled, on Merchandise carried on the Irish railways was as much as 37.14 per cent. in excess of the rate charged on the same class of Traffic in England, and 33.97 in excess of the Scotch rate. The average Irish railway rate per ton for Merchandise in 1900 was higher by nearly 2 per cent. than it was in 1890, while in England the decrease in the former as compared with the latter year was 8.79 per cent., and in Scotland 1.70:—

STATEMENT showing the AVERAGE RATE per TON on MERCHANDISE carried in ENGLAND, SCOTLAND, and IRELAND in the Years 1880, 1890, and 1900 respectively; and showing EXCESS of IRISH AVERAGE over English and Scotch for the same years.

YEARS.	Average Rate per Ton on Merchandise carried in			Excess of Irish Average Rate per Ton over	
	England.	Scotland.	Ireland.	English.	Scotch.
	s. *d.*	*s.* *d.*	*s.* *d.*		
1880	5 8.35	5 5.50	6. 11.27	21.83 per cent,	27.13 per cent.
1890	5 3.87	5 0.67	6. 6.40	22.75 ,,	29.22 ,,
1900	4 10.26	4 11.64	6. 7.90	37.14 ,,	33.97 ,,

STATEMENT showing the GROSS TONNAGE, GROSS RECEIPTS, and AVERAGE RECEIPTS per TON OF MERCHANDISE carried in ENGLAND, SCOTLAND, and IRELAND in Years 1880, 1890, and 1900.

ENGLAND.*

YEAR.	Gross Tonnage.	Gross Receipts.	Average Rate per Ton.
		£	*s.* *d.*
1880	59,415,037	16,922,646	= 5 8.35
1890	74,319,330	19,781,087	= 5 3.87
1900	102,628,842	24,916,037	= 4 10.26
1890 v. 1880	25.08 per cent. Increase	16.89 per cent. Increase	6.56 per cent. Decrease
1900 v. 1880	72.73 per cent. Increase	47.23 per cent. Increase	14.77 per cent. Decrease
1900 v. 1890	38.09 per cent. Increase	25.95 per cent. Increase	8.79 per cent. Decrease

* The figures given for England for the year 1880 are exclusive of Merchandise Traffic carried over the West Lancashire Railway, the Swansea and Mumbles Railway, and the Hoylake and Birkenhead Railway and Tramway, and those for the year 1890 are exclusive of Merchandise Traffic dealt with by the Dover and Deal Committee's Line. In all these cases Minerals have been included with Merchandise Traffic in the Board of Trade Returns from which the statement has been compiled.

SCOTLAND.

Year.	Gross Tonnage.	Gross Receipts.	Average Rate per Ton.
		£	s. d.
1880	7,611,503	2,077,400	= 5 5.50
1890	9,871,788	2,495,811	= 5 0.67
1900	12,273,754	3,050,537	= 4 11.64
1890 v. 1880	29.69 per cent. Increase	20.14 per cent. Increase	7.38 per cent. Decrease
1900 v. 1880	61.25 per cent. Increase	46.84 per cent. Increase	8.95 per cent. Decrease
1900 v. 1890	24.33 per cent. Increase	22.22 per cent. Increase	1.70 per cent. Decrease

IRELAND (excluding Light Railways).

Year.	Gross Tonnage.	Gross Receipts.	Average Rate per Ton.
		£	s. d.
1880	2,596,300	900,809	6 11.27
1890	3,102,869	1,013,621	6 6.40
1900	3,549,695	1,181,795	6 7.90
1890 v. 1880	19.51 per cent. Increase	12.52 per cent. Increase	5.86 per cent. Decrease
1900 v. 1880	36.72 per cent. Increase	31.19 per cent. Increase	4.05 per cent. Decrease
1900 v. 1890	14.40 per cent. Increase	16.59 per cent. Increase	1.92 per cent. *Increase*

In interpreting the average rates charged on Irish, English, and Scotch railways, as shown by the above Tables, it must, of course, be borne in mind that the distance hauled is not taken into account. Unfortunately, as regards the railways of the United Kingdom, ton-mile statistics are not available. If they were, it is not improbable that the Irish railways would compare more favourably than they appear to do in the matter of rates with the railways of Great Britain. The above Tables do an injustice to the Irish railways in so far as, and to the extent that, the average length of haulage may be found on examination to be greater in Ireland than in Great Britain.

CANALS AND WATERWAYS OF IRELAND.*

(*a.*) *Preliminary Observations.*

In his presidential address to the members of the Fourth International Congress on Inland Navigation, which met in 1890 in Manchester, Sir Michael Hicks-Beach was obliged to admit that the United Kingdom was very much behind other countries in its supply of statistical information on inland waterways and their traffic. However, the Board of Trade, in pursuance of powers conferred on them by the Railway and Canal Act of 1888, have, since the passing of that Act, issued two Blue Books [C. 6083—1890: Cd. 19—1899] containing fairly complete and accurate† statistics of canals and inland navigations in the United Kingdom.

It becomes more and more evident that it is an important preliminary to all lasting economic reform to have an instructed public opinion in this country concerning itself with our industrial interests. The amount of accurate information on public problems of importance to the material progress of the country is, from whatever cause, disappointingly small, even amongst those who ought to be interested in such matters. In looking up the materials on which the appended remarks are largely based, I experienced considerable difficulty, not merely in getting information, but even in getting at some of the sources of information. I take this as evidence that it is a work of some value to bring together in a succinct and connected form facts which, while accessible to any painstaking inquirer, are so scattered and hidden away in half-forgotten reports as to be beyond the easy reach of the general public. The time is not inopportune, moreover, for calling public attention to the *status quo* and the possibilities of our fine network of canals and river systems. There is (as I shall show presently) a revival of interest in every progressive country in the too long neglected question of inland waterways. Ireland—no country more so—is vitally concerned in the problem of cheap transport generally, and particularly in the cheap transport of such heavy goods of relatively small value as coal, stone, slates, brick, timber, lime, turf, manure, roots, etc., which are the characteristic items of water carriage. Again, a system of cheap and efficient water communication throughout the country would be of immense help to small industrial centres and to nascent rural industries such as, it may be hoped, will result in time from the new operations of State aid as applied to agriculture and industry. It must not be forgotten, in this connection, that, apart from new industries, there is in Ireland, as in many other countries, a large amount of potential traffic waiting on low transit rates. Sir Arthur Cotton rightly told the Commission on Canals of

* I am indebted to Mr. F. de Vismes Kane, of Drumreaske House, Co. Monaghan, late Chairman of the Grand Canal Company, for many valuable suggestions in the preparation of this statement, and for the loan of some interesting documents and MSS. on the history of Irish canals, on which subject his knowledge is exceedingly full.

† See, however, for a criticism of the Report of 1890, a paper on "Canals," by Lionel B. Wells, M. Inst. C.E., Report of Conf. on Inland Navigation, Birmingham, 1895, p. 28.

1883 that "it was not traffic that made communications, but communications that made traffic;" and an American economist has justly said that "the carriers of freight hold the keys of trade." Proximity to market (to put the same truth in another way) is the economic justification of intensive culture, and every extension or (what amounts to the same thing) every cheapening of good means of communication brings more producers and consumers into profitable trade relations, and this permits of the application of more capital, labour, and skill to the improvement of agricultural and industrial methods. In these days of wideawake competition in a world-market, a slight reduction in freight-charges may make all the difference between success and failure in any industry. It seems important, then, that our transport problems should be studied with a knowledge of the facts of the case at home and abroad, and with due regard to the growing needs and the new possibilities of an industrial revival. Our canal system—if the term "system" can be applied to an unfinished network of waterways of diverse depths and numerous breaks of gauge—is, it is quite true, far from perfect; but it is equally far from being in the moribund condition which many people seem to imagine. One cannot, of course, read the history of its creation without forming one's own opinion as to the causes of its comparative inefficiency, and also as to some of the obvious remedies; but it is not my business or intention to touch on these points further than as they arise out of the consideration of the general question of transit on inland waterways.

(*b.*) *The Economic Functions of Canals and Inland Waterways.*

New Importance and Modern Conditions of Transit Facilities.

Rivers, lakes, and inland seas are the first natural highways of commerce and intercourse between peoples, and, as everyone knows, they play a most important *rôle* in the earlier stages of civilisation. Roads and canals followed as the first artificial highways, and, finally, with the application of steam power came the railroad and the steamship.* The evolution of trade had a somewhat parallel development. Originally the producer—or rather the producing unit, the family—is self-supporting and self-sufficient, consuming in great measure what it itself produces, there being little trade between individuals or groups; a further stage is reached when with the division of trade or pursuits, exchange of wealth takes place between individuals living in the same locality; and, finally, comes the period of great specialisation of industry, involving the transportation of commodities from one district, country, and even continent, to another. It is in this latest stage of industrial growth or economic evolution that the question of transportation assumes an importance of the first order. Regularity, suitability, and safety of service, speed and cheapness of transport—these are, to-day, determining factors in the industrial struggle between the progressive nations who compete in the great markets of the world. How recent such facilities of communication are few people fully realise—they are, in effect, the creation of the second half of the nineteenth century. Porter, in his *Progress of the Nation*, written in 1842, makes the following observations on a Sussex hamlet which is now practically included as a

* On the 24th March, 1824, it is interesting to note, the first steamer service was established between Dublin and Liverpool, the "City of Dublin" doing the journey in fourteen hours. A week was the average of sailing vessels for the same journey.

suburban district of London: "An inhabitant of Hasham, in Sussex, lately living, remembered when a boy to have heard from a person whose father carried on the business of a butcher in that town, that in his time the only means of reaching the metropolis was either by going on foot or riding on horseback, the latter of which undertakings was not practicable at all periods of the year, nor in every state of the weather; that the roads were not, at any time, in such a condition as to admit of sheep or cattle being driven upon them to the London markets, and that for this reason the farmers were prevented sending thither the produce of their land, the immediate neighbourhood being, in fact, their only market. Under these circumstances a quarter of a fat ox commonly sold for about 15s., and the price of mutton throughout the year was only five farthings the pound." To-day London is partially fed from Canada, Victoria, the Argentine, and even Siberia. As to cheapness of transport, a well-known illustration of an American economist may be quoted:—"The wages for one day's work of an average mechanic in the far East (i.e., of the United States) will pay for moving a year's subsistence of bread and meat a thousand miles or more from the distant West." These are but vivid illustrations of an economic revolution with the effects of which we are all familiar, and which has been brought home keenly to all Irish agriculturists. I bring them forward now to emphasise the importance of using every available means to improve facilities of communication, and to concentrate attention on a phase of the transport problem which, though it has at no time been ignored, and has recently been a good deal discussed,* deserves, I think, a fuller study, on the part of the general public, than it has yet received. One of Ireland's outstanding economic advantages is her nearness to several of the greatest food-consuming centres in the world; but this advantage is being daily lessened by the improvements in efficient transport service of our competitors, and by scientific progress in regard to cold storage, sterilising chambers, and the use of preservatives for food products. It behoves us then to see that nothing is left undone to secure the effective working of our railways, rivers, canals, and even our roads, and to make them directly subserve the industrial needs of the country. There is, indeed, a wide field for work for the improvement of Irish agricultural and other products; there is very much still to be learnt in the matter of preparing these products for market so as to suit the requirements of the consumer; but at least of equal moment it is to bring our means of communication in regard to speed, freight-charges, and general efficiency up to the level of those European countries which at present challenge our supremacy in the British markets.

Revival of Interest in Inland Waterways.

Within the past ten or fifteen years there has been a distinct and most significant revival of interest in every European country, as well as in the United States, in the question of canals and inland waterways generally. It has come to be realised that a vital mistake was made, especially in these countries, at the time of the advent of the railway, in not maintaining the canal systems as independent competitive routes, which, as it now appears, can carry more economically certain classes of traffic than the

* Notably by Mr. James M'Cann, M.P., the present Chairman of the Grand Canal Company, in his "Address to the Shareholders of the Grand Canal Company, 1900"; speech in the House of Commons (April 30th, 1900) on "Irish Railways and Canals," and in a brochure entitled "Trade and Transit."

railways can. The *laisser faire* policy dominant in England at the time was against any direct State interference with canals and railways, and thus no less than one-third of the total canal mileage of the United Kingdom was allowed to pass, without protest or conditions, into the hands of the railway companies. This involved an even more serious interference with the competition of the waterways than appears at first sight, for it is clear that the railways had to get control of only a section of a navigation made up of one or more waterways, to interfere with competition along its entire length. Moreover, it was in regard to heavy traffic only that the railways needed to compete in the matter of freight charges with the canals. Passenger traffic, perishable traffic, and "smalls" traffic came to them as a matter of course. "That the whole subject of transit in England requires to be considered from its very foundation," wrote Sir Arthur Cotton in a very interesting Report to the Committee on "Canals" in 1883, "has been most fully proved by the late and present Committees already. The defects in the legislation hitherto on this subject are inconceivable. The one fact that all the main lines of water transit should have been paralysed by allowing the railways to buy up a short line in the middle, and so establish a monopoly, shows this beyond dispute. And this after they had been granted Acts of Parliament which gave them the power of doing anything they pleased with private property that lay in their way. It is remarkable that in France they should be so far in advance of us in this matter that the Government have taken the water lines into their own hands, and are now opening them with one object in view, the general good of the community." The French Government had, in fact, with wise prevision, bought up a good many of the canals on the occasion of the slump in their value at the advent of railways.

Canal Legislation in the United Kingdom since 1845.

In 1845 the canal companies of the United Kingdom petitioned Parliament for protection against the competition of the railroads, and secured, for the first time, strange as it may seem, the right of becoming shippers over their own canals, obtaining at the same time the power to lower and raise their tariffs. Looking back now, with a knowledge of the actual development of railways, it seems incredible that railroads were originally regarded by their promoters as well as by the public as public highways, or even "land canals," and that the companies themselves declared it was against their wish, and would be against their interest, to attempt the carriage of goods and passengers, and that they desired to be toll-takers only. The same curious lack of apprehension of the inherent possibilities of the railway system was shown in the construction of short local lines in imitation of the existing sectional waterways. Thus the present Great Northern Railway of Ireland is, as is well known, the result of the amalgamation of no less than eleven smaller companies.

It must not be assumed, however, that the old system of waterways in the United Kingdom or elsewhere was ideal in any respect. Being a practical monopoly, fares and freight charges were, in many cases, excessive to a degree. Speaking in the House of Commons, May, 1836, Mr. Morrison is reported to have said:—"The history of existing canals, waterways, etc., affords abundant evidence of the evils (i.e. of monopoly) to which I have been adverting. An original share in the Loughborough Canal, for example, which cost £142 17*s*., is now selling at £1,250, and yields a

dividend of £90 or £100 a year. The fourth part of a Trent and Mersey Canal share, or £50 of the company's stock, is now fetching £600, and yields a dividend of about £30 a year. And there are various other canals in nearly the same situation." While, however, it is quite true that the canal proprietors in pre-railway days reaped the harvest of monopoly rates, that supplies no reason whatever why they should have been sacrificed in the interests of another monopoly. It was, on the contrary, a strong reason for safeguarding the legitimate powers and functions of each means of communication, and thus permitting the development of a sound and healthy competition, which would have proved of enormous service to the trading community and (as it is now being recognised, especially on the Continent) have been in the true interests of the railways themselves. Parliament has, since 1845, made many efforts to secure an equitable readjustment of the respective interests of canal and railway owners. Several Royal Commissions and Select Committees have investigated the subject, and in the years 1854, 1873, 1888, and 1894, respectively, important Acts of Parliament to regulate railway and canal traffic have passed the Legislature. The Act of 1873 established a Railway Commission, consisting of three members and two assistants, in whose hands was placed the enforcement of the previous Act of 1854. This Act of 1873 was to have had effect for five years only, but in 1878 it was continued till the end of 1879, then till December 31st, 1882, then for five years longer. In 1887 the Commissioners were made a permanent body. The Act of 1873 enacted, *inter alia*, that :—

"Every railway company and canal company shall keep at each of their stations and wharves a book or books showing every rate for the time being charged for the carriage of traffic other than passengers and their luggage, from that station or wharf to any place to which they book, including any rates charged under any special contract, and stating the distance from that station or wharf of every station, wharf, siding, or place to which any such rate is charged.

"Every such book shall, during all reasonable hours, be open to the inspection of any person without the payment of any fee.

"The Commissioners may from time to time, on the application of any person interested, make orders with respect to any particular description of traffic, requiring a railway company or canal company to distinguish in such book how much of each rate is for the conveyance of the traffic on the railway or canal, including therein tolls for the use of the railway or canal, for the use of carriages or vessels, or for locomotive power, and how much is for other expenses, specifying the nature and detail of such other expenses.

"Any company failing to comply with the provisions of this section shall for each offence, and in the case of a continuing offence, for every day during which the offence continues, be liable to a penalty not exceeding five pounds, and such penalty shall be recovered and applied in the same manner as penalties imposed by the Railways Clauses Consolidation Act, 1845, and the Railways Clauses Consolidation (Scotland) Act, 1845 (as the case may require), are for the time being recoverable and applicable." (Section 14.)

The Commissioners had power to decide whether terminal charges were reasonable, and their consent was necessary before any railway company could, except by Act of Parliament, purchase or obtain control of a canal (sect. 16).

The Railway and Canal Traffic Act of 1888.

The Act of 1888 was a further important step in the direction of freeing the canals from danger of domination by the railways and maintaining them as genuine competitors. It created a Railway and Canal Commission to supersede the Commission established by the Act of 1873. The constitution of this permanent Commission is laid down in sections 2, 3, and 4 of the Act of 1888, which read as follows:—

"2. On the expiration of the provisions of the Regulation of Railways Act, 1873, with respect to the Commissioners therein mentioned, there shall be established a new Commission, styled the Railway and Canal Commission (in this Act referred to as the Commissioners), and consisting of two appointed and three ex-officio Commissioners; and such Commission shall be a court of record, and have an official seal, which shall be judicially noticed. The Commissioners may act notwithstanding any vacancy in their body.

"3.—(1.) The two appointed Commissioners may be appointed by Her Majesty at any time after the passing of this Act, and from time to time as vacancies occur.

(2.) They shall be appointed on the recommendation of the President of the Board of Trade, and one of them shall be of experience in railway business.

(3.) Section five of the Regulation of Railways Act, 1873, shall apply to each appointed Commissioner.

(4.) There shall be paid to each appointed Commissioner such salary not exceeding three thousand pounds a year as the President of the Board of Trade may, with the concurrence of the Treasury, determine.

(5.) It shall be lawful for the Lord Chancellor, if he think fit, to remove for inability or misbehaviour any appointed Commissioner.

"4.—(1.) Of the three ex-Officio Commissioners of the Railway and Canal Commission, one shall be nominated for England, one for Scotland, and one for Ireland; and an ex-Officio Commissioner shall not be required to attend out of the part of the United Kingdom for which he is nominated.

(2.) The ex-Officio Commissioner in each case shall be such judge of a superior court as—

(*a.*) in England the Lord Chancellor; and

(*b.*) in Scotland the Lord President of Court of Session; and

(*c.*) in Ireland the Lord Chancellor of Ireland;

may from time to time by writing under his hand assign, and such assignment shall be made for a period of not less than five years.

(3.) For the purpose of the attendance of the ex-officio Commissioners, regulations shall be made from time to time by the Lord Chancellor, the Lord President of the Court of Session, and the Lord Chancellor of Ireland respectively, in communication with the ex-officio Commissioners for England, Scotland, or Ireland, as the case may be, as to the arrangements for securing their attendance, as to the times and place of sitting in each case, and otherwise for the convenient and speedy hearing thereof."

Other sections of interest in this important Act are section 31, which provides that on the application of anyone interested in through traffic the Commissioners can order through rates and decide whether any through rate is just and reasonable; section 39 (3), which provides:—

"When the canal of a canal company, or any part thereof, is intended to be stopped for more than two days, the company shall report to the Board of Trade, stating the time during which such stoppage is intended to last, and

when the same is re-opened the company shall so report to the Board of Trade." (*Section* 39 (3).)

And section 42, which runs as follows:—

"No railway company, or director or officer of a railway company, shall, without express statutory authority, apply or use or authorise or permit the application or use of any part of the company's funds for the purpose of acquiring, either in the name of the railway company, or of any director or officer of the railway company, or other person, any canal interest, or of enabling any director or officer of the railway company, or other person, to purchase or acquire any canal interest, or of guaranteeing or repaying to any director or officer of the railway company or other person who has purchased or acquired any canal interest the sum of money expended or liability incurred by such director, officer, or person in the purchase or acquisition of such canal interest, or any part of such money or liability.

"In the event of any contravention of the provisions of this section, the canal interest purchased in such contravention shall be forfeited to the Crown, and the directors or officers of the company who so applied or used, or authorised or permitted such application or use of the company's funds, shall be liable to repay to the company the sums so applied or used and the value of the canal interest so forfeited; and proceedings to compel such repayment may be taken by any shareholder in the company.

"In this section the expression 'company's funds' means the corporate funds of any railway company, and includes any funds which are under the control of or administered by a railway company; the expression 'officer' includes any person having any control over a company's funds or any part thereof; and the expression 'canal interest' means shares in the capital of a canal company, and includes any interest of any kind in a canal company or canal." (*Section* 42.)

The Amending Act of 1894.

On August 25th, 1894, "An Act to Amend the Railway and Canal Traffic Act of 1888" became law. This brief but important Amending Act may be quoted here *in extenso*. It runs as follows:—

"An Act to amend the Railway and Canal Traffic Act, 1888.

[25th August, 1894.]

Be it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of same, as follows:

"1.—(1.) Where a railway company have, either alone or jointly with any other railway company or companies, since the last day of December, one thousand eight hundred and ninety-two, directly or indirectly increased, or hereafter increase directly or indirectly, any rate or charge, then if any complaint is made that the rate or charge is unreasonable, it shall lie on the company to prove that the increase of the rate or charge is reasonable, and for that purpose it shall not be sufficient to show that the rate or charge is within any limit fixed by an Act of Parliament or by any Provisional Order confirmed by Act of Parliament.

"(2.) Under and subjejct to any regulation which may be made by the Board of Trade, every railway company shall keep the books, schedules, or other papers, specifying all the rates, charges, and conditions of transport in use

upon such railway on the thirty-first day of December, one thousand eight hundred and ninety-two, open for inspection at its head office, and shall upon demand supply copies of or extracts from such books, schedules, and papers.

" (3.) The Railway and Canal Commissioners shall have jurisdiction to hear and determine any complaint with respect to any such increase of rate or charge, but not until a complaint with respect thereto has been made to and considered by the Board of Trade under section thirty-one of the Railway and Canal Traffic Act, 1888.

" (4.) Unless the court shall before or at the hearing of the complaint otherwise order, a complainant to the Railway and Canal Commissioners under this section shall, before or within fourteen days after filing his complaint, pay to the railway company such sum in respect of any rate or charge complained of as would have been payable by him to them had the rate or charge in force immediately before the increase remained in force; or if that rate or charge is higher than the rate or charge in force on the last day of December, one thousand eight hundred and ninety-two, then such sum as would have been payable on the footing of the last-mentioned rate or charge ; any dispute as to the amount so payable shall be decided by the registrar, or in such other mode as the court may order, but such payment or decision shall be without prejudice to any order of the court upon the complaint.

" (5.) Section twelve of the Railway and Canal Traffic Act, 1888, shall apply in the case of any such complaint, and in the case of any rate or charge increased before the passing of this Act shall have effect as if six months after the passing of this Act were substituted for the limit of one year therein mentioned, but the Board of Trade may, if they think fit, extend the said period of six months with respect to any complaints made to them during that period.

" 2. In proceeding before the Railway and Canal Commissioners, other than disputes between two or more companies, the Commissioners shall not have power to award costs on either side, unless they are of opinion that either the claim or the defence has been frivolous and vexatious.

" 3. The provisions of section fourteen of the Regulation of Railways Act, 1873, with respect to the power to make orders and failure to comply with such orders, shall extend to any rates entered in books kept in pursuance of section thirty-four of the Railway and Canal Traffic Act, 1888.

4. Whenever merchandise is received or delivered by a railway company at any siding or branch railway not belonging to the company, and a dispute arises between the railway company and the consignor or consignee of such merchandise as to any allowance or rebate to be made from the rates charged to such consignor or consignee in respect that the railway company does not provide station accommodation or perform terminal services, the Railway and Canal Commissioners shall have jurisdiction to hear and determine such dispute, and to determine what, if any, is a reasonable and just allowance or rebate.

" 5. This Act may be cited as the Railway and Canal Traffic Act, 1894, and shall be read with the Railway and Canal Traffic Acts, 1873 to 1888."

In May, 1892, the Board of Trade had begun the investigation of the powers of Navigation Companies and their rate charges, and in 1893 had revised the Schedule. Previously Parliament had revised the Schedule of Maxima which the railways might charge for the conveyance of merchandise traffic. Hence the above Act dealt with complaints as to rates or charges raised since 1892.

Railway versus Canal.

All this legislation, however, excellent in intention as it was, came rather late to secure the full free development of inland waterways. Of the whole mileage of the canals of the United Kingdom, practically one-third, as has been said, belonged to the railway companies in 1888. The actual figures were 1,204 m. 64½ ch. owned by railway companies, as against 2,608 m. 65 ch. not so owned. The mileage of canals belonging to railway companies has decreased since 1888 by a little over 65 miles, owing to the transfer to the Sheffield and South Yorkshire Navigation Company of certain canals which belonged to the Grand Central Railway Company. Of the 582 m. 12 ch.* of canals in Ireland, 95 m. 69 ch., or nearly one-sixth, is in the hands of a railway company. Commenting at the Manchester Conference on the 1888 figures of the Board of Trade, Sir Michael Hicks-Beach, the then President of the Board of Trade, said:—"Out of the whole mileage of the canals of the United Kingdom, one-third belong to the railway companies. That one-third only carries one-fourth of the total traffic carried on the canals. The gross receipts per mile on that one-third are considerably less than they are on the independent canals, and the net profits out of these gross receipts amount to as little as one-fourth of the gross receipts. I confess, without desiring to say anything that should be unpleasant to the railway companies, that the facts do seem to me to give some colour to the accusation which has been frequently made, that when a railway company becomes the owner of a canal it works that canal rather for the profit of the railway than for the profit of the canal or the advantage of the community. I believe there can be no more short-sighted policy than such a policy as that. If our railway companies allowed the free development of the traffic of their canals and through traffic from their canals to the canals of independent companies, I believe the result would be most satisfactory to canals generally and to the public at large, but even, by the increase of trade, to the railways themselves." This is emphatically the opinion of those foreign Governments which own both the railways and canals, and which can thus secure a natural and profitable division of labour between the two supplementary modes of transit. I shall return in a moment, to the illustration of this point. Meantime I take it as an evidence of what I may call the vitality of inland waterways—a vitality arising, of course, from their inherent utility and adaptability as economical means of communication—that in spite of the past action and attitude of railway companies (of which something has just been said), and in spite of their own intrinsic engineering and other defects, the canals of the United Kingdom have been able to survive at all and even to pay a moderate return on capital.

According to the Board of Trade Return issued in 1890 (the particulars given are for the year 1888), it will be seen that 25 per cent. of the paid-up ordinary capital paid 2 to 3 per cent. dividend; 47 per cent. paid 3 to 4 per cent.; and 9 per cent. paid 4 to 10½ per cent. Only 6 per cent. of the whole ordinary paid-up capital gave no return. The Board of Trade figures for the year 1898, which I append, are, it is true, far from being so favourable. Still, it will be seen that 68.48 per cent. of the entire ordinary capital

* This figure is taken from the Board of Works return for 1898, but the Table on which this mileage is estimated, omits the following waterways:—River Suir Navigation, Foyle Navigation (Foyle to Strabane), Ballinamore and Ballyconnell Navigation, Lough Corrib Navigation, and the Tyrone Navigation. An estimate of our inland navigation places it at 750 miles, more than two-thirds of which are natural lakes and rivers.

pays some dividend, while as much as 41.47 per cent. still pays more than 3 per cent. interest :—

TABLE showing for the Year 1898 the Amount of Ordinary Stock classed according to the Rate per Cent. of Dividend Paid, in respect of Canals and Navigation, in England and Wales, Ireland and the United Kingdom, not belonging to Railway Companies.

Rate Per Cent. of Dividend or Interest Paid.	ORDINARY.			
	England and Wales.	Ireland.	United Kingdom.	Per Cent. of Total.
	£	£	£	
No dividend or interest paid	4,861,738½	82,898	4,944,636½	31.52
Dividends and interest paid ;—				
Not exceeding 1 per cent.	1,086,093	66,000	1,152,093	7.34
Exceeding 1 per cent. and not exceeding 2 per cent.	259,150	—	259,150	1.65
Exceeding 2 per cent. and not exceeding 3 per cent.	2,763,100	—	2,763,100	17.61
Exceeding 3 per cent. and not exceeding 4 per cent.	5,682,575	332,950	6,015,525	38.34
Exceeding 4 per cent. and not exceeding 5 per cent.	231,032	5,120	236,152	1.51
At 5¼ per cent.	178,648	—	178,648	1.14
At 6 per cent.	—	—	—	—
At 7½ per cent.	24,400	—	24,400	.16
At 9 per cent.	50,000	—	50,000	.32
Birmingham and Warwick Junction Canal	60,000	—	60,000	.38
Premiums	5,183	—	5,183	.03
Total	15,201,919½	486,968	15,688,887½	100.0

The following comparison between the dividend-paying power on the ordinary paid up capital of the canals of the United Kingdom, the canals of Ireland, and the Irish railways, will make it clear that the canal, even under the most crippling conditions, is not yet in these countries a negligible quantity in the matter of merchandise and mineral transport :—

STATEMENT showing for the Year 1898* the Proportion per Cent. of the Ordinary Capital of the Canals of the United Kingdom, the Irish Canals, and the Irish Railways, respectively, upon which (I.) No Dividend was paid, and (II.) Dividends were paid, classified according to the Rates of Interest.

—	Amount of Ordinary Capital.	Proportion per Cent. of Ordinary Capital upon which—							
		(I.)—No Dividend was paid.	(II.)—Dividends were paid.						
			Not exceeding 1 per cent.	Exceeding 1 and not exceeding 2 per cent.	Exceeding 2 and not exceeding 3 per cent.	Exceeding 3 and not exceeding 4 per cent.	Exceeding 4 and not exceeding 5 per cent.	Exceeding 5 per cent.
	£								
Canals of the United Kingdom	15,688,887	31.5	7.4	1.7	17.6	38.3	1.5	2.0
Irish Canals ..	486,968	17.0	13.5	—	—	68.4	1.1	—
Irish Railways	16,159,991	18.2	0.3	2.0	0.7	15.0	31.4	32.4

* The latest year for which full Canal returns are available.

The traffic of the canals of Ireland amounted to 708,174 tons in 1896, while the goods traffic of the Irish railways was 5,113,419 tons in the same year.

In an admirable memorandum on "The Policy of Water Carriage in England," which Lieutenant-General Rundall, R.E., handed in to the Commission on Canals (1883), the distinctive advantages of water transport are excellently set out as follows:—

"It is not only in the item of cheapness, however, that canal carriage is superior, but it also possesses the following advantages:—

"1. It admits of any class of goods being carried in the manner and at the speed which proves to be most economical and suitable for it, without the slightest interference with any other class.

"2. The landing or shipment of cargo is not necessarily confined to certain fixed stations as is obligatory on railways, but boats can stop anywhere on their journey to load and unload.

"3. The boat itself often serves as a warehouse, in which an owner may keep his cargo till sold.

"4. The dead weight to be moved in proportion to the load is much less in the case of canal carriage than that of railway. The ordinary railway truck weighs nearly as much as the load put on it, whereas a cargo boat will carry four or five times its own weight.

"5. The capacity for traffic is practically unlimited, even in the case of canals with locks, provided the locks are properly designed. A lock 150 feet long by 20 feet broad, in a canal with a draft of six feet, will pass single boats of 300 tons burden. Locks can be designed, and are in actual operation, so as to be manœuvrable in three minutes; but supposing that time were doubled, then at the rate of 10 lockfuls of 300 tons per hour, the capability of a single lock would be at the rate of $10 \times 300 \times 24 = 72{,}000$ tons per day, or over 25 million tons per annum. If a larger traffic required to be accommodated, it would be met either by increasing the speed at which the locks were worked, or doubling their number.

"6. In the case of either State or private canals, unless worked by the owners of the canal, there is no necessity for maintaining an enormous and expensive apparatus or establishment, as all that can and would be carried on by separate agencies and by district capital, thus avoiding a large expenditure in the first cost, and subsequent maintenance of rolling stock.

"7. The almost total absence of risk and reduction of damage to cargo in transit to a minimum. In order to reap the fullest advantages of water carriage, however, it will be necessary, just as it is in all undertakings, not only to construct the most perfect instrument possible, but also to take care that it is most carefully and wisely managed afterwards."

It must be borne in mind, too, that, from the national point of view, the good influence of our system of canals and waterways has been, and is, greater than the volume of trade dealt with or the dividend returns earned might lead us to imagine. Their power of regulating freight charges on the railways is considerably more than their absolute efficiency at any moment would seem to imply; for even potential competition has an immediate influence on rates, as anyone conversant with railway problems can readily illustrate from his own experience. In any comparison between railways and canals it should never be forgotten that the former are regarded (as we actually find them) at the highest point of modern efficiency, while canals have to be considered (as we actually find them also) as a means of transport using, in these countries at any rate, out-of-date sections, locks, barges,

and haulage, and thus affording a most imperfect estimate of what their potentialities would be under improved modern conditions. The railway has developed wonderfully in response to the increasing demands of trade and passenger traffic, while inland waterways have, in the United Kingdom for the most part, remained stationary for quite half a century, and many of them have actually retrogressed or even gone derelict. In regard to this whole question of competition between waterways and railways, the following extract from Professor Emory R. Johnson's "Inland Waterways" (Philadelphia, 1893) is well worthy of respect as coming from a distinguished economist who has made a special study of transit problems:—"*The best regulator of railroad rates is* (writes Dr. Johnson), *the independent waterway.** Competition between railroads and water routes is quite different in kind from that of railroads with each other; it is bound to produce cheaper rates, and can do this without detriment to the railroads. There is abundant evidence showing the power of water transportation to lower freight rates. The past and present opposition which the railroads have shown the waterways in order that rates might be controlled indicates clearly enough that the railroads are conscious of the potency of water competition. The railroads see in the waterway an agency which can move certain kinds of freight at lower rates than they can be transported on land, and, without analysing the results of this to see what may be the secondary effects on the freight business by rail of the cheaper transportation charges for these certain kinds of goods, the railroad strives to quash the waterway out of existence. An illustration out of many that might be cited to show the real and effective competition of waterways is afforded by Belgium. Liege and Antwerp are connected by a line of navigation 156 kilometres long, that comes in competition with two railroads somewhat shorter in length. The water rates often come as low as 2 francs 15 centimes to 2 francs 30 centimes per ton for the entire distance. In order to compete, the railroads carry at their lowest rate between Liège and Antwerp. In train load lots of 200 tons, for exportation by sea, they charge only two francs a ton. This is a special rate, all others being enough higher than by boat to enable the waterways to secure a good volume of freight. The cheapest freight rates by rail to be found in the world are those for grain between Chicago and New York; and why? Because the cheapest inland water transportation rates in the world are those between the same points. All the railroads of the United States have been steadily lowering freight charges during the past twenty years, and largely, of course, because improvements in track and equipment have made this possible. Those roads, however, that have made the most improvements and the greatest reductions in rates are the great trunk lines leading into New York from the West, those that compete with the Great Lakes, the Erie Canal, and the Hudson River. The average freight earnings per ton mile of all the railways of the United States for the year ending June 30, 1890, were .941 cents.† The ton mile earnings of the New York Central and Hudson River Railroad were .730 cents, and on the Pennsylvania Railroad, .661 cents; on the Lake Shore and Michigan Southern, .653 cents, and on the Michigan Central, .726 cents; whereas the average earnings per ton mile on the Chicago, Milwaukee, and St. Paul, and the Chicago and North-western, roads coming but slightly

The Canal as a Regulator of Railway Rates.

* The italics are in the original.

† For the year ending June 30, 1891, they were .895 cents.

into competition with the Great Lakes and other waterways, were 1.06 and 1.03 cents respectively. The following table, showing the wheat rates per bushel from Chicago to New York for the years 1870, 1880, and 1889, by water, by water and rail combined, and by rail, indicates very plainly how freight charges have fallen, and how this movement has been led by the waterways:—

—	By Lake and Canal.	By Lake and Rail.	By all Rail.
1870	17.10 cents.	22.0 cents.	33.3 cents.
1880	12.27 ,,	15.7 ,,	19.9 ,,
1889	6.89 ,,	8.7 ,,	15.0 ,,

"The important influence of the Erie Canal on freight rates has often been emphasized; only a few facts need be given here. They are for the year 1891. The Erie Canal was opened in May, at which time the pool rates on grain from Buffalo to New York were seven and four-fifths per cent. per bushel. The grain rates on the canal for the various months of the season were—May, 2.51 cents; June, 2.53 cents; July, 2.68 cents; August, 3.94 cents; September, 4.19 cents; October, 4.44 cents; and November, 4.13 cents. The railroad pool rates, though nominally unchanged, were not maintained. Mr. Edward Hannan, Superintendent of Public Works of New York, says: 'My information on that subject, which has been received from private sources, is that contracts were made by the various railroads to carry grain in the months of June, July, and August, for four cents a bushel; September, four and one-half; and October, five cents. On petition of the Merchants Exchange, of Buffalo, the Superintendent of Public Works kept the canals of New York State open five days longer than the allotted time. This shows very plainly that shippers regard the canal as a freight regulator. When the canals closed for the winter the railroad charges again rose to the pool rates.'"

To return now to the interesting question of the division of labour between canals and railways which the characteristic quality of each means of communication would dictate, and which is actually in operation in countries where this problem of transit is considered from a broad national standpoint, and where consequently a unified system of inter-communication exists.

Bulky raw materials * naturally constitute the larger share of the actual traffic on canals in every country; the kind of the raw material depending, of course, on the industrial character of the district served by the particular canal. The commodities carried by the Irish canals in 1899 consist

*This must not, however, be interpreted too strictly. Mr. F. de Vismes Kane, a former Chairman of the Grand Canal, writes me on this point:—"Undoubtedly heavy traffic is well suited for canals. But if it were not that we carried large quantities of lighter goods—merchandise of all kinds—even furniture, drapery, crockery, tobacco, and groceries of all sorts, paying *good* freight, we could scarcely have maintained the service on the Grand Canal. Given good, staunch boats, we can well compete with railways in these things where *haste* is not required; and as for whiskey and tea, and valuable goods of that kind, we can lock up the holds and prevent pillage entirely. We did a large business sending whiskey sealed down all the way to Limerick; and furniture is most safely carried. To Naas we had a boat which delivered goods earlier than the railway. Our service was a continuous one—night and day—so that the difference in speed was not great for short distances."

mainly of coal, bricks, timber, sand, turf, oats, flour, grain, porter (which is 25 per cent. of all traffic on the Shannon and Maigue Navigations), and such agricultural requirements as artificial manures, grass seeds, etc., besides a fair proportion of "general cargo." In a country like Ireland whose soils vary so much in kind, there being large districts of moory land, heavy clays, shallow soils lying immediately upon limestone plateaux, and friable loams on basaltic or igneous formations, the farm produce is affected very diversely by the varying conditions of sun-heat and rainfall in different seasons, so that it is not unusual to have a heavy root crop in one district while in others it is of poor quality or scanty in bulk. In the absence of cheap transport for bulky crops such as potatoes or turnips, the local glut or scarcity rules the market prices; so that the profits of agriculture are subject to more violent fluctuations than would obtain if there were better facilities for distribution. The railway freights are necessarily disproportionate to the value of such products. However, since the "inward" exceeds very largely the "outward" traffic to seaports by reason of the scarcity of manufacturing industries in Ireland, it is, perhaps, worth consideration whether lower rates for such class of goods might not remunerate the carrying companies by utilizing the empty return wagons. Here, certainly, an efficient inland navigation service would serve the farmer. The same general classes of commodities, as quoted above, are found in the traffic-lists of continental waterways. Of the freight brought to Berlin for instance, in 1890, 49 per cent. consisted according to the official returns, of stone and brick, 21 per cent. of lime, earth, sand, etc., 10 per cent. of wood, 7 per cent. of coal, and 6 per cent. of grain. Again, an official analysis made some years ago of the traffic carried on French canals gives the following results: construction materials and minerals, 28 per cent.; agricultural produce, 14.4 per cent.; timber, 8.6 per cent.; metals, 7 per cent.; manure and accessories, 5.3 per cent.; and so on. A consideration of the character of this traffic makes it evident that the province of the waterway in transportation is a narrower one than that of the railway. The latter naturally takes all passenger traffic, all perishable goods, nearly all "smalls" traffic, and practically all live stock, and as it happens, these are precisely the classes of traffic which are most remunerative on railways. It is significant, by the way, of the influence of waterway rates on railway rates, that while goods rates have been reduced very considerably within the past two decades, passenger fares, in which there is practically no water competition, have declined to a far less extent (except, of course, in urban areas, where the competition of the tram system has been felt). This is a phenomenon observable in every country where there is genuine competition either between waterways and railways, or by railways *inter se.* The following Table for the United States will serve to illustrate this tendency:—

Year.	Rate per Ton-mile.	Rate per Passenger-mile.
	Cents.	Cents.
1884	1.124	2.356
1887	1.034	2.276
1890	.927	2.174
1893	.893	2.072
1896	.821	2.034

Accompanying this decrease (outside of this country) in rates for goods there has been, needless to say, a wonderful increase in the goods traffic in comparison with the passenger traffic. In fact, it is this very increase of freight traffic—which is obtaining a greater and greater preponderance in the entire traffic of the railroad—which has again brought prominently forward the question of waterway transit. Heavy goods traffic is the least profitable traffic for a railway to handle, and the provision for it in the matter of sidings, double and even (as on the English trunk lines) quadruple lines, reduces the small margin of profit, where there is any serious competition, to a still lower figure. It has been estimated* that a gross income of more than £30,000 a mile is earned in England off a single pair of tracks by a traffic exclusively in passengers or goods carried at passenger speed. About £8,000 per mile is said to be the largest revenue earned by any line of mixed traffic, and £6,200 a mile has been earned on mineral lines proper. On the other hand, a moderate estimate of the cost of carriage of heavy materials by canal places it at less than a third of the corresponding cost by railway. The late Mr. Francis R. Corder, C.E., who gave important evidence before the Select Committee on Canals, 1883, put in, *inter alia*, an interesting document (which will be found, p. 234 of the Report [C. 252—1883] of that Committee) dealing with the comparative costs of Railway and Canal transport. Mr. Corder was certainly an enthusiast for inland navigation, and, possibly, tended to an optimistic view of the possibilities of canal traffic, but his main contentions are unquestionably sound, and his statement of the case, though worked out nearly twenty years ago, still deserves study. I accordingly quote the following extract :—

Comparative Cost of Railroad and Water Haulage.

"The main causes which render transport by canal cheaper than transport by railway are (writes Mr. Corder) the following :—

"(1.) In canal transport there is no item of cost corresponding to the wear and tear of rails, sleepers, and fittings, or to the replacement and maintenance of permanent way. These items form 13 per cent. of the working expenditure of the railways of the United Kingdom.†

"(2.) A corresponding saving, which there are reasons for estimating as equal to the former, is made in the repairs of vehicles and locomotives, due to the damage caused by the reaction of the rigid way.

"(3.) The maintenance of the works on a canal is on the average much less costly than the corresponding outlay on a railway; not only from the absence of vibration, but from the much smaller magnitude of the works themselves. The average cost of the railways of England and Wales is £46,000 a mile. That of the canals, as far as it has been ascertained, is not more than £3,350 per mile. The average cost of 18 of the principal English canals was under £10,000 a mile; that of the Birmingham Canal, of which, in 1865 the original £1,000 shares were each worth more than £30,000 in the market,‡ was £15,000 a mile. The cost of the Manchester, Sheffield, and Lincolnshire, and of the Lancashire and Yorkshire Railways, which offer the best parallel to the Birmingham Canal, averaged £65,700 per mile. Thus for equal volumes of traffic, the cost of the maintenance of works on a canal will be less than one-fourth of that on a railway. The cost of this item on the railways of the United Kingdom

* See "Index to our Railway System," by William Fleming, No. III., 47.

† *Vide* "Index to our Railway System," No. III., p. 24.

‡ *Vide* "Du Régime des travaux publics en Angleterre.' Par Ch. De Franqueville. Paris, 1875. Vol. II., p. 301.

is 7 per cent. of the working expenditure.* In the annexed table I have taken one-third of this for the cost of canal maintenance.

"(4.) The resistance to traction on a level railway, at the speed of 30 miles an hour, is exactly ten times the resistance to traction on a canal, at the speed of $2\frac{1}{4}$ miles an hour.† The force that will draw a load on a canal at four miles an hour is just half that required to draw an equal load on a railway at 35 miles an hour. The economy of tractive force is thus in inverse proportion to the speed of transport. Traction, on the railways of the United Kingdom, costs 16 per cent. of the expenditure. I have taken it at half that figure on canals.

"(5.) It is not so evident why the item of traffic expenses, which forms‡ 30 per cent. of railway expenditure, should be so much lighter on canals. It is, however, in evidence that it is so. I have taken the proportion, from the French returns, at one-fifth of this rate.

"(6.) The items of duty and general charges, which amount to 15 per cent. of the English expenditure on railways, follow nearly the same proportion as the traffic expenses, on the French canals. I have, however, allowed an equal proportionate charge to that of the railways for the English canals.

"I can thus state with confidence that the following table underrates the economy to be attained by the use of canal transport for heavy traffic.

"Out of every £200 paid for an equal tonnage transported an equal distance, the detailed costs are:—

Item.	By Railway.	By Canal.
Maintenance of Way	13	0
Maintenance of Works	7	2.3
Repairs of Rolling Stock	19	6
Traction	16	8
Traffic Expenses	30	6
General Charges	15	15
Interest on Capital	100	33.3
Total	200	70.6

Showing an economy of 64.7 per cent. by canal.

"I may point out," adds Mr. Corder, "that in the case of the transport of fish, of light parcels, and of any commodities for the rapid carriage of which it is worth while to pay treble freight, the question of time has to be set against that of cost. But mineral trains rarely run at higher speed than fifteen miles an hour, while the time consumed in waiting in sidings is so much, that on one important line the locomotive superintendent has stated that the average rate of some of the trains, covering all stoppages, was not above five miles per hour."

It is clear from considerations such as these—and Mr. Corder's calculations are, I believe, still substantially true—that the canal, under normal conditions, could by division of appropriate traffic, both be an aid and a complement to the railway. Against this view, seemingly, is the strange apathy of these railways who own canals in the United Kingdom in regard to that portion of their property. It is commonly believed, that railway proprietors are good judges of their own interests, and presumably there are

* "Index to our Railway System," No. III., p. 24.

† *Vide* "Transactions of the Institute of Civil Engineers," Vol. I., p. 173, and "Locomotive Engineering," by Z. Colborn, Vol. I., p. 291.

‡ "Index to our Railway System," No. III., p. 24.

reasons for the neglect of the railway-owned canals. I have already quoted Sir Michael Hicks-Beach on this subject. A single fact will illustrate the case as vividly as pages of argument. Between 1888 and 1898 the traffic on independent canals in the United Kingdom increased by over 5,000,000 tons; on the railway-owned canals, in the same period, the traffic decreased 2,000,000 tons. The Midland Great Western Railway Company of Ireland, which purchased the Royal Canal for a sum of £298,059, and have, since 1845, expended on it, according to the Board of Trade returns, a sum of £109,313, do not themselves act as carriers over that waterway, being simply toll-takers to the extent of £2,713 in the year 1898. Of course, it must be remembered that the tonnage of heavy goods traffic on an Irish railroad cannot compare in volume with that on any of the trunk lines of Great Britain, and still less with that on the chief transatlantic lines.* There s seldom in this country a serious congestion of freight traffic as is, indeed, evidenced by the fact that out of the total mileage of 3,176 only 621 miles are double (or more) lines. The Great Western of England has more than twice as great a mileage as the whole Irish railway system under double (or more) lines.

Hence, on the one hand, the railways can, in a country like Ireland, provide for this class of heavy goods traffic proportionately cheaper—I mean at less cost to themselves†—than can be done on English or American lines, while, on the other, the absence of a fully-developed free water competition enables them to maintain freight charges, in most cases, at a non-competitive and therefore very remunerative level. However, the issues involved in

* Mr. J. Thompson, President of the Manchester Chamber of Commerce, and one of the members of a deputation which waited on the President of the Board of Trade last year in reference to the canal system of the United Kingdom, is reported (*Times*, December 14th, 1900) to have said that "the railways had reached the limit of their capacity for heavy traffic, and they all felt that the canals were a very valuable and imperfectly utilised mode of transport, and were capable of great improvement."

† Having regard (in the case of Ireland) to the smaller quantity of capital expenditure involved, the lack of expenditure on additional tracks, sidings, goods stores, &c., and particularly the considerably smaller outlay on wages and salaries. In connection with the latter, the following Board of Trade returns are suggestive:—

EARNINGS OF RAILWAY SERVANTS.

Country.	Number of Workpeople employed (First Week in December).			Average Wages per Head.		
	1897.	1898.	1899.	1897.	1898.	1899.
				s. *d.*	*s.* *d.*	*s.* *d.*
England and Wales (16‡ companies)	339,883	353,785	371,490	24 10½	25 1½	25 9¾
Scotland (5 companies)	40,871	41,148	42,660	22 5¼	22 7½	22 10¾
Ireland (8 companies)	17,354	17,371	17,708	19 5	19 4¾	19 4½
TOTAL for 29 companies	398,108	412,304	431,858	24 4¾	24 7¾	25 3

NOTE.—The workpeople included in the table are those employed in the coaching, goods, locomotive, and engineers' departments of the Railway Companies. The 29 Companies making returns employ over 90 per cent. of all the railway servants in the United Kingdom.

‡ Two of these are now under one management.

a careful review of the causes affecting freight-charges on railways are peculiarly complex, and could only be adequately dealt with by a railway expert. I make no pretence of discussing them here further than to make the above somewhat obvious comments on an apparent paradox, so far as it concerns Ireland. What attention I have given to the question, has convinced me of the truth of two propositions in regard to Irish transit problems: the first is that the interest of the proprietors of a railway company, and the interests of the community served by the company are not, *if we confine our attention to periods of comparatively short duration*, necessarily co-incident; the second is that a considerable increase of goods and passenger traffic is awaiting even a moderate reduction of railway rates and fares.

Inland Navigation in France and Germany.

It remains to see how keenly foreign countries are interested in the preservation and development of water-transit facilities, and how they recognise that canals are the complements rather than the competitors of railroads. There existed a right of toll on the rivers and canals in France up to 1880, but it was abolished by a statute of 19th February, 1880; and since that date the State has no longer charged any rates on boats and merchandise passing along the canals and rivers any more than on carriages and goods going along the roads. The passage through the locks is free even at night, without payment, and the State pays the lock-keepers, who work the gates day and night. There remain only a few canals, formerly handed over to some companies, on which these companies levy tolls These are very profitable to the shareholders. The State has already repurchased a good many concessions of canals, and it is intended to repurchase the rest so as to abolish all tolls. Previous to 1880 the tolls in navigation were low, amounting to from .015*d.* to .03*d.* per ton per mile for the rivers, and .03*d.* to .076*d.* for the canals, according to the classes of goods. Since 1841 France has devoted over £80,000,000 sterling to the construction and improvement of the national waterways, and now annually contributes about 30,000,000 francs (roughly £1,200,000) for maintenance and staff.*

A most suggestive French experiment, illustrating how a suitable waterway charging moderate freights can practically create its own traffic, is found in the case of the canal of Marne-au-Rhin. This navigation runs parallel, for a greater part of its length, with the railway from Paris to Strasburg, and 83 per cent. of its present traffic is contributed by neighbouring industries which came into existence subsequent to its foundation. M. Picard, President of the Section of Public Works, at the State Council, speaks of the canal as having given a wonderful impetus to the mineral and other industries of Lorraine—industries which could not have been born, according to him, except for cheap transit facilities such as these provided by the Marne-au-Rhin Canal. "Minerals which," says M. Picard, "lay undisturbed before its construction are now being actively extracted; factories and furnaces are so numerous upon its banks, and press so closely upon each other, that one might imagine them sprung up from the earth." In fact, "83 per cent. of the industries upon its banks have been established since the canal was cut." When we turn to Germany,† we find the same

* Quite recently the French Government laid before Parliament estimates to the amount 650,000,000 francs for the improvement and extension of the French Canal System. See, however, a somewhat adverse criticism of this scheme, in the first February (1902) issue of the *Revue des Deux Mondes*.

† See on German Canals an excellent article entitled "Relative advantages of the Railways and Waterways of Germany," *Journal* of Royal Statis. Soc., Vol. LI. (1888), pp. 375, *et seq*

far-sighted zeal on the part of the Government for the development of inland navigation. In spite of the great extension of railways in Germany, the traffic on the waterways is growing absolutely and relatively. It rose between 1875 and 1885 from 21 per cent. of the total traffic to 23 per cent.; and while the increase of goods traffic on the railways amounted in the same decade to 52 per cent., that on the waterways reached 66 per cent. "The German Government has," writes Mr. Gastrell,* Commercial Attaché to H. M. Embassy at Berlin, "systematically tried to establish in this country a combined net work of waterways and railways; *and they have recognised the practicability of both working well together, the canals taking the bulky part of the heavy traffic which does not require rapid transport.*" Quite a remarkable instance of the truth that the growth of a canal trade may be accompanied by an increase in the traffic and profits of a competing railway, is afforded by the canalization of the Main from Mayence to Frankfort. The Main improvement works were completed in 1886. The following table gives the tonnage by rail and by water for the three years before and for the three years succeeding the canalization of the Main :—

Year.	Traffic on Waterways.	Increase over previous Year.	Traffic on Railways.	Increase over Previous Year.
	Tons.	Tons.	Tons.	Tons.
1884	150,513	—	864,005	—
1885	150,805	281	897,040	33,035
1886	155,956	5,151	932,090	35,050
Average for 3 years	152,425	—	897,712	—
1887	360,062	204,106	1,013,628	81,538
1888	516,798	156,735	1,231,935	218,307
1889†	577,610	60,812	1,334,148	102,213

The moral of this table is that coincident with an increase of traffic on an improved waterway there can be an enormously increased freight on a competing railroad. The great gains in the tonnage of the railroad since the canalization of the Main as compared with the gains before is seen if the yearly increase is noted. Nor was the increase merely temporary. I have obtained the most recent figures available both of railway and water traffic, and they show a practically uninterrupted increase of freight on each route :

Year.	Traffic on Waterways.	Traffic on Railways.
	Tons.	Tons.
1894	724,000	1,775,306
1895	617,000	1,991,006
1896	861,000	1,946,515
1897	765,000	2,135,779
1898	914,000	2,395,461
1899	900,000	2,479,047
1900	1,112,000	‡

* Foreign Office Report on the Development of Commercial Industrial Maritime, and Traffic Interests in Germany, 1871 to 1898.

† There was a strike of railway and canal operatives in this year, which explains the relative decline in increase of tonnage both for waterways and railways.

‡ Railway returns for 1900 not yet available, but an estimate puts them at 2,500,000 tons. I am indebted for these figures to my friend, Dr. Moritz T. Bonn, of Frankfort-on-Main.

The economic use of waterways makes raw materials cheaper, and thus increases and extends industry; increased transportation follows necessarily on increased production; by this means the development of waterway traffic reacts favourably on railroad freights. The case of the canalization of the Main certainly seems to point that way. It is, of course, possible that the growth of traffic between Frankfort and Mayence may, in some measure, have been due to the recent general progress of the industrial movement in Germany, but the total increase cannot, in my opinion, be thus explained.

The British Consul at Stuttgart, in his Annual Report for 1900-1901 upon the trade of Wurtemburg (Foreign Office Annual Series, No. 2732), emphasises the importance attached in Germany to the construction of canals and the utilisation of rivers as a means of cheap transport. From 1877-97 the number of river and canal boats has increased from 17,653 to 22,564, an advance of 28 per cent.; the carrying capacity, however, has increased from 1,400,000 to 3,400,000 tons, or about 143 per cent. If this latter number, 3,400,000 tons, is compared with the loading capacity of the German sea-going fleet upon January 1, 1898, which amounted to 2,400,000 tons, it will be seen that the carrying capacity of the river and canal boats surpassed the loading capacity of the sea-going fleet by about 1,000,000 tons. A comparison of the relative size of the river and canal boats reveals that the number of small boats of 200 tons shows only a slight increase; that the number of those between 200 and 400 tons has almost trebled itself (967 as compared with 2,673); and that, finally, the number of large river and canal boats above 400 tons has increased tenfold (from 137 to 1,541). The number of steamers shows also an increase, having risen from 570, with 35,000 horse-power, to 1,953, with 240,000 horse-power, including an increase of passenger steamers of from 269 to 844, and an increase in tug-boats and steam freight boats of from 301 to 1,109. This increase in the number of boats and the increased utilisation of the loading capacity have reduced the costs of transport on German waterways during the period of twenty years mentioned above by about one-half, so that the present cost of transport per mile and ton amounts to something less than $\frac{1}{4}d.$

Value of Canals to Agriculture and Industry.

A vivid illustration of the value of canals to agriculture is afforded by the case of the reclamation of the district of France immediately west of the Loire, known as La Sologne. Mr. O'Neill, British Consul at Rouen, has admirably described* this region and its transformation by means of the facilities offered by the Canal de Sauldre. "Nearly 1,000,000 acres comprising no inconsiderable portion of the three departments, the Loir et Cher, the Cher and the Loiret, lie within the westward bend of the Loire, and they are composed of a soil that, unfertilised, is of absolutely no agricultural value. In parts the clay appears on the surface, but over the greater portion of its area the sand lies with some thickness upon a stiff impermeable clay. Left alone," writes Mr. O'Neill, "it will produce nothing of value. It is a country of sand and heather, broken up by innumerable ponds and marshy tracts, as unhealthy as they are unprofitable. Immense efforts have been made for forty years past to reclaim these lands by planting the sandy tracts with pines, by draining the stagnant surface waters, and by the transport there for intermixture with the sand of a calcareous marl, which is

* In an excellent report on "The Fluvial Traffic of the Rouen and Waterways of the Seine basin." [C. 7582—27] *Foreign Office Reports, Miscellaneous Series*, No. 366.

obtained from the northern slopes of the Sancerrois Hills that limit this district on the south-east. Nearly 200,000 acres have been turned into a pine forest; drainage of stagnant waters and proper irrigation has made good pasture land of much that lies in proximity to the rivers running through the district—the Cosson, the Beuvron, and the Sauldre. But nothing could have been done to fit the land for the culture of cereals and other more profitable products had not the Canal de Sauldre been cut right into the heart of the district from a more favoured country yielding the calcareous elements of which the soil of the Sologne was wholly deprived. For forty years the transport of 'marne,' or calcareous marl, has gone steadily on, and it is now computed that over 1,000,000 tons of this fertiliser have been carried by it and distributed over the poorer adjacent lands. The canal has been the main agent in the transformation of the country to a distance of 10 and 12 miles from its banks. Pastures enriched produce now from 30 to 35 hectolitres of hay per hectare; wheat is grown, and a return of from 25 to 35 bushels an acre obtained upon land that before only yielded the poorest crop of rye; beetroot and artichokes are amongst the latter crops of the district, and stock is fattened on many of the farms for the Paris market. The influence of the canal upon the agriculture of the district is such that we are told the selling value of land increases or decreases as it approaches or recedes from the banks of the canal, that is, from the means of obtaining at a low cost of transport the 'improvements' of which, from the poverty of the soil, it stands in need. It is not surprising to hear after this that the general cry of the inhabitants of the district is for an extension of the canal to the banks of the Loire and the Cher, so that they may be put into communication by water with the navigable portions of those rivers. So far the chief function of the canal has been to bring them the fertilisers by which their land has been reclaimed; what they ask for now is its extension to assist them to carry off and find markets for its heavier products." Mr. O'Neill, in the same report, gives two striking illustrations of the practical elimination of distance and the cheapening of raw materials by the easy and cheap communication afforded by suitable canal communication. These are well worth quoting in full, as they throw light on some of the arguments in favour of waterway transit to which attention has already been called:—

"Amongst our [*i.e.* of France] imports (writes Consul O'Neill), is a considerable quantity of feldspar from Norway. The chief part of this feldspar goes by lighters, of course, into the heart of France, into the Department Loiret. There, upon the banks of the Canal de Briar, is an immense button manufactory. Over 1,500 men are employed in it, and the sewing of the buttons on the cards on which they are sold all the world over gives occupation to many thousands of women and children in the surrounding country. Crushed up, and—curious detail—set with milk, for which purpose more than 100 cows are kept upon the premises, this feldspar from the mountains of Norway serves as the material from which buttons are made. On observing this singular importation, one naturally asks, not without surprise, 'How is it that a manufactory in the heart of France is importing feldspar from Norway when the granites and other feldspathic rocks of the central mountains of the country must provide this raw material in abundance?' All the feldspars, the common feldspar (orthoclase), lime feldspar (anorthite), and soda feldspar (albite), are to be found in abundance in the French central mountains. There can be nothing, therefore, peculiar to the feldspar of Norway, nothing in the

feldspars imported that is wanting in those of France. The answer, I believe, is simply this. The mountains of Norway are, from the point of view of cost of transport, nearer to the manufactory upon the banks of the Canal Briare than are the mountains of Limousin, in France, where feldspar abounds, although these are only distant from the Department Loiret 90 or 100 miles. But there is no water communication between these two points. The physical difficulties raised by the intervening spurs of the central mountain mass and the courses of such torrential streams as are the Vienne, Creuse, Indre, and Cher in their higher beds, prevent the development of canal construction in those regions. And such a raw material does not well support transport charges by rail.

"The other instance I will give is that of the importation of kaolin. No fewer than 43 British ships arrived here [*i.e.* at Rouen] last year laden with this product. Kaolin, I need hardly say, is a clay derived from the decomposition of granite, or more particularly from the decomposition of one of the chief constituents of granite, feldspar, from which the soluble constituents have been carried off in chemical combination with the carbonic acid of rain-water, and the insoluble, silica and alumina, have remained, and, washed down, form the clay known by that name. It is, therefore, chiefly found in the neighbourhood of granite mountains, and 38 of the British ships that came here with cargoes of it last year arrived from Cornish ports, to which it is sent from the quarries in the granite hills of that country. The remaining five came from Poole, which provides also from the eocene beds in its neighbourhood a kaolin of slightly less pure quality. A very large proportion of these cargoes was sent right across France into Alsace by the canal that joins the basin of the Seine to that of the Rhine, crossing the valleys of the Meuse and Mozelle, a distance of over 700 kiloms. by water. Here again we have a mineral product that is not a stranger to France. The fact alone that an import duty of 3 fr. 50 c. a ton is levied upon it shows clearly enough that there is an industry in its extraction which has to be protected. A small quantity is extracted in the neighbouring Department of the Somme, but it is chiefly quarried at St. Yrieix, in the Haute Vienne. The porcelain industries of Limousin owe their existence to the extensive deposits of kaolin, due to the decomposed granites and pegnatites of that neighbourhood, and more than 20,000 tons are extracted there annually. The same cause has, however, operated here as in the case of imports of feldspar. The excellence of the water routes in the Seine basin has brought the quarries of Cornwall within easier communication of the manufactories in Alsace than are the districts within France where this product is most plentiful."

It is unnecessary to quote any further evidence from other countries as to the renewed interest and activity on the part of foreign governments in regard to securing for waterways their due position and influence in a national system of transportation. Belgium and the United States, in particular, have displayed a wise prevision in the matter. It is quite possible, of course, to overdo the argument from foreign analogies, and even to misconceive the lessons of statistics of other countries. I must not be understood as implying that (even apart altogether from the vital difference of State-ownership of railways and canals), conditions at home and abroad are so similar as to admit of the direct and immediate application of a successful experiment in France or Germany to the necessities of our own industrial position.

It is, at the same time, impossible to reflect on the potential value of our own neglected waterways, and the vital need Ireland has, and will more

and more have, for cheap transit facilities, and to consider the concurrent testimony of every progressive country as to the importance of water-transit without wishing to see the lessons of foreign experience applied in a broadly-conceived policy to the general control and direction of a system of waterways, natural and artificial, not inferior probably, if rendered efficient, to those draining any similar area in the world. The gist of the whole matter is admirably summed up in the following resolution of the Fourth International Congress on Inland Navigation:—"The existence and development together of railways and waterways is desirable, first, because these two means of transport are the complements of each other, and ought to contribute each according to its special merits to the public good; second, because, viewed broadly, the industrial and commercial development which will result from the improvement of the means of communication must, in the end, profit both railways and waterways."

(c) *Sketch of the History of Inland Navigation in Ireland.*

If our system of Inland Navigation, as a whole, has so far proved disastrous as an investment of capital, it cannot be said it was from lack of an adequate conception of what a network of waterways in a country like Ireland should be. So far back as 1715, the Irish Parliament passed a statute for encouraging a scheme of drainage and inland navigation of truly national proportions, which—though executed in a spasmodic and piecemeal fashion—was still the goal at which all subsequent legislation aimed. The interests of arterial drainage and the interests of navigation were not, it is true, always reconcilable, and a good deal of misdirected effort was caused by hesitancy between the relative importance of the one and the other. But, on the whole, the scheme was a sound one in its inception, and its failure must, in my opinion, be looked for in the nature of the machinery originally provided to carry it out, and in the successive shiftings of responsibility for its conduct and maintenance between State departments, mixed boards, local companies, and private companies, rather than in any intrinsic causes. The following interesting sketch of the early history of Inland Navigation in Ireland is taken from the Report [C.-3173] of Lord Monck's Commission of 1883:—

First Statute on Inland Navigation in Ireland, 1715.

The Report of a Committee of the Irish House of Commons on Inland Navigation, presented on the 23rd June, 1800, states that "Inland Navigation has been an object of Parliamentary attention from a very early period, the journals stating proceedings and grants from the year 1703," but the first statute on the subject was an Act passed by the Irish Parliament in the second year of George I. (A.D. 1715), and entitled "An Act to encourage the draining and improving of the Boggs and unprofitable low grounds, and for easing and despatching the inland carriage and conveyance of goods from one part to another within this kingdom."

This Act, after reciting that the great tracts of bog and fenny waste grounds, which encumber the midland parts of this kingdom, are not only useless to the owners, but an occasion of a corrupt air, and a retreat and

harbour for malefactors, and that it has been ascertained that navigable and communicable passages for vessels of burthen to pass through might be made, from and through the said midland counties into the principal rivers, and that by the benefit of such master drains, the bogs and other lost grounds might be improved, and also a cheap and expeditious communication betwixt His Majesty's subjects inhabiting the several parts of his said kingdom might be opened, proceeds to authorize certain persons, whose names are given, and who are styled "undertakers," to make "at their proper costs and charges" the river Shannon navigable, "portable and passable," for boats, barges, lighters, and other vessels of burthen from the common landing-place of the city of Limerick to the town of Carrick Drumrusk (now Carrick-on-Shannon) in the county of Leitrim.

Full powers are given to the undertakers to adopt every measure necessary for their purpose, and in order to repay themselves for their original outlay and for the expense of keeping the navigation in order, they are authorized to take "to their own use" twopence toll for every 100 lbs. weight conveyed ten miles, and three pence for every passenger conveyed the same distance. The Members of Parliament and the Justices of the Peace for counties adjoining the navigation are nominated Commissioners for adjusting all differences that may arise between the undertakers and the proprietors of the lands adjacent to the river. The Act goes on to empower similarly qualified Commissioners in the districts drained by the "Liffy," the "Rye," the "Boyne," the "Mungagh," the "Brosney," the "Barrow," the "Glyn," the "Bann," the "Foyle," the "Earn," and in short nearly every river in Ireland, to appoint undertakers to make and keep navigable the said rivers, and to open communication between them and adjacent bogs and other lost and useless grounds. No navigation seems to have been undertaken under the provisions of this Act, except that of the river Maigue, which connects the town of Adare, in the county of Limerick, with the river Shannon, a distance of eight miles. No attempt was made at that time to improve the Shannon. The next Act of Parliament referring to drainage and navigation was passed in the eighth of George the First, and merely amended that of second George the First in regard to the numbers and powers of Commissioners.

Act of George II. "Commissioners of Inland Navigation appointed," 1729.

In the third year of George the Second (1729) an Act was passed referring to the failure of the original Act (second of George the First) to accomplish its purpose by reason of "undertakers" not coming forward to execute navigation works on account of the expense and risk incurred in doing so, and appointing the Lord Lieutenant, the Lord Chancellor, the four Archbishops, the Speaker of the House of Commons, together with eighty other persons, Commissioners for Ireland to put the said Act into execution, with power also to encourage tillage, and to employ the poor on works of public benefit, and providing them with funds for doing so from duties afterwards called "tillage duties," levied on carriages, on cards and dice, and on gold and silver plate, the proceeds of which duties for twenty-one years were appropriated to their use. The only navigation works that were undertaken by the new Commissioners under the Act of 1729, appear to have been that connecting Newry with the Upper Bann and Lough Neagh, and the Tyrone navigation connecting Coalisland with Lough Neagh. It seems, however, that the Commissioners must have at any rate commenced other public works from the terms of the 23rd George II., chapter 5, which refers to the time for which duties were granted for the use of the Commissioners by the 3rd of George II., as being about to expire, and renews them for twenty-one years, "because divers sums of money arising from said duties had been applied towards making and carrying on

several useful and necessary works," which works could not be made and finished without further supplies. It is probable that these useful and necessary works were roads and bridges, and possibly drainage operations, or embankments; but were not, with the exception of the Newry and Tyrone canals, for the purpose of navigation.

By the 25th of George II., chapter 10, the Commissioners were erected into a body corporate, with a perpetual succession and common seal by the name of the "Corporation for promoting and carrying on an Inland Navigation in Ireland," and thenceforward they were generally known and described as "The Commissioners of Inland Navigation." This Corporation continued in existence until 1787, when it was dissolved by the 27th George III., chap. 30, and the tillage duties by which it had been supported disappropriated. During that time it commenced the Grand Canal from Dublin to Ballinasloe, with branches to various places, the Lagan navigation which connects Belfast with Lough Neagh, the Barrow navigation from Athy to Scars, the Boyne navigation from Carrickdexter to Drogheda, and the Shannon navigation from Limerick to the Collieries on Lough Allen.

All these navigations, except the Grand Canal, which had been handed over to a company incorporated in 1772, and the Lagan which had become the property of a company in 1779, were, with the works, locks, houses, and everything connected with them, vested in local corporations, which were created by the same Act which abolished the Commissioners of Inland Navigation. All the navigations in Ireland, therefore, were in 1787, and for some time afterwards, in the hands of local corporations or private companies.

With respect to the proceedings of the Commissioners of Inland Navigation, the Committee of the Irish House of Commons already referred to reported as follows in the year 1800 :—

> "Your Committee find that the period from which the bounty of Parliament for promoting inland navigation became conspicuous was that at which there appeared to be a surplus in the Treasury to the amount of nearly half a million, viz., about the year 1755. The avidity with which public grants were from that time sought after for inland navigations, as well as for other purposes, appears from the journals of the House, the objects of those grants being as various as the interests and inclinations of the petitioners.
>
> "But the Superintendence of a body so numerous as the corporation, and so little enabled to form a just estimate of the merits of the plans submitted to their consideration, was ill calculated to promote with effect the objects of their trusts, and the expenditure of the sums granted not being sufficiently connected with the permanent private interest or capital of individuals, it is much to be regretted that great sums of public money have from time to time been lavished without being attended by corresponding advantage to the public. A system of granting public monies at once so profuse and abortive was at length exploded, and in the year 1787 the Corporation for promoting Inland Navigation was dissolved, the tillage duties were disappropriated, and a system was adopted of granting aids to private undertakers proportionate to their private subscriptions."

Canals managed by Local Corporations and Private Companies, 1787-1800.

Under the system of granting aids from the public exchequer to private undertakers in proportion to their own contributions, the inland navigations were supported and continued from 1787 to 1800. Between those dates the following enterprises were begun: —

The Royal Canal, by the Royal Canal Company, from

Dublin to Cloondara on the Shannon; and the Foyle navigation, by the Marquis of Abercorn, from Strabane to the River Foyle.

According to the Report of the Committee of the Irish House of Commons already quoted, the following sums had been issued before 1800 by the Treasury from the produce of the tillage duties, and under grants of Parliament and King's Letters for promoting inland navigation, viz.: —

Issued from the produce of tillage duties from 1730 to 1790	£351,946
Under grants of Parliament and King's Letters from 1750 to 1800, including the Lagan local duties,	505,436
Total,	£857,382

Appointment of a Board of Directors-General of Inland Navigation, 1800-1831.

In the year 1800 a new plan was adopted for promoting, completing, and controlling inland navigation in Ireland. A statute (40th of George III., chap. 51), was passed which, after reciting that the means heretofore provided against the improvident expenditure of public money towards the furtherance of inland navigation have not answered the purpose expected, gives the Lord Lieutenant power to appoint five persons to be Directors of all works relating to inland navigation, with full power and authority to order, direct, regulate, and appoint all matters and things whatsoever relating to inland navigation. A sum of £500,000 was by the same Act granted for inland navigation and for the improvement of the Port of Dublin, which sum was to be expended as recommended by the Directors. All navigations and canals managed by local corporations and not private property were vested by the same Act in the Directors. The following is a list of the navigations either wholly or partially completed in 1800, when the Directors assumed office: —

1. The Maigue,
2. The Newry,
3. The Tyrone,
4. The Lower Boyne,
5. The Shannon,
6. The Upper Boyne,
7. The Barrow,
8. The Grand Canal,
9. The Royal Canal,
10. The Foyle,
11. The Lagan.

The four first-named became vested in the Directors as not being private property. The fifth (the Shannon) was partly vested in the Directors and partly in private companies. The six last continued to be managed as private undertakings. From 1800 to 1831 the inland navigation of the country was directly or indirectly managed by the new Board, and large sums of public money, in addition to the £500,000 granted by the 40th of George the Third, were given on their recommendation for the completion and support of the various navigations, both public and private. No new navigation was commenced during the rule of the Directors-General, but all those that were unfinished in 1800 were, except the Shannon, completed. The Royal Canal Company having become insolvent, the Royal Canal was vested in the Directors in 1814, and was finished by them. This canal was handed over to a new Company in 1822. The Grand Canal Company also became much embarrassed, but having received a large grant of money from Parliament in 1813 continued to manage their business themselves. The other private navigations likewise received large support from the public funds, but we are unable to state the exact amounts granted to each. The entire expenditure, both public and private, was, as will be seen further on, very great. In

1829 the Newry navigation was transferred to a private company. In the same year a Committee of the House of Commons reported that the permanent continuance of the Board of Directors-General was "questionable." In 1829, as in 1800, it seems to have been a subject of regret that great sums of public money had from time to time been expended on inland navigation without being attended with corresponding advantage to the public.

Board of Public Works constituted.

On the constitution of the Board of Works in 1831 by the 1st and 2nd William the Fourth, cap. 33, all the property vested in the Directors of Inland Navigation, and all the powers possessed by them, were transferred to the said Board.

Since 1831 the following navigations have been constructed :—

1. The river Suir navigation, by a private Company, from Carrick-on-Suir to Granagh Ferry, near Waterford.

2. The Ballinamore and Ballyconnell navigation, from Lough Erne to the Shannon, by the Commissioners of Public Works, the expenses being defrayed partly out of public funds, and partly by advances charged on the districts adjoining the navigation.

3. The Upper and Lower Bann navigations, the former from Blackwatertown to and through Lough Neagh, the latter from Lough Neagh to Coleraine, by the Commissioners of Public Works, at the expense partly of the public, partly at that of the localities affected.

4. The Lough Corrib navigation, from Galway to Cong, by the Commissioners of Public Works, at the expense partly of the public and partly of the localities affected.

5. The Ulster Canal, connecting Lough Erne with Lough Neagh, by the Ulster Canal Company.

This canal was vested by Act of Parliament in the Commissioners of Public Works in 1865, the Company having been unable to pay interest on an advance of £120,000 made to them by the Exchequer Loan Commissioners, who consequently took possession of the property. The Shannon navigation came under the exclusive management of the Commissioners of Public Works in 1846.*

The estimated total cost of these 708 miles of canal and river communication is £4,722,211, made up as follows: —

Charged on counties,	£385,364
Raised from private sources	2,296,349
Public money,	2,040,498
Total,	£4,722,211

* This is not quite accurate—The Act 9 & 10 Vic., c., 98, provided, it is true, for the transfer, after the 30th September, 1846, of the powers and privileges of the special temporary Commission, who had control of the Shannon Works, to the permanent Department of Public Works in Dublin. Notwithstanding this Act, however, the execution of the works never received the concerted attention of the members of the new and enlarged Board. On the contrary, the superintendence of the works remained in the hands of the same three Commissioners, who, though they had lost their legal identity as Shannon Commissioners, by the Act 9 & 10 Vic., c. 86, continued to make annual reports separate and distinct from those of the Board of Works, as if the Act had never been passed. It was not till the works had been finally brought to a conclusion in 1850, that the full Board recognised amongst its duties the obligations, imposed upon it four years before by the Act of 1846, of controlling the Shannon Navigation and its works.

CANALS AND INLAND NAVIGATIONS OF IRELAND, 1902

Canals and Waterways
Lough Navigations

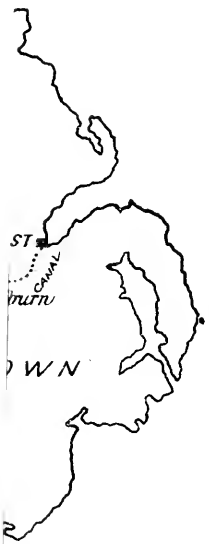
DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.
STATISTICS AND INTELLIGENCE BRANCH.

After this general introduction to the history of Irish canals and inland waterways, some details of the course and development of the leading routes may be given. A reference to the accompanying map will show, at a glance, that there are in Ireland two main systems of waterways, viz., what may be called the "Northern Navigation System" and "The Midland and Southern Navigation System." As regards the former, starting from Coleraine, we find the Bann Navigation extending to and through Lough Neagh, into which converge the Lagan Navigation from the east, the Newry Navigation from the south-east, and the Tyrone Navigation from the west. After the junction of these navigations, the line of communication proceeds in a south-westerly direction by means of the Ulster Canal to Upper Lough Erne. After passing through that lough, which affords another branch navigation (northward) past Enniskillen to Belleek on the Lower Lough, the line is continued by the Ballinamore and Ballyconnell Canal as far as the Shannon, a little above Carrick.

The Royal Canal and the Grand Canal, in conjunction with the Barrow Navigation, may be said to form the Midland and Southern Navigation System of Ireland. These navigations are connected with the River Shannon, and, therefore, provide a line of communication by water from Dublin, and from important places in the Midland and South-eastern counties, not only to the western districts, but also to the North of Ireland. There are, of course, other important separate navigations such as the Boyne Navigation, the Lough Corrib Navigation, the Maigue Navigation and the Suir Navigation, which, however, cannot be said to form part of any continuous system. The province of Munster is, it will be noted, curiously deficient in canals.

The Royal Canal.

The Royal Canal was commenced by a private company towards the end of the last century, assisted by grants from the Irish Parliament. It was subsequently taken up by the Directors-General of Navigation, and completed by them about the year 1822, when from first to last it had absorbed something over £1,400,000, of which £359,776 had been contributed out of public funds. The first Royal Canal Company was incorporated in 1789. It received before the year 1800 grants of public money to the extent of £84,000, and from the Union to 1813, further grants of £87,692. On inquiries before the Committees of the House of Commons in 1811 and 1813, it appeared that the Company had expended on making forty-six miles of the canal from Dublin to Coolnahay, £704,877; of this, £171,692 had been granted as already mentioned. To provide the balance, and to pay the dividends and interest, which had been paid out of capital to an extent ascertained to exceed £369,231, the Company had borrowed upwards of £738,462, and raised on share capital £276,923. In 1810 the Company had a gross income of only £13,868, and a net income, after providing for maintenance and establishment charges, of only £3,813, to meet an annual charge for interest of £45,806. Upon the representation of the Committee of 1813 as to the insolvent state of the Company's affairs, the charter was forfeited and the property transferred to the Directors-General of Inland Navigation in Ireland, who expended, between 1815 and 1822, £182,871 of public money in completing the canal from the summit level to the Shannon. In 1818 the holders of debentures issued by the dissolved Royal Canal Company were constituted the shareholders in the new Royal



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Canal Company. It passes through County Dublin, between Counties Kildare and Meath, and through Counties Westmeath and Longford to Tarmonbarry, where it joins the Shannon. In pursuance of the Act 58 Geo. III., c. 35, the canal on being finished was handed over to a new company in 1822, by which it continued to be worked and managed till 1845, subject, however, to the supervision of a Board of Control, required under the same Act, to be appointed by the Lord Lieutenant. It was then purchased by the Midland Great Western Railway Company, under the Act 8 and 9 Vic., c. 119 (local). The annual cost of the maintenance of the works was estimated in 1878, at £4,650, and the annual receipts at £8,530.

The Lagan Navigation.

The Lagan Navigation connects Belfast with Lough Neagh. Its length is 25 miles 47 chains; six miles of which are river, and the remainder canal. The size of the smallest lock is 69 feet 6 inches long by 16 feet broad. The depth of water on the cills of the locks varies from 7 feet in wet weather to 5 feet in dry, and on one or two occasions within the last ten years has been only 4 feet 6 inches. The work which was begun about the year 1753, but not completed till the beginning of the last century, is in the hands of a private company who, under the provisions of 6 and 7 William IV., cap. 107, pay a rent for it to the Government of £300 a year. It was stated by the Secretary of the Company in 1882* to be in perfect repair and working order with traffic sufficient, on an average of the last five years, to pay one and-a-half per cent on the capital invested after providing for the cost of maintenance. For the purpose of the Lagan Navigation the water has not been shut up, nor the drainage power of the country interfered with in the district through which it passes. "For the purposes of through traffic, as at present carried on, into Lough Neagh, it is necessary that the water in the lake at the mouth of the canal (which, however, does not derive its supply from the lake) should be maintained at what is called by the witnesses who were examined 'Summer level,' that is to say, at a depth of not less than 8 feet on the upper cill of Toome lock; but we shall observe on this point the depth of the lake when reporting on the navigation of Lough Neagh. As far as the Lagan proper is concerned, the drainage of the country is in no way injuriously affected by it, the navigation is now profitably utilised, and there is no further outlay of public money necessary to put it into order or to maintain it."†

The Upper and Lower Bann Navigations.

The "Upper Bann Navigation" is something of a misnomer, as it is applied to that section of the Blackwater river which lies below the point of its junction with the Ulster Canal at Moy, and connects that canal with Lough Neagh. The distance from Moy to Lough Neagh is by water, 7 miles and 35 chains. There are no locks or artificial obstructions on this part of the Blackwater. The navigation is maintained by the Upper Bann Navigation Trustees, out of funds raised from their entire district by local taxation.

The Lower Bann Navigation connects Coleraine with Lough Neagh. Its length is 32 miles 32 chains, of which 3 miles 12 chains are lake, 26 miles 40 chains river, and the remainder canal. The size of the locks is 130 feet

* To Lord Monck's Commission. † Report of Lord Monck's Commission.

in length by 20 feet in width. The depth of water on the cills is 8 feet. The Lower Bann is the only outlet for all the water falling into Lough Neagh. The works of the Upper and Lower Bann were, together with those of Lough Neagh, executed by the Commissioners of Public Works as both a navigation and a drainage work, between the years 1845 and 1859, at a total expense for the three navigations, according to a return made by the Commissioners, of £106,175, of which £69,078, was a grant of public money. The balance has been repaid out of county rates. A branch of the Northern Counties Railway runs parallel to the Lower Bann on the east, at an average distance of six miles for its whole length, and the Derry Central Railway runs parallel to it on the west, both railways competing with it for traffic. A railway is also projected from Ballymena to Portglenone. The works of the Lower Bann were handed over in 1859 to two bodies of trustees—one whose duty it was to maintain the navigation works the other whose duty it was to maintain the drainage works only, and whose authority extends over the drainage of both the Upper and Lower Bann. They are called respectively the Navigation and Drainage Trustees. Both sets of works are maintained by local taxation, supplementing the receipts from water traffic as regards the expenditure of the Navigation Trustees. Lord Monck's Commission took in 1882 a distinctly pessimistic view of the possibilities of developing traffic on this Navigation. "The average annual expenditure on the Lower Bann Navigation for the five years ending 30th June, 1880, was £1,154 15*s.* 8*d.* The average annual receipts from tolls, wharfage, rents, etc., for the same period were £93 14*s.* 1*d.* The deficit has been supplied by an annual presentment, made by the grand juries of the adjoining counties. These figures show that the navigation works have been practically maintained and the expenses connected therewith paid, not out of funds derived from traffic on the canal and river, but by local rates. We are satisfied from the evidence submitted to us that there is no reason to expect any considerable increase in the traffic. The testimony on this point is, in our opinion, conclusive."

The Ulster Canal.

The Ulster Canal, extending from Blackwatertown to Lough (Upper) Erne, was made by a company, formed in 1826 under 6 Geo. IV., c. 193. The works took about fifteen years to complete, and absorbed over £200,000 in capital, towards which the Government advanced on loan £130,000. When the canal was opened in 1841, the traffic proved unremunerative, and the water supply defective. In 1851 the Public Works Loan Commissioners took possession of the property as principal mortgagees, and proceeded to lease it, first to a private individual (Mr. Dargan), and subsequently to the Dundalk Steam Navigation Company. While under the management of this company, the canal works fell into very bad repair, and indeed became almost derelict. On the expiration of this company's lease in 1865, it was determined (but only after much hesitation), to vest the canal and undertaking in the Board of Works, Ireland, who were of opinion, in opposition to that of Sir John Macneill in 1861, that it was the deficiency of water, and not the railway competition, which had prevented its being remunerative. The transfer was effected by 28 & 29 Vic., c. 109. After an additional outlay of nearly £20,000 on the supply of water, the canal was re-opened in 1873; but the traffic on it has been very trifling. The annual expense of its maintenance was set down in 1878, at £1,200,

which used to be provided for in the Civil Service Estimates (Class I.); and the receipts then only averaged £166 a year.

The Commissioners appointed to inquire into the system of navigation connecting Coleraine, Belfast, and Limerick community in this navigation, in their Report [C. 31731—1882] state that—

"Notwithstanding the large sums laid out by the Commissioners of Works on the canal between 1865 and 1873, amounting, as has been stated, to £22,000, it is now, chiefly owing to leakage, in a very unsatisfactory state, and from want of water navigable only for eight months in the year. The traffic is also restricted even when the canal is fully supplied with water, by its shallowness and by the smallness of the locks. The boats in use on the Lagan canal cannot pass along the Ulster canal when fully laden, the depth of water in the channel of the latter being only four feet, whilst on the cills of the locks it is only three feet nine inches. On the Lagan canal vessels can generally be loaded so as to draw five feet six inches. The locks on the Lagan canal are sixteen feet wide. Those on the Ulster twelve feet two inches. Evidence has been submitted to us that by a further expenditure of £10,000 on the Ulster canal it may be deepened to five feet both in the channel and in the locks, additional water supplied, and all the leakages staunched. Many witnesses expressed their confidence that if this were done a large traffic would spring up, and the canal would become a remunerative concern. But it must be observed, they add, that the Great Northern Railway competes with the canal for the greater part of its length, and to expect such an increase of traffic on the latter as would be sufficient to pay its present average expenses of £1,153 a year, in addition to £350, the interest of the £10,000 necessary to put it into order, or £1,503 in all, is in our opinion to take a very sanguine view of its prospects."

This navigation was transferred during the year 1890, to the Lagan Navigation Company, and has ceased to be maintained out of the Imperial taxes In accordance with the Act of Parliament, an agreement was subsequently entered into between the Board of Works and the Lagan Navigation Company for transfer of the canal. This agreement bound the Company to expend £10,250, the amount required according to the estimate of the Board of Works' Engineer, to ensure a sufficient water supply and put the canal in order for a five feet draft for lighters, the draft formerly given by the Board of Works being only four feet. The company proceeded to carry out the works, which cost £12,700 instead of the £10,250 estimated. Towards this sum the Treasury made a free grant of £3,500, and the Board of Works lent £4,400, repayable in forty half-yearly instalments with interest at 4 per cent. per annum, on condition that the Chairman of the Lagan Navigation Company lent £4,400 on same terms. The original defect of water supply to the summit level still remains, no attempt having been made to increase the size of the storage reservoir, or to remove an obstruction which exists in this portion of the canal. The waterway above the town of Monaghan therefore, is still impassible by barges during a portion of almost every summer, and in dry seasons the stoppage of the traffic is complete for considerable periods. Until this essential improvement has been carried out the Ulster Canal will not be able to reap the traffic which awaits it at the thriving towns through which it passes. It is a most important link in the northern navigation system—continuing the line of navigation from Moy on the Blackwater river to Lough Erne, near which lake it joins the River Finn.

Ballinamore and Ballyconnell Canal.

This navigation is, practically, a series of lakes joined by canal cuts. As designed it is useless except for barges drawn by steam power; the intermittent series of small lakes through which it is conducted, making horse haulage impossible. As a connecting link with Lough Erne it might, however, be available whenever the improved industrial conditions of the country warrants steam traction; in which case the Grand Canal Company's boats might avail of it, their present terminus being Carrick-on-Shannon. It unites Lough Erne to the Shannon at the town of Leitrim. Its total length is 38 miles 46 chains. The size of the locks is 82 feet long by 16 feet 6 inches broad, with a depth of water on the cills when originally constructed of 5 feet 6 inches. The canal was made by the Board of Works for the purpose both of navigation and drainage between 1846 and 1859, at a cost of £228,652, of which sum £30,000 has been repaid by the adjoining counties. The remainder, £198,652, has been a free grant from the public exchequer.

The works were handed over to two bodies of trustees—navigation and drainage trustees—in 1860, both bodies having taxing powers for maintenance purposes. No railway runs parallel to this canal, nor competes directly with it for traffic, but there is direct railway communication from Dublin to Carrick-on-Shannon, at the western end, and from Dublin, Belfast, and Dundalk, to Belturbet Junction and Clones, not far from the eastern end. Lord Monck's Commission reported as follows on the state of this navigation in 1882:—

"The canal is now out of repair and quite unnavigable. The receipts for five years ending in 1880 were '*nil*.' The annual expenditure on navigation account, apparently for lock-keepers' wages, was about '£80.' It is alleged that the navigation was originally 'badly designed, badly made, and passed over to the trustees in an unfit state.' Evidence has been given to us that the navigation works were, up to 1865, kept by the trustees 'in the order in which they received them;' but that since that time, there being no trade, nothing has been done to keep them in repair. The canal was navigable, and no more, when given up by the Commissioners of Public Works, and there being no traffic worth mentioning upon it, was allowed to go from bad to worse until it has reached its present condition of absolute uselessness as a navigation. We have been informed by competent engineers that by the expenditure of £7,000 or £8,000, the canal could again be made navigable, but when it *was* navigable no use was made of it, and the trustees advertised in vain for persons to establish boats upon it. In 1865, whilst the canal was still in working order, the Grand Jury of the County of Cavan

"'Expressed their unanimous sense of the utter inutility of this navigation, and earnestly hoped that the Commissioners of Public Works would not continue to exercise the power vested in them of obliging the trustees to maintain (save so far as might be necessary for drainage purposes) any of the works connected with this navigation, which had been in operation for some years, and had been fully proved to be totally valueless to the county which had been so heavily taxed for it.'

"The evidence submitted to us goes to show that the restoration of the navigation would be of little benefit to the public, that there would be no profitable traffic upon it, and, further, that there would be a great disinclina-

tion on the part of the local tax-payers to support it. The canal has, however, a completely different aspect when viewed as a drainage work. The evidence is unanimous that, for drainage purposes it is most valuable, and that it is of great importance that it should be maintained as an arterial drain."

The Shannon Navigation.

The River Shannon, whose total length is 254 miles, rises in Cuilca Mountain in Cavan county, passes southward through Leitrim, and thence between Connaught and Leinster and Connaught and Munster to Limerick, forming in its course several large lakes, the principal of which are Loughs Allen, Ree, and Derg, and turning westward discharges itself into the Atlantic through a large estuary between the counties of Clare and Kerry. Previous to 1831 the Shannon Navigation appears to have been under the control of three distinct bodies, viz., the Lower Shannon under the Limerick Navigation Company; the Middle Shannon under the Grand Canal Company; and the Upper Shannon under the Directors of Inland Navigation. On the powers of the Directors of Inland Navigation being, by Act of that year (1 & 2 W. IV., c. 33), transferred to the Board of Public Works, the Upper Shannon was handed over to the Board. The navigation appears to have remained under a divided control, that is, partly in public hands, and partly in private hands, till 1839. It was taken over by the Board of Works in 1850 (see footnote, p. 108).

The navigation is open for traffic throughout its entire length, between the northern extremity of Lough Allen and Limerick, a distance of 143 miles in a direct course; but by adding the Boyle branch of nine miles and the Strokestown branch of six miles, a total length of river and canal navigation of 158 miles is now open; of which 129 miles, viz., from Killaloe to Leitrim, including the two branches above mentioned, are suited to the navigation of large steamers. In the main river of 115 miles the entire fall amounts only to 35 feet, which has been overcome by the erection of five locks. This important navigation, which occupies nearly a central position between the east and west coasts of Ireland, is connected with Dublin by means of the Grand and Royal Canals. The cost of the Shannon works was defrayed—£272,789 from local taxes, and £410,523 from general taxes. The amount of rents, tolls, etc., received in the year ended 31st March, 1877, was £5,372, and the expenditure amounted to £5,362, including £3,175 in works.

The Grand Canal.

The Grand Canal Company plies over the most extensive waterway in the United Kingdom, owning a canal system reaching from Dublin southwards to New Ross in Wexford, and westwards to the Shannon. From thence its traffic is carried over the latter navigation to Limerick in the south-west, and northwards to Carrick-on-Shannon in Leitrim. Nearly all the freight is carried in the Company's own boats, and though directly competing with railways over almost the whole distance, yet it has proved that with good management canals are capable of yielding fair profits in Ireland even through districts devoid for the most part of manufacturing centres or mineral products.

The Grand Canal proceeds from the south of Dublin westward to the Shannon at Shannon Harbour, and thence on the other side of the Shannon

to Ballinasloe, with branches to the Liffey, Robertstown, Blackwood Reservoir, Monasterevan, St. James's Well, Athy, Mountmellick, Edenderry, and Kilbeggan. The summit level, 279 feet above sea-level, and 164 feet above the Shannon at Shannon Harbour, is near Robertstown, about 25 miles from Dublin. The Grand Canal was commenced by the Commissioners of Inland Navigation, who received grants of public money, between 1753 and 1772, to the amount of £70,496. In the latter year the completion of the canal was transferred to a company. Between 1772 and 1800 the company received grants to the extent of £83,776, in addition to £18,231 to secure the completion of the Ringsend Docks. In 1798 the company obtained a loan of £27,692 of public money on the opening of the Athy branch of the canal, and a further grant of £138,461 was made as recommended by Government and approved of by a Committee of the House of Commons in 1813, on the terms that the Company should raise £46,154, to be applied, along with the £138,461, in payment of their debts. The extension of the canal from the Shannon to Ballinasloe and the Mountmellick and Kilbeggan branches were subsequently made for the purpose of giving employment to the poor, and £98,524 was advanced to facilitate their execution. The extensions were opened in 1830. In 1844 the repayment of this sum was commuted by statute for £10,000. By an Act of 1848 the original company, called "the Undertakers of the Grand Canal," was reconstituted under the name of the "Grand Canal Company." The passenger traffic on the canal ceased on the opening of the railway system, but the Company received a remission of its debt to the Government to the extent of £88,524. The total capital expenditure on the canal is put down at £1,137,680, out of which public grants amounted to £321,674. The profile of the Grand Canal at the Dublin terminus is wanting in boldness, ascending by a gradual flight of 19 locks to a level of 211 feet above the sea at low water in 9 miles. Near Robertstown, in the county Kildare, about 25 miles from Dublin, it attains the summit level of 278 feet, and thence the southward branch to the Barrow bifurcates. The Shannon line skirting the Bog of Allen continues for 25½ miles at the same level, only interrupted by one lock, having a lift of 9 feet, past Philipstown towards Tullamore. Then passing again through portions of the Bog of Allen it reaches the River Shannon at Shannon Harbour, 82 miles from the River Liffey, where is an extensive establishment of the Company, consisting of a large range of stores and a hotel. This place, together with Tullamore, were once the centres of great activity, both in the transmission of grain, etc., to Dublin from the counties of Galway and Tipperary, and as chief stations for the passenger boats, which were for many years the chief and favourite means of communication between the central parts of Ireland and the metropolis before the introduction of well-appointed stage coaches about 1810, when the service was reduced to six boats daily. The rate of 8 miles an hour, including delays at locks, was attained by narrow fly boats, which, drawn by four horses at a gallop, plied only by day. A slower passenger and parcel boat travelled night and day at a moderate rate of speed, and the Company maintained five hotels for the accommodation of the travellers. After the introduction of steamboats, the passenger service was extended to Limerick. At Shannon Harbour the trade boats of the Company tranship into steamers which ply northwards to Athlone through Lough Ree to Carrick-on-Shannon, and southwards by Banagher and Portumna through Lough Derg to Killaloe, and thence by the Limerick Canal to Limerick.

The southern branch of the canal, starting, as before mentioned, from the summit level, reaches the Barrow at Athy through two double and ten single locks. Thence to Bagnalstown on the Barrow Navigation by flat-bottomed barges, carrying a maximum load of 40 tons in winter, and less in summer, in consequence of the condition of the navigation channel of the Barrow. The Grand Canal is peculiar in having been carried at various places through bog for a total distance of 28 miles. The calculation that by so doing embankments would be avoided proved futile, inasmuch as the vicinity of the canal stimulated the trade in peat fuel, and the bog has been cut away in several places to a considerable depth on each side, necessitating considerable outlay in maintenance. The average cost of maintenance was estimated in 1878 (by the Commission on the Board of Works, Ireland),* at £16,186 per annum, and the annual receipts at an average of £24,033, exceeding, therefore, the out-goings by one-third. The canal in 1889 paid the shareholders £2 per cent. interest per annum, in 1890, £1 10*s.*, and in 1891 and 1892, £2. In March, 1894, the Dividend was 3½ per cent., in 1895 and 1896, £3 per cent., in 1897, 3½ per cent., and in 1898 and 1899, £4 per cent., in 1900, £3 10*s.* per cent., and in 1901, £3 per cent. In 1891 the capital authorised and created by the Company amounted to £665,938 14*s.* 6*d.* In 1894 the Company was authorised by the Grand Canal Act, 1894, to purchase the Barrow Navigation Company, whose system extended from a junction with the Grand Canal Company at Athy to the tidal way at St. Mullin's, passing through Carlow, Milford, Leighlinbridge, Bagnalstown, and Graiguenamanagh, and going on to New Ross and Waterford. The purchase was completed on the 1st July, 1894, at a cost of £30,000. The conversion of the Company's Capital authorised by the Act came into operation on 1st January, 1895. The Stock was converted into £10 shares, one-half of which (£332,950) are preference shares, bearing 3 per cent. interest, and the remained (£332,950) ordinary shares, which are entitled to all the profits after the preference shares receive 3 per cent. The Act also authorised the issue of Debenture Stock to an extent not exceeding £85,000, of which £36,000 has now been issued.

The Barrow Navigation.

The Barrow Navigation connects the Athy branch of the Grand Canal with the tidal part of the River Barrow below St. Mullin's. The length of the Barrow from Athy to the "Scars" at St. Mullin's, is 43 miles, and has a total fall of 169 feet. The river between Athy and St. Mullin's lock is canalized for its entire length. There are 23 locks and 22 weirs, the level at Cloghrenan lock (2 miles below Carlow) being maintained in the canal (which is about 60 chains in length) by the natural fall in the river for that distance.

An excellent account of this navigation was given by Mr. M. B. Mullins, A.M., in his address as President of the Institution of Civil Engineers of Ireland in the year 1859 which is worth quoting as illustrating the history of this waterway:—

"The river forms the course of this navigation, except in a few instances where short deviations are made. It extends from Athy, in the County of Kildare to the tide water below the rock called the 'Scars,' at St. Mullin's, in the County of Carlow—a distance of 34 miles, nearly 5 miles of which are

* Report [C.—2060], 1878, p. xliv.

lateral cuts. The works were commenced in 1759, according to the designs of Mr. Thomas Omer, who proposed to make them suitable for vessels of 70 tons at all seasons, the river in its then state not having been navigable at certain times of the year by vessels carrying more than 2 or 3 tons. Seven locks and the cuts leading to and from them had been completed up to 1790 under the immediate inspection of Mr. John Semple, as Deputy Engineer. In the above-mentioned year, £22,500 having been previously spent under the Navigation Board, the Company was incorporated, and Mr. William Chapman was appointed to direct the works. The proposal made by the Company to Parliament, was to render the river navigable for boats of 15 tons in summer and 30 tons in winter, with towing-paths for the whole length, and to expend for that purpose £40,000 of their own money, on receiving £20,000 from the public purse; but whatever success might have attended the first proposal it was only partially proceeded with, for during the progress of the works the Company were induced to enlarge their project for the purpose of enabling boats from Youghal and Dungarvan to pass through the River Barrow and Grand Canal to Dublin without transhipping, and also take in coal vessels from British ports. With that view 24 new locks were designed, 80 feet long and 16 feet wide, with 5 feet water on the cills to admit boats of 80 tons burden. Of these, 10 were built, and 4 of the original locks, of various sizes and of bad construction, were taken down and reconstructed on the modified plan. However, on the withdrawal of the canal bounties on produce carried to Dublin, the progress of the enlarged scheme was stopped, but only for a time, no importance having been apparently attached to the fact that the locks of the Grand Canal, which were not uniform in size, are in no instance more than 70 feet in length, so that Dublin could not be reached by 80-ton boats without transhipping.

"After having expended on the several works £62,881, including the grant of £20,000, the navigation being still incomplete on the enlarged scale proposed, the Company applied for aid to the Directors-General who agreed to give them £20,000 on condition of their reducing the tolls, and to give a further sum of £27,500, a moiety of £55,000, the estimated cost of completing the navigation, with the necessary locks and lateral cuts, weirs, towing paths, etc., on the enlarged scale before specified. Those several amounts, together with a sum of £11,620, the half of which was likewise contributed by the Directors-General, had been expended on the works up to February, 1812, when a survey was made of their then state, and an estimate of the cost of completion prepared amounting to £66,000.

"The outlay from 1803 to 1812, including £78,891 granted by the Directors-General, was £149,501; if to this we add the sum of £23,500 expended by the Board of Navigation previous to the incorporation of the Company, and the sum of £66,000 the amount of the estimate to finish made in 1812, we shall get a total of £239,001, equal to £7,029 8s. 9d. per mile, at a rate of lockage in that distance of only 5 feet per mile, a considerable portion of which would be absorbed in the declination sufficient to give impetus to the discharge of the waters of the river and of its tributaries.

"The profits in 1812, according to the report submitted to Parliament were £2,589 or £76 per mile per annum, not including interest on capital subscribed by individuals, or on grants obtained from the Government; but had the peculiarly favourable lie of the country for a canal the whole way been taken advantage of, the proprietors could not have failed to obtain a far different result, as well by the economy of construction and maintenance as by the general improvement of the surrounding districts, seeing that the Barrow Navigation passes through a country of great natural fertility, and high cultivation; that it meets at its outfall the rivers Nore and Suir by which it communicates with the ports of New Ross and Waterford, and that the

towns of Carrick-on-Suir, Clonmel, Ennisteague, and Thomastown, are also accessible to it, from one extremity, while the port of Dublin is open to its craft at the other; time alone having been necessary for the development of highly remunerative traffic, on a line so favourably circumstanced if cheaply and judiciously constructed. Boats cannot load more than two-thirds of their tonnage in summer."

This waterway now belongs to the Grand Canal Company, having been acquired by purchase in the year 1892.

The Newry Navigation.

This navigation is carried from Warrenpoint to Newry by the ship canal which admits vessels drawing 15 feet of water; thence northward by canal to Portadown; 16½ miles above it joins the Lower Bann, in the bed of which river it is continued to Lough Neagh. The summit level is 76 feet, and 28 above Lough Neagh. The Newry Navigation was purchased in 1901, by the Newry Harbour and Navigation Trust. In 1881, the shares of the Newry Navigation Company were worth £55; in 1900 they had fallen as low as £20, and at something like the last figure they were purchased.

The Tyrone Navigation.

This is a short navigation, extending from Coal Island to the river Blackwater, near Lough Neagh. The works were executed under 40 Geo. III., c. 51, in the early part of the century, out of public funds, to the amount of £25,813, by the Directors-General of Inland Navigation, and when the powers of those Directors were transferred to the Board of Works, under 1 and 2 W. IV., c. 33, in 1831, this navigation passed into the hands of the Board of Works, in whom it has since been vested.

The Boyne Navigation.

This navigation extends from Navan to Drogheda, in all nineteen statute miles. A sum of £75,000 was expended on the works prior to 1789, and a further outlay of £85,000 subsequently, by the Directors-General of Inland Navigation. Over £30,000 was subscribed for privately, which brought the total cost of the navigation up to about £190,000. It passed into the hands of the Board of Works, in consequence of the transfer to them in 1831 of the powers of the Directors-General.

Lough Corrib Navigation.

This was one of the navigations undertaken by the Board of Works, under 5 and 6 Vic., c. 89, in connection with arterial drainage works, between 1848 and 1889. The cost of the works was intended to be divided between the Government and the district; but, in consequence of an integral part of the scheme, which was to connect Lough Corrib with Lough Mask, being found impracticable owing to the subterraneous limestone caverns, the whole of the expense (£102,289), with the exception of £14,883 repaid by the counties, fell on public funds. The works were handed over to trustees, pursuant to 19 and 20 Vic., c. 62. In 1874 powers were given to the trustees, by the Act 37 and 38 Vic., c. 71, to dispose of the property with the consent of the Grand Jury.

The Maigue Navigation.

This navigation extends from Adare, County Limerick, to the River Shannon. The works are about eight miles in length, and they were executed at a cost of between £2,000 and £3,000 in 1715, under the first Act for promoting Inland Navigation in Ireland. After being vested first in the Commissioners, and then in the Directors-General of Inland Navigation, these works were transferred in 1831 to the Board of Works.

The history of Irish Inland Navigation is not exhilarating reading. Conceived on broad national lines, the system of artificial waterways in this country has been executed in a singularly spasmodic and haphazard fashion. Control and responsibility for its extension and maintenance have been, from the start, so separated and shifted from one authority to another that no policy of continuous development was possible. Again, opinion, even expert opinion, hesitated frequently between the claims of navigation and drainage—wherever their interests were not coincident—and hesitation led to inaction. Since the railway era, the question of inland navigation had practically been neglected, in these countries, till within the last two decades or so. In this inadequate survey of a very interesting but a very complex subject, I have endeavoured to suggest some of the classes of consideration—mainly economic—that would have to be kept in view in a general consideration of the transit possibilities of our waterways.

IRISH JOINT STOCK BANKS, 1800-1901.

The year 1797 marks an epoch in the history of the Bank of England and the Bank of Ireland. In that year, in view of war and the state of public credit, they were both authorised to suspend cash payments. An Order in Council was issued, Sunday, February 26, prohibiting the Bank of England from discharging its notes in specie. On March 2, 1797, the Lord Lieutenant (Earl Camden) and the Privy Council determined that—

"to prevent a want of a sufficient supply of cash to answer the exigencies of the public service," the Directors of the Bank of Ireland "should forbear issuing any cash in payment until the sense of Parliament should be taken on the subject."

On the same day, having received this proclamation, the Bank authorities published a notice, in which they state—

"the governor, deputy-governor, and Directors of the Bank of Ireland, in court assembled, think it proper to comply with the above order, and to suspend the payment of specie at present; but are happy in being able to inform the public that the situation of the Bank is strong, and its affairs in the most prosperous situation; and that the governors and directors will accommodate the public with the usual discounts, paying the amount in bank notes."

At a meeting of the Dublin merchants and traders, held under the presidency of the Lord Mayor (Mr. Thomas Fleming), in the Mansion House, March 3, 1797, it was unanimously resolved to accept the notes of the Bank of Ireland, and of the several other bankers, in discharge of all sums that might be payable, and to use their utmost endeavours to make all their payments with bank paper. The result of the Privy Council regulation, repeated and enforced by the Bank Restriction Act, was a great and annually growing increase in note circulation on the part of the Bank of Ireland, accompanied by a corresponding expansion in the note issues of the private banks; and a disastrous impetus was given to the formation of these concerns.

With the suspension of cash payments in this country coincided the appearance, in great numbers, of small notes, issued by some bankers, for such sums as 1*s.*, 1*s.* 6*d.*, 2*s.*, 2*s.* 6*d.*, 7*s.* 6*d.*, 9*s.*; and this, too, was the successful era of the forger. Bank of Ireland notes were repeatedly counterfeited, till the Directors adopted the Oldham process of note-production. In every way they then did what they could to protect the inexperienced public. In 1818, as the *Annual Register* informs us, they sent agents

through the kingdom with *facsimiles* of their notes, and directions for detecting forgeries; and in County Wexford a representative attended the fairs, and examined notes for the country people. The same was done in other places.

In 1820, by the Act 1 and 2 George IV., c. 72, so much of the Bank of Ireland's monopoly was then removed, as enabled companies with more than six partners, *i.e.*, with any number of partners, to start and carry on business, as bankers, at fifty Irish miles from Dublin, and to borrow, owe, or take up any sum or sums of money on their bills or notes payable on demand, and to make such bills or notes payable at any place in Ireland outside that radius. At this date the Bank of Ireland was without country branches. It had no establishment outside Dublin. In Cork and Belfast there were private banks. Wexford and Mallow had one each also. The rest of the island was bankless. There was ample room, therefore, for the exercise of banking energy and enterprise. For four years, nevertheless, the Act of 1820 could not be turned to any good account. It was contended, and successfully so, that under this legislation non-residents in Ireland could not become partners in an Irish Joint Stock Bank. Thus, English capital was excluded. To remove this obstruction to bank development, the Amending Acts of 1824 (5 George IV., c. 73) and 1825 (6 George IV., c. 42) were passed. The latter year saw three Joint Stock Banks in operation in Ireland. These were, in the order of opening, the Northern, the Hibernian, and the Provincial.

The Northern Banking Company was founded in Belfast on the private Northern Bank. In 1820, with the law as it then stood, an unsuccessful attempt had been made to convert it into a Joint Stock Bank. It was the first, however, to take advantage of the Act of 1824, and commenced business in the Northern Bank Buildings, Castle-place, Belfast, January, 1825, with a nominal capital of £500,000. In the same year the Bank of Ireland opened a branch in Belfast, in Donegall-place. Belfast had then about 45,000 of a population. In 1852, when the population was over 100,000, the Northern Banking Company moved to its present head office. In 1867 it was incorporated, and the capital doubled. The capital was again doubled, and limited liability was adopted, September 1, 1883. In 1888, the Northern Banking Company, Limited, opened an office in Dublin.

The Hibernian Bank, originally known as the Hibernian Joint Stock Loan and Annuity Company, was promoted by Catholic capitalists, who, by reason of the religious tests formerly imposed, were excluded from the direction of the Bank of Ireland. It was established under a special Act of Parliament (5 George IV., c. 159), and commenced business in June, 1825, with a capital of £1,000,000, £250,000 of which was paid up. In 1868 the capital was increased to £1,500,000, and in 1873 to £2,000,000. The nominal amount of each share was then £100, with £25 paid up. In 1885 the Company underwent reconstruction, and was called the Hibernian Bank, Limited. The capital was then sub-divided into £20 shares, with £5 paid up on each. In the originating Bill, the Bank sought the power of note-issue, but this, on the opposition of the Bank of Ireland, was not conceded. Tokens were then substituted, on engraved unstamped paper, with the words "Hibernian Bank Token, One Pound," with signature and date. These, it was contended, were not notes, but the Bank of Ireland resisted

their circulation, and they were withdrawn. Another attempt was made to acquire the advantages of note-issue, in 1844. It was unsuccessful. In the meantime a Bill had been promoted in Parliament to dissolve the Company, but it was rejected.

The Provincial Bank of Ireland was the third Joint Stock Bank to commence business in 1825. Its origination was at a meeting of English capitalists held in London, June 11, 1824, when the capital was fixed at £2,000,000, in £100 shares, £25 on each to be paid up. The then state of the law, which was constructed to require residence in Ireland on the part of every partner in an Irish Joint Stock Bank, prevented progress, after the capital had been more than subscribed; and it was not till the Amending Act of 1825 was passed that additional steps could be taken. In that year, September 1, the first branch was opened in Cork. Branches in Limerick, Clonmel, and Derry, immediately followed. In 1826, others were opened in Sligo, Wexford, Belfast (March 1), Waterford and Galway; in 1827, in Armagh, Athlone, Coleraine and Kilkenny; in 1828, in Ballina and Tralee; then, no branches were opened till 1831; after which, most years saw one or more additions to the number. The head office was in London, for a Dublin office was as yet precluded by the Bank of Ireland's parliamentary privilege of a fifty mile preserve, measured from the metropolis. But this was rather an advantage than otherwise. London was a greater metropolis; it was the grand metropolis of the money market; rich in experienced financiers—which could not be said of Ireland—from whom to form a highly capable directorate; while the men so chosen were certain to be untrammelled by local partialities and prejudices, so often detrimental to general interests in similar large undertakings. Local Directors, however, with restricted powers, were at first appointed at each branch. From its inception, the Provincial Bank gave the assurance of becoming a formidable rival to College-green, not only from the wealth and importance of the chief shareholders, but from the exceptional business talent that was at the head of affairs; the original board, sixteen in number, being all men of capacity, included such names as Matthias Attwood, M.P., a partner in the banking house of Spooner, Attwood and Co.; Moses (afterwards Sir Moses) Montefiore, and Thomas Spring-Rice, M.P., subsequently Lord Monteagle and Chancellor of the Exchequer. The appearance of the Prospectus with the announcement of the towns in which branches were intended to be established, stimulated the Bank of Ireland to make a new departure, and to go out into the country—a course not hitherto attempted. It at once broke ground in Cork, and, immediately afterwards, in Waterford, Clonmel, Derry, Belfast, and Westport. Such were the earliest fruits of competition.

In February and March, 1826, the Provincial Bank experienced the first "run." It took place in Cork, and was brought about by the closing of two local banks. The Bank of Ireland, though also established there at the time, was not affected by the consequent demand for gold, as it was, as yet, not liable to pay in specie anywhere outside Dublin. In 1827 the Provincial Bank made a considerable stride. It that year it became the Depository for the Excise Stamps, and Post Office receipts for places beyond the Bank of Ireland's Dublin district, and its notes were put on a par with that Bank's, a Treasury Order authorising Collectors of Revenue to accept them in payment.

In 1828, 1830, and 1831 there were "runs," in the South more especially.

The Bank of Ireland participated with the Provincial, in the two latter years, in meeting the rush for gold in the provinces; for, in the meantime, the Act of 9 George IV., c. 81, had been passed, putting it on a level with the other existing banks, as regards paying all notes at the places where they were issued.

In the first of these years, for the convenience of the public, the Provincial Bank had opened an office in Dublin, where they paid their own notes in gold, but did not reissue them, or keep customers' accounts. Legislation was construed as not disallowing such establishments, of mere agency, but the Bank of Ireland considered the presence of the Provincial Bank in Dublin an infringement of its vested rights in the metropolis and fifty miles district, and brought an action in their vindication, December, 1828. The verdict was for the plaintiffs, with 6*d.* damages, and 6*d.* costs; which marked the public sentiment in the situation. In 1826, the Dublin merchants and traders had memorialised the Lords of the Treasury to permit Joint Stock Banks to be established in the city, indicating the disadvantages at which they were placed in comparison with other towns where banking facilities were not so restricted; but their petition for bank extension had not been entertained. The outcome of the lawsuit referred to was—an arrangement between the two Banks, which led to the Act of 1830 (1 William IV., c. 32) empowering Joint Stock Banks to pay notes in Dublin, for the purpose, only, of withdrawing them from circulation. As Mr. Malcolm Dillon says:

"The Provincial Bank was the real pioneer of Irish banking. It fell to the lot of that institution to combat with existing prejudices, to guide legislation, and step by step to secure the freedom of trade in banking."

Other "runs" on it took place in 1833 and 1836—and in common with the other banks, the Bank of Ireland and the National Bank particularly.

The scarcity of money in London was then so extreme that even the Exchequer bills could hardly be converted into cash. Mr. Pierce Mahony stated in his evidence before the House of Commons Committee, in 1837, that the supply of gold transmitted to Ireland from the Bank of England during this panic, which lasted about a month, was almost £2,000,000. The Provincial Bank was prepared for it, and had specie on hands exceeding the amount of its note-issue. In 1839 there was another but a small "run" on the Provincial; in 1856 there was a considerable one, owing to the stoppage of the Royal British and Tipperary Banks, and other causes. In 1875 it lost heavily by the series of huge linen failures in the north of Ireland. In Belfast the Provincial had opened in 1826, in Donegall-street; in 1870, it moved to its present stately pile, erected on ground in the defunct Hercules-place, sold (very shortsightedly, and to the dissatisfaction of many Belfast Catholics at the time) by the Committee of the old Catholic Institute. In 1882, it adopted limited liability.

The Belfast Banking Company was the next in the order of establishment. It was formed, with a capital of £500,000, by an amalgamation of the old Belfast Bank and the Commercial Bank, Belfast, and commenced business August 1, 1827. Its head office was, and is, what was the historic Old Exchange—the place where the Irish Harpers' meeting was held in 1792, where winter subscription balls were given, and where Henry Joy M'Cracken was tried and sentenced to death, July 17, 1798, being hanged at

the old Market House at five o'clock the same evening. In 1846, the premises underwent alteration.

In 1865, the Belfast Banking Company was incorporated, and the capital raised to £1,000,000; August 16, 1883, it was registered as a Limited Liability Company, with a capital of £2,000,000.

In 1837 the Southern Bank of Ireland was established, with a nominal capital of £500,000, and power to bring the subscription up to £1,000,000. It sprang out of the Cork business of the Agricultural Bank, and was managed by certain of that Bank's officers. In about two months it suspended payment. Undoubtedly it promised badly, judging from facts stated about it, and its irregularities, before a Committee of the House of Commons. Mr. Pierce Mahony declared in his evidence, that, as to the credit of the shareholders, he "should be sorry to take £500 endorsed by the whole of them."

In 1835 the National Bank of Ireland—for that was its title till 1856, when the two final words were dropped—was founded by Daniel O'Connell, its first Governor. The subscribed capital was £1,000,000, in £50 shares, its constitution being that every holder of five shares had one vote, twenty shares two votes, sixty shares three votes, a hundred shares four votes. It commenced business at Carrick-on-Suir. As Mrs. Morgan John O'Connell says—

"It was intended to be especially a poor man's bank, got up for the purpose of enabling the lower classes to invest their small savings, and thus get an interest for their money, instead of trusting their pound notes to the fortunes of an old stocking, or a cracked teapot, or even a hole in the thatch. These expedients for saving money were not uncommon, and those who were a little more enlightened used frequently to hand over their money to a friend to 'keep safe' for them."

The banking instinct was not strong in our peasantry in those days. Occasionally it showed itself, and then chose a wrong place of deposit. It was some time before even the Liberator's bank got properly to work among them.

"Even I," Mrs. O'Connell continues, "born five years after the National Bank was first established, have been asked by people to take charge of their little hoards. And in the old days there were many traders, like my father's [Charles Bianconi's] old friend, Mary Kirwan, who used to gain considerably by the small sums intrusted to them—of which they were allowed to keep the interest."

Originally, an unusual principle in banking, the National Bank consisted of two separate and distinct bodies and interests—the English shareholders and the Irish shareholders. In 1836 there were 246 shareholders having votes, of whom only 46 were Irish; in 1843, there were 481 shareholders, of whom only 106 were English. When a branch was opened the local and English shareholders subscribed an equal proportion of the capital, and divided the profits. In 1837 the two stocks were consolidated, except at Clonmel and Carrick-on-Suir, where the local shareholders were indisposed to admit the whole proprietary to partake in their profits. In 1856, however, the final consolidation was arranged.

In 1836, a "run" was made on the National Bank, and others, and after the alarm was over, O'Connell issued his manifesto to the Irish people upon the folly of their procedure. It is a statesmanlike pronouncement, characterised by wise and liberally expressed feelings towards a rival bank.

In 1854 the National Bank commenced to do business in London, having taken power in its deed of settlement to open in any part of the United Kingdom. The Bank of England resisted this development, but had to withdraw its opposition after consulting high legal opinion.

The Ulster Bank began in Belfast in 1836, and in the same year opened in Ballymoney. The original capital was £1,000,000; now, £2,400,000. In 1860 its magnificent new head office in Belfast, the finest in the city, was completed. In 1862 it opened a branch in Dublin.

The rest of Ireland's banking history may be shortly dismissed. In 1843, the London and Dublin Bank was opened, with a capital of £260,000. It lasted till 1848. The business was then transferred to the National Bank. In 1862 the Union Bank of Ireland was founded, with a nominal capital of £1,000,000, and went into liquidation in 1868. The business was divided between the Munster Bank and the Hibernian Bank. In 1863 the English and Irish Bank was established, with a nominal capital of £2,000,000, and was taken over by the European Bank in 1864. In that year the European Bank opened a Dublin office, but relinquished it the following year, the business being transferred to the Munster Bank. The European Bank—originally the Union Bank of England and France—was voluntarily wound up in 1866. The Munster Bank, at first called the National Investment Co., Ltd., was established in Cork in 1864, with a capital of £1,000,000, increased in 1880 to £1,500,000. In 1870 it took over La Touche and Co.'s business. It suspended payment July 14, 1885, and went into liquidation. On the ruins of this Bank, the Munster and Leinster Bank was established in 1885. It took over the Dublin and Cork offices of the defunct institution, and subsequently purchased most of the branch premises.

The existing Joint Stock Banks have all adopted limited liability, with the exception of the Bank of Ireland. Bank of Ireland stockholders' liability is undetermined, as nothing is said in the Charter or subsequent Acts of Parliament on the subject. However, a joint opinion was signed, February 26, 1886, by Mr. (afterwards Mr. Justice) Kekewich, Q.C., Sir Richard Webster, Q.C., and Mr. Hornell, to the effect that "holders of Bank of Ireland stock are not liable for any debts or engagements of the Bank." The Bank of Ireland's subscribed capital is £2,769,231 15*s.* 5*d.*, and is all paid up.

In 1825 (6 George IV., c. 79) the assimilation of the Irish and English coinage took place. The English shilling then ceased to pass in Ireland for 13*d.*; the half-guinea for 11*s.* 4½*d.*; and the guinea for £1 2*s.* 9*d.*, which was their previous value, as settled by Proclamation of the Lords Justices and Privy Council, September 29, 1737. In 1828 (9 George IV., c. 80) Irish Banks were authorised to issue *unstamped* notes upon payment of a composition, and were thus put on an equal footing with banks in England. In 1841 (5 & 6 Victoria, c. 82) the equalisation of the Irish with the English stamp duties was effected. The result of this legislation was that the impost was more than doubled. In 1845 (8 & 9 Victoria, c. 37) the Irish Banking

Act, the latest Act on the subject, was passed. By this Act the only remaining vestige of the Bank of Ireland's monopoly (beyond being the Government bank) left by the Act of 1820, whereby banks with more than six partners were prohibited from transacting business in Dublin and fifty Irish miles therefrom, was swept away, and the whole country was thus thrown open to joint stock enterprise. Joint Stock Banks, so established, were then empowered to deal in bills at any less date than six months. The Bank of Ireland was to manage the public debt of Ireland free of charge: the interest on advances made by it to Government was reduced to 3½ per cent., which became 3 per cent. in 1865; the offensive oath formerly required of its Directors was abolished: it was entitled, in the event of any bank relinquishing note-issue, to increase its note-issue by the amount relinquished; but the relinquishing bank could not thereafter resume the power so surrendered. Bankers uncertified by the Commissioners of Stamps and Taxes were prohibited from issuing notes; limitation of note-issue was provided for; Bank-notes for fractional parts of a pound, or for a pound and a fraction, were prohibited, under a penalty of £20 for each note issued; issuing banks were required to render weekly accounts of their note-circulation and stock of specie at the head office or principal places of issue to the Commissioners of Stamps and Taxes, who were also empowered to cause an inspection of books; public officers were allowed to become partners in banks; banks were bound to return once a year to the Stamp Office, Dublin, a list of the names, addresses, and professions of their partners; power was given to sue and be sued by their public officers; promissory notes or bills of exchange for sums under a pound were made negotiable; such are the chief provisions by which banking, as we now understand it, was settled to be conducted in this country. This Act also decided the doubts which had arisen, and on which the most eminent counsel were divided, as to whether Bank of England notes were legal tender in Ireland. It enacted (which will be information to many) that they were not, but that

"nothing in this Act shall be construed to prohibit the Circulation in Ireland of the Notes of the Governor and Company of the Bank of England as heretofore."

Bank of Ireland Notes are legal tender only in payment of Revenue.

Present Position of Irish Joint Stock Banks.

The deposits and cash balances in the Joint Stock Banks at the close of December, 1901, as shown in Table I., stood at £42,923,000 (exclusive of £1,831,000 Government and other Public Balances in the Bank of Ireland), as compared with £43,280,000 at the corresponding period in the year 1900, being a decrease of £357,000. This is the first time since December, 1887 that the figures in this Table show a decrease, there having been, comparing December with December, a continuous annual increase throughout the intervening period, amounting in the aggregate to £13,509,000. It should be noted, however, that although the amount for December, 1901, is £357,000—only 0.8 per cent.—less than that recorded for December, 1900, the amount for the latter year was the highest ever reached.

In Table I. (A) the amounts of deposits and cash balances are compared by half-years: it shows that as usual there was an increase in December as compared with June.

TABLE I.—Showing amount of Deposits and Cash Balances in Joint Stock Banks, on 31st December, 1881–1901, compiled from Returns furnished by the several Joint Stock Banks in Ireland.*

DATE.	Amount.	Yearly Increase.	Yearly Decrease.
	£	£	£
1881, 31st December	30,161,000	415,000	—
1882, ,, ...	32,746,000	2,585,000	—
1883, ,, ...	31,340,000	—	1,406,000
1884, ,, ...	30,627,000	—	713,000
1885, ,, ...	29,370,000	—	1,257,000
1886, ,, ...	30,172,000	802,000	—
1887, ,, ...	29,771,000	—	401,000
1888, ,, ...	30,979,000	1,108,000	—
1889, ,, ...	32,968,000	1,989,000	—
1890, ,, ...	33,325,000	357,000	—
1891, ,, ...	34,532,000	1,207,000	—
1892, ,, ...	35,375,000	843,000	—
1893, ,, ...	35,852,000	477,000	—
1894, ,, ...	37,607,000	1,755,000	—
1895, ,, ...	39,008,000	1,401,000	—
1896, ,, ...	39,238,000	230,000	—
1897, ,, ...	39,300,000	62,000	—
1898, ,, ...	39,438,000	138,000	—
1899, ,, ...	40,772,000	1,334,000	—
1900, ,, ...	43,280,000	2,508,000	—
1901, ,, ...	42,923,000	—	357,000

*The names and the dates of foundation of the Banks, the combined statistics of which are included in Tables I, and I. (A), are as follows. Those marked with an asterisk (*) are Banks of Issue.

Name.	Established.	Name.	Established.
*Bank of Ireland, ...	1783	*National Bank, ...	1835
*Northern Banking Company,	1824	*Ulster Bank, ...	1836
Hibernian Bank, ...	1825	Royal Bank of Ireland, ..	1836
*Provincial Bank of Ireland, ..	1825	Munster and Leinster Bank, ..	1885
*Belfast Banking Company, ..	1827		

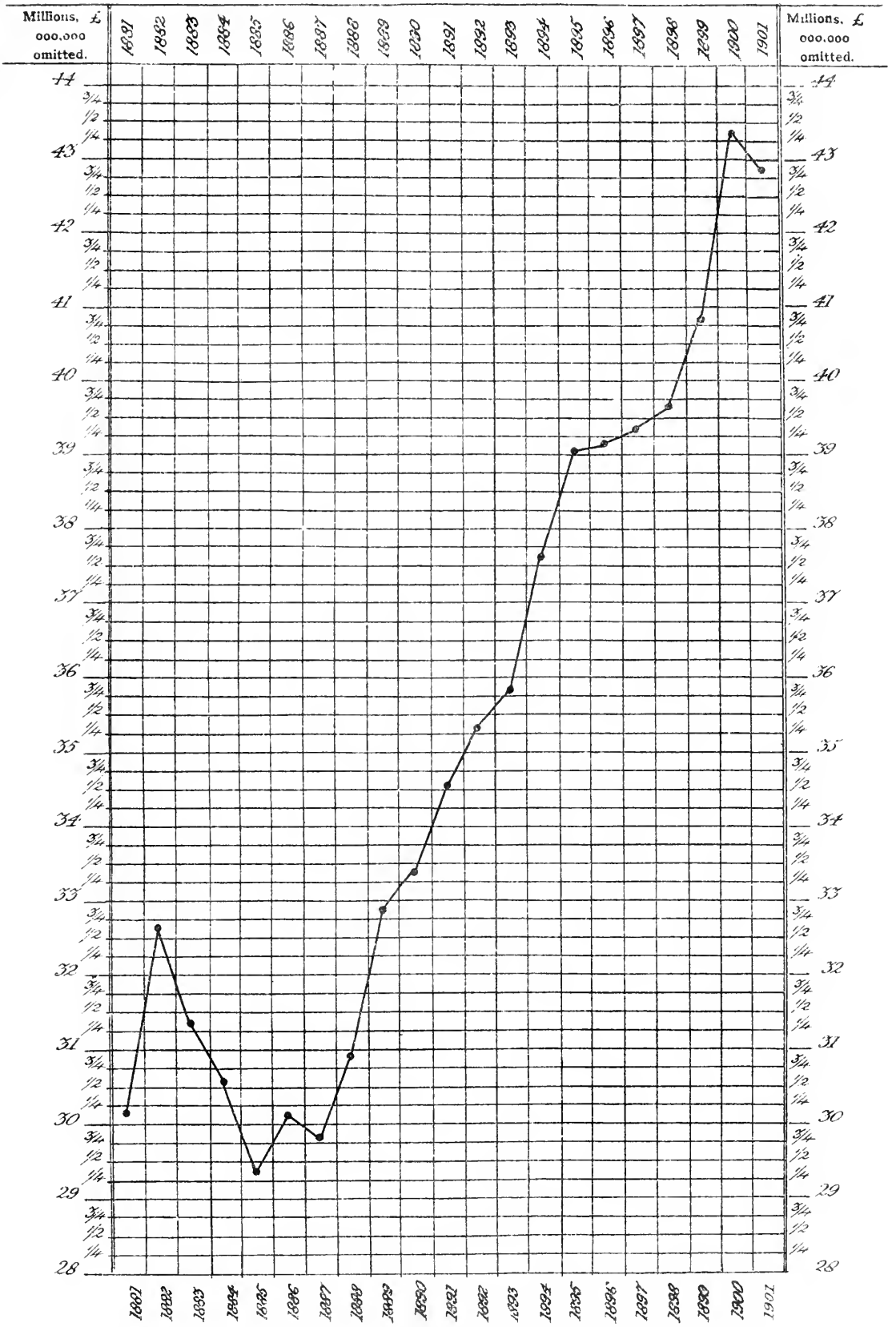
TABLE I. (A)—Showing amount of Deposits and Cash Balances in Joint Stock Banks, in the months of June and December, in the years 1891–1901, compiled from Returns furnished by the several Joint Stock Banks in Ireland.

DATE.	Amount.	Increase.	Decrease.
	£	£	£
1891, 30th June, ...	33,700,000	375,000	—
1891, 31st December, ...	34,532,000	832,000	—
1892, 30th June, ...	34,565,000	33,000	—
1892, 31st December, ...	35,375,000	810,000	—
1893, 30th June, ...	34,637,000	—	738,000
1893, 31st December, ...	35,852,000	1,215,000	—
1894, 30th June, ...	35,430,000	—	422,000
1894, 31st December, ...	37,607,000	2,177,000	—
1895, 30th June, ...	37,491,000	—	116,000
1895, 31st December, ...	39,008,000	1,517,000	—
1896, 30th June, ...	38,758,000	—	250,000
1896, 31st December, ...	39,238,000	480,000	—
1897, 30th June, ...	38,564,000	—	674,000
1897, 31st December, ...	39,300,000	736,000	—
1898, 30th June, .. .	38,973,000	—	327,000
1898, 31st December, ...	39,438,000	465,000	—
1899, 30th June, . ..	39,840,000	402,000	—
1899, 31st December, ...	40,772,000	932,000	—
1900, 30th June, ...	40,387,000	—	385,000
1900, 31st December, .. .	43,280,000	2,893,000	—
1901, 30th June, ...	41,568,000	—	1,712,000
1901, 31st December, ...	42,923,000	1,355,000	—

There are six banks in Ireland authorized to issue Notes, the statistics of which are included in this Table. The total authorized issue of Notes for these Banks is £6,354,494, distributed as in the following Table:—

Name of Bank.	Amount of Authorized Circulation.
	£
Bank of Ireland, ...	3,738,428
Provincial Bank of Ireland, ...	927,667
National Bank, ...	852,269
Ulster Bank, ...	311,079
Belfast Banking Company, ...	281,611
Northern Banking Company, ...	243,440
Total, ...	£6,354,494

Diagram A.—Showing DEPOSITS AND CASH BALANCES IN JOINT STOCK BANKS in Ireland on the 31st of December in each year for the period 1881-1901.



DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.
STATISTICS AND INTELLIGENCE BRANCH

IRISH SAVINGS BANKS.

Savings Banks, as we know them, are creations of the past century. The first genuine Bank of the kind was established at Tottenham, in England, in 1804, by six gentlemen who acted as trustees, and allowed as much as 5 per cent. interest on sums exceeding one pound sterling which remained in their hands for one year. This well-meant venture, however, involved the trustees in loss, and was abandoned. In 1810 a well-organised Savings Bank, known as "The Parish Bank Friendly Society," was established at Ruthwell, and proved so successful that by the year 1816 it had led to the establishment of nearly eighty Savings Banks in England and Ireland. The year 1817 saw the first legislation on the subject—*i.e.*, Acts 57 Geo. III., c. 105 and c. 130—intended to encourage and regulate Banks for savings in England and Ireland (these Acts were not extended to Scotland until 1835). The chief provisions of these Acts were—(1) Trustees were prohibited from making a profit out of these Banks; (2) They were bound to remit to the office for the reduction of the National Debt where "the fund for the Banks of savings" was opened all deposits exceeding £50 in the aggregate; (3) That office was to allow interest at the rate of £4 11*s.* 3*d.* per cent. per annum (whereas the Banks themselves mostly allowed their depositors 4 per cent.); (4) Not more than £50 could be deposited in any one year (in England, however, a depositor could deposit £100 in the first year). The next measure dealing with these Banks was an Act of 1824 limiting deposits to £50 in the first year and £30 in any subsequent year, and further providing that when the deposits of any person exceeded £200 no interest was to be allowed on the excess. In 1828 there was an important amending and consolidating Act which provided *inter alia*—(1) That the rules of each Trustees Savings Bank should be approved by the Commissioners for the reduction of the National Debt; (2) that the rate of interest allowed by that office should be reduced to £3 16*s.* 0½*d.* per cent. per annum, while depositors should receive from the Bank interest at the rate of £3 8*s.* 5¼*d.* per cent. per annum; (3) that no depositor should be permitted to deposit more than £150, although the interest might be allowed to accumulate until the deposit reached £200. Five years after this Act (*i.e.*, in 1833) there were in Ireland 76 Trustees Savings Banks, 49,872 depositors, and £1,380,718 deposits. The numbers for England in the same year were 385 Banks, 414,014 depositors, and £13,973,243 total deposits.

The Savings Bank principle was enormously developed by the establishment in 1861 (Act 24 Vic., c. 18), of Post Office Savings Banks, which at once became popular in England and Ireland, though in Scotland they have not rivalled the popularity of the Trustees Savings Banks. The statutory rate of interest under this Act was 2½ per cent. The security which the Post Office Savings Banks offer has influenced depositors in England and Ireland to forego the slightly higher rate of interest which the Trustees Savings Banks can offer.*

* Between 1817—the date of the first Savings Bank Act—and 1828, the Government allowed interest to the Trustees at the rate of £4 11*s.* 3*d.*, while the average rate of interest yielded by Consols varied from £4 8*s.* 4*d.* to £3 6*s.* 1*d.* From 1828 to 1844 the Trustees received £3 16*s.*, while Consols yielded from £3 15*s.* 3*d.* to £3 0*s.* 8*d.* From 1844 to 1880, Government allowed £3 5*s.* per cent., while the rate of interest on Consols varied between £3 10*s.* 7*d.* and £3 0*s.* 8*d.* From November 20, 1880, the rate of interest allowed was 3 per cent., which was again reduced in 1888 to 2¾ per cent., at which it still remains.

The increasing popularity of the Post Office Savings Bank is well brought out in the annexed Table (Table I.), which refers only to Ireland :—

TABLE I.—Showing the Estimated Balances of Deposits, on 30th of June of the undermentioned years, in the Post Office and Trustees Savings Banks respectively in Ireland ; and also total deposits for both.

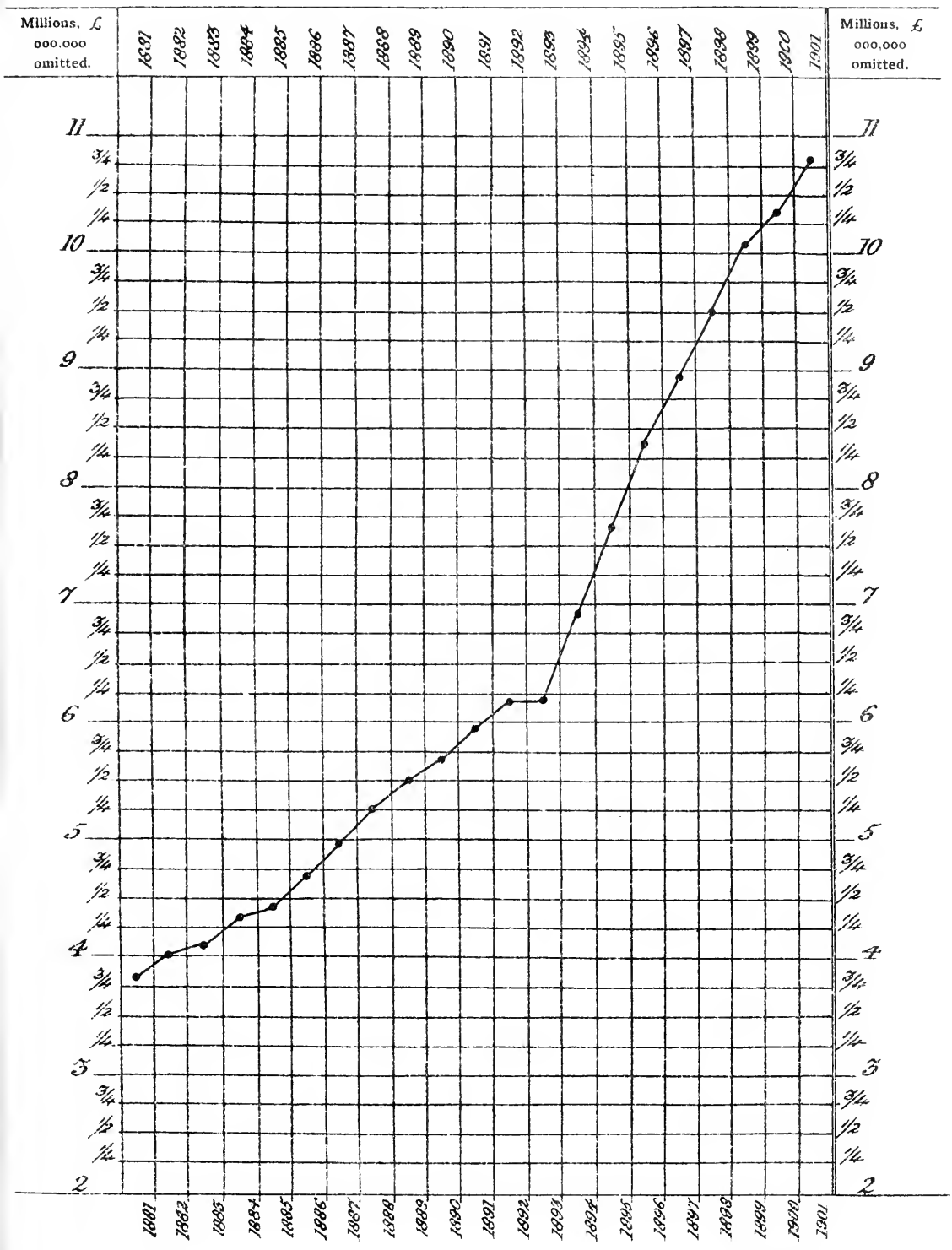
YEAR.	Trustees Saving Banks.	Post Office Savings Banks.	Total Deposits in Savings Banks in Ireland.
	£	£	£
1833, ...	1,380,718	—	1,380,718
1844, ..	2,749,107	—	2,749,107
1860, ...	2,143,082	—	2,143,082
1870, ...	2,062,758	633,000	2,695,758
1880, ...	2,063,000	1,481,000	3,544,000
1885, ...	2,022,000	2,325,000	4,347,000
1890, ...	2,035,000	3,585,000	5,620,000
1895, ..	2,034,000	5,337,000	7,371,000
1900, ...	2,295,000	7,791,000	10,086,000
1901, . ..	2,340,000	8,289,000	10,629,000

TABLE II.—Showing the Number of Accounts remaining open in Post Office and Trustees Savings Banks in Ireland on 31st December in each year of the period, 1884-1900, compiled from the STATISTICAL ABSTRACT for the United Kingdom.

YEAR.	Trustees Savings Banks.	Post Office Savings Bank.	Total for Ireland.
1884, ...	52,655	124,973	177,628
1885, ...	50,236	135,777	186,013
1886, ...	49,775	147,193	196,968
1887, ...	49,994	158,848	208,842
1888, ...	49,242	172,305	221,547
1889, . ..	50,455	185,360	235,815
1890, ...	49,643	198,790	248,433
1891, ...	49,276	212,076	261,352
1892, ...	49,005	225,823	274,828
1893, .. .	46,505	235,944	282,449
1894, ...	47,510	259,870	307,380
1895, ...	48,123	280,499	328,622
1896, ..	48,911	301,976	350,887
1897, ...	49,518	322,486	372,004
1898, ...	49,725	342,070	391,795
1899, ...	50,324	362,716	413,040
1900, ...	50,318	381,865	432,183

The Savings Bank Act of 1893 raised the maximum allowed to be deposited in cash in one year from £30 to £50, doubled the annual maximum amount of stock allowed to be purchased (it had been £100), and increased the stock limit from £300 to £500. This legislation naturally resulted in a sudden and remarkable rise in the gross amount of deposits. While the deposits in 1893 were £16,000 less than these for 1892, these in 1894 were £616,000 in excess of the 1893 returns. In fact, since 1894, the total deposits in Post Office and Trustees Savings Banks in Ireland have increased by £3,459,000. These figures seem to denote that Savings Bank depositors are no longer exclusively drawn from the poorer classes, to whose interests alone prominence was accorded in the early Savings Bank legislation.

Diagram B.—Showing AMOUNTS OF DEPOSITS IN POST OFFICE AND TRUSTEES SAVINGS BANKS in Ireland in December of each year for the period 1881-1901.



DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.
STATISTICS AND INTELLIGENCE BRANCH.

CO-OPERATIVE CREDIT ASSOCIATIONS.

The organisation of Co-operative Credit Associations in the rural districts of the south and west of Ireland was inaugurated in February of the year 1894, by the establishment of a "bank" at Doneraile, Co. Cork. The success of this trial institution, which was founded on what is known as the Raiffeisen system, naturally led to the creation of similar institutions in various parts of the country, and at the end of the year 1901 there were as many as one hundred and three of these rural "banks" registered. Herr F. W. Raiffeisen, the creator of the "loan bank" system which bears his name, was born in the year 1818, at Haum in Westphalia. Brought into sharp touch with the misery of the poor peasant cultivators of the Rhineland, through his official position as Burgomaster of several districts in the Westerwald, Raiffeisen determined to see if he could not alleviate their chronic suffering and poverty by the application of the principle of co-operation to their several needs. His first venture was a co-operative bakery, which was quickly followed by a co-operative cattle-purchase association. But successful as these experiments immediately proved—and such associations can now be counted by the hundred on the Continent—the lack of capital remained as a fatal flaw in the economy of the Westerwald peasantry. To supply this Raiffeisen started at Hammersfield, in the year 1849, his first co-operative credit association. Not till five years later was a second "bank" started, and again Raiffeisen himself was the founder. In 1862 a third was formed; in 1868 a fourth. In 1896 no fewer than 2,169 Raiffeisen "banks" were at work in Germany alone. Their founder had then been dead for eight years, but the associations which "Father Raiffeisen"—as he is affectionately spoken of by his own countrymen—had originated, grew and are growing apace in every European country.*

The practical problem which faced Raiffeisen in the Westerwald was to supply a very poor agricultural people, who had two of the requisites of production—land and labour—with a third, to wit, capital. This he did by uniting the peasants as shareholders in loan associations, regulated on the principle of unlimited liability. In these societies every member is equally, jointly, and severally liable with every other member for the debts of the association. This was the first safeguard of the "bank"—it secured care and caution in the admission of members, and constant supervision in the application of a loan. The second safeguard was afforded by the invariable rule that loans were made for a productive purpose only—a matter to be decided by the committee of the association—that is to say, by men intimately acquainted with the character and circumstances of the applicant for a loan, and each, individually, liable to be mulcted in case of his default. Raiffeisen was emphatic as to the necessity for restricting the operations of each association to a particular area—a village, a parish, a townland—and

* See "People's Banks," by Henry W. Wolff. London: P. S. King & Son.

the wisdom of such a course cannot be questioned, having regard to the principles and aims of these organisations. It is also clear that the principle of unlimited liability is only possible where all the members of a comparatively poor community are, more or less, on an equality in regard to the possession of worldly goods. The members of the committee, or other officials of the banks, get no salaries, and no dividends are paid—profits, when there are any, going generally towards the formation of a reserve fund. The Tables given in this report must, therefore, not be judged from the standpoint of an ordinary joint stock balance sheet. The measure of the prosperity of these credit associations is not large profits or handsome dividends, but rather the extent to which the capital of the "bank" has subserved the needs of its members, and proved productive in their hands; and the absence of serious loss. With three exceptions, all the credit associations in Ireland are Raiffeisen "banks," and consequently I need not do more here than allude to the well-known fact that there have been in Germany and Italy other apostles of co-operative credit in town and country whose fame is only second to that of Raiffeisen himself. Herr Schulze—called Schulze-Delitzsch from his birth-place—organised his first credit association in 1850, a year after the Raiffeisen bank was established at Flammersfeld. The Schulze "banks" are savings banks as well as credit associations, and their growth has been mainly in Continental towns. Their founder wished to bring credit and the opportunity for thrift to the doors—not of a rural peasantry—but of the artisans and small shopkeepers of town populations. The success of the Schulze-Delitzsch associations on the Continent has been remarkable. There are, at the present moment, several thousands of these organisations in Germany alone, and they have spread to Austria, Italy, and France. Still another modification of the system of co-operative credit is found in the "Banche Popolari," which Italy owes to the genius and zeal of Commendatore Luigi Luzzatti. Luzzatti started his first People's Bank in Milan in 1865. Avowedly inspired by the idea of Schulze-Delitzsch's associations, Luzzatti considerably modified the German's conception with a view to meeting the special needs of Italy. It is enough, in this place, to mention, in regard to these modifications, Luzzatti's rejection of the principle of unlimited liability. The "banche popolari" were town "Banks"; Italy needed also its rural credit associations. To supply these was the mission of Signor Wollemborg, a Venetian landlord, whose immediate desire was to rescue his tenantry and their neighbours from the thraldom of usurers. In June, 1883, the first Italian rural "bank" was organised. In essentials the "casse rurali" of Italy are Raiffeisen associations. An enormous impetus was given to the spread of the rural "banks" of Italy by the energy and ability of Father Cerutti—the parish priest of Gambarare, in Venetia—who since 1890 has been the promoter of hundreds of these institutions in Venetia alone.

In order to give some idea of the character of these rural credit associations in Ireland, I extract the following comments on their effects from the Sixth Report of the Irish Agricultural Organisation Society. The Secretary of the Burren Bank writes:—

"For a time only twenty-six members co-operated; others watched closely, and after a time when they saw the marvellous profits attained by borrowers in short spaces of time, it was then they really took to their minds what profits they could have gained had they embarked on the same ship as

their more spirited neighbours, who seemed to be outvieing each other to see who could boast of the greatest profits to his own purse after paying back the principal. I have known people who, before they became members, were quite indifferent about either themselves or their homes, and 'drank' on every occasion they could; but since they have joined the Bank are now some of the most thrifty and fast-rising people in the place, and will turn a sixpence about a score of times in their fingers before bidding good-bye to it. So you can understand we have set the axe to the roots of the huge trees of drunkenness and unthriftiness."

Another letter, from the Rev. P. Kilkenny, P.P., Claremorris, tells the same story. He writes:—

"I have great pleasure in stating that, in my opinion, the objects of the philanthropic gentlemen who have promoted the establishment of Agricultural Banks in Ireland are fully realised in the case of the small Bank of Murneen. The means at its disposal are no doubt slender, still it is easy to point to cases where the loan received from the Bank has produced twice or even thrice the amount borrowed. Cattle and pigs that would have been sold to the great loss of the borrower were enabled to be retained until their full value was realised.

"Greater even than the material advantages of the Bank are the moral effects resulting from it in the district of Murneen: firstly, in the education the people are receiving in the true use of credit, and again in the gain for the country that can so easily be obtained from mutual co-operation. Heretofore the man who borrowed lost caste in the neighbourhood, was regarded as a ne'er-do-well, and fast hastening to join the class who are a burden on society. Now the people are learning that it is honourable, when necessary, to borrow for the honest purpose of improving one's position and ascending higher the ladder of industrial prosperity. From the success that has attended the working out of this little experiment in such a remote district, one is forced to wish that branches were multiplied in the country, that this influence for good may be more widely extended."

From the Reports of the Secretaries of several Raiffeisen "Banks" I have taken the following typical instances of loans, the purposes to which they were put, and the results, which give an insight into the nature of the transactions negotiated by these small rural credit associations. I have omitted the names and residences of the borrowers—

—— £4 for ten months—bought 4 bonhams; sold them before the loan had expired for £16.

—— £3 purchased 3 bonhams, which died when value about £6. Paid loan punctually and got new one.

—— £3 for ten months; bought 3 bonhams, which he sold in nine months for £15. Paid his loan and got a new one for £2 10*s*., no more money being available.

—— got £3 for ten months; bought two bonhams at 25*s*., sold them in nine months at £5 10*s*. Also purchased a calf for £2 12*s*. 6*d*., sold it in ten months for £6.

—— £3 for ten months; purchased a calf which sold after six months for £5 5*s*. Paid his loan and invested residue in pigs. Has a new loan.

—— £2, ten months—bought pigs, which he sold in nine months for £6 10*s*.

—— £2, ten months—bought pigs. Both pigs and borrower died. His widow paid loan punctually and in full, and got a new advance.

—— got £3—bought two sheep and paid his passage to England. The sheep had two lambs, with which he paid loan. He has now five sheep.

—— would have had to sell a springer to take him to England, but borrowed £3 and kept his beast. He has a cow and calf now, and paid his loan out of money made in England.

—— £3, for six months—bought two young pigs for 30*s.* and manures and seeds. Pigs sold in October for £5 10*s.*

—— £3, for four months—bought two young pigs and paid his fare to England. Results splendid.

The following statement as to the transactions of a typical "Bank" may be of interest:—

CLARE ISLAND AGRICULTURAL BANK, CO. MAYO.

Amount.	Time.	Purpose.	Length retained.	Profit.*
£ s. d.				£ s. d.
2 0 0	10 Months.	2 Bonhams.	8½ Months.	9 5 0
2 0 0	10 ,,	2 ,,	10 ,,	6 5 0
5 0 0	7 ,,	3 Calves.	7 ,,	10 5 0
5 0 0	12 ,,	2 ,,	9 ,,	7 0 0
1 0 0	11 ,,	2 Bonhams.	11 ,,	7 15 0
1 0 0	10 ,,	1 ,,	10 ,,	4 0 0
1 10 0	10 ,,	2 ,,	10 ,,	7 2 6
2 0 0	10 ,,	2 ,,	10 ,,	7 0 0
£19 10 0				£58 12 6

The confidential reports of the secretaries of the various Banks (which I have been permitted to read) show clearly that most of the borrowers could profitably employ two and three times as much capital as the funds of the local Bank place, at present, within their reach. It is consequently a matter of some moment that the loan capital funds of these associations should be augmented. In this connection I may quote a paragraph from the Sixth Report of the Irish Agricultural Organisation Society:—

"We have great pleasure in recording the enlightened policy of the Congested Districts Board in aiding these Banks, which has been fully justified by the results. The Board has allowed banks in congested districts to borrow loan capital from it to the extent of £3,000. The amount lent to the individual societies varies from £50 to £200, on which they pay interest at the rate of 3½ per cent. About these small deposits as a nucleus other sums gather by degrees, and a sufficient capital will in time be acquired. Much might be done by the Joint Stock Banks if they would recognise the security formed by an association, and the fact that these little societies cannot be regarded as rivals, but as feeders, enabling the large banks to utilize their capital in promoting enterprise in a class hitherto excluded from their help."

The Department of Agriculture and Technical Instruction also have decided to allocate certain sums to the purposes of the organization and capitalization of Raiffeisen credit associations in non-congested areas, so

* The term "Profit," as here used, means the gross return exclusive, of course, of the amount of the loan.

that the difficulty of insufficient capital will probably be a transitory one. It is clear, however, that the time will come when, with the extension of these small local banks working within a very narrow area, the need of some sort of central credit organisation to serve both as a distributor, on reasonable terms, of capital to the local credit societies and as a kind of clearing house for these societies *inter se*, will become a pressing one. This has been the case in continental countries, and the experience will probably be repeated here. Of course outside the sphere of operation of these Raiffeisen credit associations—which deal only, and by their nature can only deal, with a small though, in Ireland, a very important part of the whole field of agricultural credit—there is room and opportunity for organising (again on continental models) agricultural credit more thoroughly, with a view to bringing within the reach of all those engaged in the greatest industry of this country, credit facilities on terms not more onerous (and this involves the question of the *duration* of the loan, no less than of the interest on it) than those on which a solvent manufacturer or merchant can now secure capital to develop his business.

It will be noticed that practically all the capital got on loans is employed, in the cases above quoted, for stocking the land. Most of the borrowers are small farmers on whose holdings—averaging from 10 to 30 acres—there is generally a disproportionally large percentage of more or less rough pasture. The credit facilities offered by the local banks enable them to buy young stock for this grazing, or an almost equally important boon, to hold over any stock they may have until such time as prices turn in their favour. The great "profit" that is the usual outcome of the use of this "lucky money"—ranging, it is stated on good authority, from 25 per cent. to 150 per cent.—arises, of course, not from the use of the money alone, but from its employment on land and with labour which, before the addition of such capital, were, to all intents and purposes, valueless. In fact the value and the need of capital in the case of these poor landholders (on such terms of interest and for such a period as they can afford to borrow it) are emphasised by the quite abnormal returns ("profits") which in a very large number of cases are gratefully recorded.

Some of the loans, it will have been observed, are sought for by migratory labourers, and repaid out of monies earned in England or Scotland. It is, perhaps, worth pointing out that though the "migrants" go annually to Great Britain in search of work, many of their own farms would profitably respond, were capital available, to a very considerable amount of intelligently applied labour. The reason for this anomaly seems to be that (as I took occasion to point out in my Report on Migratory Labourers for 1900), there is no distinct class of agricultural labourers in these districts, and hired labour is consequently very difficult to obtain even were the capital at hand to pay for it, while, at the same time, the labour of an occupier without help from his family, would not generally suffice to work his holding profitably on a system of even moderately inextensive culture, not to speak of his inability to wait over a season for the reward of his industry. The lack of capital, which is the chief want, turns the balance of advantage in favour of migration. A case in point will illustrate what I mean: "A. B., in the district of Burren (Co. Mayo), has a holding of eight acres of tillage land and a large run of mountain grazing, but is compelled to go to England every year to earn money to meet his calls. He would, according to his own statement, be better off if he could stay at home and work his farm,

but he has not sufficient capital to keep going at home for a twelvemonth. He, however, has a large family of small children which, although an encumbrance now, will, he believes, when the boys are able to handle a spade, be the means of making him an independent man. Thus men, even with good holdings, are compelled to go to England year after year because their unaided toil is not sufficient to work their farms." (Report (unpublished) of Mr. Paul Gregan, Bank Organiser, I.A.O.S.)

Another small tenant (a woman) whom Mr. Gregan interviewed in Burren said that "if money were easily got the men would stay at home, which she maintained, would be far more profitable than going to England, where they learn bad habits." "In connection with the labour problem in Burren," the same gentleman writes, "I have been endeavouring to introduce the use of small, wheeled, one-horse ploughs, light enough for a man to carry on his back, and not too deep for the shallow soil. There is not a single plough in Burren." The want of capital, in the form of money or of such machinery and other equipment as the rural economy of small holdings of poor land would justify, is, it is obvious, a grievous want in the districts served by these Raiffeisen credit associations, and consequently their increase and success must be regarded as a most hopeful and healthful means in the uplifting of backward agricultural communities.

A large percentage of the rural banks are in Congested Districts. There are in Mayo as many as 25 of these co-operative credit associations, in Galway 14, in Donegal 10, in Wexford 4, in Clare and Sligo 3 each; 2 each in Queen's County Roscommon, Cavan, Waterford, and Tyrone, and 1 in each of the Counties Cork, Kerry, Tipperary, Armagh, Down, Kilkenny, and Londonderry. It will be noticed that 3 of the 4 "banks" registered in the County Wexford do not admit the principle of unlimited liability which is characteristic of the true Raiffeisen "bank."

The following statement shows the growth of co-operative credit associations in Ireland since 1895.

CO-OPERATIVE CREDIT ASSOCIATIONS IN IRELAND, 1895–1901.

	1895, 31st Mar.	1896, 31st Mar.	1897, 31st Mar.	1898, 31st Mar.	1899, 31st Mar.	1900, 31st Dec.	1901, 31st Dec.
No. of Associations,	1	2	3	15	48	75	103

The membership has grown from less than 50 in 1895 to 4,223 (estimated) on December 31st, 1901. In a series of transactions, involving over £16,000, two societies have made losses of a trifling sum of about £4.* A very good record for punctuality in repayment of loans has been established. When it is remembered that there are no paid officials in these credit associations, and that all the services of management and control are cheerfully given without reward, the educational value of such organisations cannot be disputed.

* These "losses," it is worth pointing out, arose, not from any defaults in payments on the part of borrowers, but from certain banks not being able to put into circulation all the capital they possessed.

EDUCATION.

AGRICULTURAL EDUCATION—TECHNICAL EDUCATION: SCIENCE—ART.

[*** NOTE.—*In this chapter will be found brief historical sketches of what has been attempted and done in Ireland towards promoting technical instruction in regard to agriculture, industry, and the arts and crafts. The consideration of the whole question of literary instruction—primary, secondary, and university—though of the first importance, is beyond the scope and purpose of this work. In regard to the very interesting efforts of the Board of National Education to graft on to their literary programme a system of agricultural instruction, no better account exists than that contained in a letter addressed by the late Sir Patrick Keenan*, K.C.M.G., C.B., *Resident Commissioner of National Education, to His Excellency the Earl Spencer*, K.G., *then Lord Lieutenant of Ireland, in January*, 1883. *This document is at once authoritative and succinct. It was published originally in the Second Report of the Royal Commissioners on Technical Instruction* (*C.*—3981,—*I.*), *Vol. II., pp.* 271-281; *and it is reprinted here as giving the best brief history of a remarkable and instructive experiment.*—EDITOR.]

AGRICULTURAL EDUCATION IN IRELAND, 1826-99.

Agricultural School, Templemoyle, Co. Londonderry.

The first movement in the direction of agricultural education was made in 1826 by a committee of the Ulster gentry, at a place called Templemoyle, in the County Londonderry. This committee collected and subscribed large funds, which were expended in the farming stock and the necessary buildings of a considerable agricultural institution. From fifty to seventy agricultural pupils were annually received into the Temp'emoyle School. The stipend was only from £10 to £12 a year for board and instruction; but the school, on the other hand, commanded the free labour of the pupils. For nearly a quarter of a century it was self-supporting. But, in the long run, mainly as an effect of the famine of 1847, the committee became embarrassed in their finances, and, to relieve themselves from further responsibility, connected the institution, in 1850, with the Board of National Education.

The Templemoyle school in the course of its operations up to 1850, had received and educated about 800 pupils from different parts of England and Scotland, as well as Ireland. Concurrently with the operations of the Templemoyle School came the first attempt of the National Board to diffuse a knowledge of agricultural science amongst the people. It suggested itself to the Commissioners, when Parliament was first invited by them to vote funds for agricultural education, that the most efficient plan to spread a knowledge of sound principles in agriculture would be to make it a subject

of instruction in the Normal School for the Training of Teachers in Marlborough-street. This was in the year 1838.

Glasnevin Model Farm.

A lecture upon agriculture was accordingly given to the students of the Normal School daily. Without expository instruction upon the farm, it was, however, conceived that this lecture would be productive of somewhat comparatively barren results. It was, therefore, determined by the Board in the same year, 1838, to take a farm at Glasnevin, in the vicinity of Dublin, to which the literary students in training might have easy access, and upon which they might see, practically carried out, the plans and systems of agriculture and horticulture recommended in the daily lectures. This, in point of fact, was the origin of the agricultural department of the Irish National system of education. It is particularly important to observe this. The Glasnevin farm was not designed merely to bring up a race of skilled stewards and skilled practical farmers. Its original and primary purpose, on the contrary, was simply to qualify the ordinary elementary schoolmasters to instruct their pupils in the theory of agricultural science, and, where practicable, in school gardens and small farms attached to the National schools, to illustrate their teaching by reference to the operations on the gardens and farms. The Commissioners explicitly stated at the time, in their report presented to Parliament, that their object was not to teach trades, but to facilitate a learning of them by explaining the principles upon which they depend, and by habituating young persons to expertness in the use of their hands.

The function of Templemoyle was exclusively to produce skilled farmers; that of Glasnevin, as I have said, was mainly to qualify elementary teachers to instruct the pupils of rural schools in the principles of agricultural science. I say *mainly*, for the Commissioners entertained the idea that, without detriment to the interests of the schoolmasters, young men intending to become farmers, stewards, and colonists, might also be received as pupils in the institution. But the difficulty of directly, themselves, managing a farm almost immediately occurred to the Commissioners. How to make the farm *pay*, and how to make it *teach*, cropped up as conflicting problems. It is not surprising, therefore, to find that they soon shrank from the responsibility of farming upon their own account; and in the following year (1839) they accordingly rented the farm to their agriculturist, an arrangement which lasted until 1847, when, under the light of experience, they themselves took courage to resume its working. The idea of engrafting agricultural instruction upon the ordinary curriculum of an elementary school was accepted in the country with positive enthusiasm. Landlords and others who, on religious and political grounds, hated the National system, turned invariably to this feature of the operations of the Board with the greatest favour.

The Devon Commission, in 1843, hailed the project, and recommended the establishment of schools for agricultural instruction throughout the country. Agricultural societies and leading public men expressed their approval of the proposals with unstinted cordiality. But even at so early a period as 1848 an adverse criticism from so influential a quarter as the Select Committee of the House of Commons on Miscellaneous Expenditure was communicated to the Commissioners. This Committee expressed grave doubts as to the policy of engrafting an agricultural department upon a national system of Primary Education. The Commissioners, however,

entertaining the conviction that they were right, took pains to assure the Government that they anticipated great national advantages from the system of agricultural education which they had conceived for the country; and at the same time they announced their determination to give stability to their agricultural system by the appointment of an inspector who should have the superintendence of the Glasnevin farm, and also have the general guidance of such agricultural schools as from time to time were springing up in the country. On the other hand, the popular sentiment in support of the development of agricultural education became more demonstrative from day to day. The Lord Lieutenant (Lord Clarendon) appointed, in 1848, a body of agriculturists, called Practical Instructors, to go about amongst the farmers, especially in the districts which had been ravaged by the famine, to urge them to improve their system of cropping, and to induce them to undertake the drainage of their farms. The work of these practical instructors was eminently educational. Hence I think it right to refer to them. And I must at the same time say, from a personal recollection of their institution and labours, that no more fruitful experiment in the material interests of the country was ever attempted. It was through the agency of this corps of practical instructors that green cropping as a systematic feature in farming was introduced into the south and west, and even into the central parts of Ireland.

Scheme of Itinerant Instructors.

The acclamation of Irish opinion in favour of agricultural improvement to a large extent beguiled the Board. Instead of mainly directing their exertions, as they originally intended, to the agricultural instruction of the literary students in training in the Normal School, they resolved, through the foundation of provincial model farms, to establish a great system of technical education for the instruction of young men as farmers and land stewards. From time to time they took leases of farms, twenty in all, in different parts of the country; and (including Glasnevin) at a cost of some £115,000 erected residences and farm buildings. At each of these farms there was provided adequate accommodation for a number of resident agricultural pupils, and, besides, suitable arrangements were made for their technical education. The only coincident purpose which existed between these farms and the farm at Glasnevin was that, wherever a literary model school, under the exclusive management of the Commissioners was established adjacent to the farm, the literary pupil teachers and their head master lived upon the farm and pursued the old idea as to agricultural training which prevailed at Glasnevin. For some years the twenty country farms, as well as the Glasnevin farm, enjoyed an immense popularity. Four of these farms were in operation in 1849, and in 1856 they were all in complete working order. Besides these model farms, which were the property of the Commissioners, and entirely supported by them, numerous farm schools were opened under private influence from year to year, which obtained aid from the Board towards their organisation and working. In the year 1850 the Commissioners, with the concurrence of the Poor Law Board, determined to offer substantial attractions to the guardians of the poor law unions throughout the country to encourage agricultural education in the workhouse schools. Wherever there was a farm of suitable dimensions connected with a workhouse, the Commissioners offered a gratuity to the teacher of the school for success in the management of the farm, and for giving efficient instruction in agricultural science to his pupils.

Agitation in England against State Aid.

But an agitation, originated by the Liverpool Financial Reform Association, about a quarter of a century ago, arose against our whole agricultural system. This association disputed the right of the State to train up farmers and stewards at the public cost. In Parliament the association, especially amongst advanced free-traders, had many influential exponents. The Government, from time to time, was harassed in its defence of the system. Successive Chief Secretaries, in deference to the views of Parliament, barely tolerated its continuance. Mr. Herbert, Mr. Cardwell, and Sir Robert Peel, were absolutely hostile to it. Mr. Cardwell especially directed his hostility to the countenance given by the Board to agricultural instruction in the workhouse schools at the expense of Parliament, and distinct from its support from the rates, and strongly and successfully urged the Board to abandon this branch of their agricultural system.

This was in 1862. The workhouse experiment thus lasted only twelve years. The greatest number of workhouse schools having agricultural departments attached in any one year during the twelve years of the experiment was seventy-nine. The Board recognising this great change in Parliamentary opinion, held their hands, and determined not to add to the number of their farms. They even tried to avert hostility to the system by renting *nine* of the existing farms to the agriculturists in charge of them, with a view to reducing the cost of the agricultural department. But this latter experiment proved to be a great embarrassment to the administration, and had to be abandoned. In 1870 the Royal Commission upon Primary Education, presided over by Lord Powis, recommended:—

> "That the position of provincial and district model agricultural schools should be revised by the Commissioners of National Education, and that their number should be reduced."

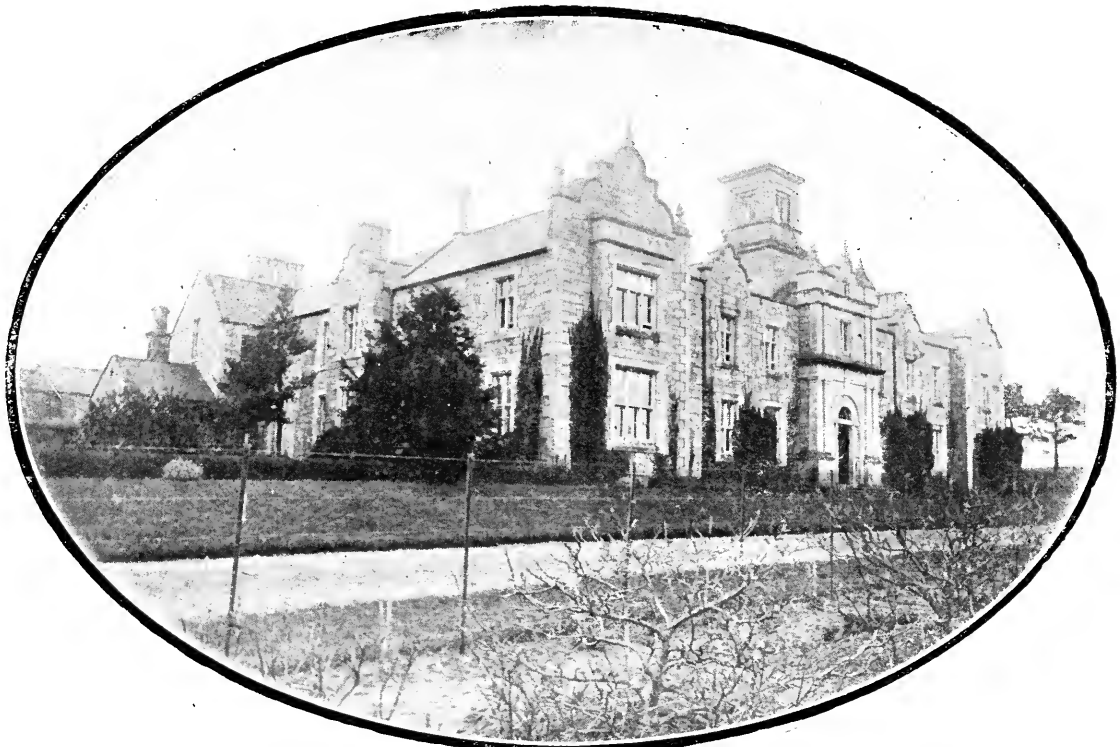
The old Templemoyle School, to which I referred in my opening remarks, died out in 1866. In the beginning of 1872 the agricultural department was at a low ebb in popular favour. It had been proscribed by Chief Secretary after Chief Secretary, and it at all times had to encounter the fiercest hostility of the Treasury, who regarded it as a baneful excrescence upon a primary system of education. Besides, the Royal Commission had spoken, as I have quoted, in anything but a sympathetic fashion.

Earl Spencer's Scheme of Farm Prizes.

You, however, my dear Lord Spencer, in your former Lord Lieutenancy, hesitated, in face of accumulating opposition, to believe that agricultural improvement through all agencies was hopeless, and in the spring of 1872 submitted, as you will remember, through your private secretary, Mr. Yates Thompson, the following project to the Board:—

"I am to state that his Excellency has long taken an especial interest in the welfare of the very numerous class of Irish small tillage farmers, and has held the opinion, which personal observation of their condition and prospects in various parts of the country has amply confirmed, that their present style of farming and the management of their homesteads admits of considerable improvement. It appears that more than half of all the holdings in Ireland, namely, 317,457 out of 608,864 (from both of which figures, however, some deductions must be made for the cases in which two or more separate holdings, being in the occupation of the same individual, are enumerated separately), were valued in 1886 at less than £8 a year. His Excellency thinks it will not

THE ALBERT AGRICULTURAL INSTITUTE, GLASNEVIN, CO. DUBLIN.



MUNSTER INSTITUTE, CORK.

be disputed that in a vast majority of cases these holdings are imperfectly cultivated, and that the habitations upon them are, speaking generally, both inferior and ill-kept. Under these circumstances, and considering that the settlement of the land question, under the Act of 1870, has turned the attention of the public to the general condition of the farming classes, and has given an impetus to many improvements in the management of farms, the present has seemed to his Excellency a favourable occasion for an endeavour to direct attention to this very large and important class of agriculturists. In doing so, I am to state that he does not desire to raise or pronounce any opinion on the very difficult question of the proper size of the farms. He would carefully avoid that, but at the same time he is confident that that most interesting question cannot be satisfactorily solved in this country until the small farmers of Ireland avail themselves of the means at their disposal for careful tillage much more extensively than they do now. Among the methods employed to promote good agriculture, his Excellency is of opinion that nothing has been more calculated to benefit the small farmers than the school farms or gardens under the inspection of the National Board of Education, which, he is glad to observe, are gradually increasing in number. Accordingly, it has occurred to him, more in the hope of seeing his action, if successfully carried out, imitated by others than from any notion that so small a contribution can have any very considerable effect in itself, to offer, on certain conditions, prizes to be adjudged in connection with certain of these school farms. He has selected eight of them in various parts of the country, viz. :—

In Leinster—Garryhill and Ballinvally.
In Ulster—Cornagilta and Parkanour.
In Munster—Tervoe and Grange.
In Connaught—Castlehackett and Killasolan.

And, taking round each of them a radius of five or six miles, he proposes to give annually for the next five years three prizes, to be called 'The Spencer Small-farm Prizes,' and consisting of £3 10s., £2 10s., and £1 10s., respectively, to the occupiers of the three holdings in each of the areas above described, and valued under £8 a year, which shall be adjudged to be the most commendable on the score of (1) the neatness and cleanliness of the house; (2) the amount and quality of the produce of the land; (3) the character and condition of the live stock of all sorts, from horses and cows down to poultry and bees; (4) any other circumstances that may attract the favourable attention of the judges."

The Commissioners received this scheme with much satisfaction, and unanimously resolved to place at the disposal of your Excellency their agricultural inspectors for the adjudication of the prizes. In each of the five years of the experiment the Commissioners received a report from their inspectors which satisfied them that the scheme proved to be a great success, not only in encouraging the small farmers to make the most of their humble resources, but in stimulating the landlords to look with a more earnest solicitude upon the industry and improving fortunes of their small tenants.

But whilst your prize scheme was still in its infancy, a Departmental Committee, 1873-4, under the presidency of Mr. W. H. Gladstone, M.P., was appointed by the Treasury to investigate (along with other Irish Departments) the affairs of the National Board of Education. The agricultural branch of the National system naturally came under the survey of this committee; and they reported, *inter alia*, that, exclusive of Glasnevin, they found that there were in the other twenty agricultural schools but thirty-three resident pupils.

This Committee then recommended that:—

"These buildings (the model farm buildings) are much too large to suit ordinary tenants of the small portions of land attached to them, and there will, therefore, be difficulty in disposing of the farms on advantageous terms; but we consider that their retention only involves the continued outlay of public money without any adequate return; and as the general opinion appears to be that their alienation will be no loss to agricultural education in the country, we entirely agree with the Royal Commissioners that these farms should be got rid of as speedily as possible."

The upshot of these recommendations of the Departmental Committee is that, under Treasury sanction, we have sold nine of the farms, surrendered to the landlords seven, relet one, and handed over two others to local management. There are thus left only two, viz., the Munster farm at Cork, and the Albert Institution, Glasnevin.

The Munster Institute, Cork.

The case of the Munster farm is interesting. Just as the Commissioners were taking steps to get rid of it a movement was set on foot in Cork to reanimate it, and to make its operation a lever in the revival of the butter trade of Cork. The following extract of a letter addressed by the Commissioners to the Lords of the Treasury on the 24th of June, 1880, will best explain the views of the Board, and the new development agricultural education had a likelihood of making:—

"The Board was led to understand that a movement of some importance was on foot in the city and county of Cork, having for its special object the diffusion of agricultural science generally, and especially a knowledge of what is technically called 'Dairy-farming.' The great agricultural trade of the South of Ireland is butter-making. In former times the butter of the Cork market was esteemed very highly throughout the United Kingdom. In recent times the Cork 'brand' declined considerably in public favour. The movement referred to has for its special object a revival of the distinction which the Cork butter formerly enjoyed. This movement is represented in Cork by a committee of influential persons connected with the farming interests of the South of Ireland. The Commissioners learned that a committee was anxious to co-operate with them in making the model farm a centre for important agricultural experiments, a school for practical instruction for agricultural students, and a training establishment for the education of dairymaids. The Board could not be indifferent to such a proposal, and they therefore cordially entered into its consideration, in the sanguine expectation that even at the eleventh hour agricultural education might in this instance prove a success."

Luckily, this appeal gained the Treasury sanction. The local committee, in augmentation of the Parliamentary grant in the first year, subscribed £526. The experiment so far has been eminently successful. Since 1880 over a hundred dairymaids have undergone a course of training in the schools of at least six weeks' duration in each instance. The butter which was made at the school almost immediately obtained a high reputation, and commanded the best price. At the Birmingham Dairy Show, in 1881, the success of the school produced quite a sensation in the agricultural world. The prizes which it obtained at the Show were First, Second, and Third, in the fresh butter classes.

Subsequently, in the same year, at Islington, other important prizes were

awarded to the school, viz.:—First and Second prizes in the fresh butter classes, special prize for salt butter, special prize given by the judges for excellency of entries, and also the Champion Cup presented by the Lord Mayor and Corporation of the City of London for the best butter exhibited. The young women who are educated as dairymaids in the school are chiefly the daughters of Munster farmers. The stipend paid by each for the six weeks' course is only £3. As I have said, the Cork butter trade had declined in its reputation. The success, so rapid and complete, of this school is said already to have increased the value of the dairy produce of Munster by so large a sum that I hesitate to record it. But there can be no doubt whatever that this propitious experiment has proved not only to be a turning-point in the fortunes of Irish agriculture, but a practical lesson to the whole population of Munster that education is not a device of statesmen to make people only masters of books and of sciences, but that, wisely directed, it is all the while a certain means of promoting their material prosperity.

Agricultural Instruction in Rural National Schools.

For many years, however, it had occurred to the Board that, whilst every rural National school in the country could not be organised in the strict sense as an agricultural school, every such school might readily be made to become an efficient instrument for the inculcation of sound instruction in the fundamental principles of agricultural science. To this the Commissioners looked with more hope than even to the successful working of a limited number of expository (model) farms. And that there might be no misconception about their views, they laid it down that agriculture in a prescribed course should be a subject of obligatory instruction, like reading, or writing, or arithmetic, in the three upper classes (standards), viz., the fourth, fifth, and sixth of every boys' rural school.

To encourage the teachers to promote the success of this project a special results fee of 4*s.* or 5*s.*, according to class, is awarded for proficiency. In 1881 the number of boys examined in agriculture under this provision was 37,476, and the number of "passes," that is, of boys who earned the results fees for their teachers, was 18,517. But whilst thus stimulating agricultural knowledge in all rural schools it was felt that, if the teachers themselves could become possessed of something more than the mere book-knowledge of the science of agriculture, which every master must exhibit in order to obtain a certificate of classification as a National teacher, our new agricultural experiment, the most hopeful we had hitherto tried, would be all the more likely to prove a success.

The male students in the Normal College, Marlborough-street, about 100, each year get sound practical instruction upon the Glasnevin farm throughout the period of their training. So far as *they* are concerned, there is no gap or want in their agricultural training. But to help other teachers to obtain the same advantages it was arranged, in 1881, to bring up classes of masters from year to year, of about fifty in each class, to Glasnevin, at the public expense, for a special practical course of six weeks' duration. In 1881, fifty-two, and in 1882, seventy, attended at Glasnevin for this special purpose. The report of the superintendent is highly favourable to this experiment.

But, besides the results fees which we grant for mere book-knowledge of agricultural science, we give, in the case of ninety-three National schools to

which small farms or cottage gardens, the property of managers of schools, are attached, results fees, not only for the book-knowledge evinced by the pupils, but for (*a*) the degree of merit which the cultivation of the little farm or garden evinces, and (*b*) the practical powers of the pupils as agents in the working of the farms.

This part of the system is working admirably, and is a vast improvement upon the plan, in force until 1875, of a uniform salary of £5 or £10 to the teachers of those schools. The fees for the book-knowledge of agriculture in the ordinary National schools are provided in the estimate for National Education generally. In 1881 these fees amounted to £2,309 14*s.* 6*d.* For the work of the Agricultural Department proper, *i.e.*, for the Glasnevin and Munster establishments, and the ninety-three small farms or cottage garden schools, a separate estimate is presented to Parliament. This year (1883) it amounts to £4,030. The expenditure upon model farms was greatest in 1853-4, when, exclusive of interest on the cost of the farm buildings, it amounted to £12,250.

Conclusion.

In conclusion, I should, perhaps, observe that at the Glasnevin and the Munster farms ordinary agricultural male students continue to be received for practical and scientific instruction in agriculture. The number of students in each of these institutions at present [*i.e.*, January, 1883] is:—

I. Munster school:—

Last session there were eight students, all residents, and paying £7 10*s.* for each term of four months.

II. Glasnevin school:—

(*a.*) Twenty-five free students (resident) who obtained their places by competitive examination.

(*b.*) Eighteen students (resident), and paying £7 10*s.* for each term of four months.

(*c.*) Four students (extern) paying £2 for each term of four months.

The following analysis of the destination of seventy-one free students who attended the Glasnevin farm since August, 1881, if not entirely satisfactory, is curious and interesting:—

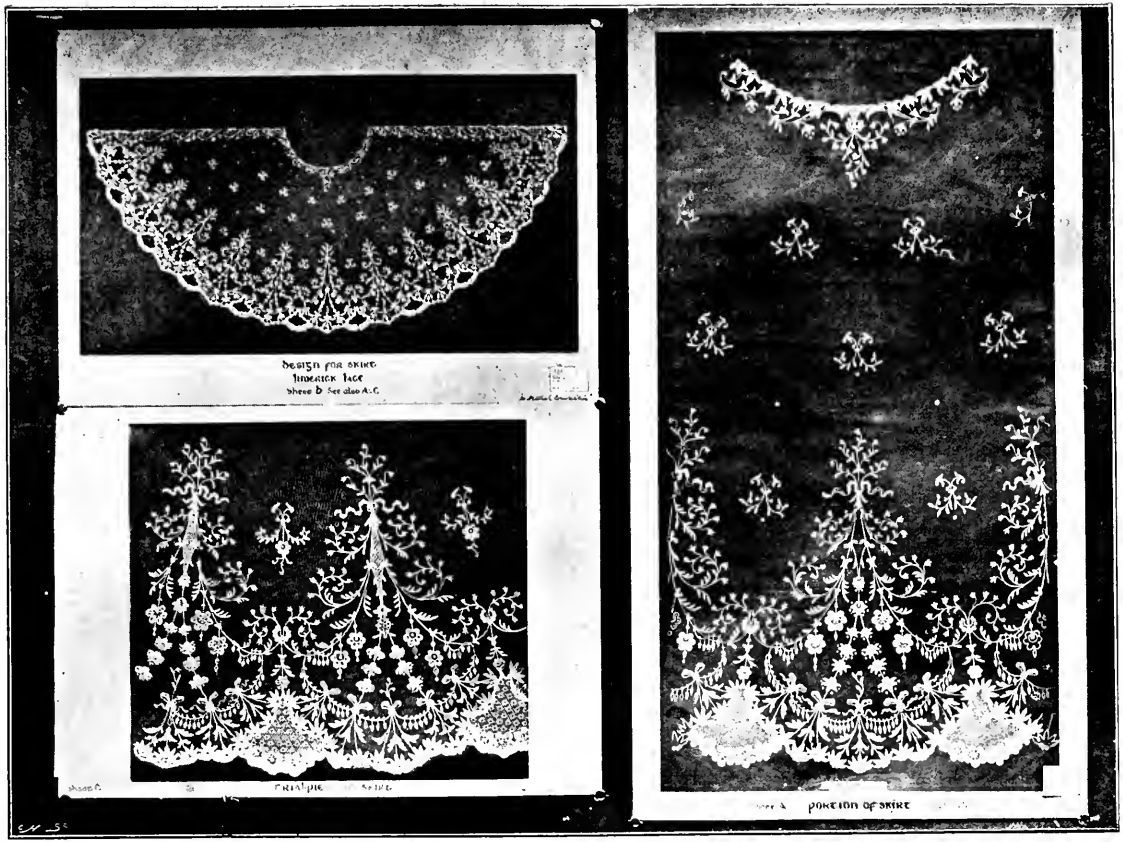
Land surveyor, valuator, etc.	4
Land steward,	6
Farming at home,	19
Gardener,	1
Herd,	1
Farm labourer, etc., at Albert Institution,	1
Engaged in charge of engine at Albert Institution,	1
National teacher,	4
In normal school for training teachers at Drumcondra,	2
Other employment,	4
Emigrated with a view to farming,	12
Unknown,	15
Died,	1
	71

Except by the allusion which I made to Lord Clarendon's Practical Instructors of 1848, and to your own [*i.e.*, Earl Spencer's] prize scheme of 1872, I have confined my remarks in this letter to the fitful fortunes of agricultural education as administered by the Commissioners of National Education. But the story of Irish agricultural education would be incomplete if no reference were made to the operations of the industrial and reformatory schools, which not only in boys', but in girls' schools, have embraced agricultural and dairy instruction in their industrial curriculum, and, I believe, with very marked success—a significant reproach to the panic-born policy which forced the National Board to withdraw their grants, in 1862, for agricultural education from the workhouse schools.

ART INSTRUCTION IN IRELAND.

Metropolitan School of Art, Dublin.

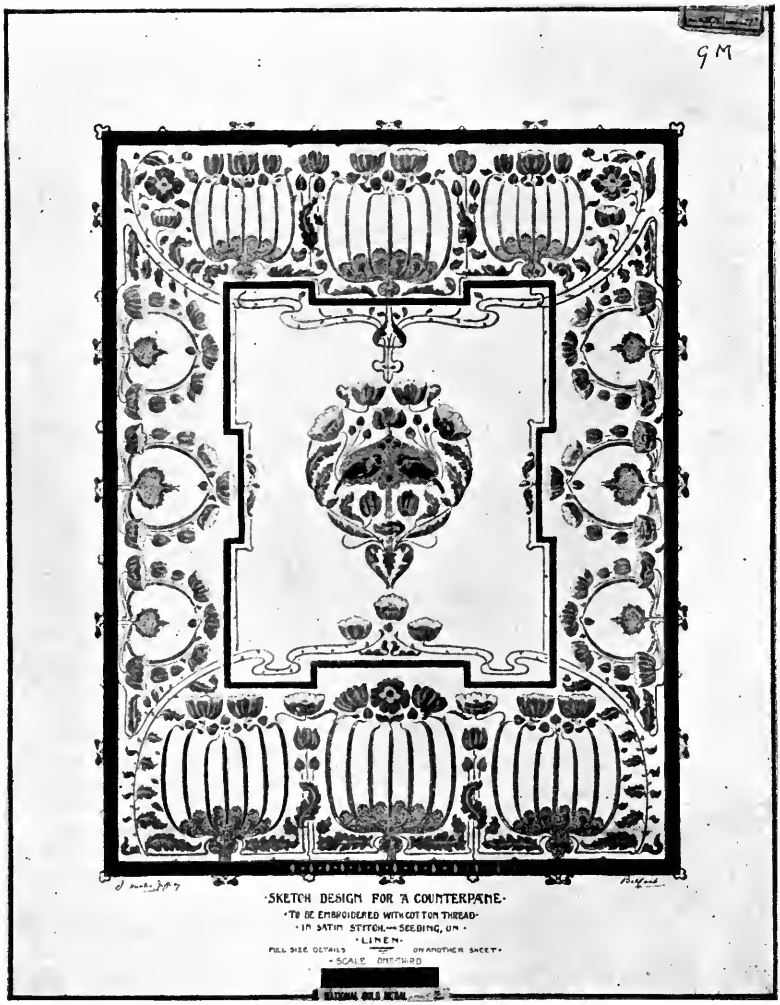
There are few schools of art in the United Kingdom which can boast a greater antiquity than the Metropolitan School of Art, Dublin. The Royal Dublin Society was (as stated elsewhere in this volume) founded in the year 1731 for improving "Husbandry, Manufactures, and other useful Arts and Sciences"; and we find that on the 18th May, 1746, it decided that, "Since a good spirit shows itself for drawing and designing, which is the groundwork of Painting, and so useful in manufactures, it is intended to erect a little academy or school for drawing and painting, from whence some geniuses may arise to the benefit and honour of this kingdom, and it is hoped that gentlemen of taste will encourage and support so useful a design." This modest announcement, expressed in the rather quaint phraseology of the period, marks the commencement of the School of Art. In 1748 we find that the "Society agrees to pay Mr. West, who keeps a drawing school in George's-lane, his usual allowance for teaching the poor boys." In 1763 the Society's Art School was located in the Society's house, Shaw's-court, Mr. West being the master. Collections of casts and water colour drawings appear to have been presented to the School from time to time; many of these are at present in the School and Museum. In the year 1815 the Society purchased Leinster House. The present gallery of the School of Art appears to have been originally intended for a museum, and was built about the year 1843. The first public distribution of prizes to pupils of the School of Art took place on the 8th December, 1842, under the presidency of his Excellency the Lord Lieutenant. On the 30th January, 1845, Mr. West, the then head master of the Art Schools, was superannuated. His services, together with those of his father and grandfather, appear to have extended over a period of ninety years. In 1848 the newly-established Government School of Design at Somerset House, London, presented the Art School with 100 casts of ornament, and from this time forward we shall find that the School has ceased to exist under the exclusive control of the Royal Dublin Society. It appears, however, that the wish expressed in the resolution of 1746 was in a large measure realized, as the records of the Society show a long list of names of artists who, having studied in the School, rose afterwards to eminence. Amongst them we find such men as Ashford, Cuming, and Cregan, all of whom became presidents of the Royal Hibernian Academy. We also find Shea, afterwards president of the Royal Academy; Comerford, the miniature painter; James Barry; Foley and Hogan, sculptors; Mossop, the medallist, and many more; indeed it is no exaggeration to state that there is scarcely an Irish painter, sculptor, or architect, from the period of the inception of the School, who did not receive portion, at least, of his art education within its walls. Up to the year 1849 the Society had four schools, or departments, for figure, landscape and ornament, architecture,



Miss Alice Jacob.

DESIGN FOR A SKIRT IN LIMERICK LACE.

Dublin School of Art.



SKETCH DESIGN FOR A COUNTERPANE.

James H. Jeffrey. Belfast School of Art.

and modelling. In this year the School was converted into a so-called School of Design, under the Board of Trade. Mr. Henry M'Manus was appointed headmaster, and the gallery was handed over for the use of the school; it has since remained in its occupation. An evening school for males was now for the first time established, also day classes for female students Up to this period the instruction given was gratuitous, and the School appears to have been attended by a daily average of 100 students. During the session 1849-50 the School was attended by 743 students, being apparently the largest number on record attending during any one session. In the year 1860 the Society accepted the Taylor trust for the promotion of Art in Ireland. From this time onward the School was in connection with the Department of Science and Art, although not directly administered by it; but in the year 1879, after a Royal Commission had been held to inquire into the advisability of establishing a separate Science and Art Department for Ireland, the School was, along with other institutions such as the Botanic Gardens, National Library, etc., formally taken over by the Government. On the 1st April, 1900, the School, along with the other science and art institutions in Ireland, passed under the control of the new Department of Agriculture and Technical Instruction for Ireland.

The Reports of the School from the year when it was taken over by the Government bear testimony to the fact that the work done has been of a high order. Some years ago the feeling throughout the country generally was to the effect that sufficient attention to what may be called the industrial side of art education was not given by the Science and Art Department. It was said that too many students were being educated as mediocre artists, that the question of design was being lost sight of; and in response to this feeling as expressed in many quarters, the Department made such changes in the arrangements for its examinations and competitions as favoured the direction towards the study of applied design in the Schools of Art. The Metropolitan School of Art was not slow in responding to the changed conditions, and an examination of the Reports for the past ten years or so will afford an index to the work of the School in various directions. After the Cork Exhibition of 1883, a great impetus to lace-making and the improvement of lace design took place in Ireland. In 1890 a special class for the study of lace design was formed in the School, and this has increased to an extent which renders more room for this class desirable. A reference to the prize lists since 1890 will show that many medals and prizes have been gained in the national competition for lace designs. In 1890, five prizes for lace design were won; in 1891, eight prizes, including two silver medals for lace; in 1898, one gold medal, one silver medal, and seven book prizes for lace. The Hungarian Government, it may be mentioned, purchased two of the lace designs this year. In 1900, thirteen prizes and medals were gained for lace design. But it is not alone these prizes gained in the national competition which evidence the success of the School in this direction, but the fact that the demand for lace designs from the various centres throughout the country has been considerable.

The principle which governs the instruction given in lace designing is, that while the students are taught to study the construction of the patterns in the antique laces of the best periods, and are encouraged to make themselves acquainted with the technical requirements of the fabric by learning to make it, yet they must go to nature for the "motifs" which furnish the body of the design. Care is taken that the individuality of the student

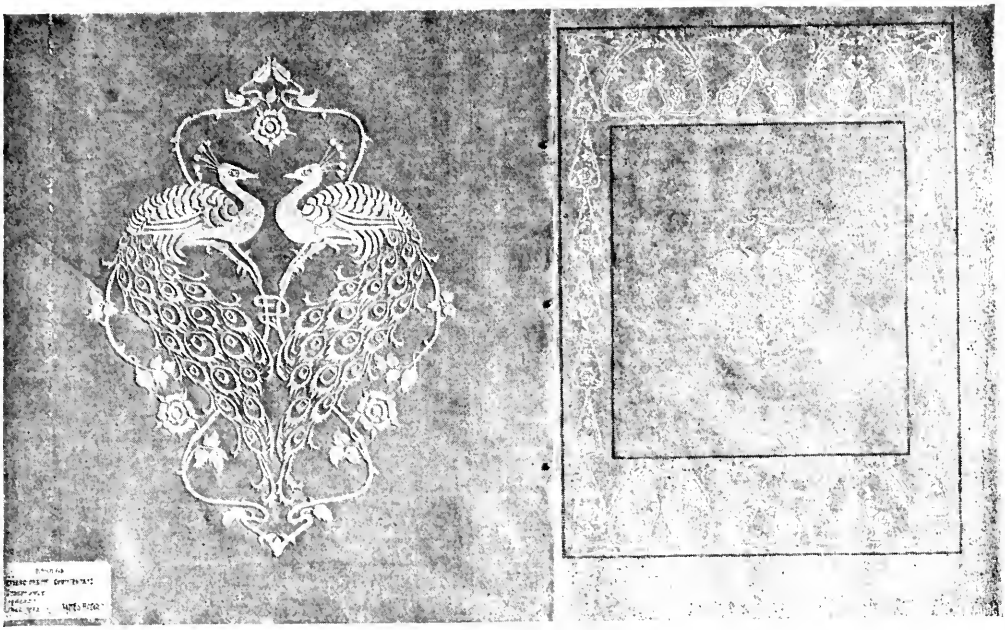
shall not be lost, and they are given to understand that if they exhibit good construction, good arrangement, good drawing, and a full evidence of their knowledge of the technical requirements of the material in their designs, they may fearlessly put them upon the market and allow their work to be judged upon its own merits.

The School has always had a good reputation for modelling, and there seems to be something in the Irish mind which takes kindly to this branch of art. Good results have been obtained in this subject also; as, for example, the School gained one gold medal and one silver medal for modelled design in the year 1890, and in 1891 three silver medals and eight book prizes for the same subject. To a small extent the students have supplied a demand for modelled work for the silversmith and the wood carver. However, until series of technical classes in those subjects with which art is more immediately connected are established in the School, and which will allow the students to embody their ideas in the material, the work of the school cannot be considered to be complete in this direction. On several occasions, chiefly through the instrumentality of the Committee of the Branchardiere Fund, lace teachers have been brought up from different parts of the country in order to obtain instruction in drawing and design, for short periods, in the School of Art. For instance, the lace mistresses at Carrickmacross, Crossmaglen, Armagh, and Benmore, near Enniskillen, have so benefitted. In all cases the Reports have been that the instruction imparted to the mistress has proved highly beneficial to the industry. In 1900 a certain number of National school and other teachers were offered a short summer course of lessons in drawing and design. Those who attended were required to do freehand drawing from the cast; foliage from nature, with the brush; geometrical drawing, so far as it applied to design, using those problems which were particularly applicable to the striking out of patterns; and elementary design. The experiment was eminently successful.

Belfast School of Art.

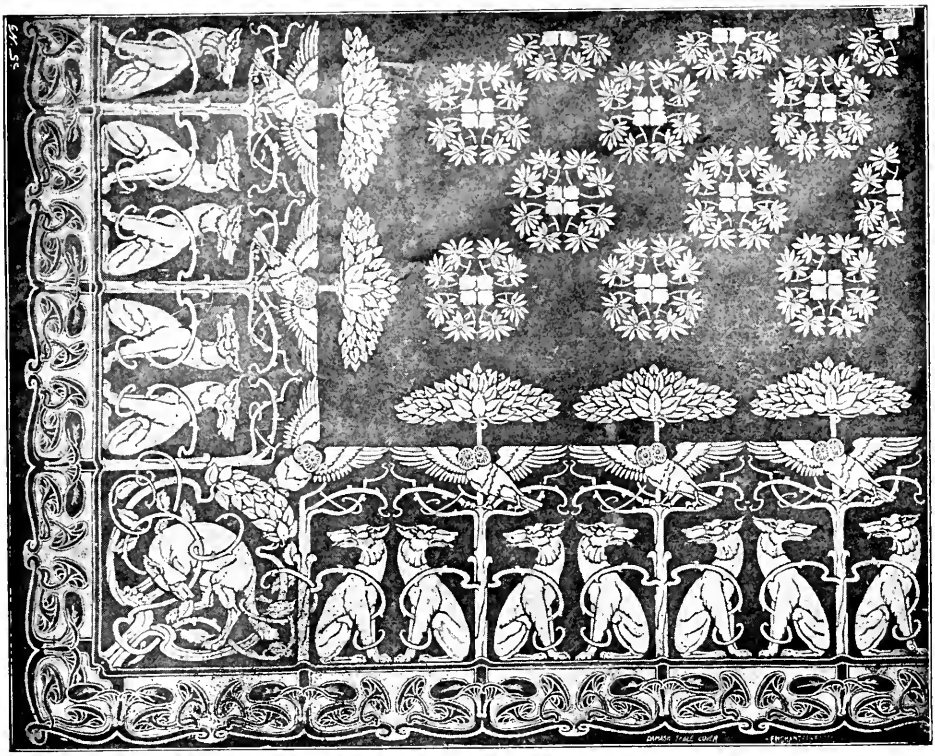
The history of the Belfast School of Art divides itself into three periods: (1) 1849-54, when it was known as the Government School of Design; (2) 1870-1901, as the Government School of Art; and (3) the Municipal School of Art, which has just come into existence.

Some years before the establishment of the Government School of Design, attention had been drawn to the desirability of providing means of practical art training for the artisans of Belfast. The first suggestion of a School of Design appears in the "Address to the Public" which prefaces the catalogue of the first exhibition of the "Belfast Association of Artists," in 1836. Among other objects to which it was proposed to devote the proceeds of the exhibitions was the establishment of "a normal school of artistic education, at which lectures on the principles of designing and colouring will be an essential part." The initial effort to get such a school established was not made, however, until 1848, when a correspondence was entered into with the Secretary to the Lord Lieutenant. In reply to official inquiries, it was stated that local subscriptions to the amount of £300 per annum could be reckoned upon; and, as a matter of fact, a sum of more than £400 was subscribed the first year, showing that there was a considerable amount of interest taken in the project. The Town Council was approached with the view of obtaining a grant from the rates; but it appeared that there was



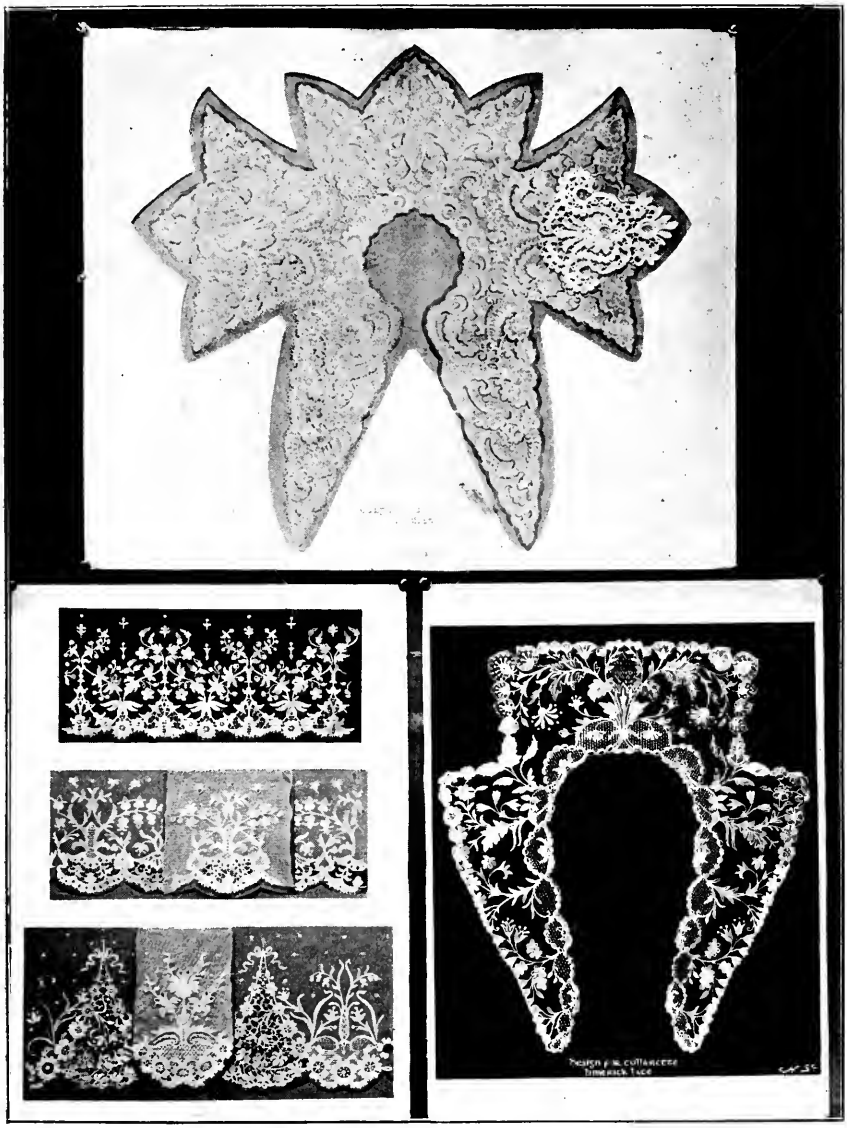
DESIGN FOR A COUNTERPANE.

James Hodgen. Belfast School of Art.



DESIGN FOR A DAMASK TABLECLOTH.

Edwin A. Morrow. Belfast School of Art.



DESIGNS FOR A LACE FLOUNCE, AND COLLARETTES IN LIMERICK LACE AND CROCHET.
Alice Jacob, Dublin School of Art.

some bar to their making one, although the Cork School of Design was at that time receiving municipal support. The Drapers Company gave an annual grant of £25, and applications for aid were also made to the Mercers', Grocers', and Fishmongers' Companies, and the Irish Society, though the scanty records available do not show whether they were successful or not. The school also received an annual grant of £500, afterwards increased to £600, from the Government. Altogether, the amount of outside aid received far exceeded that given at any time to its successor the Government School of Art.

Lord Dufferin was invited to become president, and the formal inauguration took place early in 1850, the various classes having been in operation, however, from the previous November. Lord Dufferin showed himself a good friend to the school in many ways, offering a prize of £50 in the first year, and founding a scholarship of £20 per annum as well. Another of £10 per annum was given by Mr. Blakiston-Houston, and it was contemplated to provide a third out of the School funds. A Mr. Henning, of Waringstown, offered further prizes of £10 and £5, so that there was no lack of encouragement to the students.

Mr. Claude Lorraine Nursey, who had held a similar position in the Leeds School of Design, was appointed headmaster, with Mr. David Wilkie Raimbach (a son of the well-known engraver, Abraham Raimbach) as second in command.

The course of instruction was the same as in other Schools of Design, and comprised drawing from flat copies, and from models and casts; also, studies of plant form, and original design. It is to be feared that these latter studies did not amount to much, for we find the Government Inspector expressing surprise that living plants were not provided for the students, and no design was considered worthy of the large prize offered by Lord Dufferin. Another complaint made by the Inspector was that a proper "sculpture gallery," or antique room, was not provided, and we find frequent reference to this want in the records of the School. As early as October, 1849, the Committee were in treaty with the Governors of the Royal Academical Institution for the erection of a special room, sixty feet by forty, and twenty feet high, for this purpose, and on the 8th of January, 1850, the Secretary wrote to the central authorities that it was expected such a room, only a hundred feet long, would be built at once. But nothing came of the project; and it may be remarked that what was felt to be a pressing necessity at that time, remained more than fifty years unprovided for.

From various causes, the schools of design did not fulfil the hopes of their founders. The manufacturers took very little interest in their operations; partly, no doubt, because the instruction given in most of them was not of a very practical character, so far as the main purpose of training designers was concerned. Before a special committee of the Council of the Government School of Design, Somerset House, Mr. Richard Burchett stated that the Central School was "an utter and complete failure;" and Mr. Ambrose Poynter said that the provincial schools had "no pretension to be called Schools of Design."

The great Exhibition of 1851 only tended to emphasise the lamentable deficiencies of British industrial art in comparison with that of other countries, especially our great dependency, India. The exquisite productions of that country, which many Englishmen had been accustomed to look upon as a semi-barbarous one, were a revelation to all concerned, and put to

shame the crude and pretentious work of our own manufacturers and craftsmen. Renewed efforts were made to remedy this unsatisfactory condition of things, and in 1852 a "Department of Practical Art," under the Board of Trade, was established, to supervise the work of the Schools of Design, and to advance the cause of industrial art generally. This was superseded in the following year by the Department of Science and Art, as a branch of the Education Department. A wider scheme was organised, and a new system of State aid inaugurated, throwing more responsibility upon the localities for the support of the schools. Direct grants were withdrawn, and the system of payments on results of examinations was instituted.

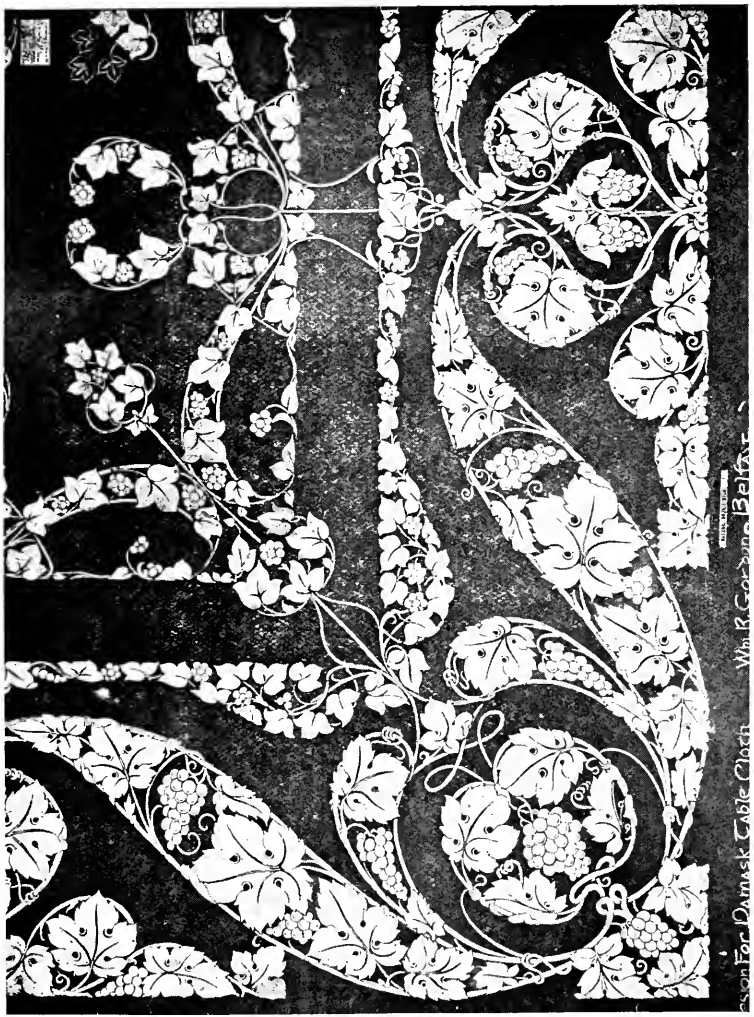
The effect of this change on the Belfast School of Design was disastrous Local interest in its work was not sufficient to provide adequately for its support, and so, in 1854, it was compelled to close its doors. During its short life it had not been without influence for good, even if it had missed its proper aim. Many local architects received more or less of their training within its walls, and some of its students eventually entered the ranks of art as professional painters or sculptors. Of these we may mention Samuel M'Cloy, Ebenezer Crawford (a promising artist who died early), Samuel F. Lynn, the well-known sculptor, and Anthony C. Stannus. The building occupied by the Belfast School of Design forms the north wing of the Royal Academical Institution. This Institution, now a public school, was the precursor of the Queen's College, and is still known by many as the "Old College," the square in which it stands being called "College Square" to this day. The School of Design building had been the home of the medical school, and of course the arrangements were not calculated to meet the needs of an art school.

After the collapse of the School of Design, drawing classes were carried on in connection with the Academical Institution; but the advantages of a public School of Art were denied to Belfast students until the year 1870, when the same old building was re-opened as the Government School of Art. An influential committee was formed, and a considerable sum of money raised for the equipment of the School, and the establishment of local prizes. Mr. Thomas M. Lindsay was chosen as head master, and justified his appointment by the success which attended his efforts. The School took a high place in the national competition, and many of the students laid the foundation of a successful career in art under his direction. In 1880 he was appointed Art Master at Rugby School, and was succeeded by Mr. George Trobridge, A.R.C.A. (London), who had just completed a highly successful course of training at the National Art Training School, South Kensington. Under his direction the work of the School was somewhat extended—so far, that is to say, as the limited space and unsatisfactory arrangements allowed—especially in the direction of figure drawing. A nude life-class was established, and, for the first time in the history of the School, students were presented for examination in anatomy, and drawing from the antique, in the year 1881. The life-class was conducted under great disadvantages, and with limited success, one small room having to answer both for life-room and modelling-room, and the students being required to pay the cost of their own models. From this small beginning there have been considerable developments in recent years; and at the last examinations thirty successes were obtained in drawing from antique and from life.

Great difficulties have always been experiencel in carrying on the work of the School, owing to lack of space, and the unsuitability of the premises.

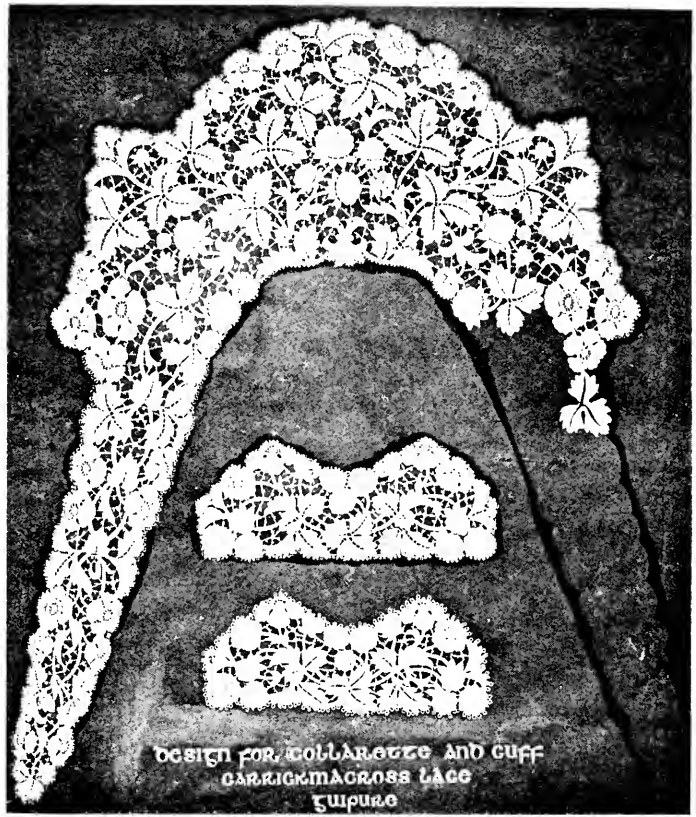
DESIGN FOR A LACE SKIRT.

Miss Frances Shortt. Cork School of Art.



DESIGN FOR DAMASK TABLECLOTH.

Mr. William Gordon. School of Art, Belfast.



DESIGN FOR A LACE COLLARETTE AND CUFF.

Miss Eleanor Rossiter. Dublin School of Art.

The Board of Management has done what was possible to minimise these drawbacks; and large sums have been spent in such improvements as could be made in the old building. The expansion of the work of the School also entailed increased expenditure in various directions, and led to an embarrassed condition of the finances, which necessarily checked development. With all these obstacles the School has a record of which it need not be ashamed. In the course of the last ten years of its history, during which period it had the advantage of a small yearly grant from the City Council, it showed remarkable progress. Between the years 1890 and 1898 the successes at the advanced examinations rose more than threefold, and the Government grant was nearly doubled. The year 1900 saw high-water mark in the national competition, sixteen awards being gained, including a gold medal. But perhaps the most remarkable achievement has been in the direction of scholarships and exhibitions. No less than nineteen national scholarships have been gained since 1872, besides four studentships-in-training, and two local scholarships.* Some of the students who have taken these scholarships now occupy a high place in the art world; some are engaged in teaching; and others are employed as designers in Belfast or elsewhere.

The most important question in regard to any School of Art is whether its operations are of benefit to local industries. A strong affirmative answer may be given in the case of Belfast, though the manufacturers themselves do not appear to know the extent of their indebtedness to the School. Some years ago, when the Technical Commissioners were taking evidence in Belfast, the head of an important firm was asked, "Do you find the School of Art of any benefit to you?" and answered, without hesitation, "None whatever;" although at the time he had two designers in his employment whom his partner had lately obtained from the School. As a matter of fact, many of the principal designers in the city are students, or former students, of the School, including the head designers in two of the largest damask manufactories. Several firms have produced designs by the late headmaster, Mr. Trobridge, which have proved most successful, and other members of the staff have been employed from time to time in connection with local industries. Mr. Henry C. Morrow, who has been teacher of design for the past ten years, is the leading house decorator in the city, and has carried out many extensive works in public and private buildings. As an indication of the general tendency of the School work it may be mentioned that, of sixteen honours gained in the national competition of 1900, six were for original designs for linen damask, six for embroidered linen, and one for printed muslins. Of the embroidery designs the examiners spoke in very high terms. They said: "The designs for white embroidery, accompanied by worked specimens, from Belfast, for one of which, by James H. Jeffrey, a gold medal is awarded, are admirably adapted for their purpose, and are quite remarkable for their treatment."

The production of practical work in a School of Art greatly depends upon the encouragement given by local manufacturers. In the early days of the Belfast School liberal donations were given for special prizes, and a large number of designs were produced in competition for these. Such donations gradually fell away until during several years there were no special prizes at all. In the year 1897, some members of the Board of Management

* In the year 1899 four Belfast students were holding scholarships in the Royal College of Art.

exerted themselves to obtain a better list of local prizes, and, as a result of their efforts, a large amount of excellent work was produced. The successes in the national competition rose at a bound from four, in 1897, to fourteen in 1898; showing how readily the School responded to such a stimulus.

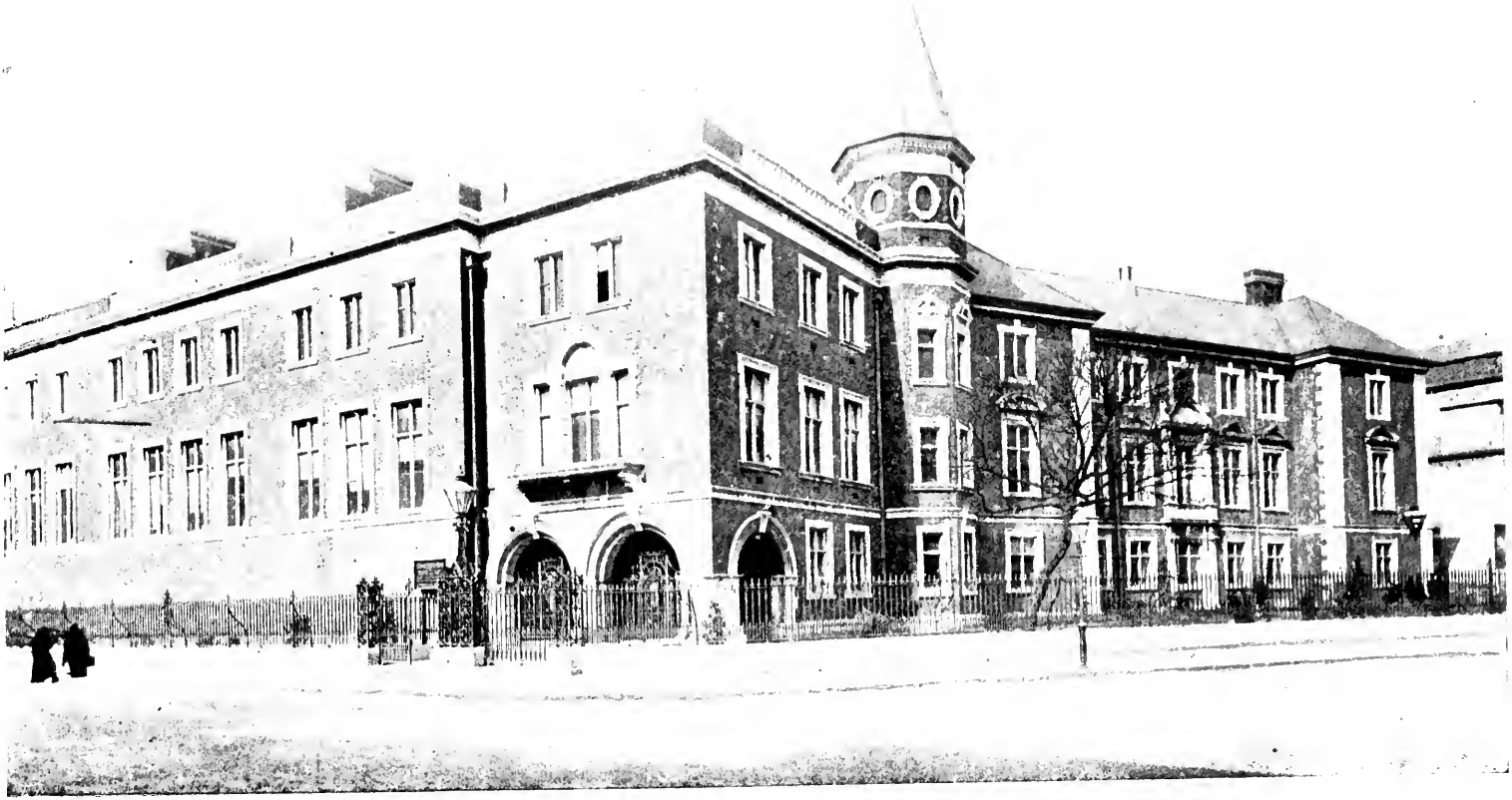
While decorative design, and studies leading thereto, formed the most important section of the School work, other studies were not neglected. In the day classes painting from flowers and still-life, and drawing and painting from life, were largely pursued, in addition to more elementary work; and in the summer time classes for sketching from nature were held

A successful Sketching Club, and an Illustration Club, have been maintained for many years as adjuncts to the general school work. Many teachers have received training which has enabled them to obtain employment, and carry the benefits they have received to other centres. A considerable number of school children also have attended the classes; and the drawing department of Victoria College, the largest ladies' school in the north of Ireland, has been conducted for some twenty-five years as a branch of the School of Art.

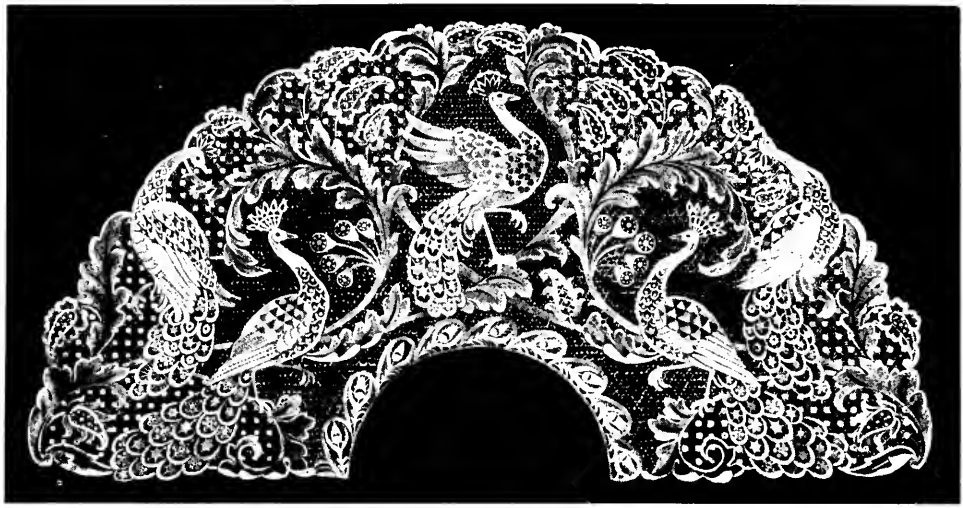
On the 31st July, 1901, the Government School of Art ceased to exist, after more than thirty years of successful work. The Technical Instruction Committee of the City Council then undertook the duties of management, incorporating the School in the new Technical Institute, and reorganising it on an extended basis. A new and greatly strengthened staff was appointed, with Mr. R. A. Dawson, A.R.C.A. (Lond.), as head master; new premises were acquired, to which the operations of the School were transferred; and additional appliances were provided with a view of making the teaching more effective. Both teachers and students will now have opportunities such as they have never had before, and we may safely predict that the Belfast School will take a still higher position in relation to other schools than it has hitherto held. The record of the old School in the last year of its existence was a highly creditable one, eclipsing in some respects all previous achievements; among other honours, three silver medals and nine other awards having been obtained in the National Competition, and no less than six open scholarships gained. These latter include three National Scholarships at the Royal College of Art, two Scholarships in the Metropolitan School of Art, Dublin, and one local Scholarship. A Bronze Medal was also awarded to the School at the Paris Exhibition for the high character of the work of its students.

The Crawford Municipal School of Art, Cork.

Over a century ago a number of Cork citizens, associated for scientific purposes, founded the Royal Cork Institution, and obtained a Royal Charter. A School of Art and Design was started, partly in connection with the institution, and a report presented to the Board of Trade in 1850 stated that there were 118 evening students and 72 day students on the register, of whom 38 were admitted free. The Royal Cork Institution fell into pecuniary difficulties and became practically moribund, and the School of Art, which occupied the upper portion of the Institution building, suffered accordingly. The place was in such bad repair that at one time the students were obliged to work under umbrellas. Mr. James Brenan, R.H.A., the headmaster of the School, and Mr. Arthur Hill, R.E., M.R.I.A., and others made repeated efforts to re-organise the Institution and the School, but for some time



THE CRAWFORD MUNICIPAL SCHOOL OF ART, CORK.



DESIGN FOR FAN.

Miss M. Nagle. Municipal School of Art, Cork.

DESIGN FOR DAMASK.

Miss M. Nagle, Municipal School of Art, Cork.

without success. At length, in 1877, with the assistance of Mr. N. D. Murphy, M.P., a scheme was authorised for the establishment of an improved School of Art, a School of Music, and a School of Science, and considerable support was received from the Corporation.

The handsome building in which the Schools of Science and Art are now housed consists of the old building of the Royal Cork Institution, with a very considerable addition, and the architect, Mr. Arthur Hill, solved a difficult problem with distinct success in the way in which he grouped together the new and the old building into one harmonious and homogeneous whole, so that a stranger could not detect the addition that was made. The new building was presented to the city by the late Mr. W. H. Crawford, with princely generosity, at a cost of over £20,000. Their Royal Highnesses the then Prince and Princess of Wales were present at the opening ceremony in 1885, and christened the building the Crawford Municipal School of Art.

The average number of students attending the School of Art for Art subjects is about 220, and those studying machine or building construction, without taking any Art subjects, bring the total under instruction to about 250. Formerly, the day and evening classes were about equal in number. Thus, in the year 1885-6, the sessions immediately following the opening of the new building, 133 students attended the day classes, and 136 the evening classes; latterly, not more than 70 have attended during the day, and the evening classes average 180. A large proportion of the evening students are either attending or have been educated at the National schools in the city, and, unfortunately, much of the work done at the School of Art is, therefore, of a very elementary character; but it is hoped that with an improvement in the hand and eye training of the National schools it will be found possible to make the instruction in the School of Art of a more advanced character.

The Cork Industrial Exhibition held in 1883 called attention to the lace and crochet industry in the South of Ireland, and the need for improved designs in their production. The visits paid by Mr. Alan S. Cole, of South Kensington, also stimulated both the lace workers and the designers, and from that time the Cork School of Art, and the branch classes founded in connection with it, have acquired an increasing reputation for the artistic character of the designs for lace and other needlework.

The surplus realised by the Cork Exhibition of 1883 was applied to the founding of two Local Scholarships, tenable at South Kensington by students of the Cork School or the branch classes elsewhere. These Scholarships have proved most beneficial in their results, as will be seen from a few examples. In 1887 Michael Murphy, a stone carver, who had previously held one of the local Exhibitions, obtained a National Scholarship at South Kensington, and has since become a most successful Art craftsman, working chiefly in London, but getting many commissions from architects in other parts of England. In 1896 Michael M'Namara, another stone carver, was successful in obtaining a National Scholarship, having the previous year held a Local Exhibition, and after being a National Scholar for two years, his Scholarship was continued for a third year, and he was placed in charge of the other National Scholars. Albina Collins, of the branch class at the Kinsale Convent, was appointed a National Scholar in 1896, and in 1897 Georgina Mackinlay, of the Cork School, and Cecilia Keyes, of the branch class at Kinsale, each secured a National Scholarship, so that in the year 1897 no less than four of the National Scholars at South Kensington were

from the School of Art, Cork, and the Kinsale Branch class. All four had previously held Local Exhibitions.

Taking into account the small number of advanced students the Cork School of Art has held a fairly high place in the National Competition of Schools of Art.

In 1896 the first grant from South Kensington under the Technical Instruction Act was made to the School in support of a class for the teaching of Embroidery. In 1899 a further grant was made in aid of the teaching of Limerick Lace making, and in October, 1900, Crochet was added to the subjects of Technical Instruction taught in the School. These Needlework classes have proved of the greatest possible benefit to the designers, whose designs are now much more practical than before, with the result that there is a much greater demand for, and readier sale of, the designs than formerly.

In April, 1900, during the visit of Her late Majesty Queen Victoria to Dublin, specimens of the Needlework executed at the Cork School were submitted to Her Majesty, who was graciously pleased to order two embroidered coverlets, which were completed and forwarded to Buckingham Palace.

Several designs for table damask have been sold in Belfast; and quite recently, in a competition for prizes held by the Old Bleach Linen Co., Randalstown, County Antrim, which was open to the United Kingdom, the second prize of £10 was won by Miss G. Sutton, and the fourth prize by Miss Whitcliffe. The seventh prize for towel design, open to ladies only, was also won by Miss Sutton. Several of the National Competition prizes awarded to this School in recent years have been for modelled works, and now that a special Modelling Master has been appointed it is hoped that modelled designs applied to local industries will be as successful as the designs already produced for Needlework and Damask. There is good terra-cotta clay in the immediate neighbourhood, so that there seems no reason why it should not be largely availed of by architects for decorative purposes.

SCIENCE TEACHING AND TECHNICAL INSTRUCTION.

The facilities for and the supply of Science Teaching and Technical Instruction in Ireland have been, at any rate until recently, so inferior to those existing in England, that a slight historical retrospect is necessary in order to understand the recent changes in this respect in Ireland. The following extract from the Report of the Royal Commission on Technical Instruction, published in 1884, shows the state of affairs in the early eighties:—

"Whilst science and art classes, many of them very successful, are to be found in several of the important towns of Ireland, there are scarcely any science classes at work in Dublin. Various reasons were assigned to us for this state of things, some of them of a kind into which it is not expedient that we should enter. At the same time, there is in Dublin the Royal College of Science, with a staff of competent professors, an admirable technical museum, and laboratories fairly well equipped for practical work. It appears from the evidence that of the small number of students who follow a complete course of instruction in this institution, about one-half are Englishmen, holders of the Royal Exhibitions of the Science and Art Department, scarcely any of whom become teachers of science in Ireland. There are no short summer courses at the College, like those at the Normal School at South Kensington, for the instruction of science teachers. There are, we are aware, some courses of evening lectures; but although the laboratories of the College are the only ones in Dublin available for practical evening instruction, such instruction in science and in mechanical drawing forms no part of the arrangements of the College. It appears that by the rules of the Science and Art Department, the professors of the College cannot earn grants on the results of instruction in science, as would be the case if they were ordinary science teachers. We are of opinion that so long as the effective work of the College in preparing associate students, and more particularly Irish students, is so limited in area as at present, evening classes with practical laboratory work should form part of the regular College courses, and that the remuneration of the professors should depend in part on the success, or at any rate on the regular attendance, of students at such classes.

"We would also remark that we have received evidence of a very contradictory nature as to the teaching of science in the Irish Intermediate Schools. We believe, however, that it is engaging the attention of the Board of Intermediate Education, and we only deem it necessary to state in reference to this subject, that efficient instruction in science will not be possible in those schools unless they are provided with proper laboratories, which in most, if not in all of them, are at present entirely wanting.

"But the most important part of our task with regard to Ireland, is to consider the possibility of improving the industrial conditions of the poor and remote districts of the West, by means of technical education.

"By the courtesy of Sir Patrick Keenan, K.C.M.G., the Resident Commissioner of National Education in Ireland, your Commissioners have been

furnished with what they understood to be a complete set of the books used in the Irish National Schools. They find that these books are well adapted for the literary instruction of the children of various ages in those schools, and that they contain much interesting information on the natural features and resources of Ireland. But, except as to agriculture, they do not afford adequate assistance towards graduated instruction in industrial processes, or in the rudiments of the sciences on which those processes are founded. As the Irish National Education Commissioners are by their regulations mainly responsible for the selection of the books used in the schools, this defect should receive their early attention.

"There is a general consensus of opinion on the part of persons of all ranks in that country, whatever may be their views on other subjects, that the prosperity of the poorer districts of Ireland may be greatly promoted by technical instruction in handicrafts and in home industries. There is a conviction not less general, and it is one which visits have fully confirmed in our minds, that the children and young people of Ireland of the labouring class possess great manual dexterity and aptitude, which only requires to be developed in order to be useful to themselves and to those amongst whom they live. As evidence of this, we need only refer to the remarkable success of the Christian Brothers, and to that of the ladies of Religious Orders, in training children and young persons for handicrafts, in Industrial Schools and institutions of a like nature. There appears to be no reason why similar instruction to that which is given in these schools should not be given elsewhere, if the necessary funds and teachers are forthcoming. We have shown that instruction of this kind given on the Continent to persons in remote districts, who would otherwise be idle, has added materially to their resources, both directly, and by training them for employment in larger industrial concerns, and we have ascertained that no great expenditure of public money has been required in order to produce these effects.

"Not only is instruction of this kind deemed to be desirable, but we have found that there is a willingness on the part of benevolent persons in Ireland to assist its promotion by subscriptions and in other ways. It is true that by some it has been proposed that the Government should itself initiate, if it did not entirely charge itself with this work, but we were happy to find there were others who would be quite satisfied if its utility received the imprimatur of the Government, and if the State offered rewards for the ascertained results of instruction of this kind. We are of opinion that successful work of this nature, whether it be conducted by individuals or societies, or by religious bodies, deserves the recognition and reward of the Government. We think it no part of our duty to state which are the home industries best adapted to the conditions of different parts of Ireland, Each locality will be able to form its own judgment in regard to this, and due weight should be given by the Government to such local expression of opinion; payment in all cases being dependent upon the results obtained in the schools or classes. We do not think it would be possible for the Government to train teachers for a variety of home industries, but it might contribute to the payment of such teachers appointed by the localities: and it would be expedient to establish a class of itinerant teachers for service in districts where resident instructors cannot be maintained.

"These suggestions apply even in a greater degree to the instruction of girls than of boys.

"We need scarcely point out that, if it be deemed desirable to introduce manual instruction in the use of tools in elementary schools at all, this would apply in an eminent degree to the primary schools of Ireland. It was stated in evidence before us that in some parts of Ireland, ordinary handicrafts, like those of the mason, have become absolutely extinct. Whether the children

remain in their own immediate localities or migrate to other parts of the country, or emigrate to our colonies or to foreign countries, such instruction leading up to their apprenticeship as skilled labourers, instead of their fulfilling, as is now too much the case, the part of mere hewers of wood and drawers of water, would be of the greatest value to them. We are happy to find that the authorities of the National Board of Education in Ireland appreciate the importance of introducing instruction in manual work into their schools. They have already begun to give instruction of this kind to some few of their teachers, with a view to qualify them for imparting it to the children in the schools; but, in order that this instruction may be satisfactory, it is important that the training of the teachers themselves should be systematic and thorough; and, obvious as this might appear to be, we do not hesitate to impress it upon the minds of the authorities of the National Board. Until the teachers are able themselves to give the instruction, it might be given by skilled and intelligent artisans. We have reason to believe that, whenever efficient teachers can be found, the National Board will be prepared to pay for the results of manual teaching in the primary schools. It is scarcely necessary to say that our statement with regard to drawing, in reference to schools generally, applies with equal force to the Irish schools. We may remark that the progress of children in learning home trades will be much more satisfactory if they have been trained at school in the use of the ordinary tools for working in wood and iron, and in drawing."

Some account of the history of the Royal College of Science for Ireland (which has now passed under the control of the Department of Agriculture and Technical Instruction for Ireland) may be fittingly introduced here.

The Royal College of Science for Ireland.

As is the case with so many other public institutions in Dublin, the origin of the Royal College of Science must probably be sought in the activity of the Royal Dublin Society, as far back as the eighteenth century. A chemical "elaboratory" was then established for practical work in the Society's premises, and students of mineralogy were recommended to resort to it for assistance in their enquiries. Prizes of the value of £50 were offered to such students; and subsequently the Society organised systematic courses of lectures on Chemistry, Physics, Mineralogy, Geology, Zoology, and Botany.

On the establishment of the Department of Science and Art in connection with the Board of Trade, in March, 1853, the Museum of Irish Industry in St. Stephen's Green, Dublin, passed under its control. This practical institution had been founded nine years before, under the office of Woods and Forests, and contained a chemical department, which conducted enquiries for the Geological Survey, and other researches "of public industrial interest" (*1st Rep. Dep. Science and Art*, 1854, p. lxvi). The staff was also "engaged on investigations of the nature of agricultural soils, and in preparing a series of maps of the agricultural surface of the Irish counties according to the chemical nature and financial values." The Department of Science and Art proceeded to carry out, in addition, an educational scheme which had been contemplated for some years, by the appointment of professors "in connection with the Museum, for the most important sciences belonging to the Industrial Arts." The subjects selected were Geology, Chemistry, Mechanics, and Botany. The lectures were of a popular nature and admission was free; being given in the evenings, the average nightly attendance was at first about 400 (*Report of Sir R. Kane, Director of the*

Museum, 1855). These lectures mark the foundation of the GOVERNMENT SCHOOL OF SCIENCE APPLIED TO MINING AND THE ARTS, DUBLIN, and were at once succeeded by the formation of a class of "Practical Chemistry." By arrangement with the Royal Dublin Society, the courses of lectures already given by that body in each year were made to serve as introductions to more special courses in the new School of Science. In addition the popular evening lectures were maintained. In 1866, the Government resolved to further systematise scientific instruction in Dublin by the conversion of the Museum of Irish Industry "into a college of science" (*14th Rep. Sci. and Art Dep.*, 1867, p. 2). At that time seven professorships already existed in connection with the Museum of Irish Industry, including one of Agriculture. Professorships of "Applied Mathematics and Mechanism," "Mineralogy and Mining," and "Descriptive Geometry, Mechanical Drawing, Machinery and Surveying," were now added, and a comprehensive scheme of instruction, extending over three years, was drawn up. Students successfully passing the final examinations were awarded the diploma of Associate of the ROYAL COLLEGE OF SCIENCE FOR IRELAND.

The College thus established was to some extent modelled on the Royal School of Mines in London, but was intended to have a wider scope. From the first it admitted women to its lectures and class-rooms, and its influence in the scientific education of women has always been considerable. The Council of Professors, in 1874, appears to have proposed some extension of the courses afforded in agriculture, which remained practically confined to agricultural chemistry; but the scheme was not regarded as practicable, and the chair of Agriculture was abolished in 1878. That of Mining was also abolished in 1899, the teaching in Mineralogy being transferred to the chair of Geology. With these changes, the general teaching has been maintained much on the lines formulated in 1867; but the practical laboratory work then encouraged has assumed greater and greater prominence, in accordance with scientific progress. External examiners are associated with the Professors in the several examinations for the Diploma.

The list of associates who have graduated in the College in the past represents only a small part of the educational and public work performed by the Royal College of Science for Ireland. An institution in which individual students can pursue special studies, without following the routine required for a degree, naturally attracts many who otherwise would find it difficult to acquire scientific knowledge. Persons, moreover, already engaged in scientific or industrial pursuits, are able to receive instruction in new methods and developments, and to work with special apparatus before introducing it into their own laboratories or workshops. While a number of past students have adopted teaching as a profession, the Department of Agriculture and Technical Instruction, to which the College was transferred in 1900, has arranged for the attendance of selected students as free scholars for courses of three years' instruction, with a view to their qualifying themselves as technical teachers and as instructors in agriculture for the service of County Councils. Short courses of instruction to qualified teachers have also been in existence during the summer months of the last four or five years. The Department proposes to revive and to enlarge the Faculty of Agriculture, with special regard to the requirements of the country. The faculties at present in operation are those of Engineering, Manufactures, Physics, and Natural Science.

The following extract from the Report of the Recess Committee,

published in 1896, shows that not much improvement in the facilities provided for Technical Education had been effected in the intervening twelve years since the Royal Commission reported:—

"There is in Dublin a Royal College of Science, whose declared object is 'to supply, as far as practicable, a complete course of instruction in science applicable to the industrial arts, especially those which may be classed broadly under the heads of—(1) mining, (2) agricultural, (3) engineering, (4) manufactures.' This College is under the Science and Art Department, and is maintained entirely by the Treasury. There is a Technical and Science and Art School in Kevin Street, under the Corporation, managed by a committee and supported by grants from the Corporation, the Science and Art Department, and the City and Guilds of London Institute. At Ringsend there is a Fishery School, endowed by the Earl of Pembroke, which also receives contributions from the Corporation, and the Science and Art Department. There is likewise in Dublin a Metropolitan School of Art under the Science and Art Department. In Belfast a Weaving School, a School of Art, and some working men's classes are partly maintained by the Corporation, and partly by the Science and Art Department and the City and Guilds of London. In Cork there is a School of Art similarly maintained, and at the Christian Brothers' Schools there is a Technical Laboratory, in which some technical instruction is given."

Since the Recess Committee reported, some important changes have been effected in the facilities for Science Teaching and Technical Instruction in Ireland. A Vice-Regal Commission was appointed in 1897 to examine into the question of Manual and Practical Instruction in the Primary Schools under the Board of National Education. The Report showed that, whilst it is generally conceded that no technical instruction should be given in primary schools, there was an overwhelming consensus of opinion that the education given was of too "bookish" a nature, and did not sufficiently provide for that training of hand and eye which is now recognised as of the greatest possible value, not only as an equipment for actual work in after life, but also as in itself an essential part of a complete education. In accordance with the recommendations of the Commission, new regulations have been issued, providing for instruction throughout the six standards in kindergarten methods and manual training, drawing, object lessons, and elementary science, and for girls, needlework, cookery, and laundry work. This instruction, it is obvious, is not intended in any way as technical education. Its object is to train the intelligence and observation, and to produce habits of neatness, dexterity, and carefulness in the National school children, so that when they leave school they will not be—as the Report declares they are at present—"unfit to enter a technical school, even if they had one at their door." Shortly after this another Commission was appointed in 1898 to inquire into the subject of Intermediate Education in Ireland. One of the recommendations contained in the Report was that a Modern Course should be established, in which science would play an important part, and no doubt these recommendations will have the effect of giving considerable encouragement to science teaching.

The Science and Art Department plays a large part in encouraging science teaching in England by means of grants awarded for attendance at a school which conforms to the regulations contained in the Science and Art Directory. At one time Ireland earned its proportionate share of these grants. The first change occurred when, owing to the stress of educational circumstances in England, and notably the opinion that the primary schools

were sufficiently catered for by the Education Department and by the local authorities, the standard was raised and, at the same time, the Department of Science and Art decided to pay in future for first class passes only, and not for second class passes, as had been its practice. As the former distinctions were difficult to obtain, especially in primary schools, the Irish grants decreased, for many of the secondary schools preferred to follow the curriculum of the Intermediate Board (established in 1878). This course was very generally adopted after 1890, when the endowments of that Board were increased by the residue of the Irish share of the beer and spirit duties, which, in England, were mainly devoted to technical education. The Irish secondary schools now found it much more profitable (from the "results fees" point of view) to follow the "Grammar School" curriculum, favoured by the Intermediate Board, in which science subjects were insufficiently recognised. The late Dr. Preston, the Irish Inspector of the Science and Art Department, in his last report (published June, 1899), again drew attention to the serious decrease in the number of schools in connection with the Science and Art Department, and in the number of pupils under instruction, as well as in the total amount of the grants earned in science, which, he declared, is likely to continue under existing conditions until science teaching becomes practically extinct in Irish schools, a point which he considered was being rapidly approached. The following figures are significant in this respect:—

In the year 1879-80 the number of students under instruction in England and Wales was 41,384, and the science grants earned were £29,899, whilst the corresponding figures in Ireland were 5,232, and £5,079, *i.e.*, Ireland had 11.2 per cent of the students, and earned 14.5 per cent. of the grants.

In the year 1889-90 the figures were: England and Wales, 91,246 students, and £75,684; Ireland, 9,531 students, and £7,286, *i.e.*, the English students had increased 120.4 per cent., and the Irish 82.2 per cent. The grants earned in England had increased 153.1 per cent., and those in Ireland 43.4 per cent. The Irish students now formed 9.2 per cent. of the whole, instead of 11.2 per cent., and the Irish grants were 8.8 per cent. of the whole instead of 14.5 per cent. as in 1879-80.

In the year 1897-8 the English and Welsh students amounted to 154,383, and the grants earned to £167,414, while the Irish students numbered 3,787, and the grants were £2,108, *i.e.*, in eight years the number of English and Welsh students increased 66.6 per cent., and their grants 121.2 per cent., whilst the number of Irish students decreased 63.7 per cent., and their grants 71.0 per cent.

Thus, whilst eighteen years ago the Irish students formed 11.2 per cent. of the total number of students, and their grants amounted to 14.5 per cent. of the total grants, the proportions now are only 2.3 per cent. and 1.2 per cent. respectively.

Art teaching, judged from the same standpoint of grants earned, shows a similar decline in the last two decades, and those other forms of technical instructions which do not form part of the ordinary syllabus of the Science and Art Department, appear to have been similarly neglected. A return dated 19th October, 1899, shows that the total amount of the residue under the Local Taxation (Customs and Excise Act) received by the County Councils in England for the year 1897-8 was £834,826 19*s.*, of which £759,400 15*s.* 4*d.* was appropriated to Technical Instruction, in addition to £64,029 8*s.* 10*d.* contributed out of the local rate levied under the Technical

Instruction Acts, 1889 and 1891. In Ireland, however, where the residue of what is commonly known as the Beer and Spirit duties was not handed over to the local authorities to be applied as in England, but was given to the Commissioners of National Education and the Board of Intermediate Education as part of their endowments, the expenditure on Technical Instruction amounted during the same year to only a little over £7,000. Of this sum £4,577 6*s.* 3*d.* was contributed out of the local rate levied in some dozen districts under the Technical Instruction Acts, which was supplemented by a grant in aid from the Science and Art Department, amounting to £2,613 10*s.* 1*d.*

This contribution of the Science and Art Department is a survival of the old Parliamentary grant which was made under the provisions of the Technical Instruction Act, 1889, and which was withdrawn as regards England, when the residue of the Beer and Spirit duties became available as mentioned above for the promotion of technical instruction in England. The grant was continued in Ireland by the Department of Science and Art under a minute issued in April, 1892, which provided that a grant-in-aid would be made to schools aided by the local authority, and would be equal in amount to the sum contributed by the local authority for instruction in subjects other than those ordinary Science and Art subjects for which the Department gave its ordinary Science and Art Grants, provided that the Department approved of the subjects taught in each district, and of the accommodation provided, etc. The administration of this grant in aid of Technical Instruction and of the ordinary Science and Art grants, and of the Royal College of Science was transferred to the Department of Agriculture and Technical Instruction for Ireland by the Act of 1899, which also placed at the Department's disposal an annual income of £55,000 to be expended in conjunction with local contributions on the promotion of Technical Instruction.

The following extract from the First Annual General Report gives a good general idea of the main lines on which the Department will work both in the administration of its various Technical Instruction and Science and Art grants and endowments:—

Aims of Technical Instruction.

While agencies for technical instruction may do much to assist existing industries and promote new ones, especially in those localities where commercial knowledge and experience are not, so to say, intensified, it should be fully understood that the main direct object of technical instruction is to give a training in those principles which govern industrial processes, and which determine the conditions of commerce and influence its flow. In fact the increase of useful knowledge, but especially the development of practical intelligence, of manual skill, and of an enlightened attitude towards industrial and commercial problems form the essential purposes of any system of technical instruction.

With such ends in view technical instruction, as a rule, assumes two forms.

(1) Instruction of a general nature, involving—(*a*) the teaching of practical science, (*b*) practice in exercises requiring skill of hand and eye, such as the various forms of drawing and designing, and manual instruction in wood, metal, leather, and other kinds of material, and (*c*) instruction in Economics. This form of technical instruction is educational; it concerns itself with the development of practical intelligence, of the intelligent disposition, and of manipulative skill;

and while it has no direct bearing upon one specific industry or commercial undertaking, it must be regarded as an essential preliminary for all. Technical instruction of this form is, as a rule, provided in day institutions for young persons who have not yet entered on an industrial or commercial career. It is the form in which the Secondary Schools of the country can chiefly contribute to the efficiency of a national system of technical instruction.

(2) The second form of technical instruction has more direct bearing on specific industries : and to this form the term technical instruction is often restricted. Thus, in connection with agriculture, experiments may be conducted, and the lessons learned therefrom may be directly brought before the notice of farmers and others interested. Lessons may be given in engineering, materials tested on a commercial scale, and the methods of testing the efficiency of machinery and designing new forms practised in the school workshops. Students of the building trades may be taught the mechanics of structures, may test the strength and properties of materials, and learn how to design buildings with due regard to strength and ornamental features suitable to the object in view. The boot and shoe operative may be instructed in the anatomical construction and functions of the human foot ; last making, cutting of skins, preparing of uppers, the mechanism of the machines, the use and construction of tools, materials, &c., would all form the subjects of lessons. Again, the business man may study the principles of book-keeping, the principles which underlie the flow of trade, commercial, shipping, or banking law, with statistics and economic science generally. In the same way household subjects may be taught, especially cookery, laundry, and dressmaking. In short, whenever and wherever an industrial, commercial, or domestic class of students can be found, instruction of a kind which enables them to do their work more efficiently, and thus holds out a prospect of improvement in earnings or position, should be one of the first considerations of a scheme of technical instruction.

These are the usual forms of technical instruction. But the conditions of industry, especially in the rural districts of Ireland, will for a time necessitate some departures from these forms in this country. The funds of the Department will, to a certain extent, and at first tentatively, have to be employed in assisting local effort in inquiries designed on the one hand to spread a knowledge of markets for existing industries, and of the readiest means of reaching them ; and on the other to discover whether, say, the nature of certain soils, the natural products of a locality, the accessibility of power, or the conditions and amount of labour available, would favour the introduction of new and profitable industries.

It will thus be seen that this is a large and complex problem, and that the preliminary steps towards solving it must be slow and carefully measured, if permanent, and not a specious and ephemeral success, is to be secured.

Conditions of the Problem.

As has already been pointed out, the establishment of a system of technical instruction in Ireland in connection with industries other than agriculture, presents exceptional difficulties. In England and Scotland the growth has been gradual, and in both these countries ordinary educational facilities existed which, it may be said without reproach, were far superior to those of Ireland. Before the widespread movement of some dozen years ago in favour of technical instruction, a system of science and art instruction had for many years been at work in those countries. Further, in both were the widespread

and diversified industries. To establish a system of technical instruction which shall dovetail into and supplement the work of existing workshops and factories is an easy matter compared with establishing a system in a country in which there is a general absence of manufactures. The limitations which have been natural for technical instruction in England and Scotland would therefore, to a large extent, be out of place in Ireland: and to increase the difficulties of the problem in Ireland the Councils (County and Urban), through whom it is proposed, as far as possible, to work schemes of technical instruction, are themselves new to their duties; in fact, they are in their first period of office. The Department, however, as already indicated, desire to enlist the co-operation of local authorities as much as possible in this work, and have, with this view, delegated to them important functions—the preparation and administration of local schemes. In order to suggest action to the local bodies, and to serve as a guide, a pamphlet of "Suggestions" was issued to them at an early date; and it was followed later on by a memorandum on the powers of these bodies, and the procedure to be followed. In most cases, however, it was found both practicable and advisable to meet the local authorities in conference, and to explain to them the provisions of the Acts dealing with technical instruction, to make a statement as to the funds available, and to indicate the kind of action to be taken. In the great majority of cases, a scheme based on a survey of the local conditions and local institutions has, at the request of the local committees, been suggested by the Department. These conferences occupied, and are still occupying, a large part of the time of the Department's officers. An idea of the extent to which this is the case may be gathered from the fact that one inspector from the Technical Instruction Branch, between September, 1900, and March, 1901, attended 62 conferences, and visited 152 institutions in connexion with local schemes.

The County Boroughs.

Naturally, the six county boroughs (where the conditions of the problem were not unlike those of England and Scotland) first occupied a share of attention.

The County Borough of Dublin has not, so far, [August, 1901,] submitted a scheme for approval.

The County Borough of Belfast, shortly after the establishment of the Department, formed a Technical Instruction Committee of twenty-one members, fifteen of whom were members of the Corporation, and six were co-opted members. They also took a step of great interest, and worthy of imitation in other places, in forming two Consultative Committees, one of manufacturers, and one of educationists, to advise the Technical Instruction Committee. These Consultative Committees have been found of much service in the actual work of planning out the scheme for Belfast. Several conferences took place between the Department and the Technical Instruction Committee of Belfast, and, after some time, a comprehensive scheme for the borough was formulated as the result of these conferences and approved by the Department. This scheme involves the erection of a Central Municipal Technical Institute, at an estimated cost of £71,000. The money for the building of this Institute is being raised on loan by the Corporation, and will constitute part of the local contribution to the scheme.

At an early stage of the work the Belfast Council, on the suggestion of the Department, resolved to appoint a principal for their Technical Institute, so that they might have the assistance of an expert in the organisation of the scheme from the beginning, and in the work of stimulating the existing day and evening schools of the borough in the essential function they have to fulfil as feeders to the central institution when, a year or two hence, its doors are open to receive pupils. After a consideration of the various candidates who applied for the post, and whose names were submitted to the Department, the

Council determined, with the approval of the Department, to appoint Mr. Forth, whose experience as principal assistant in the Manchester Technical Institute, seemed precisely of the character to suit the industrial conditions of a large manufacturing centre like Belfast.

The Technical Instruction Committee, at their earlier meetings, agreed that the efforts of the institute should be mainly directed towards the needs of the staple industries and trades of the city, while at the same time giving such instruction and knowledge as would facilitate the development of new industries. The instruction to be given will be open to both sexes, and will comprise complete evening courses in Science and Technology, the subjects being grouped under the headings: Preparatory, Mathematical, Mechanical Engineering, Naval Architecture, Textile Industries, Electrical Engineering and Applied Chemistry, commercial subjects, women's work, and Art. The Art department has been specially provided for: new buildings have been secured, and four masters, specialists in designing, drawing from life, painting and still life, and modelling, respectively, have been engaged. With a view to securing that, when built, the Institute would be filled with pupils in a condition to take advantage of special instruction, the Committee have gradually induced and enabled the various teaching institutions of the borough to take their proper place in the general scheme. The coming session will see an organised system of instruction at work in various schools in different parts of the city.

The following institutions have been merged in the general scheme:—The Government School of Art, the School of Applied Science (Model School), the Technical School (Hastings Street), the Evening Technical School of Science (the Royal Academical Institution), and the Working Men's Institute. No institution giving evening technical instruction now remains outside the general scheme. The Committee have further allocated £1,900 of the first year's grant in capital sums to day secondary schools for equipment and apparatus, in order to enable these schools to meet the difficulties of initial cost in connection with the Department's new regulations and programme.

The Borough Council of Cork have likewise done a good year's work. They formed a new Technical Instruction Committee, at the suggestion of the Department, and this Committee has formulated a scheme for the borough, of which the Department has approved. The scheme includes the establishment of a central Municipal Technical School, and a system of co-ordination with existing educational institutions similar to that which has been adopted in Belfast. There already existed in Cork the nucleus of a central Technical School in the Municipal Schools of Science and Art. These schools, better known as the Crawford Municipal Technical Schools, were presented to the City of Cork by the late Mr. W. H. Crawford, in 1884. The buildings are excellent in quality, and comprise Sculpture and Picture Galleries, Library, Lecture Theatre, Class Rooms for Art, and some rooms for Science and Technology. The Art School is fairly well equipped, and possesses a fine set of casts taken directly from the antique, under the personal supervision of Canova. These were presented by the Pope to George IV., and given by that King to the City of Cork. The buildings, however, will be quite insufficient in size for the proposed development. Accordingly, the Technical Instruction Committee in Cork are considering the best means of providing further accommodation for their central Technical Institute.

In Cork, also, the Municipal Council have appointed a Head Science Master for their proposed Technical Institute, who will render the same service as in Belfast in the organisation of the scheme, and in the aiding and stimulation of the existing schools, which should do their part as feeders to the central Institute when it is fully at work. The same procedure was adopted in the appointment of this principal, and, after due consideration of the candidates, Mr. O'Keeffe, a technological teacher who has had fifteen years' experience at

Finsbury Technical College, London, was appointed by the Committee, with the approval of the Department.

Out of the first year's grant the Technical Instruction Committee allotted to different secondary schools a sum of £1,600 for equipment and apparatus, in order to enable them to serve the purposes of co-ordination with the system of technical instruction already described. In future years it is the intention practically to reserve the whole of the technical instruction grants for the central municipal schools. These schools will include, besides the School of Art, technological classes in subjects which it is believed will be of direct value to existing and future industries and manufactures in Cork.

The School of Art has in the past done excellent work; but the Science classes, on the whole, have been starved. In the direction of Science and Technological instruction great changes may be expected. On the industrial side of the school there are classes for Lace-making and Crochet. These classes are largely attended, and most of the designs are supplied by students of the Design Class in the School of Art. A good feature of the School of Art is the system of scholarships in connection therewith. In 1892 ten free studentships were offered to pupils of National Schools in the city, admitting to evening classes. A preliminary test examination in freehand enabled the Committee to select the best candidates. In respect of scholarships the Exhibition of 1883 had important influence on the work of the School. It was decided that a surplus remaining from the fund raised for the Exhibition should be devoted to the endowment of two scholarships of £50 each, to enable successful candidates to receive a year's training at the Royal College of Art, South Kensington. At first these scholarships were limited to young men (industrial students or artisans), but in 1889-90 one of the scholarships was offered to women students. These scholarships have been of great benefit to many of the successful candidates; several have won scholarships in the College of Art, South Kensington, and have obtained appointments under the London School Board.

The Technical Instruction Committee of Limerick County Borough have moved with a greater deliberation, but a comprehensive scheme is now under consideration.

At Londonderry the School of Art has formed the nucleus of the new scheme, which will include a large development in science and technical classes, chiefly in Naval Architecture, Engineering, Carpentry and Joinery, and the erection of a Municipal Technical School suitable to the requirements of the city. The site for this school has been obtained, and plans are being discussed.

The scheme for Waterford City involves the erection of a central Municipal Technical School. Meanwhile four Secondary Schools have received grants for apparatus and equipment. The School of Art is to be used as the nucleus of the science and art and technical evening schools.

The other Urban Centres.

After the six county boroughs come in importance the large urban centres. With a view to enabling the Technical Instruction Committees to obtain information on the actual working of technical instruction which would be of use to them in the preparation of their own schemes, the Department suggested the sending of deputations to visit certain centres in England and Scotland where schemes of technical instruction could be seen in operation. This suggestion was, in the first instance, made to the Technical Instruction Committees of the County Boroughs of Cork, Limerick, Londonderry, and Waterford. Dublin and Belfast had already, on their own initiative, sent such deputations to England and elsewhere. The County Boroughs of Limerick, Londonderry, and Waterford adopted the suggestion of the Department, and a deputation from these three cities, accompanied by the Chief Inspector of

Technical Instruction of the Department, visited Birmingham, Manchester, Bolton, Longton, and Burslem. A Cork deputation was formed at a later date to visit centres in England and Scotland.

The results of these visits were very satisfactory, and it was decided to organise other visits of inspection on similar lines. In April four deputations, each accompanied by an officer of the Department, visited centres in England and Scotland. One deputation consisted of seven members of the Rathmines Technical Instruction Committee: this deputation visited schools—chiefly Schools of Commerce—in Liverpool, Leeds, Bradford, and London. The second deputation consisted of fourteen members of Technical Instruction Committees from Pembroke, Kingstown and Blackrock: technical schools in Longton, Leek, Radcliffe and Heywood were visited. The third deputation consisted of nine members of Technical Instruction Committees from Ballymena, Coleraine, and Lurgan: the members of this deputation visited technical schools in Glasgow, Leith, Paisley, and Dunfermline. The fourth deputation, consisting of seven members of Technical Instruction Committees from Dundalk and Wexford, visited technical schools in Bath, Swindon, Worcester, and Birmingham.

As to the actual schemes of technical instruction formulated by the urban centres and considered by the Department, those of Wexford, Armagh, Ballina, Ballymena, Blackrock, Coleraine, Kingstown, Lurgan, Rathmines, Tipperary (including the rural district) have been approved. In each case there were several conferences with the officers of the Department, resulting in a discussion of their reports on the local circumstances and needs, and a decision as to the types of schools, and the appointment of head instructors and organisers.

As the Wexford scheme was the first of those approved of, the outlines may be given here as illustrating the method followed of adapting schemes of technical instruction where local industries exist to the needs of these industries.

The central idea of the scheme is a small School of Engineering. Wexford has a population of about 12,000 inhabitants, and is the centre of much industrial activity. The manufacture of agricultural implements, building, and repairing-engineering, and coach-building, are the most important industries. The well-known works of Messrs. Pierce and Co., William Doyle, Thompson Brothers, R. & R. Allen, and those of the Wexford Engineering Company (which are about to be transferred to the town of Wexford), and Cooper's Cement Works at Drinagh, employ about 1,000 hands, and of these a good proportion are men whose work demands skill and experience with engineering tools. It is proposed to build, at a cost of £2,000, a new school, which, it is hoped, may be open in September or October, 1902. The subjects to be taught in the school would include Workshop Mathematics, Drawing (not only of a special character for artisans, but such as would be of use to ordinary students), Practical Geometry, Physics, Manual Instruction, Mechanical Engineering, Coach-building, and, from time to time, as occasion may desire, other subjects of a more important character. Instruction in technical subjects was commenced temporarily in the Town Hall in September, 1901.

The scheme for Athlone is an interesting illustration of how local contributions from other sources than the rates can be utilised in this work. In that town a local manufacturer of public spirit, has supplemented the money in aid of the scheme from the Urban District Council rate by subscribing a capital sum of £500, and an annual sum of £150, and the Department have arranged to include this handsome contribution in the finance of the scheme. The scheme includes provision in the existing schools for day and evening instruction in Science, Drawing, and manual work, and for the establishment of a technical school, in connection with the school of the Marist Fathers, in which

Wood-carving, Furniture-making, Basket-making, and other industrial subjects can be taught. It also includes provision for instruction in Cookery, Laundry-work, Domestic Economy, Needlework, &c., in the girls' schools.

The majority of the smaller Irish towns, whose character is more rural than industrial, will, in all probability, come within county schemes, and of schemes of technical instruction which include such towns, typical examples will be found under the next heading.

The Counties.

The counties have been active in their requests for the assistance of officers of the Department in the formulation of schemes. The position of the counties in reference to schemes of Technical Instruction, and to Agricultural schemes under the Department, involves a complication which it is not always easy for the representatives of rural districts to appreciate. Schemes for counties are chiefly aided from that portion of the Department's funds which is administered with the concurrence of the Agricultural Board, the proportion of the Department's funds coming through the Board of Technical Instruction generally being considerably smaller in rural districts. Rural Councillors are sometimes apt, in consequence, to feel a reluctance in approving of a County Council rate being applied in aid of technical instruction schemes in the urban districts of the county. It is necessary to make it very clear that the funds of the Department, no matter which channel they come through, are meant to be regarded as a whole, and that the schemes under the Act to which a county rate applies include schemes for the benefit of rural districts for which moneys come that are not available for urban schemes. Moreover, as pointed out in Part I. of the Report, the country towns in Ireland are intimately bound up in many ways with rural life, and are natural centres for many forms of technical instruction of which pupils from rural districts can avail themselves. In most of these towns a large proportion of pupils from surrounding rural districts attend the schools; by a system of bursaries or scholarships pupils from more distant rural districts can be helped to avail themselves of the teaching of these schools; and a system of technical instruction by means of itinerant teachers visiting rural districts or rural schools, usually can best be directed from such centres. The Department, accordingly, in considering schemes of technical instruction for counties, is obliged to arrange for the closest co-ordination between the work of its Agricultural Branch and that of its Technical Instruction Branch; and the Department's scheme for a county as a whole must be looked for under both heads. The schemes for which the funds of the Board of Technical Instruction are available in counties have been conceived with this idea carefully in mind. It will be understood that the task of organising Technical Instruction in the counties is one which will naturally take a longer time to complete than in urban centres. Considerable progress has, nevertheless, been made.

Twenty-four counties have had schemes under consideration, and many of these are well advanced. About half of them are so far forward that a considerable portion of the scheme will be in operation during the school session 1901-2. Five counties, viz., Carlow, Fermanagh, Galway, Meath, and Waterford, have had schemes fully approved; and those for Clare, Kerry, Louth, Queen's County, Sligo, and Tipperary North, are almost complete.

An instance of a county scheme of Technical Instruction (as distinct from Agriculture) which deals with some of the small provincial towns is that for North Tipperary. This scheme includes the towns of Nenagh, Thurles, and Roscrea. An economic system of co-ordination has been arranged with the County Council Committee, of which, for example, an instructress in Cookery, Laundry-work, and Home-sewing can give lessons in these centres, and other centres of the county, such as Templemore, Borrisoleigh, and Borrisokane.

(Under the Agricultural scheme for such a county these lessons would be supplemented by itinerant instruction in Dairying, Poultry-keeping, &c.) Similarly, co-ordination can be effected in the teaching of Drawing in the different centres. The Christian Brothers' Schools at Nenagh and Thurles are introducing the teaching of Practical Science, Drawing, and Manual Instruction, and of Technical Subjects suited to the local trades. The Lace class at the Presentation Convent in Thurles is being improved by aid for additional equipment and teaching, and a Day Technical School for domestic servants is being organised at the Mercy Convent, Nenagh.

SCIENCE AND ART GRANTS.

Besides its special endowment for technical instruction, to which the foregoing relates, and the grant under the Technical Instruction Act of 1889 in Ireland, the Department now administers, as from the 1st of April of this year, the grant for Science and Art in Ireland hitherto administered by the Board of Education, South Kensington. This is a Parliamentary grant in aid of Science and Art Instruction in day schools and in evening schools, and in some institutions (for example, Schools of Art), in which instruction is given partly in the day time and partly in the evening. It is an educational endowment which is capable of being utilised to a much greater extent than it has hitherto been in Ireland, both for the purposes of a liberal education and, indirectly, for those of a system of technical instruction. Ireland, in 1900, only earned £3,840 from this grant; while Scotland, in 1899 (the latest year for which figures are available), earned from it £38,800.

Instruction in Science and Art in Ireland has of late years fallen to a very low ebb. Ten years ago, in 1891, the Science and Art grants in Ireland amounted to £8,481, a sum which, though small, was twice the figure to which the grants have since declined. In 1891 the number of boys presented for Science in the Intermediate Examinations was 2,885; the number in 1899 was 673, less than one-fourth. In 1891 the total number of boys presented at these examinations was 3,856, whilst in 1899 it was 5,726.

Such was the situation of Science and Art instruction in this country when the Department took up its work as administrator of the Science and Art grant. Happily, it was a situation the mischiefs of which had already begun to be recognised by educational authorities in Ireland. For the Primary Schools under their control the National Commissioners of Education, following the recommendations of the Manual Instruction Commission, were engaged in introducing a new Programme, in which elementary Science and Manual Instruction are leading features. For Secondary Schools the Intermediate Education Commission had reported strongly in favour of Natural Science teaching; and an Act of Parliament had just been passed to enable an enlarged Intermediate Education Board to carry out the summary of conclusions of the Report. These facts, together with the statutory means for educational co-ordination provided in the Act which created this Department, rendered the occasion propitious for reform.

The New Programme.

The Department accordingly proceeded to revise the system on which the Science and Art grant had previously been administered in Ireland, and to draw up a new Programme of instruction in the subjects for which the grant might be earned in Secondary Day Schools (the revision of the system as regards Evening Schools being left over for the time being). This Programme was conceived with the two-fold object of rendering it less difficult for Irish schools to avail themselves of the Science and Art grant, and of helping them at the same time to introduce into their curriculum an element of great value both to general

education and, subsequently, to specialised practical instruction. As stated earlier in the Report, the Department approach this subject of the administration of the Science and Art grant primarily from the point of view of general education. They desire it to be understood that they regard a liberal introduction to general culture as the essential foundation for all sound forms of systematic specialised instruction whatsoever, and that, in their opinion, Science and Art instruction cannot be a substitute for humane letters in such a general course. It can, however, they believe, be made a powerful ally. Apart from its utility in teaching facts, Science instruction, if it be given through the laboratory (where the teacher does not dogmatise but stimulates and directs inquiry), rather than through the lecture-room, and if it be accompanied by a certain amount of instruction in drawing and manual work, becomes a valuable mode of intellectual training. It gives full opportunities for creating interest on the part of the pupil, it draws out his powers of observation, puts him in the attitude of a seeker after knowledge, and gives him accurate and orderly habits of thought. Having done its part side by side with Literary instruction, in a course of general education, Science and Art instruction will have prepared the pupils who have received it, when the age for specialisation comes, for those practical and technical courses towards which it is so important in Ireland to direct much of the teaching power of the country, and which it is the particular duty of this Department to organise. The new Programme of Experimental Science, Drawing, Manual Instruction, and Domestic Economy, which the Department prepared for the administration of the Science and Art grant, was conceived with a view to serving these purposes in the Secondary Day Schools.

It was essential that in this matter there should be no over-lapping of efforts nor divergence of aims on the part of the Department and the Intermediate Education Board. Accordingly the Department submitted their programme to the Intermediate Education Board, and the Board in its turn appointed a sub-committee to confer with the officers of the Department on the subject. As the result of these negotiations the Intermediate Board resolved to adopt the programme of the Department, and made it a part of their curriculum.

The following are the special Regulations of the Board as to Experimental Science and Drawing, Drawing, Domestic Economy, and Botany :—

"Drawing shall be allowed as a separate subject in all grades.

"The courses in Experimental Science and Drawing, and in Drawing "as a separate subject, shall be those adopted by the Department of "Agriculture and Technical Instruction for Ireland.

"Experimental Science cannot be taken without Drawing.

"The examinations in the subject of Experimental Science and Drawing, "and in Drawing as a separate subject, will be held by the Department of "Agriculture and Technical Instruction for Ireland. The Board will not "hold any examinations in these subjects.

"Every candidate who will be certified by the Inspector of the Depart- "ment of Agriculture and Technical Instruction for Ireland to have worked "satisfactorily through a practical course on the lines set out in the pro- "gramme for Experimental Science and Drawing of the Department, and "to have been present at the final inspection, shall be deemed to have "passed the examination in that subject.

"Candidates for Honours, Prizes, and Exhibitions who take up the "subject of Experimental Science and Drawing will be examined indi- "vidually by an Inspector of the Department, and the marks assigned by

"the Department shall be treated as if the examination in these subjects "had been held by the Board.

"In the year 1902 the course in Experimental Science and Drawing for "all Grades shall be the First Year's Course, as set out in the Programme "of the Department. In the year 1903, the course for the Preparatory "Grade shall be the First Year's Course of the Department, and for the "other Grades the Second Year's Course of the Department.

"In the years 1902 and 1903 the examination and inspection of the higher "Grades will be more searching, in consideration of the students having "reached a more advanced stage.

"The subjects of Domestic Economy and Botany will be ultimately "included in the Programme; but in the year 1902, pending the com-"pletion of arrangements with the Department of Agriculture and Technical "Instruction, and the establishment of a system of inspection, the Board "will not examine in these subjects, except as provided in Rule 53."

By this arrangement between the Intermediate Board and the Department a strong reinforcement of the new reform has been secured, and a close co-operation, which must prove of the greatest value to the interest of educational progress, has been established between the two authorities.

Aid to the Schools.

This arrangement has one great advantage for the schools. It provides that the rules and regulations governing the administration and distribution of Science and Art grants, and also the inspection of all science and art instruction in Secondary Schools in Ireland, are, for the time being, entirely under the care of one authority. The Department took the earliest steps to facilitate the introduction of the Programme into the schools. It was clear that as the natural result of the previously existing situation of science and art instruction the schools were ill prepared for the change proposed. They suffered from three serious drawbacks:—

(1) They were without definite aims in such Science and Art instruction as they had been giving;

(2) They had, as a rule, neither laboratories nor specialised art rooms;

(3) There was, on the whole, a dearth of science teachers with experience of experimental work.

The Department endeavoured to meet the first of these drawbacks by publishing with their Programme a pamphlet setting forth the aims of the instruction, and suggested syllabuses of the first two years' work; and at the same time, by taking the heads of schools into direct conference on the subject. This latter was a new and, it is believed, a useful, step in the action of an educational Department of the State in these countries towards the schools with which its work is concerned. A conference of some thirty representatives of the more important day schools was arranged at the offices of the Department. The members of the Sub-Committee of the Intermediate Education Board and the chief officers of the Department attended. A day or two before the conference the pamphlet referred to was in the hands of the members; at the conference, lasting some three hours, the contents were submitted to criticism; and to ease down the difficulties of introducing the system, several important details were altered.

With regard to apparatus and equipment, the Department propose to help the schools on the one hand by means of financial grants, and on the other

with expert advice. Having regard to the fact that no system of technical instruction can be efficient for a country until the general schools of the country have incorporated in their regular curriculum a sound system of teaching in science and drawing, the Department felt that part of its first year's endowment for technical instruction which could not be expended on schemes before 1st April, 1901, might be applied in aiding the Secondary Schools to acquire the apparatus and equipment necessary for the new Programme. They accordingly, with the concurrence of the Board of Technical Instruction, made such aid a feature of schemes in most localities throughout the country. They had, moreover, a small allowance for apparatus and equipment under the Science and Art grant, which was similarly applied. At the same time the Department had prepared dimension drawings of typical laboratories and issued them to the heads of schools asking for them. Suggestions with regard to the equipment, and a list of indispensable apparatus for the first two years' work in Science, accompanied by a statement of the probable cost, were issued to the Managers of all Secondary Schools in Ireland. Further, the schools were invited to send dimensioned drawings of the rooms proposed to be converted into laboratories. At the moment of writing one hundred cases of provision of laboratories have been dealt with. A suggested arrangement (with accompanying notes, hints, and advice with regard to equipment and necessary apparatus) has been supplied to the school. Where necessary, an officer of the Technical Instruction Branch of the Department visited the school and gave the Managers the benefit of his experience on the spot. The arrangements finally decided on have been approved. The number of laboratories to be dealt with in this way is daily increasing, and shows that the work of Science and Art instruction in Day Secondary Schools is largely to be taken up in the coming session.

Special Courses for Teachers.

As to the provision of teachers, it was decided to meet this difficulty by holding short courses of instruction during the months of July and August, with a view to enabling teachers who who had already received a training in Science to obtain the necessary knowledge and skill to give the first year's instruction in the new Programme of Introductory Physics or Drawing. It should be understood that these short courses were not to be given to teachers in a subject with which they had not been previously conversant. They were, rather, courses to train teachers in a special application of a subject which they were already qualified to teach. It was found, on communicating with the schools, that there were a very considerable number of teachers who had already had sufficient training to enable them to benefit by the special course. Further courses will be given to the same, and to other teachers, to prepare them for giving the second and further years' instruction in the new Programme.

Courses in Experimental Science (Introductory Physics) were held in Dublin, Belfast, and Cork. A course of twenty days' instruction, from 10 a.m. to 4 p.m. each day (Saturdays, 10 a.m. to 1 p.m.), was arranged for at the Royal College of Science, Dublin, in charge of Professor Barrett and seven assistants. For this course seventy teachers were accepted. A course for forty teachers, also in Introductory Physics, was arranged for at Queen's College, Belfast, in charge of Professor Morton and three assistants; and a similar course, also for forty teachers, was arranged for at the Christian Brothers' School, Cork. The Professor in charge at this centre was Mr. John Buchanan, D.Sc., of Gordon's College, Aberdeen. He was assisted by three demonstrators. These courses have been most successful.

With a view to placing similar opportunities for instruction within the reach

of the nuns of the various teaching Orders, courses were organised at four centres, and given successfully.

Practical and written examinations were held at the close of each course; the teachers' work during the course and the results of the practical examinations being determined by the Professor in charge, the written papers being valued by examiners unconnected with any of the classes.

A course of four weeks' instruction for teachers of Drawing was organised at the Metropolitan School of Art, Dublin. The course was in charge of Mr. Brenan, the headmaster, assisted by four members of his regular staff. Eighty teachers attended this course.

In all these courses no less than 293 teachers, representing 196 schools have been in attendance; and it has been gratifying to find that a large number of teachers were willing to sacrifice their holidays in the work of preparation for the coming session. They attended the courses with admirable punctuality and regularity; and in work, beyond the regular hours of the course, displayed a keenness and enthusiasm which were remarkable, and augur well for the future of Science and Art instruction. As the results of this form of instruction are to be tested, and grants paid mainly on inspection, a great responsibility is thrown on the teachers and on the inspectors of the Department. The teachers have shown their willingness to share the burden; it is hoped that the steps already taken by the Department in the direction of establishing the new scheme by training teachers and offering advice as to equipment of laboratories, &c., may be continued and supplemented during the coming session through the Department's inspectorate, whose duties will be largely of a constructive character.

Evening Schools.

The need for revising the system of grants for Science and Art instruction to schools other than day schools was not immediately urgent, and it was, therefore, decided to continue substantially the same regulations as had hitherto applied (those of the Science and Art Directory of the Board of Education, South Kensington) for the session 1901-2. It is hoped by another session that the officers of the Department will have had sufficient experience of the needs and possibilities of evening instruction in Ireland to enable them to advise the Department in regard to a revised system.

The Work of the Session 1900-1901.

The academic year just closing was the first in which grants were to be paid on the results of inspection alone. The changes in the inspectorate during the year and the exceptional pressure of work resulted in the inspection being far less thorough than was intended.

Science and Art classes in connection with the Board of Education (South Kensington), as shown in the following statement, were in existence:—

Science and Art Schools and Classes in Ireland.

Total number,	127
Number giving evening instruction,	35
,, ,, day instruction,	92
,, ,, Art instruction only,	33
"Schools of Science,"	2

The number of large institutions is small. In some of these very good work is done; in others the work, as a whole, is poor.

In Day Secondary Schools in connection with the Board of Education (South Kensington) practical instruction in Chemistry was given in only four cases; in Physics in two cases only. In no other schools was practical in-

struction given. Of the laboratories in which this work was carried out, two only could be described as satisfactory in regard to size and equipment. The usual subjects taught in these day schools were Mathematics, Practical Plane and Solid Geometry, and Mechanics (Solids and Fluids). Physiography, Electricity, and Magnetism and Chemistry were next in order of frequency. Mathematics, in general, was efficiently taught, the Euclid being, as a rule, very sound.

Instruction in Practical Plane and Solid Geometry suffered much from want of illustrative models; and, as a rule, the Solid Geometry was left untouched. In most schools the instruction in Mechanics and Chemistry was mainly in preparation for the written examination of the Intermediate Education Board. In some few cases, the school possessed no apparatus at all; in most, far too little use was made of that which they did possess. In a very few cases only were note-books systematically and regularly kept.

Much earnest and painstaking work was done in the Art classes throughout the session. Improvements in method, however, are possible, and it is felt that the development of these classes will receive fresh impetus under the Department's new Programme.

Technical Schools were allowed, during the past session, an equivalent grant under Sections LXXXVI. *a.* and LXXXVI. *b.* of the Directory of the Board of Education, South Kensington. Much of the work assisted in this way was distinctly good. In a few cases the work requires reorganisation.

RURAL INDUSTRIES.

Lace, Crochet, and Needlework.

Out of the sum voted by the Agricultural Board for rural industries, to be administered with the concurrence of the Board of Technical Instruction, twenty-one Home Industries societies and classes were assisted. The industries promoted by these societies are mostly those which can be carried on by women of the rural classes, such as lace, crochet, embroidery, needlework; and the aid consisted chiefly of a grant to meet the salary of the teacher giving the necessary technical instruction. These societies and classes are distributed over eleven different counties. The approximate number of workers involved is 1,011. The workers, who are chiefly the daughters of small farmers and labourers, help on the farm during the busy season of the year, and resume the industry when pressure of work it over. Few devote all their time to the industry; it is rather the occupation of their leisure hours, and is thus distinctly supplementary to agriculture.

The lace and crochet industry is capable of much development in Ireland. Crochet, moreover, can be produced under difficult conditions, and is adapted to all classes of workers. The finer varieties of crochet require as much care and as delicate handling as any other sort of lace, but ordinary crochet in white thread can be washed, steeped, even boiled and bleached before it is sent to market. This fact alone enables the crochet industry to be carried on in many a poor cabin where lacemaking would be impossible. But to establish these industries on a permanent basis a high standard of quality must be maintained. To this end a knowledge of drawing is of the greatest importance to all workers, in enabling them to reproduce patterns with truth, accuracy, and artistic feeling. Girls who can draw, and who are good at plain sewing, are able to produce saleable work in a much shorter time than others. For crochet a knowledge of drawing is even more important than for lace, for the crochet-worker has often to form her own pattern, and join her details to fit into certain shapes, as best she may, without plan or guidance. Such work, to be done in the best manner, calls for some knowledge of design, as well as of drawing

To meet these requirements the Department have sent to lace and crochet classes, whenever possible, teachers who possessed a knowledge of drawing and design, and they have under consideration special courses of instruction in design to be given at the Metropolitan School of Art to lace and crochet teachers. At the same time the introduction of the Department's new Programme of Drawing into the schools will have an important influence upon the position of these industries, as well as on the prospects of other artistic industries in Ireland.

PIONEER LECTURES.

Technical Instruction—Pioneer Lectures.

During the winter a scheme of "Pioneer Lectures" was organised, in order, as stated in a prospectus sent to every local authority, "to illustrate the need and use of scientific instruction in agriculture and industries, and to explain to local authorities and the public generally, and especially to the working classes, the manner in which the Department can aid in supplying this need." The syllabus of Pioneer Lectures was divided into two sections, under the headings, respectively, of Agriculture (including Veterinary Science) and Technical Instruction, the former being intended for rural audiences and the latter for townspeople. In both cases the kind of audience which the Department had mainly in view was one composed of farmers and artisans, and the subjects were, therefore, treated in a strictly practical manner, and, where suitable, were accompanied by lantern illustrations. The Department supplied the lectures free to any County Council or other local authorities applying for them, on the latter undertaking to provide a suitable hall, and to meet all purely local expenses, including advertising.

Up to the 31st March a considerable number of lectures from the Technical Instruction Syllabus had been delivered in large and small towns throughout all parts of Ireland on the subject of the Textile Industries, the Building Trades, the Machine Trade, the Electric Current, Art in application to Industry, Science in the Household and the general principles of Technical Instruction as applied to Industry. The lecturers were—Professor Beaumont, of the Yorkshire College, Leeds (the Textile Industries); the Rev. P. J. Dowling, C.M.; Professor James Lyon, M.A., Royal College of Science, and Mr. William Gray, M.R.I.A. (Technical Instruction); Mr. William Tatlow, M.A. (the Electric Current); Mr. R. C. Orpen, C.E. (the Building Trades); Miss O'Conor-Eccles (Science in the Household), and Mr. T. W. Rolleston, M.R.I.A. (Art and Industry). Professor Lyon also lectured on the Machine Trades. Among the places visited by lecturers, on invitation of the local authorities, were—Armagh, Athlone, Ballymena, Banbridge, Belfast, Clonakilty, Clonmel, Coleraine, Cork, Drogheda, Dungannon, Enniscorthy, Galway, Kilkenny, Killarney, Limerick, Nenagh, Skibbereen, Sligo, Thurles, Tralee, Waterford, Youghal; the lecturing centres being distributed very evenly throughout the country. The lectures were in general largely attended, and excellently reported in the provincial Press, which thus helped materially in enabling the objects of the scheme to be fulfilled. In almost every case the Committee in charge of the local arrangements were cordial in their co-operation with the Department, and carried out the duties which devolved upon them ably and successfully. From Press reports and other information received by the Department, it is clear that the lectures have been of much service in bringing the value and meaning of technical instruction before the working classes, especially in the smaller centres of population, and they have, in many cases, been followed by requests for guidance in the drawing up of schemes of technical instruction.

THE ROYAL DUBLIN SOCIETY.

The Royal Dublin Society owes its origin to some fourteen citizens of Dublin, who met in the rooms of the Philosophical Society of Trinity College on June 25th, 1731, for the purpose of considering how they could best "promote improvements of all kinds." The outcome of their deliberations was the establishment of "The Dublin Society for improving Husbandry, Manufactures, and other Useful Arts and Sciences." The original founders of the Society, if we are to judge by the titles of the papers read before its Science Section in the early days, had a just idea of the importance of developing the scientific side of practical industries. The first paper read was one by Thomas Prior upon "A New Method of Draining Marshy and Boggy Lands." Then there was a paper by the same author on the cultivation and management of hops, and one by Dr. Steevens (the founder of Steevens' Hospital), entitled "A Dissertation on Dyeing, and the several materials made use of in Dyeing, and particularly Woad." Other papers on various scientific subjects occupied the attention of the Society in the first few months of its existence.

The Society, at an early stage in its history, became the medium for the administration of funds for the encouragement of Science, Art, and Industry. These funds were originally provided by the members themselves, but in 1761 the Irish Parliament voted the Society a sum of £2,000. This grant was gradually increased until 1800, when it amounted to £15,500. The Imperial Parliament varied the grant considerably, which in 1832 only amounted to £3,000; but it was subsequently increased to a little over £6,000. Originally, most of the money available was spent on premiums, which were awarded for a variety of subjects. Thus, in the year 1765, a sum of £1,215 was devoted to Agriculture and planting. This included premiums for the reclamation of bog and mountain land, the growth of cereals and root crops, the planting of fruit and forest trees, the fencing and irrigation of land, the improvement of bee-keeping and the growth of dye-stuffs.

In 1771 a committee was appointed "to consider in what manner it might be expedient to give encouragement for the establishment of good public breweries in different parts of the kingdom." They reported shortly afterwards that, in their opinion, "the discouragement of the consumption of low-priced spirituous liquors in the country is an object of the utmost consequence to the health and morals of the people, as well as to the police and manufacturers of this kingdom, and of course highly deserving of the attention of the Dublin Society." Also "that the erection of new breweries, for a good kind of malt liquor, in the several provinces of this kingdom would be the most likely means to promote this desirable end." The Report was adopted, and a premium of 4*s.* per barrel was offered for the first 1,000 barrels brewed in a new brewery and sold at 30*s.* a barrel. The Society continued its efforts in this direction for some time, till the brewing industry became firmly established in the city.

Various premiums were offered for Manufactures, including the manufacture of broad-cloths, wool combs, stocking frames, felt hats, pearl barley, tanning, knitting, and the production of saltpetre and smalt. One of these premiums, that would not commend itself to modern ideas, was for the person who should employ the greatest number of children not exceeding 13 years of age. The premiums for the encouragement of fisheries amounted to £150, and were offered for the promotion of new fisheries, and for the largest takes of fish. A sum of £100 was also offered for the discovery of black lead mines, beds of fireclay, and for the production of fuller's earth, whilst a premium of £50 was offered to the author who should produce the best Natural History of any county, and £22 15*s.* to the author of the best "Farmer's Monthly Kalendar."

Meanwhile the Society had acquired a local habitation. The first meetings were held in the rooms of the Philosophical Society in Trinity College, and then, for a time, it met in one of the Committee rooms of the Parliament House. On account of its development the Society acquired premises of its own in 1756, in Shaw's-court (now the site of the Commercial Buildings). In 1768 the Society moved to more commodious premises, at No. 114, Grafton-street. In their turn these premises were found to afford insufficient accommodation, and the Society erected a large building in Hawkins-street and Poolbeg-street. This house, which subsequently became the old Theatre Royal, was not long occupied, and in 1815 the Society purchased the city residence of the Duke of Leinster, in Kildare-street, and since that date Leinster House has been the Society's headquarters. In 1732 a field at Ballybough Bridge was taken by the Society for "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." This was the first step in the establishment of the Royal Botanic Gardens. In 1736 four acres of land near St. Martin's-lane, Marlborough-street, were taken, and in 1795 the Society secured the site now occupied by the gardens at Glasnevin.

From the very beginning books were purchased, and some, such as Jethro Tull's Treatise on Husbandry, were printed and distributed at the expense of the young Society. Models and specimens began to accumulate, and with the permission of the Lords Justices, they were deposited for public inspection in a vault of the Parliament House. Such was the beginning of the Library and Museum. A catalogue of the Library about the year 1740 which is extant includes eighteen folio volumes, eleven quartos, and seven octavos, published between the dates 1618 and 1736.

Arthur Young, in his *Tour in Ireland*, published in 1780, was already able to extol the Society's work:—"Great honour," he writes, "is due to Ireland for having given birth to the Dublin Society, which has the undisputed merit of being the father of all the similar societies now existing in Europe. . . . For some years it was supported only by the voluntary subscriptions of the members, forming a fund much under £1,000 a year; yet was there such a liberality of sentiment in their conduct, and so pure a love of the public interest apparent in all their transactions, as enabled them, with that small fund, to effect much greater things than they have done in later times, since Parliament has granted them regularly £10,000 a session."

Early in the nineteenth century a number of inspectors were appointed to make statistical surveys of the different counties, and 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 nearly a century ago. Out of this work arose the Geological Survey of Ireland. It began with the survey of the County Kilkenny, which was entrusted by the Society to Mr., afterwards Sir, Richard Griffith, the Society's Mining Engineer. The survey was extended to the rest of Ireland, and Griffith's Geological Map is still a standard work. A difficulty arose in this work through the lack of proper maps of the country. The Society commenced a trigonometrical survey, and after considerable progress had been made in the south of Ireland, the Government took over the work. Thus commenced the survey now carried on by the Ordnance Department, which has its head quarters in the Phœnix Park.

The Irish Parliament had already entrusted the Society with the formation and management of Drawing Schools, and of a Museum of Natural History, in connection with which Professorships of Chemistry, Mineralogy, Natural History, and Botany, were also established. In 1845 the Government decided to create in Ireland an institution similar to the Museum of Practical Geology in London, and a house in St. Stephen's-green was taken for this purpose. Its original scope was, on the recommendation of its first Director, Sir R. Kane, extended and, under the name of the "Museum of Irish Industry and Government School of Science applied to Mining and the Arts," it embraced the whole range of the Industrial Arts. In 1853 it was placed under the control of the Department of Science and Art. The inter-relations of this Museum and those institutions of the Royal Dublin Society, which were partly maintained out of State money, became rather complicated, and in 1865 a re-adjustment had to be effected. The Institution in St. Stephen's-green ceased to be developed as a Museum, and its "School of Science applied to Mining and the Arts" was converted into the Royal College of Science, and the greater part of its collections were transferred to the Museum of Natural History. The funds required for this Institution, the Botanic Gardens, and the Library, were henceforth entirely provided by the State, which also defrayed most of the expenses of the School of Art, whilst the Society was responsible as trustees for the administration. In 1877 it was found necessary to make a fresh arrangement, with the result that the Government took over the control of the Museum, the Metropolitan School of Art, the Library, and the Botanic Gardens, and acquired the Leinster House and the adjoining premises. The Government, besides making certain payments, arranged to give the Society such accommodation in the Leinster House, free of rent and taxes, as might be sufficient for the functions of the Society, on conditions similar to those accorded to the learned Societies accommodated in Burlington House.

The Society nominates a large number of the Council of Trustees of the Botanic Gardens and the Library (now known as the National Library of Ireland), and of the Board of Visitors of the Science and Art Museum, and so still exercises a considerable influence over these institutions. The Museum, which, under the title of the Science and Art Museum, was greatly extended and improved by the addition of the fine collection of Irish Antiquities formerly belonging to the Royal Irish Academy, was placed under the care of a Director, appointed by the Science and Art Department. After much discussion as to the advisability of building on the Leinster Lawn, two wings were added to Leinster House. The wing, extending from Kildare-street nearly up to the National Gallery, was devoted to the

National Library and the Metropolitan School of Art, whilst the south wing and the annexes since added (extending from Kildare-street up to the rear of Upper Merrion-street) were devoted to the Museum. In pursuance of the Agriculture and Technical Instruction (Ireland) Act, 1899, the powers and duties of the Department of Science and Art, with regard to these institutions and the Royal College of Science, have been transferred to the Department of Agriculture and Technical Instruction for Ireland.

The separation effected in 1877 between the Society and the Science and Art institutions inaugurated a new era in the history of the Society. The increased freedom and independence of the Society enabled it to strike out new lines of action, and to devote itself more particularly to agricultural and scientific pursuits, notably to its famous Horse Show. Despite, or perhaps in consequence of, the large sums of money which have been expended upon the Show buildings, the Society is in a most flourishing financial condition, with a large capital fund, and a yearly income of about £25,000. This money is spent in the promotion of Science and its applications, Agriculture, Art and Industries. These departments are under the control of three distinct sections of the Council; the three sections, meeting jointly, along with the honorary officers, constitute the governing body of the Society, a parliament in which the control and management of the affairs of the corporation is completely vested. Each section of the Council is the nucleus of a Committee which is intrusted with the detail work of the department to which it belongs. The Council and the additional members to form the Committees are elected annually by the Society.

Of all the Society's undertakings the annual Horse Show is, without doubt, the best known in this and other countries. In the fifth volume of the late Sir John Gilbert's edition of the Dublin Calendar an interesting letter of Sir William Temple's is quoted urging on the Earl of Essex, the Lord Lieutenant of the day, the advisability of holding both a "horse fair and races" every year for the space of a week in the "fairest green near the city of Dublin. At each race may be two plates given by the King, one of thirty pounds, and the other of twenty (besides the fashion), as the prizes for the first and second horse . . . Besides these plates the wagers may be as the persons please among themselves; but the horses must be evidenced by good testimonies to have been bred in Ireland.

"For honour the Lord Lieutenant may ever be present himself, or, at least, name a deputy in his room, and two judges of the field, who shall decide all controversies, and, with sound of the trumpet, declare the two victors. The masters of these two horses may be admitted to ride from the field to the Castle with the Lord Lieutenant or his deputy, and to dine with him that day, and there receive all the honour of the table. This to be done what quality soever the persons are of; for the lower that is, the more will be the honour, and perhaps, the more the sport; and the encouragement of breeding will, by that means, extend to all sorts of men.

"For the fairs the Lord Lieutenant may likewise be present every day in the height of them, by himself or deputy; and may with the advice of the two chief officers in the Army then present chuse out one of the best horses and two of the best geldings that appear in the fair, not under four, and not above seven years old, for which shall be paid to the owners of them, after sufficient testimony of their being bred in Ireland, one hundred pounds for the horse, and fifty pounds apiece for the geldings.

"The benefit of such an institution as this will be very great and various:

for, besides the encouragement to breed the best horses, from the honour and gain already mentioned, there will be a sort of public entertainment for one whole week, during which the Lord Lieutenant, the Lord Mayor of the city, and the great officers, both civil and military, ought to keep open table for all strangers. This will draw a confluence of people from all parts of the country. Many, perhaps, from the nearer parts of England may come, not only as to a public kind of solemnity, but as to a great mart of the best horses. This will enrich the city by the expense of such a concourse, and the country by the sale of many horses into England, and, in time, into foreign parts."

These acute anticipations of more than two centuries ago have been more than realized to-day. Not only from the "nearer parts of England," but from nearly every country in Europe, and from America, visitors come to enjoy the matchless display offered every August by the Horse Show of the Royal Dublin Society. The first Show was held by the Society in July, 1868, when 368 horses were entered, and prizes were awarded to the value of £470. The Show was held each year, up to 1880, at the Society's Agricultural buildings in Kildare-street, on the site of the present Museum. In consequence of the changes made in 1877, the present splendid premises at Ball's Bridge was acquired, upon which a sum of nearly £70,000 has been expended. How the Show has since prospered is best shown by the following figures, which speak for themselves:—

	Entries.	Attendances.
1868, First Show, Kildare-street,	368	—
1880, Last Show, Kildare-street,	600	—
1881, First Show, Ball's Bridge,	589	17,736
1882,	694	14,973
1883,	733	19,980
1884,	806	26,558
1885,	761	22,481
1886,	837	24,251
1887,	950	26,244
1888,	1051	32,534
1889,	1075	36,711
1890,	1324	43,438
1891,	1325	46,083
1892,	1304	53,457
1893,	1156	49,856
1894,	1081	50,250
1895,	1402	58,636
1896,	1363	58,728
1897,	1431	66,167
1898,	1367	59,252
1899,	1397	59,276
1900,	1322	55,326
1901,	1277	56,694

The Society also holds a Spring Show of Breeding Cattle, Implements, etc., and a Winter Show for Fat Cattle, Poultry and Farm Produce. These Shows, though not so popular as the Horse Show, are of greater agricultural interest. They originated late in the eighteenth century, in the efforts of a body known as the "Farming Society," which was carried on under the

patronage, and with the financial support, of the Dublin Society. The Spring Show has gradually, but steadily developed, and can now claim to be one of the largest, if not the largest, Show of breeding cattle in the world. The Society administers a yearly Government grant of £5,000 for the improvement of the Breed of Horses and Cattle. It has also carried out some useful agricultural inquiries and experiments, especially in connection with the prevention of the potato disease, and with example holdings. The Society gives assistance to a number of Provincial Farming Societies, and employs a Chemical Analyst and a consulting Entomologist and Botanist. Other branches of the Society's work include the holding of Exhibitions of Lace and Wood-carving, at which liberal prizes are offered. A survey of the fishing grounds of the west and south-west coast of Ireland has been conducted under the auspices of the Society, which defrayed half the expenses, the rest being borne by the Government.

The work of the Society in Science is carried on at evening Meetings, at which original communications are read and discussed. The papers are subsequently published in the Scientific Transactions and Proceedings, and the Economic Proceedings of the Society, and by a system of exchange these publications are distributed amongst about 400 of the leading Scientific Societies in all parts of the world. Systematic courses of Science lectures for young people, and popular courses on subjects of scientific interest are delivered each Session. Art is encouraged by Scholarships and Prizes, and the Recitals of Classical Music, which are given during the Session, are said to have had a marked influence on the development of Music in Dublin. The Members and Associates (numbering about four thousand) have also at their disposal reading rooms and a library containing over 20,000 volumes, which includes, along with works of general interest, the most important collection in Ireland of the publications of Learned Societies.

THE ROYAL AGRICULTURAL SOCIETY OF IRELAND.

Amongst the great voluntary Societies aiming directly at the improvement of Irish husbandry, an important place must be accorded to "The Royal Agricultural Society of Ireland," founded in the year 1841. The original conception of this body was due to the practical sense, the enthusiasm, and philanthropic spirit of the late Peter Purcell. This gentleman (whose Memorial Tablet may be read in the Roman Catholic pro-Cathedral, Marlborough-street), was, in addition to being a large landed proprietor, an owner of stage coaches, a mail contractor, and a large employer of labour in Dublin. He was a man of great public spirit, and, in his economic ideas, was ahead of his time.

In the early part of 1841 a well attended public meeting was held in the Royal Exchange, Dublin, under the presidency of the Duke of Leinster.

Mr. Peter Purcell gave a brief account of the proceedings that had led up to the formation of the Society, and announced the formation of provisional Committees and gave some details of the work already done. It was resolved that all donations to the Society should be funded at once with a view to securing financial stability, and "that nothing but the interest of the money and the annual subscriptions should be applied to current expenditure." The Duke of Leinster suggested the propriety of "giving honorary rewards as much as possible to the gentry, and the money and more substantial prizes to the farmers and the labourers." Mr. Naper, one of the Vice-Presidents of the Dublin Society, said that a resolution had been passed by that Society that it "was ready and willing to give such aid and co-operation as its means and premises might afford to the new Agricultural Improvement Society of Ireland." It was further announced that the subscriptions and donations promised amounted to £3,983, of which sum as much as £3,199 had then been lodged in La Touche's Bank, and that forty-six annual subscribers had sent in their names to the Society. A large correspondence was then read, including letters from the Bishops of Kildare and Derry and from the Roman Catholic Primate and Archbishop of Dublin and the Roman Catholic Bishops of Elphin, Kildare and Leighlin, Achonry, and Raphoe, besides several of the most influential of the clergy, gentry, and landed proprietors from all parts of the country.

So great was the desire to communicate with this Society that numerous applications were forwarded from various quarters, particularly from the local Agricultural Societies already in existence, seeking for support.

A number of letters were read, some describing works of Agricultural

improvement in progress, others suggesting schemes of Agricultural improvements and development. Among the correspondents were Mr. Blacker, Market Hill, County Armagh, Mr. Justin Brenan, and Dr. Edward Bewley, Secretary to the Moate Agricultural Society.

The rules and regulations for the government of the Society were then read, and the primary objects of the corporation were discussed and decided. The following were among the chief provisions :—

1. The establishment of at least one Annual Agricultural Show, to be held each year, and as far as possible, in each of the four provinces alternately.

2. The founding of Local or District Agricultural Societies, to act in co-operation with the parent Society for the improvement of husbandry, farming, and the breeding of cattle.

3. The establishment of an Agricultural Museum in Dublin for the exhibition of the newest and most improved implements of husbandry "similar to that in Stirling."

4. The encouragement and circulation of practical and useful knowledge connected with husbandry and Agriculture in all branches through the medium of cheap periodical publications and the formation of an Agricultural Library in Dublin.

Information as to the transactions and enterprises of the Highland Society of Scotland was received and discussed, and it was decided to work as far as possible on the lines of that Society.

It was further resolved that the first great Agricultural Meeting and Cattle Show should be held by the Society in some large and central town, in one of the four provinces, in 1842; that the prize list and regulations should be published at least six months before the Show.

Whilst assisting Local Societies with aid and advice it was determined to avoid exercising anything like dictation, control, or any direct interference in the rules or regulations of such Societies beyond what the Society might deem absolutely necessary. As an illustration of the method to be followed in aiding Local Societies it was suggested that if a County Association should enter into communication with the Central Society for Ireland in Dublin and prove to its satisfaction that their Annual Exhibition or Cattle Show was to take place on a certain day, and under certain regulations, and that a fixed sum had been collected or subscribed for the purpose, that the head Society should offer to give certain premiums or prizes of a specific kind to be competed for under certain rules and conditions. An arrangement was also suggested for the classification of the prizes of Local Societies that were to be aided from the funds of the general Society, with a view to meeting the peculiar circumstances of each locality. For instance, in low or marshy counties prizes for land drainage were to be given, and water meadows and irrigation, where suitable, were to be encouraged. The use of bulls and rams of breeds suitable for the various districts; and in the North of Ireland flat cultivation, on improved principles, were to receive assistance, and improvement in the methods of green crop cultivation was to form one of the chief objects of the Society, as this was considered to be an

excellent mode of securing the permanent and lasting improvement of Agriculture.

In consideration of the great difficulty in inducing the peasantry to adopt improvements in Agricultural tools and implements, the establishment of an Agricultural Museum in Dublin, and afterwards in the provinces, was decided upon. This idea was not carried out by the Royal Agricultural Improvement Society, but was, as is well known, subsequently realised by the Royal Dublin Society on their premises in Kildare-street. The Society also made one of its principal objects the publication and distribution of practical knowledge by the publication of Essays by competent persons, and afterwards by the starting of a journal of the Society in which papers written for meetings of the Society and the discussions following were published. The first measure discussed for the amelioration of Agriculture "was the formation of an establishment of a collegiate nature in the form of an Agricultural School or College, on an extensive scale, for the education of farmers' sons in all the different branches of husbandry, so as to qualify them hereafter as practical farmers in different parts of the country." The want of such an institution had been long felt, and its necessity in some central part of the country was fully recognised. The Glasnevin Agricultural School had been just established at this time, but as this institution was intended solely for teachers it was considered inadequate to meet the necessities of Agricultural instruction for farmers' sons. The general plan of the proposal to establish an Agricultural College was discussed, and a sub-committee was arranged to prepare details. It was hoped that afterwards provincial schools might follow, but the Society would for the present confine itself to the promotion of one large Agricultural College and allow Model Farms and Agricultural Schools to develop with time. It was considered inexpedient that the funds of the Society should be applied under any circumstance to the foundation of such an establishment; but the Society hoped that when its prospective benefits were known and fully appreciated, the most ample means would be forthcoming for its institution and support. As an outcome of the discussion upon the necessity for a great Agricultural College for Ireland, a committee of the Society was formed which included the names of Acheson Lyle, Chairman, the Provost of Trinity College, Thomas Hutton, George Alexander Hamilton, and James Redmond Barry, gentlemen who at this period were well known as leading philanthropists. A large farm was secured at Leopardstown, County Dublin, the property of Mr. Anthony Hawkins, a prospectus was issued, and the College opened.

The Society recognised the great desirability of encouraging improvement in the social condition of the Agricultural labourers and small farmers of Ireland. "They are therefore firmly persuaded that no measures can be adopted for permanently and effectually promoting the Agricultural interests in Ireland which do not tend to advance the moral and social condition of the labouring population and to elevate them in society, so that they may learn to feel that the interests of all classes are identified."

During the remainder of the year 1841 considerable energy was exercised in placing the Royal Agricultural Improvement Society of Ireland on a

satisfactory basis. The existing Local Societies came forward for affiliation and support. The Societies were:—

Name of Society.	County.
North Inishowen	Donegal
Ballytore	Wicklow
Moate	Westmeath
Portlaw	Waterford
Barrymore and Imokilly	
Tullamore	King's
Wicklow	Wicklow
Kells and Callan	
Galmoy	
Ballinasloe Union	Galway
Upper Ossory	Kilkenny
Dromore	
West Carbery	Cork
Mallow	Cork
Fingal	Dublin
Innistiogue	Kilkenny
Shillelagh and Cashaw	Wicklow
Louth	Louth
County of Cork	
Newport Pratt	
Limerick	
Clara, and Tipperary	
Nenagh Union	
Drogheda, Meath, and Louth	

Of the Local Societies then existing, twenty became affiliated and received premiums for distribution in their respective districts as follows:—

STOCK.

For the best Bull in district. The Society's Silver Medal.
For the best Breeding Cow, the property of a farmer holding not more than 40 acres. £1 10*s*.
For the best Yearling Heifer, under similar conditions. £1 10*s*.
For the best Breeding Sow, under similar conditions. £1 10*s*.

HUSBANDRY.

For the best 5 acres of Turnips. The Society's Silver Medal.
For the best half acre of Drilled Turnips, the property of a farmer, as before. £2.
For the best half acre of Red Clover, same conditions. £1 10*s*.
For the best acre of Drilled Potatoes, same conditions. £1 10*s*.

Before the end of 1841 twenty-two Local Societies in addition to those that had received aid for prizes became connected with the Central Society, these were :—

Name of Society.	County.
Antrim Union	Antrim
Bandon Union	Cork
Bangor	Antrim
Ballymoney	Antrim
Carickfergus and Kilroot	Down
Donegal (Ballyshannon)	Donegal
Donoghmore	Tyrone
Duhallow	Cork
Enniscorthy	Wexford
Fartullagh	Armagh
Hollywood	Down
Killyleagh, Killinchy, Kilmood, Tullynakillen Farming Soc.	
Lifford	Donegal
Lisnaskea	Fermanagh
Maryborough	Queen's County
North Wexford	Wexford
South Tipperary	
Strade and Ballivint	
Tanderagee	Down
Thurles	Tipperary
Tuam Union	Galway
Westmeath	

This makes a total of forty-five Societies in connection with the Central Society at the end of 1841.

In the correspondence and communications during 1841 some valuable suggestions were made indicating the great interest that had been aroused in the country through the initiation of the Royal Agricultural Improvement Society of Ireland. The desirability of co-operating with, and substantially aiding, the Loan Fund Societies of the country was urged by Mr. Gustavus Lambert of Beauparc. Mr. Blacker, of Market Hill, suggested a method of itinerant Agricultural Instruction.

Acknowledgment is made in the Minutes of valuable aid received from the Highland Society, through Sir Charles Gordon, the Secretary, and from the Royal Agricultural Society of England who furnished information on their methods of procedure. Dr. Robert Kane (Sir R. Kane), Professor of Natural Philosophy to the Dublin Society, presented the Society with his voluminous work *Elements of Chemistry,* and intimated his intention of devoting himself to the study of Agricultural Chemistry for the future, and Professor Apjohn, of Trinity College, undertook the analysis of the newly imported manure called guano. A set of very valuable reports which had been published and circulated on the estates of Lord Clifden, and which had a most beneficial effect in stimulating and encouraging the tenants on the property and in inducing them to adopt the different new and improved modes of husbandry, were furnished by Mr. Martin Dwyer.

The Council's Minute Book also states, "It is difficult to enumerate the

various communications that have been received from all quarters both in England and Scotland, but among the rest the Council feel bound to mention the letters of Mr. Edward Carroll, Agricultural Superintendent on the estates of Sir William Wrexon Beecher, Bart., near Mallow, which are full of the most practical and useful suggestions. Among the rest Mr. Carroll has sent up no less than twenty names of tenants on the above estates who had subscribed £2 18s. in small contributions in order to form a connection with the Central Society—an example which it is hoped will be generally followed."

Arrangements were made for the Agricultural Show to be held in 1842. It was decided to give medals and money prizes in the classes for breeding animals, and medals only in the classes for fat stock. In the former classes money to the amount of £484 was to be awarded, together with 19 Silver and 2 Gold Medals. In the classes for fat stock there were to be awarded, 13 Silver Medals; 2 Gold Medals.

The classes provided for were :—

CATTLE.

Shorthorned
Hereford
Longhorned
Ayrshires
Devons
West Highlands
Kerrys

SHEEP.

Leicester Cotswold and other Longwoolled.
Southdowns

SWINE.

No particular variety. named

HORSES.

Cart Horses
Thoroughbred

DONKEYS.

Spanish

The interesting peculiarity of the provisions of the schedule is the high value of the first prizes—25 and 20 Sovereigns; the providing prizes for Longhorned, Ayrshire, Devon, and West Highland cattle; the giving of prizes for plough oxen that had been fattened, and in the sheep classes the offering of prizes for fat sheep of two and three years only. For pigs, prizes were offered for fat pigs two years old, and the lowest age for competing fat swine was thirteen months.

Ten Silver Medals were provided as prizes for essays and works as follows :—

1. An essay on Manures, showing methods of use.
2. Essay on Neat cattle. Kinds most adapted to Ireland.
3. Essay on the general diseases of cattle and their remedies.
4. Essay on the draining of land and its effects.
5. Essay on the improvement of waste and bogland in Ireland.
6. Essay on the building of cottages suited to small farmers and the labouring classes.
7. To the proprietor who in 1841-42 has erected on his property the greatest number of the best cottages.
8. The proprietor or tenant who shall, in 1841-42, plant trees on the greatest number of acres, not less than 50.
9. The proprietor or tenant who shall have successfully executed the

greatest quantity of drains (not being less than ten miles) on lands owned by him or in his occupation in 1841-42.

10. The proprietor or tenant who shall have brought into profitable tillage, or pasture, within three years preceding, the greatest extent of waste and hitherto uncultivated land or bog, not being less than 50 acres.

Lord Cloncurry offered two prizes of £50 each for the following:—

For the most approved practical grammar of Agricultural Chemistry or essay on Manures as applicable to Ireland.

For the best Report on the construction of Roads in Ireland, and the best materials to be employed in their formation.

An important communication was received from the Right Hon. T. F. Kennedy, of the Treasury Chambers, Dublin Castle, suggesting measures for the future conducting of the affairs of the Society in the interests of Irish Agriculture. Briefly stated the suggestions were:—

1. Each Local Agricultural Society to have a definite and not too extensive boundary.

2. That the limits of Poor Law Unions appear suitable for these boundaries.

3. That it is expedient to establish an Agricultural Society in each Poor Law Union.

4. That it is desirable to have each Union Society affiliated to the Central Society.

5. That it is desirable to have an Agricultural Superintendent attached to each Local Society; the Royal Agricultural Improvement Society to render assistance and to aid in the selection of the Agricultural Superintendent.

6. That it is expedient that the Royal Agricultural Improvement Society should offer premiums within the boundaries of the Local Agricultural Society.

7. That the Local Society should furnish reports to the Central Society periodically, setting forth the condition of the district in all matters of rural economy in order that the aid of the Central Society might be duly considered and profitably applied.

Mr. Kennedy furnished a draft of a letter which he proposed should be sent to each Chairman of Boards of Guardians in Ireland. This letter explained the policy involved in the work of the Agricultural Superintendents that had been proposed for work with Local Agricultural Societies, their duties, etc. The letter ran as follows:—"The Society can entertain no doubt that an active, intelligent, and faithful person being located in a district could not fail successfully to encourage and to direct most valuable improvements, and that under his guidance a spirit of emulation would be generated such as must conduce greatly to the best interests of all classes of Society, and above all of the labouring classes, for whom extensive employment and payment of wages could not fail to arise. In making this statement the Society have contemplated individuals, landlords, and tenants, and landlords for their tenants, applying for and receiving advice and assistance; and that many such would exist they entertain a confident hope."

The question of utilising funds from the Loan Fund Board for the purpose of encouraging Agricultural progress in connection with the new movement was raised by Mr. Kennedy at a meeting of the Loan Fund Board in 1841. As a member of the Loan Fund Board Mr. Kennedy had ample opportunity for studying its workings and bearing upon Agriculture, and in urging the application of funds from the Loan Fund Societies to Agricultural Society's projects, he stated that a loan fund, duly constituted and administered was to the small local economist and capitalist a most secure and convenient Savings Bank, paying, and very able to pay to the depositors or debenture holders, a very high rate of interest, 5 or 6 per cent. So far it is to them most advantageous and offers great facility to their valuable habits of economy and saving. The Loan Fund distributes its loans and receives its payments on a system which when well administered confers the greatest benefits on the parties borrowing." It was suggested that the net profits of the Loan Fund Societies should be applied to paying the salaries of the Agricultural Superintendents that were to be engaged for each Union Agricultural Society. Mr. Kennedy remarks, "If these profits were appropriated as I contemplate, to a purpose highly reproductive of advantage, they would tend directly to the aggrandisement and profit of the many persons who exist either as small farmers or day labourers. In the one case by improving their culture and increasing their produce, in the other by creating a demand for labour which would be required to carry into effect the improvements suggested and guided by the skill and practical knowledge of the Agricultural Superintendent."

The project of appointing Agricultural Superintendents to Local Agricultural Societies was much discussed in the early years of the Royal Agricultural Improvement Society. Mr. Blacker, of Market Hill, who took an extremely lively interest in the Society urged the matter with much energy. The Ballinasloe Agricultural Union Society had made a start in Agricultural instruction and aid in its district. This as an exemplar afforded Mr. Blacker opportunity for urging his views. In his letter to the Society Mr. Blacker states that responding to the efforts of the Ballinasloe Society and the appointment of an Agriculturist to give instruction, 438 farmers had cordially received Mr. Clapperton, the Agriculturist, nearly the whole of whom promised to follow advice. Out of which number 202 had actually commenced the new system, which, considering the novelty of the undertaking, the want of manure, the absence of preparations made by loans of seed, lime, bone-dust, or any other assistance to enable persons to follow his advice, was as large a number as could be expected.

It may be mentioned that about this time Pleuro-pneumonia was first general in Ireland. This fearful plague which afterwards caused such havoc commenced in Cork. Its outbreak was said to have been caused by the introduction of Dutch cattle which were imported to Cork County in consequence of their reputation as dairy cattle. In the County of Cork, from whence the first announcement of the evil came, nothing could exceed the alarm of the farmers, one of whom—Mr. John Jeffreys, of Blarney, lost eighteen of the finest cows out of one dairy alone, without a single one of those attacked recovering. Following the notes of the Society come reports upon the disease from Messrs. Olden, the then eminent Veterinary Surgeons of Cork, and Dr. William Faussett, a Licentiate of the Royal College in Ireland. These reports and suggestions gave evidence of much

careful study, but read in the light of modern research they appear very wide of the true diagnosis of the affliction.

The first great Agricultural Show of the Society was held in Cork in 1842, and Deputations from the Royal English Society and the Highland Society of Scotland attended this meeting. Considerable interest was manifested in Cork city and county in the advent of the Royal Agricultural Improvement Society, and on the arrival in Cork of the Council a few days previous to the Show, they found preparations made for their reception upon a scale such as had seldom been witnessed in this country. The catalogues were made out with the greatest care, and the cattle were classified and arranged in perfect order. The different edifices connected with the meeting were fitted up in the most splendid style, and nothing was left undone to secure the success and brilliancy of the undertaking. "As stock and implements were to be exhibited from three parts of the kingdom, the Council thought it advisable to have judges chosen indifferently from each." Some of the most eminent of England's and Scotland's Agriculturists were invited, and Sir Percy Nugent, Mr. William Cooke-Collis, and Mr. William Fishbourne acted for Ireland.

The proceedings began by a Council dinner at which 250 persons attended. This banquet was, in respect of menu the subject of high laudation by Thackeray, who was then making his first visit to Ireland, but, with his usual cynicism, the great novelist could not close his eyes to some of the peculiarities of the Irish ways:—

"'Sir,' says a waiter whom I had asked for currant jelly for the haunch (there were a dozen smoking on various parts of the table) 'Sir,' says the waiter, 'there's no jelly, but I've brought you some very fine lobster salad.' I think this was the most remarkable speech of the evening, not excepting that of my Lord Bernard, who to three hundred gentlemen, more or less connected with farming, had actually the audacity to quote the words of the great agriculturist poet of Rome, 'O fortunatos nimium,' etc. How long are our statesmen in England to continue to back their opinions by their Latin grammar? Are the Irish Agriculturists so *very* happy if they did but know it, at least, out of doors. Well, those within were jolly enough."

The financial results to the County Cork Agricultural Show, which had to provide for an expenditure of £1009 1*s*. 6*d*., were satisfactory, as they had a credit balance of £109 11*s*. 9*d*. The Central Society also had a satisfactory balance sheet, which showed a sum of £111 to its credit. The success of the Cork Show gave the Royal Agricultural Improvement Society a status in the country which ensured success. Enthusiasm was manifested in all quarters. Local Societies were formed and became affiliated to the Central Society as follows:—

LOCAL AGRICULTURAL SOCIETIES.

YEAR.	NUMBER.
1841	23
1842	50
1843	80
1844	100 "still increasing."

The Show at Belfast in 1843 was also a very considerable success. In

addition to live stock, prizes were, at Belfast, awarded for flax and for home industries. The department of the Showyard which excited the greatest interest was naturally that in which the implements, flax seeds, butter, etc., were exhibited. The local Committee received for this Show £3,354 16*s.* 11*d.* The expenditure, including £500 to the Central Society was £2,954 3*s.* 1*d.* The home industries exhibited were—1. Sewed collars; 2. Sewed trimming or insertion; 3. Sewed babies' robes; 4. Sewed babies' caps; 5. Open or oblique work; 6. Sewed cambric, bleached or unbleached. Amongst exhibits not for competition were damask, cambric, and yarns. The following extract from the report is interesting. "The yarn was the finest ever spun in this country, and fully equalled, if not surpassed, what is usually imported from Germany for the purpose of manufacturing Irish cambric. The flax, from which it was spun, was of Irish growth and preparation." Curiously, the judges awarded the "Royal Society's Medal" to Miss Donovan for work sent from the Clonakilty National School, County Cork, for the best and most meritorious lot of needlework exhibited at the Show. That Munster workers should excel those of Ulster in this particular class of work is at the present time rather astonishing. For land reclamation there was only one entry, the quantity of land (200 acres) to be reclaimed was rather prohibitive. The prize was awarded to Mr. William Stewart Trench, Queen's County, whose reclamation works in Ireland were most valuable.

Consequent upon the duplication of prizes, through the local Societies offering prizes for live stock at the joint Shows of Central and Local Societies, it was considered expedient for the Central Society to confine their prizes to husbandry and to allow the Local Society's prizes to be applied mainly to live stock. (A very curious competition was proposed by Dr. Bewley (a Quaker) in 1843. "To the person who shall before the 1st October, 1843, prosecute to conviction the greatest number of turnip stealers, not less than twenty, £5 given by Dr. Bewley.")

The Cattle Shows subsequently held by the Society continued extremely satisfactory. Competition increased as travelling facilities were improved, and the number of entries of live stock from England and Scotland grew to good proportions. The stimulus of these competitions gave rise to an interest in stock breeding in Ireland such as had not existed previously. The number of shorthorn herds for breeding purposes that were founded augured well for future improvement in Irish stock. The alternating of Shows of stock in various districts has doubtless been of immense service to Irish Agriculturists through bringing under the notice of persons who otherwise could not become acquainted with them the best types of different breeds.

The hopes of the Society as to the foundation of an Agricultural College were realised in 1844. The prospectus was published in the *Farmer's Gazette*, and the College was shortly afterwards opened. Owing to untoward circumstances this College had but a short existence, but the changing of the system of Agricultural teaching at the Agricultural Institution, Glasnevin, under the Commissioners of National Education, by which pupils other than teachers were admitted, rendered the closing of the Leopardstown Agricultural College an event of less serious importance than it would otherwise have been.

As this Prospectus is an interesting document in the history of Irish Agricultural education, it is given here in full.

PROSPECTUS OF THE LEOPARDSTOWN AGRICULTURAL COLLEGE.

"Under the patronage of the Royal Dublin Society, and of the Royal Agricultural Improvement Society of Ireland; and under the management of a Committee consisting of the following gentlemen:—Robert Archibold, Esq., M.P., Davidstown, Co. Kildare; Charles Doyne, Esq., Newtown Park, Co. Dublin; Christopher Fitzsimon, Esq., J.P., Glencullen House, Co. Dublin; L. E. Foot, Esq., Fitzwilliam-street, Dublin; John Hawkins, Esq., Henrietta-street, Dublin; A. J. Hawkins, Esq., Leopardstown, Co, Dublin; William Sherrard, Esq., Kilbogget, Co. Dublin; D. H. Sherrard, Esq., Thorndale, Co. Dublin; John W. Stubbs, J.P., Esq., Rollistown, Co. Dublin; Edmund Murphy, *Secretary*.

"Leopardstown—the property of John Hawkins, Esq., and formerly the residence of Lord Castlecoote—is situated one mile from Stillorgan, two miles from the Railway Station, Black Rock, three from Kingstown, and five from the Post Office, Dublin. The Demesne (which is surrounded by a wall twelve feet high) contains 327 Statute Acres of Arable and Pasture Land, of various qualities; a first-class Mansion, peculiarly suited to a Public Institution; excellent Garden, with Hot-houses; and Plantations containing nearly every kind of Tree and Shrub which will bear this climate; and, at the distance of half a mile from the Mansion, and central with respect to the Arable Land, an excellent Farm-house and suitable Steading.

"The Farm-house is well suited for affording accommodation to Masters; and a School-room, Dining-room, and Dormitory have been fitted up for the immediate reception of Fifty Pupils. An extension of accommodation is contemplated. This branch of the Establishment will be opened on the first of January, 1845, for the reception of Pupils:

"No Pupil will be received under the age of fifteen years, and who cannot read and write; nor without a written engagement signed by parent or guardian that he will be amenable to the Rules and Regulations of the Establishment.

"Terms, £16 per annum, payable by quarterly payments of £4 each; for which the Pupils will be found in Diet, Lodging, and Washing; be instructed in the Practice and Theory of Improved Agriculture, and receive a good English Education, together with instruction in Practical Land-surveying and Mapping, Levelling, Road-making, Book-keeping, &c.

"The Pupils will be employed during the half of each day in Manual Labour and the Ordinary Operations of the Farm and Garden, under the superintendence of the Head Agriculturist. The other half of each day will be devoted to the acquisition of Literary Knowledge in the School-room. The Farm will be arranged so as to afford examples of the various Rotations (one of which will include the Cultivation of Flax). A sufficient extent will be devoted to Experimental Farming, of the operations of which the Pupils will be required to keep journals.

"Thorough-draining, Deepening Land, Irrigation, House-feeding, and the Management of Manure, solid and liquid, will engage most particular attention; and a few of each of the approved breeds of Cattle and Sheep will be kept for the purpose of familiarizing the Pupils with the peculiar habits of the breeds. A Chemical Laboratory and a collection of rocks and earths will be provided. In a word, every effort will be made to inculcate, along with habits of industry, order and attention, a sound practical knowledge of the best system of Husbandry, so as to enable them in after life to accomplish the great object of Improved Farming, viz.,

"To raise the largest crops at the least expense, and with the least possible injury to the land.

RULES AND REGULATIONS.

"1. Pupils to rise at half-past five o'clock in summer and at daylight in winter.

"2. In half an hour after the dressing-bell has rung, one half or portion of the pupils shall be on the ground ready to commence work, or in the house, where they will be provided with various industrial employments (should the weather not permit of out-door occupation), the other half or portion shall, within the same period, repair to the school-room and commence business there.

"3. The bell shall ring at nine for breakfast; three-quarters of an hour shall be allowed for that meal, at the expiration of which the classes shall return to their respective occupations, as before breakfast.

"4. At one o'clock the bell shall ring for dinner; one hour shall be devoted to this meal and to relaxation; at two o'clock the classes shall exchange; thus, the portion which was at work in the farm in the forenoon shall remain in the school, and that portion which was in the school shall go to work in the farm.

"5. At six o'clock in summer and at dusk in winter the bell shall ring for leaving off work. Supper shall be ready at eight o'clock; and the period between leaving off work and supper time in winter, shall be occupied in the study of agricultural chemistry, geology, botany, &c.

"6. All controversial discussion on religious or political subjects is strictly prohibited.

"7. The pupils in the farm and those in the school shall be under the sole control of the respective masters, for the time being.

"8. The masters will be required to the best of their ability and in a kind and affable manner to impart instruction to the pupils, and to report to the Committee any instance of insubordination, misconduct, or absence from the institution without permission of the Committee, who may, should they see fit, punish by expulsion from the College, for the infringement of the rules or regulations.

"9. Any pupil expelled the College, shall forfeit any sum which he or his friends may have paid for him in advance.

"10. On Sundays the pupils shall, accompanied by one or other of their masters, or by a monitor, repair to their respective places of public worship.

"11. Each pupil shall come provided with four shirts, four pairs of stockings, two pairs of shoes and a working and Sunday dress.

"12. A certificate will be given at the discretion of the Committee to pupils who have resided three years in the institution.

"13. A vacation of a fortnight at Christmas will be allowed to such of the pupils as choose to avail themselves of it.

"14. The Committee shall have power from time to time to vary the foregoing rules and to make others, and also such bye-laws as may appear necessary.

DIETARY.

"Breakfast—Stirabout or Bread and Milk.

"Dinner—Three-quarters of a pound of Corn Beef or Pork with vegetables and potatoes, on three days of the week. Fresh Meat on Sunday, Soup on Monday, and on the other two days, butter and milk will be substituted for flesh meat.

"Supper—Bread and Milk or Flummary and Milk.

UPPER OR FIRST CLASS DEPARTMENT.

"Arrangements will be made for opening this branch of the institution for the education of the sons of gentry, as soon as it shall appear that such would be likely to be supported. The course of education in this branch is proposed to embrace the Classics, Mathematics, Mechanics, Drawing, Engineering, as connected with the improvement of landed property, and the French and German Languages. The sciences more immediately bearing on agriculture, such as Chemistry, Geology, Botany, Physiology, and the treatment of the diseases of Cattle, will be taught by competent lecturers, and an intimate knowledge of the practice of improved agriculture will be acquired by the pupils in their walks for exercise and by attending the lectures on the theory and practice of agriculture, common to all classes.

FORM OF APPLICATION FOR ADMISSION.

"I do beg to recommend aged as a fit and proper person to be received as a pupil in the Leopardstown Agricultural College, and I hereby undertake that he shall be amenable to the rules and regulations of the institution, which I have read.

"Application for Admission to be addressed to the Secretary, at the *Farmer's Gazette* Office."

As might be expected the year 1845 proved an intensely anxious one for the Royal Agricultural Improvement Society. From its formation the Society had a run of splendid successes; its connection with Local Societies brought it into touch with all parts of the country. Its Provincial Shows, of which four had already been held, had stimulated a desire for Agricultural improvement. The prizes offered for land reclamation, drainage, and good tillage, were earnestly competed for. The reports received from Local Societies contained matter of the most interesting and important character, which was disseminated by Press reports and subsequently in the published transactions of the Society. But '45 arrived and with it the fearsome "blight." The Society took early action. Special meetings of the Council were held, the situation discussed, and remedial measures suggested. Lest a panic might be created by the publication of alarming reports that had reached it, the Society, in spite of frequent suggestions, refrained from making public the information that had been received regarding the mysterious disease. Professor Kane (afterwards Sir Robert) reported proceedings of sub-committee that had been nominated to watch the progress of the disease, and a number of experiments were suggested as to treatment of potatoes that were slightly affected. Treatment by salt, lime, chloride of lime, drying by artificial heats, parboiling, crushing and drying the meal (farina), covering up tubes in ground with earth or straw in order to keep them dry, all these were suggested, but needless to say their adoption was not successful in result. Considerable attention was given to the idea of securing by crushing and drying the potato starch, and prizes were offered by the Society for machines suited to this purpose; but although several machines were sent in for competition, the process did not appear to be taken up generally, probably because of the absence of adaptability of the people to meet such exceptional circumstances as now existed. Viewed by the light of subsequent events, and the knowledge afforded by scientific research and teaching, there can be little doubt that much of the dreadful suffering that occurred during the famine years in Ireland might have been

averted if the suggestion of "Professor Kane" to the Agricultural Society as to drying the farina of the potato had been extensively carried out.

Towards the end of 1845 the Society, at the suggestion of "Pierce Mahony," a member of Council, placed themselves in communication with Her Majesty's Government with the view of urging the employment of the people in works of land drainage and reclamation and the cheapening of procedure in availing of the Drainage Acts, 5 and 6 Vic., c. 89. Strong representations were urged at the reception of a deputation. Sir T. Freemantle promised to have the matter brought under the notice of H. M. Government. Professor Kane reported that a committee consisting of Professor Lindley, Professor Lyon Playfair, and himself were sitting at the Royal Dublin Society, having been nominated by the Government, to inquire into the scientific aspect of the potato disease. Professor Kane wrote suggesting the growing of new varieties of potatoes from the seed of the potato apple. The Lord Lieutenant offered prizes of £500 for the raising of new varieties of potatoes and for land drainage.

Various conflicting reports on the potato disease were received, but on the whole the situation in this regard was considered most serious. Suggestions were sent out from Societies urging circumspection and recommending the sowing of Swedish turnips, Aberdeens, or cabbages at once on land where the disease appeared.

Early in 1847 Mr. C. V. Trevellyan of the Treasury sends to the Society extracts and papers from Miss Martineau and Mr. Buckland for the instruction of the farming classes. During 1847 the Local Societies increased considerably in number for affiliation. Most interesting reports showing much enthusiasm were received from them.

The Society presented an address of welcome to Lord Clarendon, who, during his Vice-Royalty gave most earnest attention to Irish affairs. His Excellency gave a long and sympathetic reply in which he commends "The zeal and perseverance with which you labour not only to introduce improvement in Agriculture and to diffuse sound practical knowledge, but to combat want of support and the apathy of those from whom you had a right to expect far different conduct; but that this blindness to their own interests should long continue on the part of landowners I hold to be impossible, for they must know that we live in times of active competition when all who will not be distanced in the race must exert every energy." The question of bringing instruction to the small farmers and to districts out of touch with improved methods had not hitherto been considered. In a long and thoughtful letter to the Council of the Society Lord Clarendon notes, "The means for bettering the condition of the Irish people must for a long time be looked for in the improvement of the processes adopted in the cultivation of the soil," and urges "a sound practical instruction as to the well established principles upon which their operations should be based." He suggests the autumn for practical instruction by competent persons who should impress upon the people the means to be adopted for good cultivation the following year. The instructors, he goes on to say, should be able to speak with authority, and the lectures should give information on such subjects as—

1. Draining and subsoiling.
2. Rotation and green cropping.
3. Economy of manuring, and housefeeding cattle.

"Lectures should not be delivered in an abstract or purely scientific form, but suited to the educational condition of the people; simple language should be used," and practical demonstrations given in each locality. The Society not having funds for the purpose, the Lord Lieutenant subscribed £50, and suggested that the Duke of Leinster and others should assist, as the Government could not find funds. It was arranged that the balance of Lord Heytesbury's fund for land drainage should be applied to the scheme of practical instruction.

In November of this year (1847) there were appointed five Practical Instructors. All of these were men of high professional status who had been practically engaged in Agricultural and Horticultural works on estates and farms in Ireland; the salaries were £20 a month, which sum was to cover all expenses incident to the office. A large number of proprietors, including William Smith O'Brien, M.P., applied for the services of the practical instructors. The five who had been appointed were allotted to the poor districts in Mayo, West Limerick, Clare, and South Kerry. The reports received from the Practical Instructors on their first visits were full of interesting information and enthusiasm by reason of the warmth of their reception at Show stations. Largely increased numbers of applications were now daily received for Practical Instructors, and considerable financial support was received from the country. In the beginning of 1848 His Excellency Lord Clarendon contributed £1,000, and suggested increasing the number of Practical Instructors in consequence of the success of the scheme. He also recommended the issuing of short tracts on Agricultural subjects. Mr. Todhunter, of the Society of Friends, suggested that the Royal Agricultural Society should allow their Practical Instructors to aid in the relief measures that were instituted by the Society of Friends, by receiving consignments of seeds, etc., at depots and distributing same in a methodical manner. It was decided to advertise for further Instructors, the salary to be a maximum of £100 a year, and minimum £80. It was found in November, 1848, the balance in hand for Practical Instructors was £1,348 12*s.* 3*d.* The scheme for Practical Instruction had throughout 1848 most successful results. The Lord Lieutenant gave another sum of £1,000 for the year. The Society of Friends contributed "in kind," most liberally, one gift of seeds, being 60 cwt. of mangold seeds; 24 cwt. of carrots; 6 cwt. of spinach. The latter item indicates, no doubt, good intention but small knowledge of dietetics for a starving people. The Relief Committee also gave considerable quantities of turnip seeds to be distributed by the Practical Instructors.

Towards the close of 1849 the system of Practical Instruction appeared to be in danger from want of funds. The Lord Lieutenant again sent £1,000 and numerous contributions were received in money and kind; but still the funds available were found to be insufficient for carrying on the work. In September, 1850, the Committee of the Society entrusted with the management of the Practical Instruction scheme expressed regret that for want of funds all the Instructors must be withdrawn, which was (they added) regrettable at a period of the year when their services were most required, and at a time when the class for whose benefit they were most particularly employed was becoming sensible of the advantages of their advice. As much as £800 worth of green crops seeds had been distributed at a reduced price in the season (1850). With these seeds 9,000 acres of green crops have been raised on land which in all probability would have

been uncultivated but for the exertions of the Practical Instructors. It was estimated that the system of Practical Instruction could not be carried on at a cost less than £2,600 per annum—*i.e.*, £2,000 for instruction and £600 for seeds, etc. The report of the Committee was sent to His Excellency the Lord Lieutenant who subscribed £1,000. The Society reduced the number of instructors from 20 to 10, which number would absorb His Excellency's subscription. The subsequent work of the Practical Instruction scheme though brief was full of usefulness. Taken as a whole this project was one of the most beneficent and far-seeing for the agriculture of Ireland. All classes united to take advantage of the instruction, and, fortunately, there were means available for teaching work, because of the system of apprenticeship to agricultural horticulture which then existed. Landed proprietors generally kept up establishments in the country. At these the steward, or the man who held the combined office of steward and gardener took apprentices to his work. A very considerable number of these agriculturists, stewards, and gardeners were men of good education, who had themselves been trained to their business; many having passed through apprenticeship in farming along with a service and instruction in the Trinity College or Glasnevin Botanic Gardens. Some Englishmen and Scotchmen were amongst the class. Thoughtful, intelligent, and industrious, they were eminently suited to the work. The subsequent career of these Practical Instructors gave evidence of the high class men that were engaged. On their being disbanded almost all of them became well settled, being employed upon estates as agents, agriculturists, stewards, or drainage engineers. Several were offered valuable farms with aid towards stocking them on estates where their services had been appreciated during their service as Instructors.

If the work of the Royal Agricultural Improvement Society had terminated with the scheme of Practical Instruction alone, its existence would have been justified; but its efforts on behalf of the improvement of farm stock during a time when the difficulties of travelling and the movement of stock were enormous were admirably conceived and carried out.

It was, however, in what may be called its moral influence that the greatest usefulness of the Society was manifested. Here was a Society composed of all classes, brought together for the industrial development of the whole country, in which, throughout its existence, almost complete harmony prevailed. This is an influence that cannot be statistically expressed, but it was none the less real for that; and though its action was silent it was also significant and widespread. A time came, however, when, from a variety of causes, financial and other, the Society could no longer usefully carry out the trust it had undertaken. Happily, the Royal Dublin Society, many of whose Council members were also on the Council of the Royal Agricultural Society, considered that an amalgamation of the Societies might be usefully effected; and, as the Royal Dublin Society had recently developed a spirit of agricultural aid, the members of the Royal Agricultural Society were on the whole not adverse to the proposed union. Accordingly, in 1887, an agreement was entered into between the two great Societies that an amalgamation by Royal Charter should be brought about.

THE NORTH-EAST AGRICULTURAL ASSOCIATION.

The operations of the late Royal Agricultural Society of Ireland having been found so extensive and costly as to prevent the great body of practical farmers from participating directly in its benefits, and the smaller local societies being necessarily too restricted in their funds and operations to effect much permanent advantage, several landed proprietors and others interested in agricultural pursuits, entertained a conviction that an intermediate society might, as a connecting link, become the means of extending the benefit of the Great National Society on the one hand, and stimulating the energies of local societies on the other hand. Acting upon this idea, the following met in Hillsborough, County Down, on the 21st September, 1854:—The Marquis of Downshire, Very Rev. Dean Stannus, Lisburn; John Waring Maxwell, Finnebrogue; A. H. Montgomery, Tyrella; H. Stanley McClintock, Randalstown; S. K. Mulholland, Eglantine; S. D. Crommelin, Carrowdore Castle; Rev. Dr. Montgomery, Dunmurry; Jonathan Richardson, Glenmore; William Charley, Seymour Hill; and Fitzherbert Filgate, Hillsborough.

The Marquis of Downshire, who took the chair, read a great number of letters from the leading landed proprietors of the counties of Down and Antrim, approving of the views above stated, and it was unanimously resolved that steps should be taken t wards the formation of a Society, to be entitled "The North-East Agricultural Association of Ireland," embracing the counties of Down, Antrim, Armagh, and Monaghan, and having for its general objects, (1) the improvement of stock and farm produce by holding an annual show for their exhibition; (2) the encouragement of the manufacture of implements suitable to the North-eastern counties of Ireland, and (3) the dissemination of practical and useful knowledge connected with agriculture in its various branches.

In order to carry out the resolution of this preliminary meeting, a general meeting of those favourable to the establishment of such an association was held in the Town Hall, Belfast, on 20th October, 1854, to consider its organisation, and the principles and regulations on which its proceedings should be conducted and based.

At this meeting, presided over by the Marquis of Downshire, there was a very large attendance of those interested. Resolutions embodying the objects named were adopted, and the rules submitted to the meeting as the constitution of the Association having been approved of, office-bearers were elected.

The first Show of the Association was held at Belfast on 23rd and 24th August, 1855, when there were offered for competition in the various classes

204 money premiums, amounting to £216; 93 medals, and 74 certificates. In drafting the prize list, the committee acted upon the principle of having two distinct classes, viz.:—one for the amateur, and another for the working farmer. To the former they allotted of the money premiums £78, and to the latter £138. Instead of giving a few large money premiums, they subdivided the sum allocated into a number of smaller ones, thereby distributing the prizes over a greater number of exhibitors, which they considered the most likely plan to secure an extensive competition. There were 506 entries at this Show, which were classified according to the following summary:—

AMATEUR CLASSES.

Bulls,	-	23
Cows and Heifers	-	84
Horses,	-	29
Sheep,	-	68
Swine,	-	32
		—236

FARMERS' CLASSES.

Bulls,	-	19
Cows and Heifers,	-	43
Horses,	-	42
Sheep,	-	17
Swine,	-	13
Poultry,	-	59
Butter,	-	36
Flax,	-	8
Flax-seed,	-	4
		—241
Implement Stands,	-	29
Total,	-	506

With a view to carrying out the third object of the Association, viz., the diffusion of practical and useful knowledge connected with agriculture, the committee entered into a negotiation with the Chemico-Agricultural Society of Ulster, for the purpose of seeing whether they could have a joint journal for the two Societies. After a good deal of consideration and discussion, it was concluded that, although it would be most desirable to have a medium through which to communicate the transactions of the Association to the public, the funds were not sufficiently ample to warrant them at that time embarking in such an undertaking.

By the constitution of the Association, its operations were limited to three objects—the holding of an annual show, the encouragement of the manufacture of agricultural implements, and the dissemination of practical and

useful knowledge connected with agriculture. These, while primary objects in the extension of agricultural improvement, did not embrace all that was requisite to carry out the purposes of the Association. The committee, therefore, decided to offer premiums for such objects as might, from time to time, appear best calculated to improve the manufacture of agricultural implements, the breeds of stock, and the general husbandry of the country, and they considered it would be desirable to offer prizes for the best managed farms. To carry this into effect, each county was divided into three districts, as nearly as possible of equal extent; and as the best defined boundaries, the baronial divisions were selected, grouping together those that were contiguous to each other. The competitions in each district were divided into two sections—one for holdings containing above forty statute acres, and another for holdings containing not more than forty statute acres; to each section there was allocated three premiums. These competitions were carried on from 1857 to 1867, but at no period did they come up to the expectation formed at their institution, the entries having been much more limited than might reasonably have been expected.

In 1857 the committee called attention to the desirability of having a uniformity of weights and measures for the sale of agricultural produce throughout the United Kingdom. A report was submitted, showing the variety of systems in use in a number of the principal centres and towns in England, Ireland, and Scotland. This report was printed and circulated amongst the members of the Society, and sent to the Grand Juries, Corporations, and other municipal bodies in Ireland, several of whom signified their approval of the movement, and steps were taken to bring the subject before Parliament. The principle recommended by the Association was, "That all agricultural produce should be sold by weight alone, irrespective of measure, and that it would be desirable to abolish the system of barrels." In 1861 a Bill for the Regulation of Markets and Fairs was brought before Parliament by the Chief Secretary (Mr. Cardwell), which, however, did not contain any provision for the regulation of weights and measures. The Association appointed a special sub-committee to consider the clauses of the Bill, and a report was issued, a copy of which was sent to every Member of Parliament for Ireland, and a request made for their co-operation in obtaining the introduction of clauses into the Bill with regard to weights and measures. No enactment, however, was passed during that Session. In 1862 the Chief Secretary for Ireland (Sir Robert Peel) introduced a Bill for the Regulation of Markets and Fairs, which was subsequently withdrawn, and introduced a Bill for the Regulation of Weights and Measures, the clauses of which were not merely in accordance with the principle contended for, but were in many cases couched in the very language in which the views of the Association were brought under the notice of the Government. This Act having been passed through Parliament, is now the law of the land, and thus the many years' labour of the Association were finally crowned with success.

The dissolution in 1859 of the Royal Flax Improvement Society had left Ulster without any established body to stimulate the growth of this valuable crop, and consequently loud complaints had been made by farmers in various places. A special committee, consisting of Messrs. Jonathan Richardson, Glenmore, Lisburn; William Charley, J.P., Seymour Hill, Dunmurry; and John Borthwick, Prospect, Carrickfergus, were appointed and

authorised to take such steps as they might consider desirable for promoting the growth of Irish flax. This committee, feeling that it was advisable to proceed gradually and cautiously in carrying out any extensive measures involving a heavy expenditure, more especially as the funds at their disposal were so very limited, confined themselves to revising and publishing in their amended form the instructions compiled by the late Royal Flax Improvement Society. These instructions met with general approval, inasmuch as applications for supplies were received from the farmers, local societies, flax merchants, and spinners throughout the kingdom, as well as from Russia and other European States and America. In addition to these labours the Association made a large increase at the annual show to the prizes offered for Irish flax and flax-seed, and had the gratification of learning that those efforts met with the approval of the landed proprietors of Ulster, many of whom, although not residing nor having property within the district of the Association, united themselves with it as members. According to the Agricultural Returns, it appears that the extent of land under flax in 1860 was 128,595 acres, and in 1861, 147,866 acres, showing an increase of 19,271 acres in the latter year. This satisfactory result was mainly owing to the efforts made by this and other kindred associations, aided, no doubt, by the remunerative prices of the fibre during the preceding season. The diffusion of instruction and information on the subject of flax cultivation, especially in the south and west of Ireland, where such instruction had been most required, occupied for many years the attention of the Association, and the committee had the gratification of learning from many growers in those provinces that, by simply following the printed "directions" supplied to them, and without any further aid, they had succeeded in producing good and remunerative crops, for which they had found a ready sale by consigning it to Belfast. In all cases the committee took particular care to caution growers against placing more than a small proportion of their respective holdings under flax, in consequence of the uncertain character of the crop.

A winter show of fat stock, poultry, roots, cereals, flax, flax-seed, butter, and cheese was held by the Association on 5th December, 1860. From the unfavourable character of the previous year, which had proved detrimental to similar exhibitions held elsewhere, the committee did not expect a large exhibition, but even taking this drawback into consideration, the success of the show was not sufficiently marked to warrant its continuance.

In connection with the annual show, held in 1870, the Association inaugurated a trial of mowing machines and double furrow ploughs. There were twenty-five of the former and nineteen of the latter entered. The ground selected was the Ulster Model Farm, Balmoral, Belfast, generously granted for that purpose by the Commissioners of National Education. The nature of the soil was such as to fully test the capacity of the most improved implements. This test of the practical working powers of the several machines afforded great gratification to the farming public, many of whom came from great distances to witness the trial. Trials of mowing machines, hay tedders, and horse rakes were held with marked success on the Model Farm in 1871 and 1873. In the former year, forty-seven machines were entered for competition, and fifty-five in the latter. Although no prizes were offered, many eminent makers from England and Scotland, as well as in Ireland, were represented. The committee, however, had been appealed to to dispense with these exhibitions in consequence of the disadvantage under

which manufacturers at a distance laboured in competing with those located in Belfast or the neighbourhood.

In 1871 a most influential deputation, representing the railway, banking, and commercial interests of Belfast, waited upon the Committee, requesting them to invite the Royal Agricultural Society of Ireland to hold their exhibition in conjunction with that of the Association's in Belfast in the following year. The Committee, fully sensible of the benefits likely to result not only to the commerce of Belfast, but also to the agriculture of Ulster, by the holding of such an exhibition, gave the subject their earnest consideration, and unanimously passed a resolution deciding to invite the Royal Society to Belfast, and to give the usual guarantee, provided there was a reasonable prospect of the necessary funds being raised by the town of Belfast and the province of Ulster generally. Acting upon that resolution, a requisition from the merchants of Belfast, and High Sheriffs and Members of Parliament of adjoining counties and boroughs, were presented to the Mayor of Belfast, who accordingly convened a public meeting in the Town Hall, at which the feeling was unanimous in favour of the united exhibitions. The Committee of this Association accordingly transmitted the invitation, and gave the usual preliminary guarantee to the Council of the Royal Agricultural Society, by whom the invitation was accepted in the most complimentary manner, under the personal presidency of His Royal Highness the Prince of Wales. The show was held in Ormeau Park, Belfast, on the 7th, 8th, and 9th August, 1872. The display in the live stock classes was creditable, but in the whole fell short of what might have been expected. This, however, was accounted for by the fact that Foot and Mouth Disease existed among stock at that period to such an extent that the Government Veterinary Department deemed it incumbent upon them to appoint an officer specially to attend the show.

In 1891 a circular was issued to the members of the Association, as well as to the general public of Belfast and the North of Ireland, with the view of raising a fund sufficient for the acquisition and fitting up of new premises in the neighbourhood of Belfast, which would afford more ample space for the Association's shows, and more particularly for the development of its horse shows, which the markets of the Belfast Corporation, in which the shows were always held, were not adapted for. The Committee were pleased to find that the response to the first issue of that circular elicited subscriptions to an amount which gave them every confidence that in a short time the amount required would be subscribed. It was not, however, until 1894 that a sum sufficient to justify them in proceeding with the undertaking was forthcoming, and in 1895 thirty acres of ground were taken at Balmoral, Belfast, from Mr. A. Hamill, D.L., a Vice-President of the Association. These grounds are in every way suitable for the purpose and most conveniently situated as regards tramway and railway accommodation. A sum of upwards of £28,000 has since been expended in putting them into proper order and erecting permanent buildings and stands.

The annual show was held on the 17th, 18th, and 19th June, 1896, and was a memorable one, on account of its being the first held in the new premises, and also by its being extended to three days. The value of the prizes offered amounted to nearly £1,000, and the number of entries was a very great advance on that of any show previously held by the Association.

It may be interesting here to note the number of entries, and the amounts offered in prizes since the first show was held.

Year.	Shorthorns.	Ayrshires.	Miscellaneous Breeds.	Horses.	Sheep.	Swine.	Poultry and Eggs.	Butter.	Honey.	Flax.	Flaxseed.	Implement Stands.	Farms.	Total.	Prizes.
															£
1855,	89	28	52	71	85	45	59	36	—	8	4	29	—	506	216
1856.	94	66	93	112	100	77	123	50	—	5	4	64	5	793	273
1857,	73	63	82	76	89	67	88	46	—	5	4	39	12	644	297
1858,	76	61	82	85	119	52	70	37	—	—	—	52	5	639	289
1859,	107	76	45	91	69	60	97	35	—	3	2	51	—	636	385
1860,	99	67	50	72	59	69	102	34	—	—	—	48	7	607	314
1861,*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1862,	102	61	45	74	54	77	120	16	—	4	2	40	8	603	453
1863,	52	84	112	62	63	56	145	15	—	4	4	50	—	647	372
1864,	64	86	104	40	64	45	226	25	—	11	—	40	—	705	331
1865,	77	76	75	76	67	30	168	29	—	11	—	32	3	644	326
1866,†	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1867,	61	41	79	55	81	18	164	24	—	3	—	36	2	564	310
1868,	69	50	56	67	80	26	121	23	—	9	—	40	—	541	278
1869,	78	37	60	40	76	32	120	19	—	8	—	47	—	517	289
1870,	72	37	89	48	55	34	126	14	—	8	—	66	—	549	261
1871,	67	37	43	58	45	54	158	9	—	16	—	73	—	560	254
1872,‡	—	—	—	—	—	—	—	—	—	—	—	—	—	—	110
1873,	73	26	39	60	34	33	89	30	—	13	—	62	—	459	343
1874,	84	21	54	70	62	39	73	32	—	9	—	60	—	504	390
1875,	90	30	37	75	41	30	107	29	—	14	—	55	—	508	439
1876,	96	25	39	121	38	42	68	26	—	9	—	59	—	523	437
1877,	93	47	35	122	29	42	85	33	—	10	—	66	—	562	450
1878,	117	36	40	98	68	37	89	39	—	8	—	66	—	598	452
1879,	81	32	57	131	63	35	103	37	—	10	—	57	—	606	452
1880,	70	30	43	100	59	35	86	38	—	9	—	56	—	526	402
1881,	79	28	45	79	39	42	116	29	—	5	—	60	—	522	396
1882,	61	30	42	95	58	53	108	34	—	—	—	59	—	540	400
1883,	64	26	54	83	55	33	83	41	—	—	—	58	—	497	384
1884,	91	23	54	78	52	41	117	27	—	—	—	66	—	549	409
1885,	72	21	37	92	57	31	114	29	—	—	—	66	—	519	422
1886,	84	22	41	109	45	23	108	39	—	—	—	58	—	529	421
1887,	72	34	63	106	69	44	101	49	10	—	—	63	—	611	425
1888,	72	24	45	82	76	42	72	20	14	27	—	71	—	545	413
1889,	85	22	86	88	80	28	179	38	7	41	—	66	—	720	462
1890,	95	24	102	178	130	58	152	26	12	53	—	66	—	896	461
1891,	81	26	72	139	108	34	125	45	9	35	—	71	—	745	458
1892,	61	22	69	158	95	21	145	26	18	33	—	80	—	728	457
1893,	55	20	75	210	101	20	248	28	20	55	—	68	—	900	494
1894,	58	20	63	199	94	—	281	38	10	46	—	66	—	875	426
1895,	56	12	69	193	100	32	312	24	—	28	—	82	—	908	466
1896,	63	30	113	486	105	47	405	27	10	27	—	78	—	1,391	978

* Show of Royal Agricultural Society of Ireland. † No Show on account of Rinderpest.
‡ Show held in conjunction with Show of Royal Agricultural Society of Ireland.

The Chief Secretary for Ireland (Mr. Gerald Balfour), in the course of his speech introducing the Agriculture and Industries (Ireland) Bill during the last Session of Parliament in 1897, made a gratifying allusion to the work of the Association, and at the same time the First Lord of the Treasury called for an expression of expert agricultural opinion upon the measure then before the House. In obedience to this call, the Council appointed a com-

mittee to prepare a memorandum on the Bill for submission to the Government, and appointed a deputation for this purpose to wait upon Mr. Balfour in London. The deputation was headed by the Most Noble the Marquis of Londonderry, K.G., President of the Association.

Owing to the financial clauses of the Bill not being considered satisfactory, the Bill was eventually withdrawn. Nevertheless, the necessity for the establishment of a Board of Agriculture seemed to the Council to be as urgent as ever, and the pledges which the Government had given upon the subject in two Queen's Speeches remained as guarantees that this important legislation was not finally abandoned. The Council, therefore, six months later, on receiving an invitation from the Belfast Chamber of Commerce to co-operate with that body and with the Dublin Chamber for the re-introduction of the Bill with some necessary amendments, appeared by deputation before the Chief Secretary at Dublin Castle, in company with many associations representative of agriculture and commerce throughout the country. This deputation, the largest and most representative ever received at Dublin Castle, met with a cordial reception from Mr. Balfour, who renewed the pledges on behalf of the Irish Government to take up their agricultural programme so soon as the exigencies of Parliamentary time should admit.

In 1892 a Parliamentary Commission met, with power to incorporate under the Educational Endowments (Ireland) Act, 1885, such educational and other societies as it might deem qualified. The effect of such incorporation is to relieve the committee and members of those societies of liability beyond the funds available by the societies which they represent.

Steps were taken to obtain for the Committee a similar exemption, and an application was made to the Educational Endowment Commissioners to draft a scheme for the incorporation of the Association. The draft was accordingly prepared, and was finally approved of by an Order in Council, dated 21st May, 1894. Under this Act the Association was to be afterwards designated the "North-East Agricultural Association," and the Committee the "Council."

In 1899, Mr. Balfour introduced a Bill for Establishing a Department of Agriculture and other Industries and Technical Instruction in Ireland, and for other purposes connected therewith. This Bill having passed through Parliament, the Council, in conjunction with the Belfast Chamber of Commerce, decided to invite Mr. Balfour to come to Belfast in January, 1900, and explain at length the object and provisions of the Act, concerning which, naturally, a good deal of uncertainty prevailed. Mr. Balfour kindly accepted the invitation, and his address was followed with close attention.

In order that the aims of the Association might be more fully accomplished, the Council decided in 1897 to hold two shows during each year—one in spring for draught horses, cattle, swine, poultry, dairy produce, implements, and machinery; the other in summer for light horses and sheep, and it is gratifying to state that this departure has been attended by most encouraging results.

The following Tables give the number of entries and amount of prizes offered since the show was split up into two separate groups:—

The Spring Show.

Year.	Thoroughbred, Half-bred, & Hackney Stallions.	Draught Horses.	Polo Ponies.	Cattle.	Milking Test.	Swine.	Goats.	Draught Horses in Gear.	Harness Horses.	Jumping Competitions.	Driving & Trotting Competitions.	Poultry.	Butter and Eggs.	Butter-making Contests.	Implement Stands.	Total Entries.	Prizes.
																	£
1897,	*	33	16	200	*	41	*	96	*	67	14	361	200	*	73	1,101	638
1898,	17	30	21	215	*	52	*	85	51	92	9	354	163	*	78	1,170	701
1899,	15	29	21	292	6	43	19	109	56	135	10	466	176	24	68	1,469	923
1900,	13	29	18	333	9	48	38	78	44	93	48	480	212	18	72	1,533	990
1901,	9	40	26	361	9	29	†	82	56	46	13	465	249	31	75	1,491	963

* No classes given. † Classes cancelled. Jumping Competitions held on one day of the Show only in 1901.

The Horse and Sheep Show.

Year.	Thoroughbreds.	Hackneys.	Yearlings and Two-year Olds other than Thoroughbreds.	Young Horses suitable for Harness.	Hunter Brood Mares and Foals.	Young Horses suitable for Hunters.	Hunters.	Roadsters and Saddle Horses.	Harness Horses.	Trotting Horses.	Jumping Competitions.	Driving Competitions.	Sheep.	Roses.	Total Entries.	Prizes.
																£
1897,	18	32	28	10	22	91	76	96	119	21	101	*	92	*	709	786
1898,	19	23	20	24	12	104	62	94	103	19	111	*	137	*	731	866
1899,	21	27	27	24	18	125	80	88	104	19	100	*	117	*	750	891
1900,	18	18	21	13	9	104	76	106	113	14	103	18	158	90	861	949
1901,	19	24	32	20	17	112	76	104	94	10	134	15	120	112	889	795

* No classes given.

The total number of members on 31st December, 1901, was 866, and there were 83 lady associates.

It is nearly half a century since the Association came into active operation. At its formation there was but little expectation that it would assume the dimensions to which it has expanded, and in now taking a survey of the past, the members have every reason to be gratified at the enlarged field of usefulness to which it has extended its labours, and the singular success that has marked its career.

THE IRISH FLAX INDUSTRY AND THE FLAX EXTENSION ASSOCIATION.

No single event in recent years caused greater disturbance in the Irish flax industry than the Civil War in America, which for a time almost completely prevented the cultivation of cotton, and led to the destruction of large quantities already harvested in the Southern States; the effects of this were felt wherever the raw material of any textile manufacture was produced in sufficient quantity to be recognised as a distinct branch of productive labour, and in Ireland, where for a century and a half the manufacture of linen had been almost a national industry, the scarcity of cotton led to marked fluctuations.

The area under flax, which was 128,595 acres in 1860, rose in 1864 to 301,693 acres, an increase of 134 per cent. As might be expected, this enormous increase had a tendency to check the inflation of prices which had taken place in '62 and '63, owing to the scarcity of cotton alluded to above; in point of fact, the balance between supply and demand was completely overturned, a state of affairs which must always produce harmful results.

In 1860, Ireland had about 600,000 spindles in active employment, consuming roughly 32,000 tons of flax; of this, the home supply was 24,000 tons, or about three-fourths, between that year and 1864. However, spindles had increased by 50,000, or say 8½ per cent., whereas the area under flax had gone up to 301,693 acres, with a total production of 64,500 tons, an increase, compared with 1860, of 170 per cent.; or in another form, the supply in 1860 was about 6.4 stones per spindle, and in 1864 about 15.8 stones; and assuming for the moment that Irish flax only was used, the consumption could not exceed 34,500 tons, leaving a nominal surplus of 30,000 tons; but as the quantity of foreign flax which was used at that time, and estimated at about one-fourth of the total consumption, must be taken into account, the surplus would approach 40,000 tons.

Taken by itself, perhaps, the large sowing of 1864 was not out of proportion to the disastrous destruction of cotton and waste in the labour available for cotton-growing, but the possibility of judiciously substituting flax for cotton was lost sight of, or, perhaps, never thought of at all, by the Irish farmer when he hurriedly increased his sowing, expecting as a matter of course to reap a profitable harvest.

Capital, however, cannot be manipulated so quickly; neither private enterprise nor limited companies could secure funds, organize plans, construct or equip factories speedily enough to save the situation; it is highly probable that if this could have been done, the outlay would have repaid itself. It may be well to point out here, also, that there was no regular export trade established to assist in removing what must have proved a glut in the market, and the inevitable now occurs, the price of raw material, which had been high in 1862 and 1863 and in the spring of 1864, begins to show symptoms of weakness, and in the end of the season, by which time the

big harvest is ensured, prices go down with a rush, the difference in the rate between the opening months of the year and the end of the season is nearly 20 per cent.

This is, perhaps, one of the most unfortunate events in connection with the Irish flax industry which history will have to record; and looking back dispassionately at all the events which led up to it, and the critical position of trade prospects at that immediate period, it is difficult to see how things could have turned out otherwise. In the early months of 1864, prices were at a fairly encouraging level, and the prospects of a supply of cotton were so gloomy, that it is not surprising the Irish farmer over-estimated the reasonable possibilities of an increased demand for flax. There is this much to be said in their favour, the sowing-time was at hand, and the farmers of one district, knowing little of what was going on in other districts, and having no very clear data to guide them, made a very natural mistake; one course only could have helped to keep up the price of flax, viz., speculative buying and storing up; but this was evidently too risky to find favour with capitalists—a collapse of the war in the "States," or another crop in Ireland approaching the one in question, would have led to a very great loss.

The flax-grower did not, however, repeat his mistake, for in 1865 the area sown with flax seed fell off 16 per cent., and the harvest-time being unfavourable, the total production was still further reduced—the result was a supply 23 per cent. smaller than the previous year's. The effect of this was that prices again took a sharp turn upwards, and remained exceptionally high during 1866 and into the spring of 1867, notwithstanding that the supply was fully equal to the demand.

Enough has been written in relation to the raw material to indicate what preceded and partly led up to the formation of the Flax Extension Association in 1867; but another side of the subject not yet touched upon has still to be dealt with; the business of the spinner and manufacturer is two-sided—his wares have to find a profitable outlet, and the difficulties he has to contend with in this direction are as pressing as the acquisition of raw material, if not more so.

The export of linen manufactures of all kinds from the United Kingdom, which had been steadily increasing from 1861 till 1866, began to flag. The value of these exports in the first year named was £3,852,341; in 1866 it had risen to £9,576,245, an increase of 148 per cent.; during 1867, however, there was a falling-off exceeding two millions sterling. This pressed with telling force on the entire trade, and the idea spread rapidly that something should be done to steady and, if possible, increase the supply of home-grown flax. The following advertisement which appeared in the Belfast papers brought the scheme into public notice:—

> "Having been requested to appoint a day of meeting to discuss the desirability of forming an association for the extension of the growth of flax, I hereby invite all who take an interest in the subject to meet me at the Chamber of Commerce on Friday, the 16th inst., at 1 p.m.
>
> "JOHN LYTLE,
>
> "President, Chamber of Commerce.
>
> "1867."

A most successful meeting was held in accordance with this invitation, and the following resolutions unanimously agreed to :—

1. "That the formation of an association in Belfast for the purpose of improving the quality of flax grown in Ulster, and extending the cultivation of the crop elsewhere, is calculated to be productive of much benefit, not only to the trade in general, but also to the agricultural community."

2. "That, for the promotion of the general aims of this association, it should co-operate as much as possible with the landlords, agricultural societies, and all organisations which have taken, or may hereinafter take, practical steps for the extension and improvement of flax culture."

3. "That, as one of the chief obstacles to the growth of flax has hitherto been the difficulty of sale in outlying districts, the association should take such steps as would enable the farmers in those districts to dispose of their crop to the best advantage."

4. "That, in order to facilitate the preparation of the flax for sale, this association should afford such encouragement as might be in its power for the erection of scutching machinery in new districts."

5. "That, while encouraging the saving of home-grown seed (chiefly for feeding purposes), the association should afford all possible assistance to landlords and farmers in procuring a supply of the best description of foreign seed for sowing on the most favourable terms."

6. "That the following gentlemen be requested to act as a committee for the purpose of framing rules and regulations for the association, and for further carrying out the object in view." (It is unnecessary to give the names after such a lapse of time.)

7. "That the committee be authorized to apply for subscriptions for the carrying out of the objects of the association."

These resolutions are sufficiently explicit to foreshadow the operations contemplated by the gentlemen forming the association, but a statement which appeared in the Belfast papers a short time previously was, no doubt, in the hands of those who took part in the meeting; it contained among other statistics the following figures :—

Relative acreage under flax to total acreage under crops in 1866 and 1867.

	1866.	1867.
In Ulster under flax, -	13.04 per cent.	12.69 per cent.
In Munster „ -	0.32 „	0.25 „
In Leinster „ -	0.46 „	0.51 „
In Connaught „ -	0.93 „	1.03 „

From these figures it is manifest at a glance that there was ample scope for extension. In Munster alone, with its area of 6,000,000 acres, there was a million and a quarter acres under crops, and only 3,248 acres in flax; the area under flax could be increased here on a very liberal scale, and interfere with no other interests.

The question which naturally follows is, how to commence and carry out successfully the proposed extension? The first step decided upon was to

approach the "Joint Flax Committee" in Dublin. The sum of £2,000 having been placed at the disposal of the Lord Lieutenant in 1864 by the Government for promoting the cultivation of flax in the South and West, the Royal Dublin Society and the Royal Agricultural Society were consulted, each appointed a committee, the two were amalgamated, forming a "Joint Flax Committee," authorized to look after the arrangements for giving effect to the wishes of the Government. At the time under review this committee had benefited by three or four years' experience, and co-operation with the Northern association, could not be otherwise than beneficial to both. A deputation from Belfast waited upon the "Joint Flax Committee," and received a favourable hearing, and as a result the operations carried on by the Flax Extension Association were calculated to increase the usefulness of what was being done, and supply the links needed to make flax-growing a complete industry.

The reports of the Joint Flax Committee show that the movement carried on by them did not go beyond sending into certain districts a class of men termed instructors; they were drawn principally from the North of Ireland, where flax cultivation was widely pursued and well understood; they were adapted for the work entrusted to their care, and were described at the time as "able, intelligent, and well-informed."

In the first year (1864) twenty-nine were employed, but only for some three months, and their sphere of action was limited to Munster and Connaught. In the second year (1865) fifty-four were appointed, and remained at their posts for a term of six months. During the third year (1866) forty-two instructors were selected for employment; they arrived at the Poor Law Unions to which they were allotted on the 1st March, and being only engaged for eleven weeks, retired on the 15th May, but returned to their districts on the 15th July and carried out another spell of duty, also for eleven weeks.

In the fourth year (1867) twenty-eight were sent out in spring and thirty-nine in the autumn, and it is at this time that the Flax Extension Association comes on the scene, and prepares to supplement the work of the Committee by providing scutch mills, markets, etc., the want of which was much felt from the first.

Before entering into particulars respecting the operations carried on by the Association, it may be inquired what were the results of the four years' labours of the instructors. It must be confessed they were not encouraging. In 1864, when the work was commenced, the area under flax in Munster and Connaught amounted to 16,162 acres; in 1867 it had fallen to 10,569 acres —a decrease of 36.6 per cent.

To turn now to the details of the work which engaged the attention of the Association. In a report prepared by a special committee and presented at a general meeting held in January, 1868, the following passages occur, and give a pretty accurate indication of the scheme recommended to the Association:—

"We now approach the more immediate sphere of the Association. The scutching in Ireland, as a rule, is not at all what it should be; and this Association should satisfy itself with the supply of machinery to new mills. It should endeavour also to effect a reform, where needed, in the old.

"Attempts have been made by your Committee to encourage monthly flax markets in outlying districts; and some of the leading spinners and merchants in Belfast have sent their buyers to these markets, and even attended them

themselves regardless of inconvenience or expense. But such efforts can only be spasmodic so long as there is no certainty of a supply of well-scutched flax being met with, sufficient to make the attendance on these markets a matter of pure commercial advantage."

In the direction of supplying machinery during the year 1868, grants, or rather loans, for long periods, free of interest, were made towards this object, as follows:—

For a mill at	Tulla, Co. Clare,	£50
„	Borrisokane, Co. Tipperary,	100
„	Skibbereen, Co. Cork,	60

Prizes for dressed flax to the amount of £58 were paid away during the year for competition at the following places:—

Londonderry, Co. Londonderry	£10
Strokestown, Co. Roscommon,	10
Waterford, Co. Waterford,	10
Cork, Co. Cork,	10
Skibbereen, Co. Cork,	10
Limerick, Co. Limerick,	8

A series of markets were also arranged in conjunction with the local authorities to be held in Cork, Ballineen, and Limerick, regularly in the four winter months, viz.:—October, November, December, and January. These markets were attended by two or three buyers from the large spinning mills in rotation.

In June it was resolved that a careful inspection of the South and West should be made in the interests of the Association at as early a date as possible. Two experienced persons were shortly appointed—one to travel through Connaught, and the other through Leinster; the Secretary of the Association undertaking a similar duty in Munster. A fund of very useful information was thus acquired for the use and guidance of the Association in the succeeding years.

In July a collection of samples from waters intended for retting purposes was secured, and a comparative analysis carried out in the Queen's College, Belfast, to test their fitness for the purpose in view. They comprised two from King's County, one each from Tipperary, Waterford, and Roscommon, seventeen from Cork, two from Kerry and two from Clare.

Considerable attention was also paid in the spring to the matter of having good seed available for the farmer in all likely districts, but the care necessary to carry out in detail the plans sketched in the extracts given above occupied the chief attention of the Secretary and his assistants.

In 1869 work of a similar character was continued. The loans were as follows:—

For a mill at	Rosscarbery, Co. Cork,	£30
„	Mallow, „	60
„	Kilworth, „	60
„	Skibbereen, „	50
„	Rosscarbery, „	60
„	Killala, Co. Mayo,	78

A much larger sum was devoted to prizes this year—the total amounts to £116 17*s.* 6*d.*:—

Mountmellick, Queen's County,	£13	10	0
Waterford, Co. Waterford,	15	0	0
Cork, Co. Cork,	15	0	0
Limerick, Co. Limerick,	15	0	0
Mohill, Co. Leitrim,	13	2	6
Longford, Co. Longford,	16	0	0
Strokestown, Co. Roscommon,	14	5	0
Skibbereen, Co. Cork,	15	0	0

Prizes were also offered in Dundalk, Co. Louth, and Ballina, Co. Mayo, but they were not taken advantage of.

The markets arranged in the previous year (1868) were very well supported the next season, the following firms having sent buyers:—

Whiteabbey Spinning Company, Limited.
Northern „
Wolfhill „
Bessbrook „
Braidwater „
Ligoniel „
Philip Johnston and Son, Limited.
J. Savage and Company, Limited.
Dunbar, M'Master, and Company, Limited.

In the Spring the Secretary made a tour in Connaught and a part of Leinster, and visited the following places:—Strokestown, Roscommon, Ballaghadereen, Ballina, Killala, Crossmolina, Boyle, and Sligo; and later in the year he also visited Belgium and Holland with the object of studying the careful way in which the details in handling flax are carried out in these countries, and being an experienced and successful grower of flax himself, he was able to grasp the entire subject and apply his knowledge to further the aims of the Association.

1870.—The routine of the work was very much the same as during the preceding year. In the month of May the Secretary made a journey in the South and West; it was principally with the object of inquiring about scutching accommodation. Among the places visited were New Ross, County Wexford; Fermoy, Mallow, Cork, Dunmanway, Brookville, Kilkeel (near Bantry), County Cork; Castlebar and Ballyvary in County Mayo. During the year loans were made—

For Scutch-mill at Dunmanway, Co. Cork,	£78
„ Castlelyons, „	150
„ Kildorrery, „	60
„ Mountcharles, Co. Donegal,	100

The amount paid in prizes this year was £171 5s. In addition to the places mentioned in the last season are the following:—

Dundalk, Co. Louth,	£15	0	0
Castlebar, Co. Mayo,	1	15	0
Maryborough, Queen's County,	15	0	0
Ballina, Co. Mayo,	30	0	0

The markets established at Cork, Ballineen, etc., were attended by the usual buyers, and rather more flax was on sale than on previous occasions.

The year 1871 was a more eventful one. There was a falling off in the acreage in flax in Munster, Leinster, and Connaught—from 14,477 acres in 1870, to 9,578 acres—a decrease of 33.7 per cent. The "Joint Flax Committee" attribute this to several causes—the want of scutch-mills and markets, sufficiently numerous and convenient, bad seed, and the low price of flax in the end of the previous season. Whether the general results appeared unsatisfactory to the Government or not is unknown; but, at all events, no further grant was made, and the operations of this Committee ceased with this year.

The executive of the Flax Extension Association were also somewhat disheartened, but they resolved to continue their efforts for some time longer. The loans for scutch-mills were still large, as the following shows:

For a mill at	Mountcharles,	Co. Donegal,	£100
„	Clonakilty,	Co. Cork,	50
„	Rosscarbery,	„	30
„	Kildorrery,	„	40
„	Killala,	Co. Mayo,	84
„	Rosscarbery,	Co. Cork,	50
„	Skibbereen,	„	30

The prizes this year were given in the districts already enumerated, and amounted to £149.

With respect to the markets, the small supply was beginning to be felt disadvantageously, and a practice referred to in an extract from the Annual Report, as follows, had also a tendency to injure them:—

"It is with regret that allusion must be made to a practice which has recently prevailed, and which, if persevered in, will preclude this Association, through their Secretary, incurring the responsibility of inducing spinners to send buyers. The practice alluded to is selling the choice samples of flax at the scutch-mills, and at the farmers' homes; spinners cannot be expected to send buyers, at a cost of both time and money, and find little but low-class flax in the markets, the bulk of the better quality having been bought up in the interval between each monthly market."

Change of Title.—"Extension" having proved impracticable, and the Association having become extremely useful in various ways for the benefit of the spinning and manufacturing industry generally, the title was changed to "Flax Supply Association," as analogous to the "Cotton Supply Association."

No new departure having taken place in the succeeding years, it is unnecessary to dwell on them at any length. In 1872 the loans were:—

For a mill at	Mallow,	Co. Cork,	£100
„	Kilworth,	„	20

The grants were larger in 1873, amounting to £470:—

For a mill at	Rosscarbery,	Co. Cork,	£40
„	Leap,	„	100
„	Castletownroche,	„	160
„	Kilworth,	„	140
„	„	„	30

From this time forward the amounts began to fall off, for in 1874 only three mills were supplemented—

Dunmanway,	Co. Cork,	£90
Rosscarbery,	„	60
Kilworth,	„	20

No loans were made in 1875, and in 1876 there were only two small sums disposed of amounting to £70.

In 1872 the amount allotted for prizes was £93, and in 1873 it had dwindled down to £37. Abuses commenced to creep in, and on the recommendation of the Secretary, prize-giving was discontinued.

In the report of the latter year (1873), the Secretary, after referring to unfavourable seasons, enhanced cost of labour, and increased value of stock, writes as follows :—" Viewing these facts, flax culture in Ireland is in a somewhat uncertain condition, and resolves itself into a question of maintenance, rather than of extension."

In the end, the executive committee recommended that the Association should be kept in working order so as to be ready to embrace any opportunity to foster flax in the South and West, and in the meantime turn attention to the much-needed improvement in the manipulation and scutching of flax in the North, where it is still largely grown.

NORTH-WEST OF IRELAND AGRICULTURAL SOCIETY.

This Society was established in the year 1821 and extended its operations in the promotion of its various objects through the Counties of Londonderry, Tyrone, and Donegal. It originated at a meeting of gentlemen residing at Londonderry, whose views on the possibilities of agricultural development in the North-West were warmly seconded by a number of the nobility and gentry of the above counties. The prime object of the Society was to investigate the condition of the district with a view to the development of the various resources, and its attention was especially directed to the state of the fisheries, manufactures, agriculture, and cattle breeding. A school for the instruction of boys of the middle class, in the agricultural knowledge necessary to fit them for land-stewards or scientific farmers, was established by the Society at a place called Templemoyle, about five miles from the city of Londonderry. This School of Agriculture continued for many years to do a useful work in the betterment of farming methods, and only ceased to exist some three years ago.*

The work of the Society was conducted by a committee, who met quarterly in Londonderry, and whose proceedings were reported to the general meetings convened in April and September. In connection with these general meetings Shows of Cattle were held, specimens of agricultural produce and rural manufactures exhibited, challenges issued for future competition and premiums awarded. In the first year (1821) the number of subscribers was 220, among them being the Hon. the Irish Society, as an extract from their minutes will show, viz., 24th July, 1821, Mr. Thomas Saunders laid before the Court of the Irish Society a printed paper respecting the establishment of an agricultural society in the North-West of Ireland. Moved, that it be referred to a Committee to examine and report on the propriety of this Society patronising the same. 6th September, 1821, the Hon. the Irish Society granted the sum of twenty guineas as a present donation to the funds of the establishment at Londonderry, of a Society called the North-West of Ireland Agricultural Society, for the encouragement of agriculture, arts, manufactures, and fisheries, and in future an annual sum of ten guineas during the pleasure of the Society.

In 1823 the North-West Society established a monthly publication, called the "North-West Society's Magazine," which was discontinued in 1825. Other series were attempted but were abandoned in 1829, and the Society confined itself to practical departments. Branch Societies were established, amongst which the Tirkeeran, the Kenmaught, the Cumber, and Banagher, and the Coleraine Farming Societies, have done useful work in aiding agriculture in the County of Londonderry.

These branch Societies received from the parent Society prizes of money, and a volume of the Society's Magazine. No member of the parent Society

* See also article on Agricultural Education, p. 137.

was admissible to pecuniary competition in any of the branch Societies. Premiums were offered, it is important to note, for the best statistical reports on any parishes within the three counties. The following extract from one of the Society's reports will exemplify the extent of the premiums awarded for rural manufactures:—

"Imitation of Leghorn Hats from Irish Grown Materials.—For the best set of hats of not less than twelve, manufactured from grass or straw, First Prize, £9. For the second best ditto, £6. For the third best ditto, £3.

"Woollen Manufacture.—To the person residing in the North-West district, who shall manufacture the best piece of woollen cloth, not less than twenty-five yards, First Prize, £3. Second best ditto, £2. Third best ditto, £1."

Such is a very brief note on the Society during the earlier years of its existence.

During more recent times, much has been done towards encouraging the improvement of all classes of Live Stock, Farm and Dairy Produce, and to educate the farmers in the use of the latest agricultural implements and machinery. A Summer Show of horses, cattle, sheep, swine, poultry, butter, farriery, green flax, and agricultural implements, horse jumping, riding and driving, etc., is held annually at Londonderry, and the turn-out of young horses and shorthorns, and cross-bred dairy cattle is always a particularly good one. A Spring Show of pure-bred pedigree bulls is also held, both Shows being open to all comers. Of late years the Society has extended its boundaries, the Counties of Londonderry, Donegal, Tyrone, and Fermanagh, now being included in its district. The Society has a most satisfactory membership roll, and a substantial balance to credit on the past year's work. For much of the information contained in this sketch, more especially with respect to the earlier portion of the Society's history, I must express my indebtedness to Mr. Robert Bailey of Fawnay, one of the leading and most progressive farmers in Londonderry.

THE COUNTY OF CORK AGRICULTURAL SOCIETY.

The County Cork Agricultural Society has had a long, useful existence. In the statistical survey of the County Cork, published in 1810, it is mentioned in the following terms:—"The establishment of a farming society, though its beneficial influence can hardly be said to have reached the lower orders, has, however, done material service. It has excited a spirit of useful competition among the higher, and rendered rural economy a favourite and fashionable pursuit."

In 1842 the Royal Agricultural Improvement Society reports:—"The County of Cork Agricultural Society, a large and influential body comprising the entire of that great County and a number of smaller local societies within its sphere, undertook to provide the necessary accommodation for the Show (of the Agricultural Improvement Society) in the City of Cork, and to pay the Central Society the sum of £500 in addition towards the expense of the premiums that were offered and other incidental expenses that may be incurred on the occasion." The Show was held in Cork in 1842. It was one of the most successful of the series of Agricultural Shows that subsequently were held alternately in the premises by the Royal Agricultural Society of Ireland. Very considerable improvements and advantages to Agriculture accrued through the influence of the Agricultural Society. Mr. Farmer Lloyd, the energetic Assistant Secretary knew the Agricultural requirements of the county, and the Society was brought into relationship with these. On the establishment of the chair of Agriculture in the Queen's College in Cork, an harmonious working took place between this department of the College and the Society. Mr. Bennett, who became Secretary subsequently to Mr. Farmer Lloyd, gave considerable attention to the work of developing Agriculture in the county through the influence of the Society.

In 1856 the Society appears to have entered upon a new phase of enlightened progress. It was chiefly owing to the exertions of the late Messrs. W. R. Meade and Thomas Garde that this was brought about, and much of its success for several years afterwards was due to the energy and ability of these gentlemen. Mr. Meade, who was a distinguished breeder of shorthorns and Leicester sheep, lived near Kinsale; he held the confidence of all classes in the county. Mr. Garde, who was an equally distinguished breeder of Leicester sheep, lived near Midleton. From 1856 down to 1890 the Shows were held in the grounds of the Corn Market. In this space there was sufficient room for an ordinary Cattle Show; but when the Society, following the lead of the Metropolitan ones, increased its area of operations and adopted the idea of holding horse-jumping contests, the enclosure in the Corn Market was found to be too limited. The Society, for the next few years, held its shows in the racing ground in the Park; but as it was thought there was a great loss in the annual erection of temporary structures it was decided to come to terms with the Corporation of Cork

and lease a piece of ground at the eastern end of the Park for the purpose of converting it into a permanent Show ground. The idea was well received by the Corporation, and a piece of ground containing some twenty acres was leased to the Society at an annual rent of £20. On this ground, which is within a mile of the city, the Society expended, in 1892, £5,300 in buildings, cycle and driving tracks, and enclosures. The funds were raised in shares bearing interest at 5 per cent. The Cork, Blackrock and Passage Railway passes by the Showyard, and a special platform has been erected for the use of visitors and others attending the Show. The great drawback to the Showyard is, that it is a portion of land reclaimed from the tide. In wet weather it becomes quite sodden, and as the Society have not been over fortunate in their fixtures in the matter of weather, it frequently happens that the wetness of the ground injuriously affects the attendance. To meet this the Society have entered into arrangements with some companies in Cork to deposit road scrapings and rubbish on the low-lying parts of the grounds, so that in a few years the grounds will be much improved.

In order to encourage cattle breeding a Spring Show for breeding animals has been tried for the past few years, but it was not well supported, and entailed a financial loss. A special Butter Show was also held in connection with the Irish Dairy Association, a few years since, and it, too, resulted in a loss. The same may be said of experiments tried in the way of Root, Fruit, and Grain Shows. Dog and Poultry Shows are occasionally held in conjunction with the Horse and Cattle Shows. The indebtedness of the Society at present is about £350. The Shows of the County Cork Agricultural Society were open to exhibitors from all parts of Ireland, and some of the best animals in Ireland stood in its rings. The show of hunters is always a particularly good one. The show of cattle lately, however, has not been up to the mark. We have no breeders in Munster, now, to replace Messrs. Welsted, Campion, Crosbie, Gumbleton, Meade, Smith, or Downing.

Besides the holding of exhibitions, papers on various subjects have from time to time been read by the members of the Society, and resolutions dealing with the principal agricultural topics of the day have been passed and forwarded to the proper authorities. One of the subjects which engaged the attention of the Society for a number of years was the anomalous condition of the Cork Butter Market, under which there were several grievances in respect of the butter industry. Another question which was warmly taken up was a recommendation to the Government of the day to take steps to establish cordons to prevent the spread of infectious disease among farm animals. But the greatest achievement of the Society was its successful effort to save the Munster Agricultural and Dairy School from extinction. The Government, at one time, were credited with the intention of discontinuing all the agricultural schools in Ireland, Cork among the number, but some public-spirited members of the County Agricultural Society came to the rescue, and by liberally subscribing, the first established dairy school in the United Kingdom was opened. The Cork School was the pioneer one in the undertaking. Its success as a dairy school is proved by the number of imitators it has in different parts of Great Britain. The Society has 600 members on its rolls.

Though the Society has not been uniformly successful its prospects are now bright. The Cork County Council has allocated to the County Cork Agricultural Society a sum of £560 out of the funds available under the schemes of the Department of Agriculture. Of this sum £354 is set apart

for cattle premiums, £140 for horses, £35 for sheep, and £31 for swine. The debt due at present by the Society is £350; but with the increase of numbers and the subsidy above referred to, which it is hoped will be continued, the debt is likely to be wiped out this year. As the number of thoroughbred herds of cattle in the south of Ireland has fallen off owing to agricultural depression, the number exhibited at the April Show was not, by any means, as numerous as might be expected in a pastoral district, being fewer than at Dublin or even Belfast. Nevertheless, the exhibit of pure-bred stock was a great improvement in respect of quality on the Shows hitherto held. Under the stimulating influence of the Department of Agriculture, the Spring Show at Cork in future should rank among the best of their kind. Owing to the offer of the Royal Dublin Society of six service premiums of £50 each to the Cork Society, a record exhibit of stallions took place, namely 31 thoroughbreds, 7 agricultural, and 3 half-bred sires. These were notably mentioned by the English Judge as the best class he had yet seen.

With the capacious show ground, with large and commodious buildings, and backed up with a substantial grant from the Department of Agriculture and the County Council, there can be little doubt but the Society will enter upon a new career of usefulness. The local Societies newly formed at Skibbereen, Clonakilty, and Mallow, as well as those in the adjoining counties, should assist as feeders to the Cork Show, which should be the chief one in the province.

AGRICULTURAL CO-OPERATION IN IRELAND.

The Work of the Irish Agricultural Organisation Society.

The Irish Agricultural Organisation Society was founded in April, 1894, to carry on a movement which had been promoted during the five previous years by a few individuals, but which had assumed too large proportions to be carried further without additional support.

The objects of the movement were stated in the Rules of the Society to be "to improve the condition of the agricultural population of Ireland, by teaching the principles and methods of co-operation as applicable to farming and the allied industries; to promote industrial organisation for any purposes which may appear to be beneficial; and generally to counsel and advise those engaged in agricultural pursuits."

The originators of this programme held that combination was as necessary to the welfare of agriculture as its general adoption proved it to be to that of all other industries. They saw plainly the economic advantage that could be derived from co-operation in every branch of the farmer's business, and a study of the co-operative movement in England convinced them that the discipline of combination for material advantage would be followed by an all-round improvement in the business habits and methods of the individual. There were, however, immense difficulties to be overcome in inducing Irish farmers even to consider co-operative action. In the first place, voluntary association for industrial purposes was unknown in Ireland, and almost every man who prided himself on special knowledge of the Irish people, confidently declared that it was altogether alien to the national temperament and habits. Moreover, it was pointed out that the leaders of the English movement had utterly failed to apply their principles to the farming industry.

The task before the originators of the movement in Ireland seemed, indeed, almost impossible of accomplishment. However, seeing no other resource in the prevailing depression, and being satisfied that their scheme was economically sound, and that it would appeal as such to the intelligence of the farmers, they determined to enter upon a vigorous propaganda, and persist in it until their programme had been adopted or finally rejected.

The *modus operandi* previously employed and now followed by the Society need not be detailed, but the following extract from the speech of the President, at the inaugural meeting on April 18th, 1894, will at least indicate the reasons why, and the spirit in which, the work of organisation was undertaken:—

"The keynote of our proposals is the proposition that the Irish farmers must work out their own salvation, and further, that this can only be done by combination among themselves. I am quite aware of the difficulty which at once suggests itself. It will be pointed out that effective combination for productive or commercial purposes is not to be accomplished simply by a

recognition of the fact that it is necessary to combine. An association, which is not to be a mere debating society, but which is to be capable of joint action, must be organised on certain well-known, but rather complicated lines in order to be permanent. The farmers, from the nature of their occupation, are incapable of evolving for themselves the principles which must be observed in framing such rules as will do justice between man and man, and harmonize the interests of all concerned. Even when a farmer grasps the idea that he ought to combine with his neighbours, he cannot put before them an intelligible and working scheme. Now, here is the point at which, without any interference with his business, without weakening his spirit of independence, without any departure from the principles of political economy, we can do the Irish farmer a great service. To bring to the help of those whose life is passed in the quiet of the field the experience which belongs to wider opportunities of observation, and a larger acquaintance with commercial and industrial affairs —that, gentlemen, is the object and aim of this society."

It is a curious fact that the original promoters of the programme which the Society had taken over, were for some years quite unaware that they had evolved out of a study of conditions at home, the industrial remedy which was already being applied in foreign countries. Of course, when this became known to them, and the knowledge came from the researches of the Vice-President, Father Finlay, they became far more confident of ultimate success, and redoubled their efforts. For it then became simply a question whether the superior natural intelligence of the Irish farmer, in which they confidently believed, could off-set the higher technical and commercial education of his foreign competitor.

At the time of the formation of the Society, the work of organisation had been confined, for reasons not necessary to enlarge upon here, to the promotion of Co-operative Creameries—that is, creameries owned and managed by the farmers themselves—thirty having been established by the end of 1893. The original scheme contemplated, as soon as sufficient organising help could be obtained, the extension of the co-operative principle to every branch of the farmer's business. It was, however, necessary to show, before practical men would support a more extended programme, that the success already achieved by the Co-operative Creameries warranted the anticipation of similar success in the other projected developments. A close study of the audited accounts and published statements with regard to these creameries, brought out some remarkable facts and figures. At the end of 1893, the accounts of these 30 creameries, with their 6 branches, showed the following satisfactory results :—

Total number of shareholders	1,509
Paid-up capital	£13,845
Loan capital	7,746
Value of buildings and plant, after allowing for depreciation	24,872
Milk purchases (7,575,036 gallons)	123,780
Butter sales (1,273 tons, 6 cwt., 3 qrs., 20 lbs).	140,780

The farmers supplying milk to these creameries, variously estimate the increased profit on the return from their cows at 30 per cent. to 35 per cent. This profit, whatever its amount, could only be realized by the farmer through co-operation—a lesson which he was not slow to take to heart.

The societies were not numerous, but they were widely scattered and

representative. A distinct step had been taken. It could be generally stated that a highly technical manufacture had been conducted on sound commercial principles by associations of farmers acting through committees elected under their rules from among themselves. Their product was excellent, and the venture was highly remunerative. There was not the slightest indication of even the average percentage of commercial failure being incurred. This result had been accomplished without any external aid whatsoever, except the advice and exhortation of the apostles of co-operation.

The Co-operative Creameries had proved to the farmers the advantage which accrued to the individual from combination in the production of their butter. The societies were still, though in a less degree, subject to the same disadvantages as the individual, in its distribution. The waste of and damage to their product, incidental to the local butter market was, it is true, obviated by the creamery system, which enabled them to sell their butter in bulk to the commission men. But they had not the means of testing the solvency of these men, or of keeping in touch with the English markets. In fact, the local committees had learned much, but had not commercial experience. Several of the societies, therefore, federated themselves together in a selling society, called the Irish Co-operative Agency Society, which started in the autumn of 1892, with its head office in Limerick, and a store in Manchester. This venture was, perhaps, premature, and too bold. It resulted disastrously at first. The society became involved in lawsuits, contracted bad debts, and, in its first year, lost all its capital. However, the farmers recognised the necessity for independent distribution of their co-operative product, and persevered with their new departure, giving remarkable proof of the thoroughness with which they were imbued with the co-operative spirit.

The accompanying Map* shows graphically the remarkable extension of the work of the Irish Agricultural Organisation Society. In order to give the reader an idea of the scope of that work, the following account (mainly taken from the Report of the Organisation Society for the fifteen months ending 31st December, 1900, and consequently, so far at least as the statistics quoted are concerned, not quite up to date) has been compiled :—

Dairy Societies.

The actual number of Dairy Societies in existence [*i.e.* in December, 1900] was 236, and their distribution, membership, and trade was as follows :—

Province.	Societies.	Membership.	Trade.
Leinster -	25	1,903	
Munster -	69	5,474	£703,826
Ulster -	109	10,825	
Connaught -	33	8,375	
† TOTALS,	236	26,577	

From the statistics it appears that the 26,577 members of these Societies had invested no less a capital than £74,223, which is held by them in fully or

* The statistics on which the Map is based have been brought up to date.

† The total trade (£703,826) given here only represents the total trade of those Societies furnishing complete returns.

Map showing the position of Societies.

	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901
Dairy & Agricultural Societies	1	1	17	25	30	33	56	61	83	123	153	171	187
Auxiliaries							8	9	10	13	38	65	81
Agricultural Societies ...							10	31	46	77	99	106	106
Co-operative Banks ...							1	2	3	15	48	76	102
Poultry Societies										3	16	21	29
Miscellaneous									4	10	18	36	46
Federations				1	1	1	1	1	2	2	2	2	2
Total No. of Societies ...	1	1	17	25	31	34	76	104	148	243	374	477	553
Total Membership ...	50	50	850	1,050	1,250	1,650	3,800	10,120	14,290	27,322	36,683	46,206	51,000

EXPLANATION OF MAP.

Dairy and Agricultural Societies

Auxiliaries

Agricultural Societies

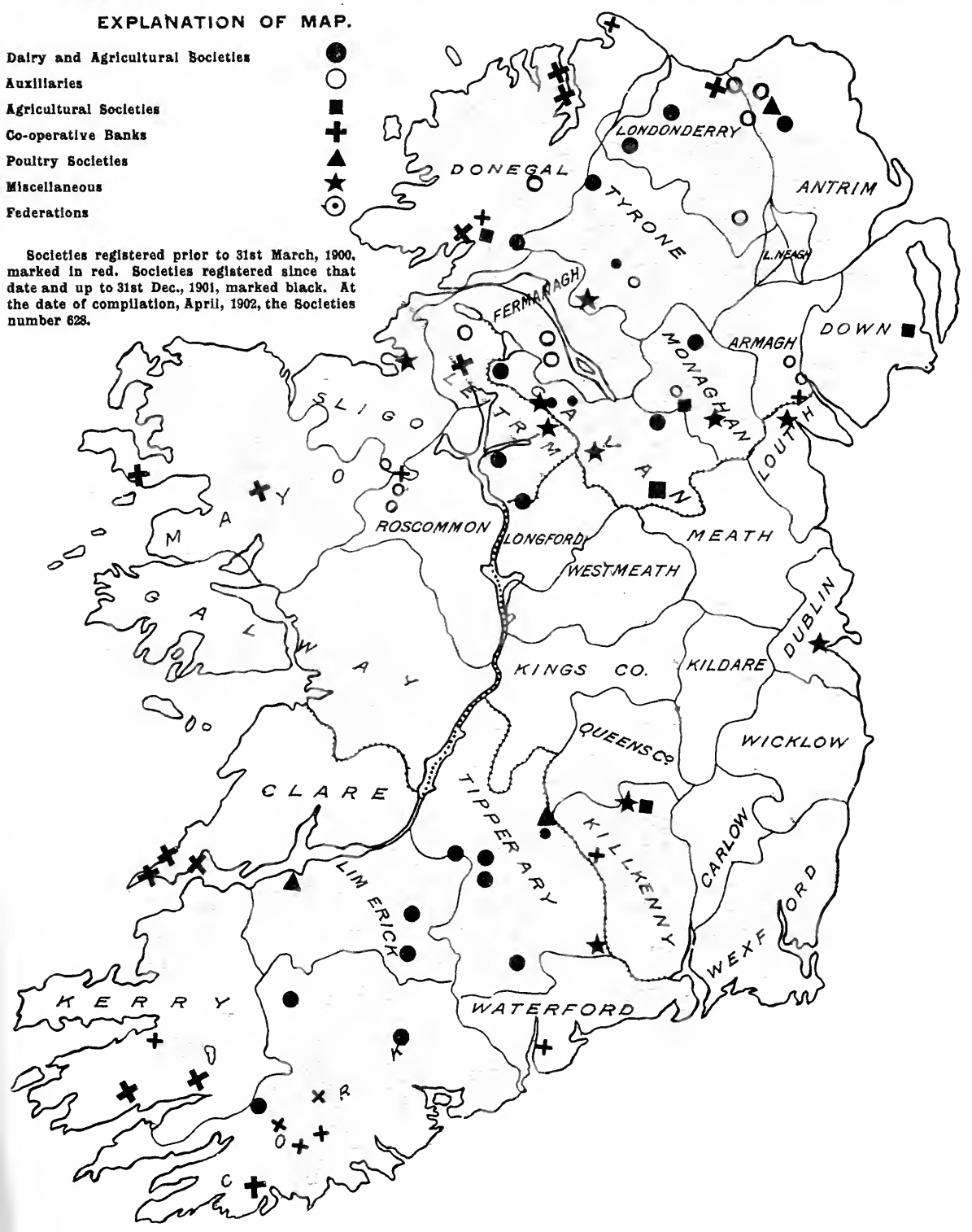
Co-operative Banks

Poultry Societies

Miscellaneous

Federations

Societies registered prior to 31st March, 1900, marked in red. Societies registered since that date and up to 31st Dec., 1901, marked black. At the date of compilation, April, 1902, the Societies number 628.



part-paid shares. This share capital has been augmented by the sum of £46,262 loan capital, making altogether £120,485, invested by Irish farmers in the development of this branch of their industry. The value of buildings and plant after depreciation was returned as £129,528, but it was estimated to greatly exceed this figure, as many Dairies were in course of equipment at the date to which the returns refer. Turning to the actual trade done by Dairy Societies, we find that they received 35,629,743 gallons of milk, from which they produced 13,601,184 lbs. of butter, or 4,177 tons. The farmers supplying milk realised an average price per gallon of 3.84*d*., with the separated milk and buttermilk given back free. The working expenses amounted to £74,259—roughly 9½ per cent. on the value of the output, which realised the large figure of £703,826. A net profit of £12,472 was earned on the year's trading, which is available for allocation among the members of the Societies, whose reserve and accumulated profit now amounts to £19,545. The price received for butter was 10.84*d*. per lb.—a shade less than the price received in 1899, which was 10.92*d*. The average yield of butter from the milk is, however, high, 6.59 ozs. being produced from a gallon. With the exception of 1893, the yield per gallon has gone up steadily since a record began to be kept in 1892.

This increase is clear gain to the farmer, and is the result of improved machinery, greater care in separating and churning, and paying for milk strictly according to its quality. There appears to be no longer any reason to doubt that the greater efficiency of the new creameries will enhance the productiveness of milk by at least 1 oz. per gallon, while, if the farmer pays greater attention to regularly testing the milking qualities of his dairy herd, he will be able to obtain far greater profits than he now can realise without any additional expenditure, merely by weeding out bad milkers and by using suitable fodder. It has been proved conclusively, by experiments at Wisconsin and elsewhere, that by the mere process of selection, together with judicious feeding and careful management, it is possible to increase the productiveness of the milk of a herd of dairy cows by 25 per cent.

A very pleasing feature in the development of the creamery system is the opportunity which it has given to labourers to become cow-owners. Numbers of them now have cows, and one case has been reported where a man, living in an ordinary way-side cottage with one acre of land, has been enabled to own eight milch cows, from the milk of which he has realised £70 in cash during the past year. This man's case is typical of many others. From grazing one cow by the roadside—on the "long farm," as it is called in the country—he was enabled to buy additional cows and rent grazing for them through the profits he derived from the Creamery. The gain per cow over the old butter-making methods is pretty generally estimated at 30*s*. per annum, but in some cases milk suppliers put it down at a much higher figure.

The Co-operative Creameries are gradually taking up other branches of the farmer's business. There is a considerable increase in the number which now transact "agricultural" business; others have introduced schemes for the improvement of their members' live stock; others again are developing the egg and poultry industry; while some are establishing Agricultural Banks to be worked as an adjunct to their ordinary business. Little advance has been made in the fresh cream trade, the success of which depends almost entirely upon pasteurisation. The Co-operative Dairies have had in some places to encounter very keen competition, owing to the extension

of other creameries worked on the proprietary system. It may be said at once that the Irish dairying industry, and indeed the entire agricultural industry, is suffering from the want of capital; but if the investment of capital from outside deprives the farmer of the power to control his industry it can bring him but little pecuniary benefit, while it places him in the position of a servant rather than that of a partner in the attempt to develop it. In short his industry is merely being developed in the interest of the *entrepreneur* proprietor, who competes with a Co-operative Society, to pay prices for milk which are beyond the power of the Society and which are sufficient to tempt unthinking men to leave their own Creamery for the sake of a small immediate gain, and if this policy is successful it ultimately leads to the failure of the Co-operative Creamery, which must die of inanition, and thus leave to the enterprising and wealthy proprietor undisputed possession of the district. This, from every point of view, must be regarded as a misfortune to the farmers whose apathy or shortsightedness has allowed them to let the control of their industry slip out of their hands. It is undesirable that the investment of, say, £1,000 in the erection and equipment of a Creamery should entitle the investor to control an industry in which the farmers supplying milk have invested, in the form of cows and land, a capital to the extent of £20,000. It has been already argued that our farmers either have, or can command, the required capital; the success of their own Creameries proves that they also possess the necessary business intelligence.

The "Auxiliary" System.

Perhaps the most remarkable feature in the development of Co-operative Dairying is the extension of the "Auxiliary" system which is the best proof that it is working satisfactorily. There is still much difference of opinion as to what is the best working arrangement between Auxiliaries and Central Dairies. As the organisation of Dairy farmers into Societies for the improvement of their industry by mutual help rather than the creation of a centralised system of butter-making on a large scale (which is apt to come under the sole control of the local committee and thus lose, to some extent, its co-operative character) appears to be more properly the function of the Society, the registration of Auxiliaries as independent, self-governing Societies is generally advocated. But two serious difficulties present themselves: (*a*) that of exercising a certain amount of control by the Central Dairy over the purely technical work of the Auxiliary, without, however, impairing its co-operative character, lessening the sense of responsibility of its members, or unduly interfering with its independence; and (*b*) that of arranging an equitable basis upon which both Societies may work harmoniously. Now that the Societies are obliged in many instances to compete with dairies owned by individual capitalists or corporations they are forced, to some extent at all events, to imitate the methods of their competitors; they must centralise their manufacture, they must adopt a uniform system of working in their branches or Auxiliaries, and they must strive by every means in their power to make their business as profitable as possible by cutting down working expenses, by increasing their output, and by improving its quality. To attain this it is necessary to employ a skilled Manager and Staff at the Central Dairy and to ensure that the results of this skilled labour shall not be impaired by any slovenliness or neglect at the branches. To do this without causing friction requires not only a good system but also

tactful management. What appears to be the best plan is to give the Manager of the Central Dairy, subject to the approval of his committee (on which the Auxiliaries ought to be invariably represented), supreme authority over the Managers of the Auxiliaries so far as relates to dairying business only. This arrangement we believe to be absolutely necessary and need cause no disagreement between the two bodies or their respective Managers if the duties of the Auxiliary Manager and the powers of the Central Manager are clearly defined in the first instance. But the maintenance of harmonious relations between the Central Dairy and its Auxiliaries, without which the system must break down, mainly depends upon two factors:—(*a*) the basis upon which the cream is received by the Central Dairy, and (*b*) the subsequent division of profits between the Societies. The ideal plan seems to be for the Central Dairy to purchase the cream from the Auxiliary at the same price per lb. for butter fat contained as that which it pays to its own milk suppliers, allowing, of course, for cost of separation and cartage to the Central Dairy. The Auxiliary is thus put on a par with the ordinary milk supplier, for it receives payment for the butter fat contained in its cream regularly once a month, and participates in the profits of the Central Dairy at the end of the year. There are two difficulties, however, which have to be overcome. One is, to ascertain the just proportion of expenses to be allowed by the Central Dairy to the Auxiliary for separation (which, of course, must include depreciation, interest on capital, etc.), and for carting the cream; the other is, to determine accurately the percentage and weight of butter fats contained in the cream. Testing cream is immeasurably more troublesome and less accurate than testing milk, but if both Societies are really determined to work together for their common good it ought to prove easy enough to check the cream tests by the simple process of churning the cream and weighing the butter produced. The cream should also be tested before being sent from the Auxiliary to the Central Dairy. There is another drawback to the Auxiliary system which pasteurisation at the Auxiliary itself will remedy: this is the injury to cream in transit by partial churning where it has not been at first pasteurised, or at all events properly cooled. If the Auxiliary system is to be perfected each Creamery must be fitted up with pasteurising machinery, and, though the first cost will be heavy, it will unquestionably be repaid by the improved quality. Pasteurising involves the use of an artificial "starter" to set the true lactic ferment at work in the cream, by which means only butter of an uniformly excellent flavour and quality can be produced. Without this precaution it would be quite possible for the Central Dairy to inflict a very great injustice upon its Auxiliaries, for there would be nothing to prevent it from churning the cream before it was properly ripened, or at too high a temperature, and this would, of course, result in a diminution in the produce. In order that the arrangement between the Central Dairy and its Auxiliaries should be as perfect as possible, the representatives of the latter should be permitted to take samples of the buttermilk after churning, for the purpose of analysis, and, if necessary, to supervise the process of churning itself. There appears to be little doubt but that the Auxiliary system will become practically universal in the future. The principle of centralisation is economically sound, and all that is required is to evolve a scheme of working which will prove as satisfactory to the Auxiliary Creameries and the Central Dairy as the existing Independent Creamery system is found to be to a Creamery and its suppliers.

Agricultural Societies.

The number, membership, and trade of the Agricultural Societies in 1900, as compared with 1899, is shown in the appended statement:—

	Number.	Membership.	Trade.
On 31st Dec., 1900 -	106	11,961	£74,202
On 31st Dec., 1899 -	104	11,606	68,217
INCREASE, -	2	355	£5,985

They are distributed among the four provinces thus:—Leinster, 26; Munster, 17; Ulster, 9; and Connaught, 54.

The two developments of their business which call for special notice are the improvement of live stock, and the establishment of "experimental plots."

Hitherto far too little importance has been attached by our Societies to the improvement of live stock, and it has been left almost entirely to individuals to breed and maintain pure-bred herds of cattle and flocks of sheep, a most costly undertaking, and one quite beyond the means of the average farmer. The Royal Dublin Society has rendered a signal service to the country in this direction, but we believe that in future by doing this work in conjunction with the Agricultural Societies its value to Irish farmers will be greatly enhanced. Without any external assistance the Societies have in many cases enabled small farmers to provide themselves at a moderate cost with pure-bred bulls, boars, rams, and even stallions, and this most valuable work is being now undertaken by Societies in the very poorest parts of the country where improvement was needed most. It is quite impossible to estimate the extent to which the live stock of the Irish farmer may be capable of improvement through the judicious introductions of strains suited to the conditions of each district. The improvement of stock is a branch of the farmers' business which can be well and economically effected by co-operation, but, like the Agricultural Banks, the good results will not all at once be noticeable, and cannot be expressed in pounds, shillings, and pence. The Department of Agriculture will make the improvement of live stock part of its programme, and it will find no more valuable auxiliary in this work than Societies, whose members know what they want, and whose business training, and methods of self-help will enable them to show far better results from a small but judicious expenditure than could possibly be expected from a much larger outlay upon an unorganised community.

In their initial stages our Agricultural Societies naturally find it somewhat difficult to obtain the accommodation which they require in their business from the existing Banking institutions in the country but as the true character of these Societies becomes more manifest this difficulty tends to disappear, as it has invariably done in other countries. Societies, therefore, are forced to obtain such accommodation on the joint and several security of the members of their Committees at current bank rates, to enable them to give their members the credit to which they have been accustomed in the past. Short of a rigid cash basis, this is decidedly the best plan for an Agricultural Society to adopt in financing its business. The loan is in the form of an over-draft, and interest is, of course, only paid upon what is actually due to the bank for the time being. This arrangement enables a

Society to purchase its members' requirements for cash and upon the very best terms, and, actually in some cases, to earn a small percentage of profit on each transaction where the trade cash discount is higher than the interest paid to the bank. Societies do not as yet universally appreciate the value of the commercial standing which a cash system of trading will enable them to acquire. Their members have been accustomed all their lives to take as much credit as they could get without enquiring too closely into the price which they were paying for the accommodation. Capital can now be procured for business purposes at much cheaper rates than ever before, but still the majority of the farmers of Ireland prefer to deal on credit. If the Agricultural Societies, therefore, did nothing more than to put an end to such a wasteful and extravagant system of doing business they would have rendered a signal service to the agricultural industry of the country.

One very important branch of business has been developed by the Agricultural Societies, viz.:—the sale of bacon pigs. Arrangements have been made by which Societies can now send their pigs direct to the curers, receiving payment for them in accordance with quality and weight. The *modus operandi* is to collect a sufficient number of pigs to fill one or more railway trucks, each member's pig or pigs being ear-marked with a tin label bearing a certain number to identify his lot. When the pigs have been killed, cleaned, and cloven, a return of their weight is prepared, and cheques are made out in payment for each lot at the current market prices. The curers report on the returns as to the quality of the pigs when killed and, of course, the price is regulated by the quality; they point out to the Society from which the pigs come the shortcomings of any particular member's lot, and thus pig-feeders obtain what was never before available to them, an expert opinion on the quality of the pigs they supply. This enables them to correct errors in feeding, etc., and it gives to the careful feeder the proper value of his pig. The curer who buys the pigs allows a commission of 1*s.* per pig to the Society, which, in the case of many Societies, has provided sufficient funds to remunerate their Secretaries. On the whole this system works well, for it has resulted in the members of Societies in remote districts obtaining far better prices for their pigs than they ever before received. There is still, however, a very great difficulty in disposing of heavy pigs which are over the weight required by the curers for bacon purposes; these are mostly sold in Scotland at present, and at, comparatively speaking, low prices. It is hoped that Societies may take up the industry of killing and curing such pigs for the use of their members and thereby displace a very large quantity of the inferior American salt pork, which at present finds its way into the country, and is actually bought at a higher price than that realised by the sale of these heavy pigs.

Payment being made direct by the curers to the pig-feeders in these cases precludes the possibility of including the sale of pigs in the returns of their trade, and it is not possible to arrive at even an approximation of the extent of the business thus done, but it may be assumed that it amounts to several thousands of pounds sterling.

In a few Societies some dissatisfaction exists owing to the fact that the pigs are bought on a dead-weight basis and at a price fixed absolutely by the curers, and it has been suggested that pigs should be bought alive and by live weight. At present the curers do not see their way to agree to this system of doing business, which, however, is that which governs the far larger transactions of such centres of bacon-curing in Chicago, and it is to

be hoped that they may see their way to meeting the demand of the pig-feeders, which appears to be perfectly reasonable. If pigs can be bought by weight and the quality judged while alive in the market elsewhere, it ought not to be impossible to adopt a similar custom in Ireland.

The returns of the business done by the Agricultural Societies give but a faint idea of the amount of good which they have accomplished, for their effect has been to reduce prices of agricultural commodities not only to members of Societies but also to those who are not members but who live in districts where the influence of a Society is felt. Farmers, whether members of Societies or not, are now becoming more critical purchasers, and unless they are deeply indebted to the merchant from whom they obtain supplies, are now much more particular as to the quality of the goods which they purchase. As far as possible it has always been the desire of the Society to encourage Home Manufacture in manures, cakes, etc., in order to keep the money in the country, and it must be admitted that the manufacturers are, at last, becoming alive to the importance of the Co-operative trade, and evince a far greater desire to cater for the wants of Societies than hitherto. As the Societies are bound to increase rapidly, it behoves Irish manufacturers to leave nothing undone to render it unnecessary for our Societies to look anywhere outside Ireland for their supplies, and the least that can be expected of them is that they will put the Societies upon trading terms as favourable as those enjoyed by ordinary dealers in their products.

Poultry Societies.

The Co-operative Poultry Societies now number 21, with a membership of 2,569. These Societies have been formed for the double purpose of improving the breeds and methods of rearing and fattening poultry, and improving the methods of placing poultry and eggs on the market. With these objects in view, this Society has employed Poultry Experts who impart Technical Instruction to the Societies in the form of lectures and by demonstration. One of these experts—Mr. Viggo Schwartz—has been brought from Denmark especially to teach the Societies the Danish methods of selecting, grading and packing eggs for exportation. Besides these twenty-one Societies specially formed for carrying on this business, twenty Dairy and Agricultural Societies have taken it up. Most of the Poultry Societies have been but a short time at work, and their total trade turnover for 1900 only amounted to £9,475. This comparatively small trade was mainly due to the difficulties which they had to encounter in obtaining due recognition for the excellence of their eggs on the English markets—the past barbarous system of packing and exporting eggs from Ireland having almost forced down Irish eggs to the lowest position on the markets. Another cause which militated against them was the determined opposition of the egg dealers who offered prices far in excess of what they had been paying before the Societies were started, and, even in some cases, beyond the real value of the eggs.

When it was decided to take up the re-organisation of the egg and poultry industry some years ago a crisis had arisen in the Irish Egg Export Trade. The Liverpool and Glasgow egg merchants had issued a circular to the Irish Egg Shippers informing them that on and after a certain date they would cease to buy Irish eggs unless they were fresh, clean, properly packed in clean dry straw, or "wood-wool" and in non-returnable cases of the pattern used by Continental shippers. Though this resolution was not

universally adhered to by the trade, it created a considerable sensation among the Irish Egg Shippers, who, realising at last that their methods of doing business had almost destroyed their trade, held several meetings and passed many resolutions pledging themselves to carry out the necessary reforms so as to comply with the requirements of the English and Scotch buyers. Hitherto the practice all over Ireland among farmers' wives had been to hold their eggs until they had a sufficient quantity to make it worth while taking them to market, particularly when prices were going up. The egg buyers' circulars and resolutions made no impression whatever on them, for no guarantee was given that better prices would be paid for fresh, clean eggs, than had been hitherto paid, and so they continued to send their eggs to market as before, where they were dealt with as before. The injury done to the trade by the perpetuation of this abominable system of "holding up" eggs was enormous. The Irish egg—under proper conditions the best in the world—was sold at the lowest market price, and was difficult to sell even then. Poultry-keepers grumbled at the low prices and threatened to give up the egg business, and the egg buyers seemed equally dissatisfied. Both had contributed to ruin a profitable industry; neither appeared capable of restoring it to a proper basis.

It was at this juncture that the Poultry Societies began to be formed with the object of bringing co-operation among the poultry keepers and better methods of trading to bear on the business. They at once started on completely new and improved lines which practically amounted to a revolution—they bought the eggs from their members *by weight* instead of by the dozen or score; they refused to take any but perfectly fresh and perfectly clean eggs, and they packed them in accordance with the instructions given by the expert, Mr. Schwartz, on the Continental plan, in non-returnable cases and in wood-wool. But the mischief wrought by the old system made it hard for the Societies to develop their trade.

The Societies' business so far has been mainly confined to the collection and sale of eggs, but some are taking up the table poultry trade—a business which is far more difficult and risky, but which can, without doubt, be developed very considerably. The fowls are bought by weight, killed, plucked, properly trussed, and packed for market, instruction being given by experts as in the egg business. The sales of poultry have not been as yet very large, but they are steadily increasing, and profits, hitherto unknown, are being realised. The Newmarket Society reports that on one trial consignment alone a profit of one hundred per cent. over the prices that could be obtained locally was realised. This is, of course, exceptional.

Attention is being directed at present to the establishment of central egg packing depots to be supplied by local federations of small Poultry Societies, so as to minimise working expenses, and to secure greater efficiency in management. The local Societies will thus act merely as collecting centres where the eggs and poultry are bought and paid for by weight, and then forwarded in patent returnable cases by cart to the packing depot where the eggs and poultry are again weighed and paid for, and are prepared for shipment. At these packing centres poultry fattening will in all probability be carried out in the near future, and a poultry farm will be attached to each, where chickens can be artificially hatched and reared, so as to command the top market prices, and from which the members of the local Societies may obtain sittings of eggs, and stock birds of the breeds most suited to their requirements, at moderate prices. These central depots will

also afford those who wish to take up poultry keeping the means of acquiring a thorough knowledge of the industry in all its branches.

When it is remembered that England paid to foreign countries and the colonies in 1898 £4,457,117 for eggs alone, it will be seen that these Societies have a future before them which is only second in importance to that of the Co-operative Creameries.

Trade Federation.

One of the most enccuraging successes is that of the Irish Co-operative Agency Society. This body was established in 1893 by a number of the Dairy Societies which found it necessary to form a federation for the purpose of jointly selling their produce in the large English markets, and of establishing a distinctive reputation, and, if possible, a national brand, for unadulterated Irish Creamery butter. Repeated difficulties, incidental to a totally novel and extensive class of business undertaken by farmers hitherto inexperienced in large commercial transactions, beset the earlier years of this enterprise. Among these troubles were costly lawsuits resulting from the acts of unsatisfactory officials; the difficulty of financing in Ireland an unprecedented undertaking of the kind; and, worse than all, the apathy, perhaps not surprising at the outset, of the Dairy Societies generally towards the venture. Thanks, however, to the persevering determination, the caution and the natural business capacity of its Committee, seconded by the zeal and ability of its present manager, Mr. Roche, the Agency Society gradually overcame all its difficulties, and to-day it occupies a perfectly sound financial position, and its reputation as a trading body stands high in the business world.

Its growth may be best illustrated by the following figures:—

Year.	SALES.	£
1893	- - - - -	45,574
1894	- - - - -	64,857
1895	- - - - -	75,922
1896	- - - - -	110,726
1897	- - - - -	116,238
1898	- - - - -	133,010
1899	- - - - -	159,401
1900	- - - - -	177,205
	Total Sales for seven years	£882,933
	Bad Debts for this period	£168

No better proof could be furnished of the solid business qualities of the Irish farmers who direct this Society than their having incurred so extraordinarily small a proportion of bad debts as £168 in a volume of trade amounting to over three-quarters of a million sterling.

The Irish Agricultural Wholesale Society.

The Agricultural Societies now formed a federation for the purpose of transacting the business of joint purchase of their requirements and joint sale of their produce on lines somewhat similar to those on which the Creameries have established the Co-operative Agency Society. This federation, under the name of the Irish Agricultural Wholesale Society,

has been at work now for some years and is steadily proving its utility to the Societies. As in the case of the Agency Society its earlier stage has been attended by some difficulties; but there is every confidence that, like the Agency Society, when it has bought its experience, it will overcome all its difficulties and occupy a position of great importance in the development of the commercial side of the Agricultural industry. Its chief difficulty for some time to come will be finance, and it is necessary to impress upon local Agricultural Societies the necessity for providing sufficient capital either by shares or loan, or through a system of cash payments by their members, to enable them to deal on a cash basis with the Agricultural Wholesale Society, and thus secure the fullest benefit in price and quality which a cash system of trading alone can render possible.

The trade turnover of the Wholesale Society for 1900 amounted to £36,763. It has secured new and commodious premises at 151 Thomas Street, Dublin, and the business management of the Society is under the charge of Mr. A. O. Watkins, whose reputation in the agricultural trade is well known.

The Educational Work of the Movement.

Side by side with its programme of organisation the Society has found it necessary to undertake a good deal of directly educational work, including a considerable system of Technical Instruction, in order that the Societies which it organises may be properly able to fulfil the industrial purposes for which they have been formed.

This fact will have been made sufficiently apparent from various particulars mentioned in the preceding portions of this article, but it is desirable to make a more direct reference to this branch of the work here.

The purposes of these Societies, we may recapitulate, are the manufacture of their butter on the best and most scientific principles in creameries; joint purchase of their Agricultural requirements and the sale of their produce; the improvement of their live-stock, including cattle, horses, sheep, swine, and poultry; the acquisition of machinery, such as steam-threshers, potato sprayers, etc., for the joint use of their members; the improvement of their methods of tillage; the development of early market gardening; the introduction of the Continental system of collecting, grading, and packing eggs for high-class English markets; the establishment of experimental farms under the direction of the Organisation Society's expert instructors; the formation of Co-operative Rural Banks on the Raiffeisen principle; the promotion of rural industries, such as lace-making, weaving, crochet, embroidery, and needlework generally, for the employment of women in rural districts when not otherwise engaged. To forward these aims the Society employs a number of expert instructors, and carries out a regular system of technical instruction in addition to its work of organising.

Even in the early stages of the movement it was seen that the mere organisation of a certain number of farmers into Societies, the framing of an equitable constitution for these bodies, the drafting of rules which would provide for every contingency which might arise, were but the first and easiest steps. Once a Society is organised, the technical instruction begins with the teaching of business methods and the keeping of accounts, and extends through every phase and detail of the industry for which the Society is formed.

So much for the statistical and technical sides of this great co-operative agricultural movement. To understand its inner spirit—its philosophy, so

to speak—and the less obvious causes of its success, it is necessary that the reader should read the following able review of these causes which has been extracted from an address on "The Trend of Co-operation in Great Britain and Ireland," delivered by the Right Hon. Horace Plunkett, as President of the National Co-operative Festival Society, 1901-2:—

"To understand the Irish movement, you must realise that the problem to be dealt with in Ireland was wholly different to that which confronted the pioneers of the English movement. The need for co-operation in distribution was not urgent in Ireland, and, even if it had been, the business of shop-keeping would not have appealed to the Irish imagination in a way calculated to bring out the qualities which, as will be seen, other forms of co-operation evoked. Ireland is occupied by a scattered population, with a low standard of comfort, themselves producing a good deal, though a diminishing quantity, of their own essential dietary. The vast majority of the people live directly upon agriculture, and almost all classes depend directly upon that industry. The country being practically devoid of coal and iron, and having few important manufactures, its wealth can almost be measured by the output from the land. Any movement, dependent for its establishment on a permanent basis upon economic advantage, would stand or fall by the influence it exercised upon the habits and methods of the wealth-producers of Ireland—the farmers and farm labourers.

"While any such movement must be kept wholly apart from politics, one of its chief initial difficulties was incidental to the political attitude of the Irish mind. The history of the country has taught the Irish people to attribute all their industrial shortcomings and their commercial disadvantages to the action of the Government. Their political leaders quite sincerely teach them that a Parliament of their own would quickly repair the injuries inflicted by past misgovernment. When this attitude of mind had been successfully dealt with, when the all-sufficiency of political remedies had been disposed of, we had to reckon with the still more formidable opposition of those who openly declared that any improvement in the condition of the farmer would only postpone the day when all agricultural problems would be solved by the abolition of landlordism. Lastly, when the political and the agrarian objections had been met, there was the large human problem, so well known to co-operative propagandists, still to be solved. Did the Irish farmers possess the qualities out of which co-operators were made? They had no commercial experience or business education: had they business capacity? Would they ever display that confidence in each other which is essential to sustained association for business purposes, or, indeed, that confidence in themselves which must precede business enterprise? Could they be induced to form themselves into societies, adopt, and loyally abide by those rules and regulations by which alone an equitable distribution of responsibility and profit among the participants in the joint undertaking can be assured, and harmonious and successful working be rendered possible? We never doubted their capacity to fulfil all these conditions, but few in Ireland, and none in England, shared our confidence. Some sympathised with our enthusiasm, others laughed at our ignorant optimism. The pioneers of co-operation in Ireland had, to all appearances, an uphill fight before them.

"But it was a fight well worth making. For, apart from the other good results we looked for, the success of organised self-help was an essential element in the solution of a phase of the Irish land question which is fraught with great importance for the future of our country—I mean the gradual creation in Ireland of a system of peasant proprietorship. Now, paradox though it seem in expression, I have long been convinced—though I do not remember to have said so before—that while under existing economic

conditions in the world's markets a peasant proprietor is impossible, a peasant proprietary is not only possible but desirable. Co-operation solves this paradox. By mutual help, and by common organisation for common objects, the isolated and unprogressive peasant owner, while not sinking but strengthening his individuality, is lifted to a competitive level, from which he can conduct his industry on the most advanced lines, and with every resource that rivalry in the modern market requires.

"When I look back over the work of the last twelve years, I see that, although we had much to contend with, we had also many important advantages. Whatever your leaders thought of the prospects of success, we had not only the moral, but the financial support of the Co-operative Union, and the invaluable guidance in details of organisation of Mr. Vansittart Neale, and his former understudy, now his worthy successor, Mr. J. C. Gray. There is much in the genius and tradition of the Irish farmer which fits him for combination. The old clan spirit is by no means dead in him. Isolated, the Irish farmer is conservative, sceptical of innovation, a believer in routine and tradition; in union with his fellows, he is progressive, open to ideas, and wonderfully keen at grasping the essential features of any new proposal for his advancement. He was, then, eminently a subject for co-operative treatment. The smallness of his holding, his lack of capital, the backwardness of his methods, made him helpless in competition with his rivals abroad, who were either favoured by natural conditions, as in the case of the United States and the Colonies, or were organised on the very best lines for co-operative success, as in the case of many European countries, notably Denmark. And remember that co-operation in agriculture means, nowadays, not merely organisation for strictly productive purposes, but also joint effort in the preparation of produce for rapid distribution in large centres of population. The distributive needs of a modern market in a great city demand, as you know, above everything else, a commodity consigned in bulk, and of such a uniform quality that the merchant can take his sample as genuinely characteristic of the whole consignment. Now, the middleman can do this for a consideration, and the organised farmers can do it—the individual farmer cannot. It was our conviction that the farmers of Ireland could, by associative effort, intercept the intermediate profit by carrying the productive process a step further, and applying the principles of co-operation to the marketing of their joint produce, no less than to the preliminary processes of their industry. Their foreign competitors had done so with signal success, and we were determined to imitate them in this also, recognising it to be the necessary corollary of our earlier efforts.

"It happened that at the time we commenced our Irish work, a belated industrial revolution was taking place in one great farmers' industry. The event is of special interest, because one reason why the co-operative movement in England has not touched the agricultural classes is, that in the agricultural industry, with this exception, there has been no industrial revolution, for this reason amongst others, that in agriculture division of labour cannot, from the nature of the industry, be carried very far. But in this case a recent invention had changed butter-making from a home to a factory industry. Ignorant of the principles of co-operation, the farmers had to look on while capitalists introduced the new system. They were tempted to go out of the butter-making business, and send their milk to be manufactured by others. The result was found to be that they remained with all that part of the dairying industry which agricultural depression had made unprofitable, while the making and marketing of butter, which science, combined with commercial enterprise, under joint-stock organisation, had rendered profitable, had passed out of their hands. Here was an ideal opportunity to test the value of co-operative principles.

"And now let us see how the experiment works out. You find in a backward parish, say, 100 farmers, struggling with antiquated methods and out-of-date appliances, marketing their inferior, rapidly-depreciating produce through a host of middle-men, and realising a miserable price. You go back in two years, and, perhaps, happen to be present at the annual general meeting of the new society, held in the new building among the steam-driven separators, butter-workers, and churns, and all sorts of scientific appliances unavailable to the isolated farmer, but well within the means of the associated 100 farmers. Here are your 100 newly-fledged co-operators, with their democratically-elected committee, on which you find the best business-men in the community, be they landlord or tenant, Protestant or Roman Catholic, Unionist or Nationalist, in co-operative peace and harmony. You have only to listen to their deliberations to see that a change has come over the spirit of the scene which would delight the co-operator's heart. You find these men showing a rare capacity to understand all the complicated technical details of the manufacture, and shrewd in the discussion of the commercial questions which surround the disposal of their product. Here is a picture which will revive the recollection of the older co-operative faith. And, as if to point the moral which I am seeking to enforce, you may see alongside of this attempted realisation of old co-operative ideas, the newer tendencies in full work in this outpost of the co-operative world. You may see some eighty creameries, chiefly owned by the English, but a few of them by the Scottish Wholesale, in which the farmers supply their milk as they do to any other capitalist who gives them their price, but in which they have no share in either management or profit, in which they take no pride, from which they learn no lesson. When Congress endorsed this action of the Wholesale, the Irish section of the Co-operative Union ceased to exist, and we went in for co-operative Home Rule. Fortunately, our movement was fairly launched before the Irish policy of the Wholesale, which might have frustrated our earliest efforts, was developed. That policy naturally aroused some bitter feelings, for we did not then understand the change which was coming over the British movement.

"It was an extraordinary piece of good fortune for us to find such an opportunity for our first experiments as the crisis in the dairy industry afforded. Our scheme made, it is true, a large demand upon co-operative qualities compared with those which are necessary to start a store. But that consideration was quite ignored by my friends in view of the social and economic improvement which would result from the success of these voluntary associations. They knew that if the co-operative dairy societies were to succeed commercially, the organisation of societies for other purposes connected with agriculture would be a matter of comparative ease.

"We never indulged the dream of co-operative agriculture in the sense of joint ownership and joint management of farming lands. But we saw our way clear to the association of farmers for the improvement of every branch of their industry. I have no time to give you any further account of how the movement was started, or any description of its subsequent progress. Anything more than a brief summary of the position it occupies to-day would be beyond the scope of this address. A few facts and figures will afford a general idea of how far we have travelled towards the goal we have set before us. The latest returns I have deal with 546 societies, with some 54,000 members. Of these societies, 193 are central creameries and 77 auxiliaries, as we call them—that is, societies which separate the milk from the cream and send the latter to be churned at a central creamery. There were 111 agricultural societies, whose chief function is the cheapening of production by the joint purchase of honest seed and manures, of implements and general farming requisites. In some cases these societies undertake the sale of produce. Then there are 78

miscellaneous societies which carry on various rural industries, from flax-scutching to the making of lace, and also include the improvement and marketing of poultry and eggs. Lastly—they come last, but had I realised their enormous educational value, they should have preceded all other forms of association—come 87 agricultural banks. These societies exist for the sole purpose of creating funds to be lent out to their members. The loans are made chiefly on the security of the character as to honesty and industry, of the borrowers, but only when the committee is satisfied that the purpose to which the loan is to be applied is a productive one, and that it can be repaid, interest and principal, out of such application. When I tell you that these associations are registered with unlimited liability, that thousands of loans have been made by them to their members, that the cases of unpunctual repayment are rare, and that default is unknown, that the system flourishes best and is productive of the greatest good in the poorest districts, I think you will fancy that there must be something very like magic in the agency which converts hopelessly insolvent individuals into a community to which capital can be advanced with the certainty of repayment. And, surely, the transformation scene is remarkable. You find a desperately poor community owned body and soul by the local trader, who systematically keeps his customers just up to their necks in debt, and then supplies them with barely enough to keep them alive, taking in exchange everything they have got, from their poultry and eggs to their labour. If you could analyse the accounts in which these barter transactions are recorded, you would find revealed a system of usury more ingenious than any which Shylock knew. I leave to your imagination the economic and social effect produced when, by co-operative organisation of the intelligence of these poor but honest and would-be industrious folk, payment in cash is supplemented for a barter credit, when the functions of capital, and the meaning and the proper proportions of interest come to be understood, and when the difference between borrowing to spend, and borrowing to make, so brightens the mental horizon that the man who has always hidden his indebtedness, as he would an unsightly sore, now parades his credit as the sign that by virtue of his honesty and his industry he is given by his fellows the opportunity of becoming a wealth-producer in the community.

"There is one factor in the Irish problem which perhaps more than any other stimulated the Irish pioneers, which appealed equally to the comprehensive sympathies of Lord Monteagle and Father Finlay, the President and Vice-President of the Irish Agricultural Organisation Society, to Mr. Anderson and Mr. Russell, its Secretary and Assistant Secretaty, and which in some measure directed the trend of the Irish movement. Our population is melting away as fast as yours is being reinforced. The drain from Ireland is worse from the standpoint of quality even than from that of quantity, for the active and enterprising leave us with an undue proportion of the very old and very young, of the mentally and physically unsound. These leaders and their associates realised that in addition to organised self-help, which was, I need hardly tell you, their chief reliance, the economic condition of the country required a measure of State aid—a slight departure from your idolised *laissez faire*—not by any means as a substitute for, but as a stimulant and supplement to, associated effort. This principle was accepted by the Recess Committee, a self-appointed body of Irishmen representing all shades of opinion, which, you will remember, issued a unanimous report calling upon the Government to create a new Department of State. Mr. Gerald Balfour, with a statesmanship quite new to us in Ireland, conceded an Irish demand so novel in its unanimity, and in the non-political arguments upon which it was founded. Now State aid to agricultural industry unless accompanied by a growing spirit of self-reliance would, in our opinion, be as disastrous as, properly administered, it ought to

be beneficial. If I may be pardoned a personal allusion, I happen myself to be an illustration of the working of this principle, a strange proof that the doctrine of self-help, if not generally very clearly formulated, is, at least, mentally accepted by Irish public opinion. For circumstances—chiefly the fact that I was an idle man, with plenty of money to spend upon my social ideals—have pitchforked me out of the Chairmanship of the Irish Agricultural Organisation Society into the working headship of the new Department. And although this office is properly a Parliamentary one, I am allowed by the Government, with popular sanction, to hold on to my post until the Department is fully launched, notwithstanding the fact that co-operative education has so demoralised my politics that I am a political outcast. But you may take it from me that every week which passes brings fresh evidences of the close relationship which exists between successful administration of State aid, and the exercise of organised voluntary effort. I cannot exaggerate the importance of the rapid spread of these farmers' associations at this juncture. The value and potency of organised effort (whether for business or pleasure) have been brought home to the people, and no lesson was more needed amongst the poor, spiritless, and isolated peasantry of rural Ireland. The effect, too, of the new spirit upon the newly-constituted local bodies is manifest at least to the student of social economics. And not only as the condition precedent of State aid was the co-operative movement required to stay the drain of emigration. We hope to use the societies, whose primary function is business purposes, for the brightening of rural life on the purely social and domestic side."

THE DAIRYING INDUSTRY IN IRELAND.*

In every country dairying, in a more or less developed form, is one of the earliest industries to spring up, and Ireland is no exception to the rule. Indeed, in this country dairying was carried on at a very early period, and the ways of making butter practised by the early Irish are minutely described in the ancient histories of the country. At what date butter was first exported from Ireland is doubtful, but we know that a flourishing export trade existed in the middle of the sixteenth century. The trade gradually increased in importance, a hundred years later it had assumed considerable dimensions, and towards the end of the seventeenth century it was an important item in the national economy. How the trade developed at a later period can be seen from the following figures given by Arthur Young :—

1768	£173,259
1769	260,357
1770	149,464
1771	236,403
1772	204,810
1773	229,528
1774	211,152
1775	245,624
1776	237,926

Most of this butter was sent from the ports of Cork and Waterford. From 1790 to 1825 there was a large increase in the export trade, as the following figures show :—

				Cwts.
Annual average of	3	years to	1790	198,149
„	3	„	1800	215,100
„	5	„	1805	225,187
„	5	„	1810	303,586
„	5	„	1815	330,635
„	5	„	1820	365,226
„	5	„	1825	442,883

After 1825 there is no record of the Irish exports, as subsequently the traffic between the two Kingdoms was treated as a coasting trade.

* [This article on the Dairying Industry in Ireland is largely historical. The statistics of the great Cork Butter Market deal with its best period, and one not meant, of course, to illustrate existing conditions. For an account of the Creamery movement the reader is referred to p. 218.—Ed.]

The foreign butter trade was also of considerable importance, and the West Indies, Spain, Portugal, Brazil, etc., took a large quantity of Irish butter mainly because the art of making butter of good keeping quality, such as would not deteriorate on long sea voyages, was principally confined to Ireland. Chaptal, a French writer on scientific agriculture, mentions that the art of salting butter was better known in Ireland than in any other country. The methods of butter making in Ireland varied considerably, the most striking difference being between the methods in use in the northern portion of the country and those practised in the South. Whilst the whole of the milk was prepared for, and churned to extract, butter in the North of Ireland, the Southern dairy farmer "set" the milk in vessels and churned the cream only. There were strenuous advocates of both methods, but the different districts kept to their systems until the coming of the creamery system, which to a large extent revolutionised dairying all over the country. The first attempts to systematise and improve dairying in Ireland were made in Cork about the year 1770, and the Cork Butter Exchange was established about this time for the purpose of regulating the butter trade in the city. It is probable the first attempts at regulating the butter trade in Cork originated through a desire to safeguard the interests of the city in the tolls of the Cork Butter market. Very soon, however, the Butter Exchange was made an important factor in the dealings between the butter maker, the butter merchant, and the butter exporter. Mr. Maguire, in his "Notes on the Industrial Movement in Ireland, as illustrated by the National Exhibition of 1852," describes the Cork Butter Weigh-House and its functions as follows :—

"Every firkin of butter that passes through the Cork Weigh-House—and nearly every firkin that enters this city passes through it—is rigidly examined and its quality accurately determined, and when this butter is received by the foreign buyer he has a sufficient guarantee as to the character and quality of the article in the well-known brand upon its cask. The farmer, the merchant, and the foreign buyer are equally protected against fraud by the rigid system of inspection which has rendered this market famous.

"The inspector declares the exact quality of the article—whether it is entitled to the first, or ought to be degraded to the sixth quality ; and the market—*i.e.*, the committee—fixes the price which the farmers ought to receive and which the merchant must pay. Did it stop here, and were the local seller and buyer alone protected from mutual injustice, the system would be sadly deficient. But it does not. The brand of the market protects the foreign dealer from the possible fraud of a dishonest merchant who might—that is, who *could*—without such vigilant inspection as is maintained to the very moment of shipping the article from the quays, 'decant' inferior butter into high-brand firkins, and thus impose for once, at least, on the foreign dealer. The committee of merchants are the body responsible to all parties for the character of the Cork Butter Market, and it is their pride as well as their interest to encourage honesty in dealing and to punish every attempt at fraud with rigorous severity.

"Fully conscious of their responsibility to all classes, they have brought the system of inspection to the greatest perfection, by the necessity of which tedy have made it the interest of the farmer to improve the quality of his make, anh to avoid the slightest attempt at fraud or adulteration, inasmuch as if his butter be declared a 'first,' he is entitled to, say, 79*s.* ; if 'third,' to 70*s.* ; if 'fifth,' to 56*s.* ; if 'sixth,' to 46*s.* ; so that it is clearly his interest to devote

his best attention to its improvement, to the care and feeding of his cattle, and to the cleanliness and general management of his dairy."

There can be no doubt whatever that the way in which business was conducted in the Cork Butter Market under the direction of the committee of merchants, was satisfactory for a long period, and that considerable improvement was induced in the butter manufacture by the system of inspection, fixing the qualities, and arranging the prices to be paid for the butter of the market each day. But a time came when the exigencies of trade required a re-organisation of the market, and in 1884 an Act of Parliament was obtained which regulates its conduct, and by which many of the rules of the "committee of merchants" are set aside. Before that date butter could only be sold in the market which was subjected to inspection and branding according to quality; now a portion of the market is set aside for open sale, in which free buying and selling may take place. Formerly a "member" of the Butter Exchange only could buy in the market. He was called the "butter merchant," and from him the "exporter" had to buy his butter for exportation. Now the exporter may purchase in open market.

The business transacted in the Cork Butter market is of enormous proportions. Considering its magnitude, the regularity and freedom from difficulties are matters for congratulation. The following Table, compiled from the Report upon the Cork Industrial Exhibition of 1883, will give an idea of the magnitude of the operations in the Cork Butter Exchange at that date :—

CORK MARKET, SEASON 1883-84.

Quality of Butter.	Kegs.	Firkins.	Total Quantity.	Total Value.	Price per Cwt.		
					Average.	Highest.	Lowest.
Heavy Salted—			Cwts.	£ s. d.	£ s. d.	£ s.	£ s.
First	159	104,135	69,784	377,240 16 5	5 8 1½	7 4	4 15
Second	547	123,949	83,180	418,843 17 3	5 0 8¼	7 5	4 8
Third	1,525	70,859	47,954	216,822 3 3	4 10 5	5 10	3 15
Fourth	796	11,659	8,070	27,408 0 0	3 7 11	4 12	2 14
Fifth	128	1,483	1,035	2,731 14 10	2 12 9	3 12	2 0
Mild Cured—							
Superfine ..	20	7,292	4,889	29.218 11 5	5 19 6	7 4	5 6
Fine Mild ..	27	15,020	10,066	55,952 2 10	5 11 2	7 7	4 17
Mild	82	7,083	4,769	24,862 8 5	5 4 4¾	7 11	4 10
Total Quantity—							
Heavy Salted ..	3,155	312,085	210,025	1,043,046 11 9	4 19 3¾	—	—
Mild Cured ..	129	29,395	19,726	11,028 6 4	5 11 6½	—	—
Total of all kinds ..	3,284	341,480	229,751	1,153,374 18 1	5 0 5	—	—

The following interesting return, published some time ago, will give an

idea of the proportions of the trade done in the Cork Butter Exchange at a period when its prosperity was at its height, viz., in 1886:—

PRICE per cwt. of "SALT" and "MILD CURED" BUTTER, in Firkins, at the CORK BUTTER MARKET, on the 1st and 15th days of the Months specified in the Year 1886.

Showing the Prices in shillings per cwt. for 1st, 2nd, 3rd, and 4th Qualities on the 1st and 15th of each Month.

SALT BUTTER.

Date in Month.	JANUARY.				FEBRUARY.				MARCH.			
	1st.	2nd.	3rd.	4th.	1st.	2nd.	3rd.	4th.	1st.	2nd.	3rd.	4th.
1st ..	—	109	77	49	—	115	74	46	—	119	89	54
15th ..	—	109	63	41	—	123	89	48	—	117	95	66
—	APRIL.				MAY.				JUNE.			
1st ..	122	109	64	47	87	73	51	46	70	58	52	41
15th ..	107	80	59	43	78	60	51	39	65	57	52	42
—	JULY.				AUGUST.				SEPTEMBER.			
1st ..	67	60	54	48	73	64	58	51	80	69	62	54
15th ..	68	60	55	52	81	67	61	52	91	76	63	53
—	OCTOBER.				NOVEMBER.				DECEMBER.			
1st ..	105	91	77	63	105	99	90	74	114	92	78	73
15th ..	105	92	77	64	104	90	82	74	124	98	85	74

MILD CURED BUTTER.

—	JANUARY.			FEBRUARY.			MARCH.		
	Sup.	Fine.	Mild.	Sup.	Fine.	Mild.	Sup.	Fine.	Mild.
1st ..	—	—	109	—	—	—	—	—	—
15th ..	—	—	—	—	--	Kegs. 113	—	—	111
—	APRIL.			MAY.			JUNE.		
1st ..	—	—	—	98	82	51	89	65	53
15th ..	127	107	78	88	77	57	74	63	52
—	JULY.			AUGUST.			SEPTEMBER.		
1st ..	79	69	57	86	74	69	94	79	69
15th ..	92	69	56	89	84	70	100	90	78
—	OCTOBER.			NOVEMBER.			DECEMBER.		
1st ..	118	105	90	114	103	94	123	102	91
15th ..	118	107	91	113	99	87	131	112	95

No. of Packages, arranged according to Quality, received Monthly during the Year 1886, at the Cork Butter Market.

SALT BUTTER.

1886.	Quality.					Total.
	1st.	2nd.	3rd.	4th.	5th.	
January ..	—	73	1,103	640	89	1,905
February ..	—	243	980	533	64	1,820
March ..	8	1,102	2,552	458	41	3,861
April ..	652	6,307	6,159	681	37	13,836
May ..	6,862	16,656	5,950	734	59	30,261
June ..	20,711	18,695	4,073	445	42	43,966
July ..	20,745	22,407	4,946	395	17	48,510
August ..	16,772	14,281	3,640	348	24	35,065
September ..	14,881	16,400	5,941	613	32	37,867
October ..	16,000	12,294	4,142	520	17	32,973
November ..	5,444	14,861	4,299	439	33	25,076
December ..	119	4,211	5,123	811	46	10,310
	102,194	127,530	48,608	6,617	501	285,450

MILD CURED BUTTER.

1886.	Superfine.	Fine Mild.	Mild.	Total.
January	—	1	30	31
February	—	5	8	13
March	—	13	76	89
April	8	93	534	735
May	797	2,163	1,296	4,556
June	2,158	4,211	1,667	7,536
July	1,792	4,163	1,427	7,382
August	2,035	4,139	1,233	7,407
September	1,793	3,711	1,564	7,068
October	1,706	2,906	961	5,573
November	700	1,785	859	3,344
December	27	252	449	728
	11,016	23,842	9,604	44,462

Returns of a like character to above would show that a considerable progressive improvement has taken place in the quality of the butter now coming to the Cork market, evidenced by the increase in the number of packages of butter of high quality put upon the market. In "salt butter" there has been an increase in the first quality equal to 7.3 per cent.; the increase in second equals 12.5; whilst there have been decreases of 25, 38, and 63 per cent. respectively in third, fourth, and fifth qualities.

The Cork butter merchant who purchased from the farmer was in many cases a medium for instruction in butter making. The following Memorandum, prepared by a firm of butter merchants in Cork as early as 1843, was circulated amongst the dairy farmers that did business with this firm. This method of instruction which was practised by the most advanced butter merchants, must have had considerable influence upon the butter making industry in Munster. Holland, noted for its superior butter, was selected whence instruction in butter making should be sought.

"METHOD OF MAKING 'DUTCH' BUTTER.

"The dairy should be very cold, clean, and of equal temperature, with very little light and no sunshine getting on any part of it. A good current of air should pass through the dairy.

"In milking, put one-eighth of an ounce of pure ground saltpetre in a vessel that will contain about eight gallons of the milk; use more or less saltpetre in proportion to the size of the vessel to be filled. Strain with care into coolers perfectly sweet and dry, and keep the whole thus from two to four days, when all the milk should be churned, and not skimmed.

"After churning the milk should be withdrawn and the butter divided and placed in pans of pickle, made from pure water and fine salt.

"The butter should then be well worked with the hand, frequently changing the pickle until all the milk is worked out. The butter should be cured with two pounds of the finest stoved salt, with which should be mixed two ounces of powdered refined sugar, then well packed down into a white firkin, which ought to be filled a few days previously with strong pickle.

"Cork, 19th October, 1843."

The port of Waterford was also largely used for butter exportation, the markets of Tipperary, Clonmel, and smaller towns in the Counties of Waterford and Tipperary contributing very large quantities of butter for exportation from this port.

Time changes all things, and scientific methods of dairying quickly brought reformation in dairying methods in Ireland. Not alone were methods of dairying changed, but in some districts that formerly ranked high both as regards the quality and quantity of the butter produced, the industry has at present almost completely died out through the dairy farmers in those districts refusing to recognise the altered conditions and requirements of the markets in the matter of dairy produce. Ireland has, however, fully awakened to the necessity for change in dairy methods. Already market quotations reveal a satisfactory state of affairs in the prices of Irish butter as compared with those of its most formidable competitors; and this is as it should be, for, with the undoubted advantages possessed by Ireland for the production of the best butter, it is certain that in this country dairying must continue to hold an important place in the national economy. The systems of butter production in Ireland may be classed under two headings:—

(*a*) *The Home-dairying method*, in which butter is made in varying quantities and sold either in (1) large packages, firkins, or boxes, or (2) in lumps to be blended and packed for the markets.

(*b*) *The Creamery method*, in which milk is sent to centres in which the cream is separated, prepared for churning, and the butter made up and prepared for different markets either by being put into (1) firkins or boxes, or (2) made up as rolls.

The Creamery system is gradually but surely extending in the country, and is conducted in several ways—by co-operative methods, by joint stock companies, and by large farmers who can afford to set up the machinery necessary for this system. The accompanying map will give some idea of the proportion and territorial distribution of the systems now existing in Ireland.

THE BACON CURING INDUSTRY.

In the records that have been handed down to us there is abundant evidence that the pig has always formed an important element in Ireland's domestic economy, whether roaming in herds in the forest of the Chieftain or acting as a savings bank for the cottager. But it was only in more modern times that the Irish pig succeeded in making himself so universally known in the form of the now celebrated Irish mild cured breakfast bacon. Much labour and money had to be expended on him before this was accomplished. The old Irish hog was so ill shaped that we doubt if all the skill and accumulated experience of our present-day curers could succeed in turning him into marketable bacon. There is nothing to show when the first efforts were made to improve him, yet we think we are safe in saying that little was done in this direction until early in the last century. After that the owners of large estates seem to have occasionally imported some specimens of the improved breeds from England for the use of their tenants. However, any good that was accomplished practically disappeared again owing to the strained relations that arose over the land question. The boar-keepers then having no means of securing new blood continued to breed from their own stock, and deterioration in shape and quality followed as a result of in-and-in breeding. This neglect, although not universal, was pretty general, particularly in the West of Ireland. In Leinster and Ulster there was a fairly continuous importation of improved English breeds by private individuals. The effect of this must have been felt outside these provinces, as Irish swine, except in remote districts, began to lose their resemblance to the greyhound for which they had formerly been so remarkable.

A very interesting statistical review of the Irish Bacon and Provision trade was made in the year 1860 by the then Solicitor-General for Ireland, in a paper which he read before the Social Science Congress that met in Dublin in that year. As many parts of this paper have an historical interest and will further help to throw light on the present position of the bacon-curing industry, discussed in this article, several excerpts from it are here inserted.

> "During the Peninsular War Ireland possessed a great trade in curing beef and pork. Cork, Waterford, Limerick, and Dublin, all afforded their quota of beef to the English navy. Upon the proclamation of peace this trade fell off greatly, and the introduction of steam navigation, in 1825, tended still further to diminish the trade, for thus a ready market was opened in England for the live animal. Again, the repeal of the laws prohibiting the import of foreign cattle and provisions still further affected this trade, or so much of it as was left, and thus the supplying of beef has passed into foreign hands. Live animals and bacon now form the staple article of the Irish provision trade. The existence of this trade appeared to be perilled by the potato failure. Previously to it many cottier tenants,

and even those who had no land at all, kept their pig, and in fact the pig was often depended on for paying the rent.

The entire number of pigs in Ireland, in 1841, was	1,412,813
Of these there were owned by persons holding under one acre	355,977
By those holding from one to five acres	254,437
By those holding from five to fifteen acres	342,436

Making a total of 952,850 pigs owned by those holding under fifteen acres each, and only 459,963 by those holding over fifteen acres.

The effect of the failure of the potato was to prevent the production of pigs and to force a sale of those on hand. The export of live pigs to England in the year 1846 was 480,827, and the number of pigs in Ireland was reduced in 1848 to 565,629, the decrease being 847,184 animals. Of these 323,337 were from the cottier class, each of whom held less than an acre of land; 223,882 were from those holding from one to five acres, and 260,882 from those who held from five to fifteen acres of land each; thus showing that the potato failure had swept away the principal live stock of the poorer classes.

There was at this time an increase in the number owned by those holding over fifteen acres of land. Persons prophesied that the race of pigs would disappear with the cottier class, but we shall find that it has not; and on the contrary, its production and fattening is now looked upon as a profitable branch of trade by the farmer having larger holdings. During the four years from 1847 to 1851, the number of pigs in Ireland increased steadily: in 1848 they were 565,629; in 1849, 795,463; and in 1850, 923,502. The export of live pigs during this period was very short of the export of 1846. Thus, in 1847 it was 106,407; in 1848, 110,787; in 1849, 68,053; and in 1850, 109,170; the total exports for the four years being 394,417 pigs, while in 1846 alone the export of live pigs was 480,872.

"Confining our attention at present to the export of live pigs and the annual produce of the country, we have returns which show a steady increase in the export of live pigs, without reducing materially the stock, as will appear by the following returns:—

Date.	No. of Pigs in Ireland.	Exports to England.
1851	1,084,857	136,162
1852	1,072,658	151,895
1853	1,444,925	101,396
1854	1,342,549	170,188
1855	1,177,605	254,054
1856	918,525	299,638
1857	1,255,186	269,125
1858	1,409,883	369,041
1859	1,265,751	368,275
1860	1,268,590	—

"The natural inference from the foregoing figures would be, that as the stock has not increased in proportion to the growth of the export trade, there has been a falling off in the quantity of bacon prepared; but in the absence of absolute data we should be slow to adopt this conclusion, especially when we find that the quantity of Irish bacon arriving in London (which is the principal market) has been steadily increasing since 1851. We should therefore rather attribute the increased exports to the earlier maturity of pigs in consequence of the improvement of the breed, and to the greater care bestowed upon them while young.

"The subject under consideration naturally divides itself into three branches:—1st, as to the annual production of pigs; 2nd, as to their geographical distribution; 3rd, as to the changes and improvements that have taken place in the manufacture of provisions.

"In the first class there are a large number so young that they will not be fit to kill within the year, the average age at which pigs are killed being about fifteen months, consequently the available product of each year will be less than the return by about one-fifth. In the return for 1859, the number under twelve months old is stated at 942,769, and if one-fifth be deducted for those under three months old it would leave 754,215 of this class as the available produce of the year: in the other class, that over twelve months old, the numbers are stated to be 322,982. Of these, about one-third—say 100,000—are breeding sows, but 222,982 would probably be left for conversion into bacon, thus making the total annual produce of pigs fit for sale at fifteen months old, 977,197. If the breeding stock be 100,000 and the annual average produce ten for each sow, we shall nearly arrive at the same result—viz., about one million pigs per annum. The export of live pigs in 1859 was 368,275, thus leaving for the home provision trade about 650,000 animals per annum.

"We must not overlook the fact that pigs are the only description of stock which is fattened and finished for the markets of Great Britain in Ireland. There is a large export from Ireland of cattle and sheep, but the bulk of these shipments are stores—that is, animals not fit for the butcher and which go to England to be finished. There are but a few fat oxen and sheep shipped, while all the pigs which are exported are fit to kill; thus the provision trade confers vast benefit on the agricultural classes in offering a ready market for this finished produce. On an average, pigs at twelve months old are worth about 40s. each; they are then put in and fed on corn food for two months or ten weeks, and then sold at an average of £3 10s.; so that the farming classes receive about £3,500,000 per annum from this branch of trade.

"Secondly, as to the geographical distribution of pigs. The influence of the large curing establishments of Waterford, Cork, Limerick, and Belfast, on the production of pigs is very great. The number of pigs in Ireland, in 1860, was 1,268,590; the area of the country is 20,815,111 acres, and on an average there was one pig to each sixteen acres of land. In Waterford county there was one pig to each eight acres, being double the average of the whole of Ireland; in the neighbouring counties of Kilkenny and Wexford the average was one pig to ten acres. Going further, we find that in Cork, Tipperary, and Limerick, there was one pig for twelve acres; in Clare, one pig for twenty acres; and in Kerry, one pig for twenty-two acres. These eight counties, containing 7,154,312 acres, had a pig population of 507,211, being at the rate of one pig to each fourteen acres; while the rest of Ireland, having an area of 13,660,801, had only 721,379 pigs, being at the rate of one pig to each nineteen acres.

"Waterford produces nearly two-thirds of the Irish bacon imported into London, and the pigs supplied by the adjacent counties, Waterford, Kilkenny, and Wexford, not being sufficient for the wants of the trade, Waterford buyers attend the fairs in Carlow, Tipperary, Cork, and Limerick, extending their journeys at times into the midland counties, into Connaught. If pig-feeding be, as no doubt it is, profitable to farmers, it follows that facility of access to the principal market is of great importance to them. The risk from delay, the loss of interest on the money employed, and the expenses of conveyance, have all to be calculated by

the purchaser, so that a farmer at a distance practically pays the cost of the carriage of the pig to Waterford.

"The pigs which come to Waterford market all arrive alive and are killed and cured at the provision stores, but those which reach Belfast market are brought in dead and are only cured by the exporters. Belfast is the only place in Ulster where a large provision trade is carried on, and its exports, partly of hams, are considerable, while in Munster there are large establishments at Waterford, Cork, and Limerick.

"A large proportion of the bacon and hams cured in Belfast is exported to the colonies, and the remainder finds consumption in this country, as well as in Lancashire and the north of England. A similar trade to that of Belfast has been carried on in Limerick for many years. In the north the pigs are killed by the farmers at their own homesteads and then brought to market; while in Limerick they are slaughtered in the curing establishments. In both cases the bristles are removed by scalding, previous to curing, while those animals intended for bacon for London must have the bristles taken off by singeing. Slight as this difference may appear, bacon prepared in the former way will not sell in the London market. Belfast bacon and hams are shipped in a finished condition, dried and smoked, while that from the south of Ireland, with the exception of a portion of that manufactured in Limerick, is shipped in an undried state, and is dried and smoked at the other side. The bacon cured in the south is sent chiefly to London; it differs from that cured in the north in another particular, namely, that the ham is not separated from the flitch; it is shipped in bales, each bale consisting of the flesh of two pigs.

"There has been an increased demand for and consumption of bacon in London, which has enhanced the price; but even this inducement has failed to increase materially the supply from Ireland, and the deficiency is met by much larger foreign arrivals. The London price for bacon on the 1st October, 1858, was 50*s*. to 61*s*. per cwt.; at the same date in 1859, it was 56*s*. to 67*s*. per cwt.; and in 1860, 70*s*. to 75*s*. per cwt.: the quotation for July, 1861, was 75*s*. to 79*s*. per cwt. This advance in price has produced an increase in the imports of foreign bacon into London. In the year 1855 they were 20,306 bales; in 1856, 19,891; in 1857, 26,425; in 1858, 18,664; in 1859, 23,411; in 1860, 43,770. Of the Irish supply to the London market considerably more than one-half is cured in Waterford.

"Third, as to the recent improvements in the mode of curing bacon.

"Previous to the application of steam to the propulsion of vessels, the only mode of intercourse between Ireland and the sister isle was by sailing ships: and as their passage was more or less doubtful and protracted, it was necessary that bacon should be salted sufficiently to bear the longest voyage. Subsequently, a regular line of fast-sailing ships was put on the the berth between Waterford and London, sailing once a week, whether fully loaded or not. This was a vast improvement in the mode of transit, and enabled the curers to moderate the amount of salt used; but since the introduction of steamers, by which alone provisions are now conveyed, the greatest care is taken to prevent over salting, and an article is now produced by the Irish curers which brings the highest price in the best markets in the world. The usage of the trade some years ago was to suspend working about the 1st of May, and to resume about the beginning of October. Most of the men employed in curing were only engaged for the season; a few of the best hands were retained during the summer, at reduced wages. Several modes of curing bacon in summer were suggested and tried; many of them failed, and at length a Waterford curing

establishment discovered a method of applying ice in the process, which has been wonderfully successful. This invention has conferred material benefit on the Irish farmer, as he can now find a market for his pigs through the entire year.

"The pig requires a good deal of warmth while fattening in winter; this warmth has to be produced by food; it follows that a much greater quantity is necessary to bring up a pig to a given weight in winter than in summer; consequently the summer feeding is the most profitable, and the introduction of a mode of curing which enables the process to take place in summer has proved a source of vast profit to the farmer, as well as a great boon to the working men who now have constant employment in place of the intermitting engagements of former times. The bacon which is cured by ice is treated in this manner:—The flitches are carefully piled in large tanks; pickle, which has been brought to a given temperature by the use of ice and salt, is then poured in, and as the temperature is raised by the warmth of the atmosphere or of the article operated on, further cooling is effected from time to time. The process in very warm weather is more tedious and difficult than during the cooler part of the summer. The ice-cured bacon is sound and firm, and, consequently, much prized. The farmers in the south of Ireland have not been slow to avail themselves of the opportunities offered by a summer market, and we find that the proportion of pigs over twelve months old is much greater in the southern counties than in the west or north of Ireland.

"The returns are taken in the month of June, and the pigs which are enumerated as being over twelve months old are, with the exception of breeding sows, animals that will be killed in the summer and autumn months. In June, 1859, when the return was taken, there were in Ireland pigs over twelve months old, 322,982.

Of these there were in Munster	150,097
,, in County Kilkenny . .	10,515
,, ,, Wexford . .	12,970
Total in eight southern counties . .	173,582
Leaving for the rest of Ireland	149,400

"The very high price of pigs which prevailed in the spring of 1860, and the scarcity of food, reduced the stock of animals of the age under consideration, and we find that in June, 1860, there were in Ireland pigs over twelve months old, 274,116.

Of these there were in Munster	124,782
,, in County Kilkenny . .	8,800
,, ,, Wexford . .	10,096
Total in eight southern counties . .	143,678
Leaving for the rest of Ireland	130,438

"The above figures show very decisively the beneficial effect which the system of summer curing by ice has had on the farming operations of the south of Ireland. It enables the pig-farmer to economise food by fattening these animals during the summer; it offers to them the advantage of an immediate sale as soon as the pig is ready for market, whereas, formerly, they had to be fed until the usual winter season opened in October, though the increase in weight was far from proportionate to the cost. The

consumer also reaps advantages in having delicious mild food at all seasons, instead of highly salted and overheld bacon."

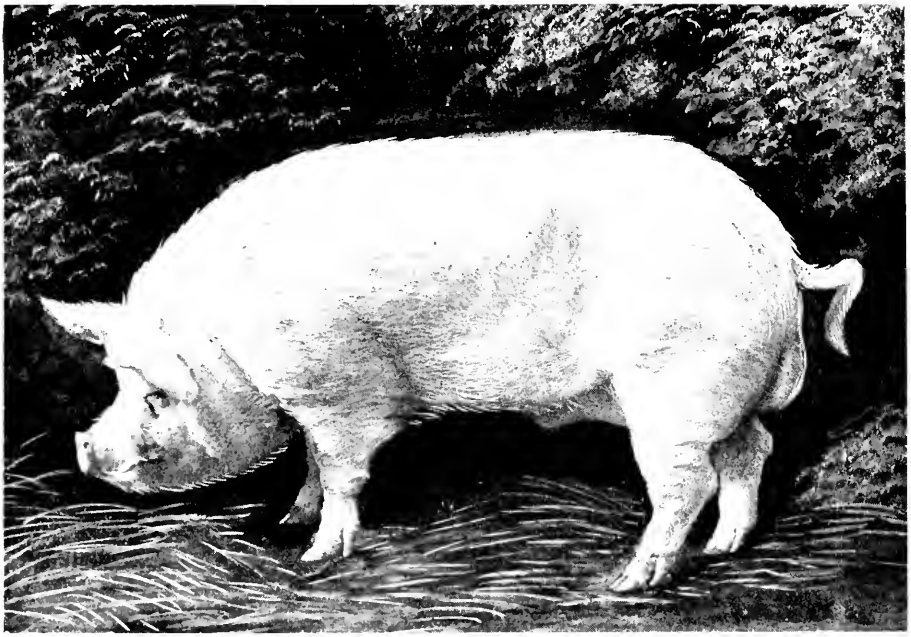
An important step in the direction of swine improvement was taken at the Albert Institute, Glasnevin, County Dublin, in the sixties.

The present herd of pigs at the Albert Farm has been in existence for a long time. About forty years ago the late Prince Albert sent from his herd at Windsor several animals of the type then known as the Improved Yorkshire. The foundation of the Glasnevin herd was laid by crossing these Windsor pigs with the best animals from Irish herds. The Large Yorkshire pigs were unknown in Ireland until the early fifties, when Wainman, of Yorkshire, and Duckering, of Lincoln, had produced a variety of Yorkshires of enormous proportions. Other breeders followed, notably the Earl of Ellesmere, Mr. Sanders Spencer, of Huntingdonshire, and Mr. John Barron, Barrowash, Derby, from whose herds the best animals were selected about twenty years ago. By the selection of sires, discarding at once any animal that showed the least trace of the Smaller York breed, and by carefully selecting the true type of Large York, a herd has been secured which possesses all the characteristics of the best strains of the Large White Yorkshire pigs. The object kept prominently in view has been to produce animals that will grow quickly, and attain to a great size and weight with a minimum amount of offal. All the stock pigs now on hands are remarkable for their even-fleshed bodies, good hams, straight legs, thin skins, and large quantity of silky hair. The herd is kept in a normal breeding condition, and none of them are made up for show.

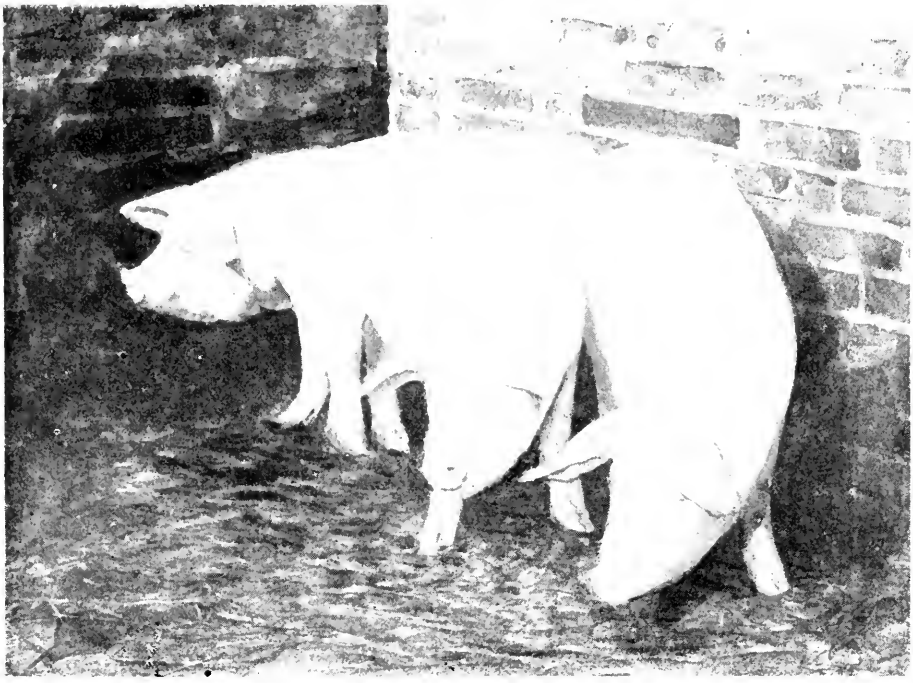
A few photographs of swine from the Glasnevin herd accompany this article.

About 1877 some of the bacon curers in Munster made efforts to improve the pigs in the districts from which they drew their supplies, but it was not until about ten years later that any organised effort was made by the members of the provision curing trade to get the farmers to breed the class of pigs most profitable to themselves and most suitable for the production of high class bacon. Munster had taken the lead in the bacon curing business, owing, probably, to its being the best dairying district in the country, but a great part of its supplies of pigs was drawn from Connaught. There the pigs had remained poor in quality, bad in shape, and black in colour. Boars of the Large White Yorkshire breed were imported and sent to remedy this, but for a very long time much difficulty was experienced in getting the farmers to take advantage of the opportunities for improving the pigs. They still clung to the long-legged, flat-hammed animal, whose unthriftiness was in sad contrast to his appetite, with the result that for years the prices quoted by the bacon merchants for Connaught pigs were always a couple of shillings per cwt. under the prices quoted for those in Munster. Perseverance eventually conquered, and to-day as fine pigs can be found in Connaught as in any other province.

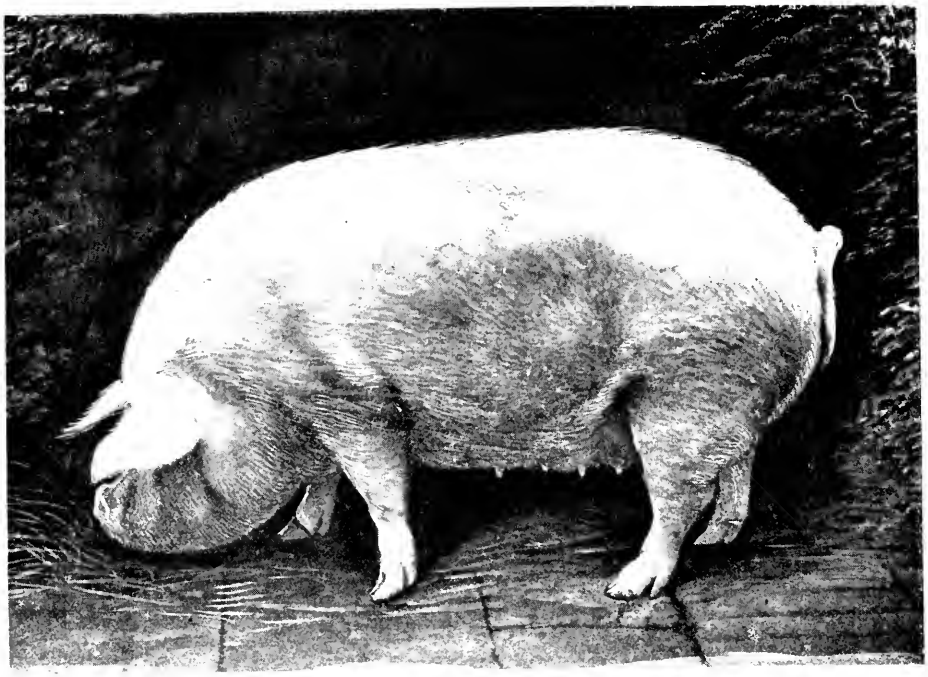
The South of Ireland Bacon Curers' Pig Improvement Association has three breeding establishments, one at Limerick, one at Cork, and another in Waterford. To each of these is attached a skilled inspector whose duty it is to keep in constant touch with the boar-keepers in his district, to supply them with boars bred at these establishments or purchased from the herds of reliable breeders, such boars being calculated to rectify the faults that may be noticed generally in the pigs of districts where they are stationed, and to prevent in-and-in breeding. We are informed that this Association



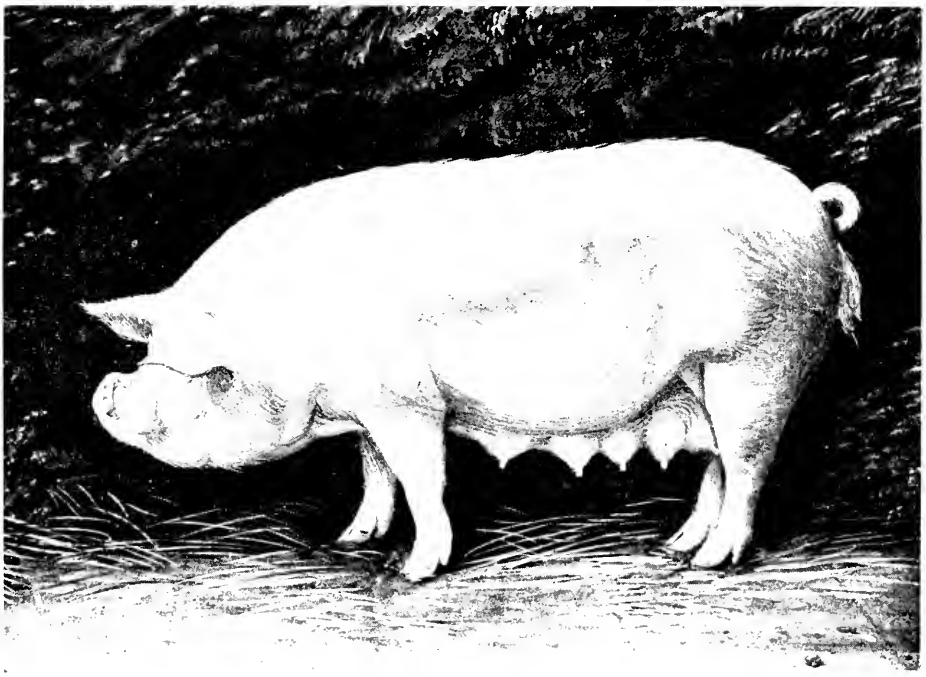
"ALBERT GEM" BOAR, FOUR YEARS OLD.



THREE YOUNG SOWS, FIVE MONTHS OLD.



"ALBERT WONDER III." SOW, FOUR YEARS OLD.



"ALBERT WONDER V." SOW, THREE YEARS OLD.

has up to the present spent £13,000 in their improvement schemes, and that for the past four years they have sent out over 1,420 boars, which were placed as follows:—Tipperary 231, Galway 115, Clare 188, Roscommon 28, Limerick 133, Kerry 67, Sligo 24, King's County 51, Cork 91, Mayo 74, Queen's County 77, Kildare 27, Wexford 115, Waterford 71, Kilkenny 108, Carlow 18.

Of late years the Congested Districts Board have included the distribution of boars in the good work in which they have been engaged, having placed 230 boars; Donegal having received 37, Cork 15, Kerry 18, Mayo 83, Galway 40, Sligo 7, Leitrim 15, Roscommon 15.

The Department of Agriculture issued its first scheme for the improvement of the breeding of swine in May, 1901. The Department believe the number of well-bred boars in Ireland is not sufficient to warrant them in hoping that a very large number of premiums for these sires can be taken up for the next few years; but it is believed that the offering of the premiums will have the effect of inducing more farmers to go in for the breeding of pure-bred animals. Should it be possible to relax further the restrictions on the importation of swine from Great Britain, this class of live stock may also be improved by the importation in greater numbers of pure-bred boars.

The text of the Department's scheme for 1902 is given hereunder:—

DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.

Scheme for Encouraging Improvement in the Breeds of Swine.

1902.

SWINE.

"1. The joint fund available under this scheme for encouraging improvement in the breeds of swine shall be applied chiefly in providing premiums for selected pure-bred boars; and the remainder may be offered in prizes for swine, in accordance with the regulations of the Department's scheme of prizes at county and local shows (see Clause 13, section iv. of that scheme).

"2. Under exceptional circumstances the Department may provide for a county, as far as funds will permit, and under certain conditions to be prescribed by them, by granting a loan for a short period to enable a representative, appointed by the County Committee, and an Inspector of the Department, to import suitable boars into the county on behalf of approved applicants.

"3. Subject to the approval of the Department, premiums may be restricted to any one or more pure breeds of swine.

"4. Only boars eligible for entry in the Register of Pigs of the Royal Dublin Society shall be selected for premiums. The owner of a boar selected for a premium must have the animal entered in said Register.

"5. Boars belonging to any Society or to any Association of Farmers shall be eligible, if pure-bred, to compete for premiums.

"6. The value of a county premium shall be £5, tenable for one year.

"7. A boar which was awarded a county premium in 1901 shall not be eligible for a premium under this scheme.

"A boar which may be awarded this year a premium out of funds

administered by any other body shall not be eligible for a premium under this scheme.

"8. The County Committee shall appoint a judge (who must be non-resident in the county) to select boars for premiums along with the Department's Inspector, and the selection of the judge and the Department's Inspector shall be final.

"In the event of the judge appointed by the County Committee being absent for any reason, the Department's Inspector shall judge alone, and his selection shall be final.

"9. Boars shall be selected at the principal shows and at local exhibitions.

"10. On consecutive dates and at places to be at first approved of by the Department (in writing), one or more special local exhibition of boars may be held.

"(1) Local exhibition of boars must be advertised by posters or in the local newspapers, at least five weeks before the dates fixed for the exhibition. (2) Entries for these exhibitions must be made on forms to be supplied by the Secretary of the County Committee. Such a form must be signed by the owner of each boar, and, if required, he must sign a statutory declaration to the effect that the particulars given in the entry form are correct. (3) Boars from all parts shall be eligible to compete provided they are to serve in the county. (4) Whenever practicable, and in order to avoid unnecessary expense, two exhibitions should be held on one day at two centres, *i.e.*, one in the morning and one in the afternoon. (5) Supplemental exhibitions will not be sanctioned. (6) The selection made for premiums at these exhibitions shall be provisional. (7) The County Committee shall meet immediately after the last exhibition and allocate the available premiums, having regard to the condition of each part of the county. (8) Not later than six days after the holding of the last exhibition the Secretary shall prepare and submit to the Department a complete list of the boars recommended by the County Committee for the season.

"11. The entry fee for premiums shall not exceed *2s. 6d.* per boar.

"12. No person shall possess two premium boars of the same breed unless located at least three miles from each other.

"13. The selections under Clauses 9 and 10 will not be final until the approval of the Department has been given in writing.

"14. The Secretary of the County Committee shall, as soon as the Department have approved of the boars selected, supply the owner of each premium boar under this scheme with posters which such owner must undertake to distribute in the district in which the boar is to serve.

"15. Each premium boar shall serve not less than thirty sows. The service fee, inclusive of all charges, for this number of sows shall not exceed 1*s.* for each sow. After the minimum number of sows have been served, the owner of the boar may fix such fee as he desires.

"16. The County Committee may make such provision as they think necessary with regard to the maximum number of sows which may be served during the season.

"17. Each sow shall be the property of a farmer, the aggregate tenement valuation of whose holding or holdings wherever situated, and for which he is rated, does not exceed the limit fixed by the County Committee.

"Herds, *bona fide* agricultural labourers, and artisans may obtain service for their sows on the same terms as a farmer.

"18. The term 'farmer' is to be understood to mean a person who derives his means of living mainly from farming.

"19. The owner or owners of a premium boar shall not, before the

stipulated number of sows have been served, reserve the use of the boar for the sows of any individual or of the members of any Society. Subject to the provisions of Clause 23, sows must be served by a premium boar in the order in which they are presented.

"20. The Department reserve the right to brand or mark premium boars, and to inspect them from time to time.

"21. (1.) Not earlier than 1st September, 1902, and not later than 1st December, 1902, the owner of each premium boar shall forward to the Secretary of the County Committee a form containing a return of the names, addresses, and valuations of the persons whose sows have been served by the premium boar, at the fee named in Clause 15, together with a statutory declaration, signed before a magistrate, other than the owner of the boar, certifying that the said sows have been served, and that all the regulations of this scheme have been complied with. (2.) The Secretary of the County Committee shall examine and check all these documents, and when correct shall forward same to the Department. (3.) As soon thereafter as the Department are satisfied as to the fulfilment of the conditions of this scheme, their share of the grant payable thereunder will be transmitted to the Treasurer of the County Committee of Agriculture and Technical Instruction, and the Secretary shall be notified that payment may be made to owners of boars by that Committee of the premiums, or part of the premiums, payable under this scheme. (4.) Any premium not applied for on or before the 1st December, 1902, shall be considered as having lapsed.

"Forms for the declaration required by this clause may be had on application to the Secretary of the County Committee.

"22. In the event of a boar being unable, from any cause, to complete the prescribed number of services, the Department reserve the right to withhold the premium, or any part of it, or in any other way to deal specially with the case, according as the circumstances may require.

"23. The owner of a premium boar has the right to refuse the use of his boar in any case where he is satisfied that the service would be prejudicial to the animal. The reason for such refusal must, however, be communicated to the Department and to the County Committee, immediately on the refusal of the application.

"24. The service season for premium boars shall close finally on 30th November.

"25. Pigs to be eligible for a prize or commendation shall be of such conformation as the judge or judges and the Department's Inspector consider suitable for the improvement of swine in Ireland.

"26. In all cases of dispute in matters connected with this scheme the decision of the Department shall be final.

In the North of Ireland no organised effort to improve the breeds of swine was made; but the farmers there took the matter in their own hands and have succeeded in maintaining a fair standard of quality in their pigs. With regard to the present condition of the Irish bacon trade generally, it has been found that the Large White Yorkshire is the breed best fitted for the purpose of improving the pigs of the country; or rather, we should say, the improved Large Yorkshire, the original pig of this type being a coarse animal with heavy jowl and ears, which did not mature until a great weight had been reached, much greater than is needed by modern requirements. The nearest approach to perfection is something between the Large and the Middle York breeds, and this has not alone been produced by some breeders, but has been successfully maintained. The Berkshire, although

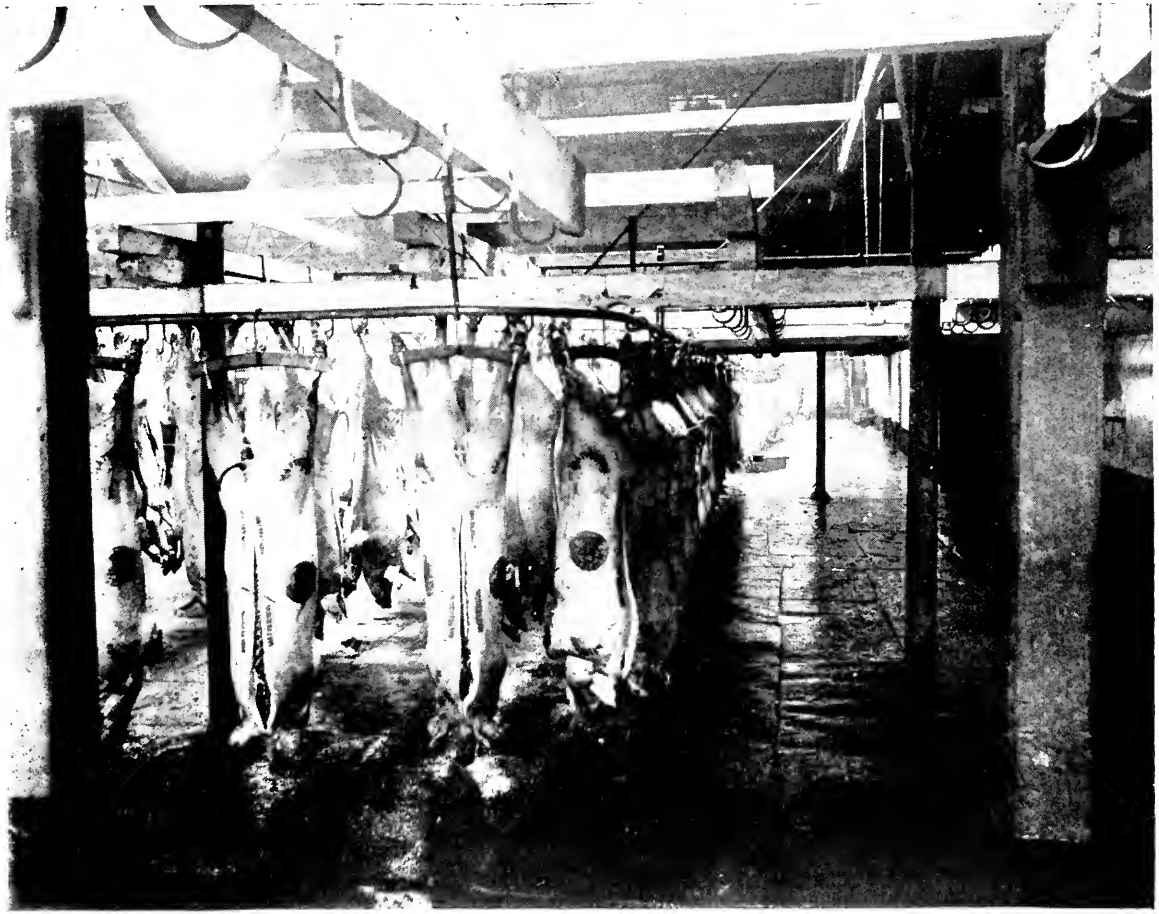
an excellent type and very popular with the English curers, has failed to "nick"—as the breeders' expression is—with the common Irish pig. The Tamworth has also been tried and found wanting, while the Suffolk has been rejected on account of its black colour and large proportion of fat to lean meat; and therefore the York at present holds the field. The cross between boars of this breed and native sows has been found most successful both from the farmer's and the curer's point of view. It possesses a vigorous constitution, is a capital feeder with a good digestion, a quick thriver, and very prolific. It suits the curer because in it the more valuable cuts predominate, and the offal is light. It suits the feeder because it finishes quickly and gives proportionately good weight for the amount of food it consumes. Beyond what was done by the Bacon Curers' Association little or no effort was made otherwise to encourage the breeding of the proper class of pigs, compared with what has been done for horses, cattle, and sheep. The labourer or cottager whose pig not alone represented his largest investment in live stock, but also the foundation of the country's bacon curing industry, was seldom if ever reached by the few prizes that were offered at the annual shows of the Royal Dublin Society or at the limited number of shows held irregularly in the provinces. For many years prizes were awarded to pigs, not because they possessed the points looked for in a good bacon pig, but because they were fatter than their competitors. There was no Irish herd book; and a pig with a pedigree was not thought of except by the few well-to-do breeders who registered their pigs across the Channel. In fact the quality of the products of the animal appears to have been overlooked for its appearance and fatness.

The herd book recently started by the Royal Dublin Society, and the scheme of Service premiums now established by the Department of Agriculture, and explained in the scheme quoted above, are distinctly moves in the right direction. Much care will, however, require to be taken that the County Councils are not led by those who admire pigs of a particular breed, and whose ambitions are to produce animals showing in the greatest perfection the points associated with this particular breed, regardless of the great ultimate end of all pigs—pork and bacon.

Each breed has its own advocates, but it is not too much to ask that the judges in such an important matter should be those whose business is to make the most money in the shortest time out of the animal alive, viz.—the feeders, and those who are compelled to stand the brunt of a vigorous competition in selling him when manufactured into bacon, viz.—the curers.

Denmark, which has been Ireland's greatest competitor for the English trade in bacon since 1887, has not been idle in the matter of improving its swine. Up to the middle of the last century the same description might be applied to the Danish as applied to the old Irish pig. It was hardy, but ill-shaped, and very unthrifty. In 1887, when Germany prohibited the importation of swine, and the raw products from swine, Denmark turned its attention to the English bacon market. It imported, with State assistance, specimens of the best English breeds of swine, and has succeeded in changing the character of its swine as regards appearance and quality. It has now about 100 breeding centres devoted to the breeding of the best class of pig suitable for producing pork to be manufactured into the highest class bacon, and raises more than double the number of swine it did twenty years ago, the production increasing from 1,200,000 to 2,043,000 in five years. It has now 25 co-operative slaughter-houses, which annually deal with from

TIN-MAKING DEPARTMENT.



KILLING BAR AND HANGING HOUSE.

700,000 to 725,000 pigs, and employ from 500 to 550 hands exclusive of the clerical staffs. In Ireland, not including a number of small curers, who kill merely to supply a limited local trade, there are 20 factories, being all either Limited Liability Companies or private concerns except one started a short time ago in Tralee in the English Co-operative Wholesale Society. These factories deal annually with about 850,000 pigs, and employ over 1,600 hands, not including the clerical staffs.

The greater number of hands employed in Ireland is accounted for by the number of minor industries carried on in connection with the bacon factories in this country, which either do not exist or exist only to a very small extent in Denmark. The average number of pigs produced in Ireland for the twenty years ending 1900 was 1,322,480, while in 1901 the number fell to 1,219,135, being a reduction of 103,345. During this period the shipping of pigs alive to Great Britain has increased rapidly, the average number shipped during the first five years being 440,432, the second five years 504,778, the third 518,659, and the fourth 659,687. In 1900 there were shipped 715,202, but last year the number fell to 596,129. Looking back a couple of years it would at the first glance appear that this trade depends to a great extent on the supply of pigs in Great Britain, as we find that the decrease there under the average for the 20 years was 313,921 for the past two years, while for the same period the increase in the shipping trade over the average was 320,673. Ireland during those two years was 157,496 short of its normal supply, which with the increased shipping meant that there were over 478,000 less to be turned into Irish bacon. But going back further, say five years, we find that the total number shipped over the average is more than twice as great as the total shortage under the average supply in Great Britain during the same time. It is, therefore, apparent that serious inroads are being made into the Irish curers' supplies of raw material. The killings in Ireland increased steadily from 1880 to 1890, the province of Munster alone accounting for 787,223 pigs in 1890, as against 486,400 last year.

Much of the increase in the shipping of pigs from Ireland may have been due to the very severe restrictions imposed in England on the movements of swine from one district to another in the effort to stamp out swine fever there. In Ireland this was done much more successfully; and a well deserved tribute is due to the Veterinary Department (now under the Department of Agriculture), for the able manner in which they have combated the disease. The increase may also be accounted for (*a*) by the increase in the consumption of pork in England; (*b*) by the increase in the number of bacon curing establishments in England.

The supply of pigs in Ireland has in the past been looked on, to a great extent, as depending on a good or a bad potato crop; but as we have already pointed out, Denmark, whose climatic conditions are not at all as favourable to pig raising as Ireland's, and which is not a potato-growing country, and in extent but very little larger than the province of Munster, succeeds in producing annually 50 per cent. more pigs than the whole of Ireland. Denmark, it must be remembered, however, grows feeding barley, and this, with the large supply of skim milk available enables the Danes to compete with Irish bacon curers and farmers who use potatoes, etc., instead of barley.

Tradition has it that the birthplace of the bacon curing industry was Baltinglass in the County Wicklow, and that that county was at one time the

scene of operations of a large number of small curers, who cured long sides for the Dublin market. This particular "cut" of bacon is still being turned out although with waning prosperity.

The greatest impetus given to bacon curing was undoubtedly the rapid advance made by the dairying industry in Ireland generally, the province of Munster being particularly forward in this direction. One of the best ways to utilise the waste products of the dairy was, no doubt, in pig-feeding, and consequently the pig became a necessary adjunct to every dairy farm. The largest curing centre in Ireland is Limerick, the annual turnover there being about equal to that of Cork and Waterford together. These cities come next to it and each deals with about the same number of pigs. Next come Belfast, Londonderry, Dublin, Tralee, Enniscorthy, Dundalk, Ballymena, and New Ross. The system of marketing in the North of Ireland differs very considerably from that in the centre and South. In the North the farmers kill and clean the pigs themselves, and bring them to the markets. The "offal" of the pig in Ulster is utilised as food at the farm house where the pig is fed, which is a distinct advantage to the small feeder in providing a wholesome and economical addition to his diet. All through the rest of the country the pigs are sold "on their feet," that is to say, they are driven or conveyed to the markets alive to be sold to the buyers who purchase either for the home curers or for exportation to the bacon curers or fresh pork butchers in England.

The farmer who keeps a breeding sow generally markets the bonhams or "slips," as they are sometimes called, at ten weeks old, after which they are kept by the purchasers who feed them until they are sixteen weeks old, when they are sometimes brought to the market a second time and sold as "stores." The purchaser of the stores feeds them until they are properly finished which should be, if the best results are to be attained, when they are between five and a-half and six months old, and then disposes of them at the markets or fairs to the regular pig buyers, who buy either as commissioners for the home or English curers. The purchaser of the fat pigs sometimes buys on his own account to sell the pigs again by dead weight at some of the Irish bacon factories. The original breeder, or more probably the man who purchased the bonhams at ten weeks old, frequently feeds the pigs until they are fully finished and ready for the bacon curer. This has been found the most general as well as the most profitable way of dealing with the fattening of pigs. In districts of small farms where each farmer fattens one or two pigs, it is universally the system pursued.

Of late years a system has come into vogue around Limerick and Waterford of sending the pigs when fattened direct to the curers either in the owners' cars or by rail from long distances. Most of the large merchants have agents in the surrounding towns, who quote the current prices each week. The farmer hands his pigs to the agent, who attaches a numbered tin label to an ear of each animal, loads and consigns them at the railway station to the bacon curer, giving the owner a receipt which notifies (*a*) the numbers on the labels which have been attached to the pigs' ears; (*b*) the conditions on which they are received, and the current price for each quality of pig. The agent sends the same particulars to the firm for which he acts. The animals are killed and weighed on the day following their purchase, and cheques for the amounts they realise are at once posted to the owners together with a ticket showing the weight of each pig, and the quality in which he was classified.

These selections of quality are:—"sizeable," "stout," "overweights," "heavy overweights," "unfinished," "sixes," and "Berwick." "Sizeable," are those pigs that generally, because of suitability to public requirements, command the highest price all the year round. Though well-finished, they must not be over fat, and must turn the scale dead weight at about 12 stone, which indicates that they should weight from 15½ to 16 stone alive. "Stout," (1 cwt. 2 qrs. 15 lbs. to 1 cwt. 3 qrs.) and "overweights" 1 cwt. 3 qrs. 1 lb. to 1 cwt. 3 qrs. 14 lbs), are, as a rule, 2*s*. to 3*s*. under the top price, as the bacon manufactured from them is inferior and has to be sold at considerably less than best quality in the English markets. "Heavy overweights" (over 1 cwt. 3 qrs. 14 lbs) are of little or no value for high-class bacon, and are taken at 4*s*. to 6*s*. per cwt. under the top quotation. "Sixes" (under 1 cwt. 1 qr.) sometimes command top price, but in some seasons, notably the Spring, they are quoted 2*s*. to 5*s*. per cwt. less, and, of course, it then pays the farmer to keep them for a few weeks longer even if he has to purchase food for them.

These five selections are for the English long-side "singed" trade, while "Berwicks" are for the Irish "middle" and "ham" trade. The "Berwick" are small plump pigs, averaging about 1 cwt. dead weight, that is to say, ranging between 7 and 8½ stone. As a rule they fetch the same price as 'sizeable" bacon pigs, but occasionally are quoted 2*s*. per cwt. more or less according to the supply. "Unfinished" pigs are thin, coarse-legged, thick-skinned, pigs of soft fat, that through being badly bred or badly fed, or both, do not "finish" properly. These are almost valueless to the bacon curer. One of the leading bacon curers has described the points of a perfect pig as follows:—Neat in the head, light in the neck and shoulders, deep in the region of the heart and well sprung in the ribs, thick in the loin, stout in the thighs, short in the leg, and long and silky in the hair.

The method of sending pigs through agents direct to the curer is said to have had a wonderful educational effect on the farmers of the districts in which it is practised, from a commercial as well as an agricultural point of view, teaching them to be excellent judges of the probable weight of their pigs when killed, and impressing on them the absolute necessity of proper breeding and proper feeding if they wish to have their pigs ready for market in the shortest time and obtain the highest current prices for them when ready.

In olden times bacon was cured "hard salted," as owing to the slow and uncertain means of transit it was required to keep much longer. The process of curing was very primitive. The pig having been stunned by one or more blows of a mallet, as the case might be, its throat was cut and the blood allowed to flow. The carcase was then surrounded by a quantity of straw or reed, which was set on fire in order to burn the hair off the skin, which was then scraped after hot water had been thrown upon it and it had been hung up by the hind legs. Having been disembowled and left suspended in the hanging house for twenty-four hours, it was weighed and paid for as dead weight. The shoulder blade bones and loin bones were then removed, the sides were laid on a flagged floor in what was practically an open shed, and salt and saltpetre scattered over them. There being no artificial way of producing cold, the curing could be carried on only for six months of the year. The Berwick pigs were treated in much the same way, except that instead of the hair being burned off, the slaughtered pig was thrown into a wooden vessel of boiling water and left there until the hair

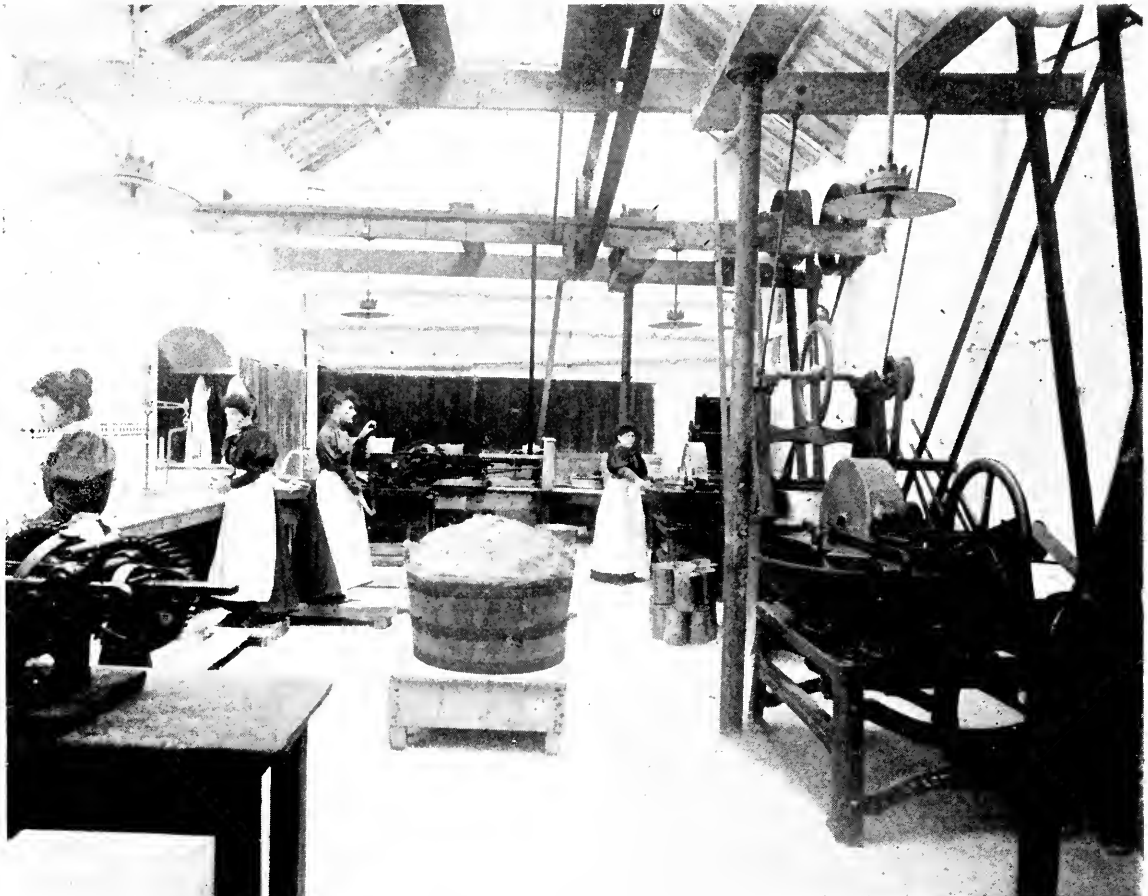
would come freely off when it was scraped, and the sides cut into three pieces before being put into salt.

The introduction of ice-curing came, as will have been seen from the quotation at the beginning of this article, about 1860, and this system, too, was carried on in a very crude way at first, the ice being simply left in open crates in the centre of the building where the curing was in progress, in order to keep the air cool. The next step was the Harris patent Ice House. This consisted of large chambers on iron floors supported by heavy beams or uprights; the necessity for strong supports will be understood when we mention that one of these floors had to bear as much as 1,000 tons of ice at a time in the bacon curing season. The bacon was piled in cellars underneath these chambers, the cold air from the ice overhead descending through the iron floor and keeping the temperature low during the summer months. In winter the use of ice was of course not necessary.

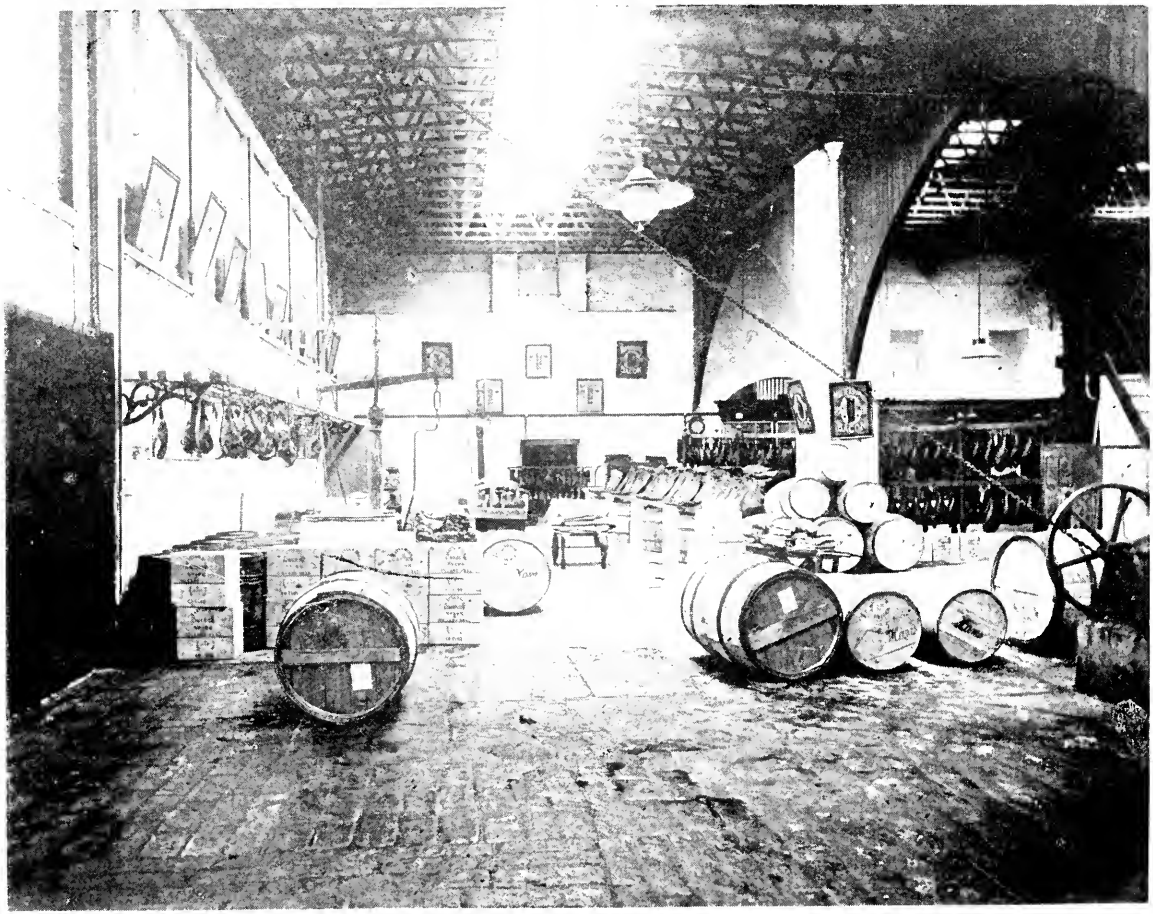
It was thought the limit of improvement in this direction had been reached; but about 1887 a complete revolution was caused in the arrangements existing in the factories by the introduction of elaborate machinery for the production of cold by the ammonia or carbonic acid process. The initial cost of these systems was heavy, coming to over £100,000 in the bacon curing establishments of the South of Ireland; but it has proved to be money well spent, the work now being done much better and at half the cost of the old methods. The regulation of the temperature being under such complete control makes the modern refrigerating plant admirably adapted for use in connection with the production of the mild cured bacon which the public now so generally insist on having. The hard cured bacon of former days would now be looked on as akin to Lot's wife, and it was by mere chance that the change in taste was brought about.

About twenty years ago, a struggling Limerick curer, who has long since joined the majority, being on an occasion unusually short of money, in order to turn his bacon into cash was obliged to turn it out in what was then considered a half-cured condition. Strange to say those who got this bacon liked it, and more was asked for. The other curers having heard of the matter, followed their neighbour's unintentional lead, with the result that the consumption of bacon of this character has been quadrupled. The manufacture of mild cure has now been brought to such perfection that it can be sent into tropical climates for consumption within a reasonable time.

The modern method of the bacon manufacture is very different from the crude system we have already described. A bracelet arrangement is fastened to one of the pig's hind legs. This is attached to a steam hoist, which quickly suspends the animal on a sliding bar head downwards. By a slight thrust of a knife in the throat, the jugular is pierced, the blood flows, and the animal dies quickly. If intended for the "singed" or "long side" trade, the carcase is passed into a patent furnace and comes out in a quarter of a minute thoroughly singed or "swealed." It next goes under a self-acting shower bath, after which the singed hair is scraped off by one man, who passes the carcase along the overhead rail to another who disembowels it. It is then weighed, and the weight stamped on it. An endless ratchet chain takes it further along the bar to the branding stage. Here a great saving of time and labour has been effected by the introduction of gas brands; the branding formerly had to be done by solid iron brands which were constantly reheated during operations. The carcase, after singeing, etc., is suspended in the hanging house for a period of twelve to twenty hours,



SAUSAGE ROOM.



GENERAL PACKING DEPARTMENT.

to reduce it to the temperature of the air. It is then cloven in two. The head having been taken off, the sides are sent into the chill room, in which they are hung at a temperature approximating to freezing point for another twenty hours. From this the sides are sent to the curing cellars, where they are first "pumped," as it is called. This consists of injecting into the thicker portions of the meat, through a strong hollow needle, a strong pickle consisting of salt and saltpetre. The sides are then piled six layers high, salt being spread between them particularly on the flank and thinner portions which have not been injected with brine. The temperature of the chill room or curing cellars is maintained at about 42° F., and the sides are left in them for some fourteen days, when they are taken out of the salt, wiped and packed in bales containing four sides each, and shipped to London or other markets. When "smoked bacon" is required, it is usually smoked by the wholesale buyers to whom it is sold. Bacon of this class, if "smoked" on this side of the Channel, would lose considerably in appearance through rough usage in transit. The Berwick pigs, killed for the Irish trade, are treated pretty much in the same way as we have described up to a certain point; the difference being that the pig is put into a cauldron of scalding water, after which the hair is scraped off. The singeing in a furnace is not done. The sides are cut into hams, middles, shoulders or fore-ends, and are finished and smoked in the factories in which they are cured. They are not pumped or injected with pickle, the hams in particular never being treated in this way, being entirely what is termed dry salt cured. The curing of hams takes a much longer time to finish than the other portions of the pig.

The bye-products form a very important portion of the trade, nearly every portion of the carcase being turned to some useful purpose. Sausage and pudding making in the curing house form a little industry in themselves, employing a large number of women; while tinned meats, such as brawn, ham and chicken, etc., are also made, principally for export. The livers are shipped to Germany, there to be made into liver sausages, esteemed a great delicacy in that country, but not generally appreciated by the people of the United Kingdom. They are also used in the manufacture of sauces. The sweetbreads or pancreas are utilised by manufacturing chemists in the making of pepsine.

Judging from the steady decrease in the killing of pigs for the past twelve years, it would seem that Ireland is losing its hold on this, one of its most important industries; thus reducing an area which gives employment to a host of operatives, male and female, along with pigbuyers, pig drovers, etc. Were it not for the money spent by the Irish curers in improving the quality of the breed of swine in Ireland, there is no doubt that Irish bacon would have ere this lost its prestige. It is, however, to be hoped that the trade will share in the better times looked forward to under the auspices of our new Department of Agriculture, and again attain to, if not exceed, the proportions it did in 1890.

Before long the County Councils, bacon curers, and others interested in the improvement of swine, will be face to face with the necessity of providing new and totally fresh blood for the country, as it must be borne in mind that the breeding of nearly all the Large White Yorkshire pigs in the kingdom is in the hands of but a few persons, thus rendering it not improbable that "in-and-in breeding" may, within a brief period, cause serious deterioration to the breeds of pigs that are now rapidly approaching a state

of perfection in respect of their suitability for the present requirements of the bacon trade of the United Kingdom.

The following Tables may serve to illustrate some aspects of the extent and distribution of the pig industry in Ireland :—

TABLE A.—Showing the Number of PIGS in Ireland in the Year 1841; the Average for the Three Years 1847-49-50; and the Average for each Quinquennial and Decennial Period in the Fifty Years 1851-1900; together with the Number per Head of Population during the same period.

Period.	*No. of Pigs.	No. per Head of Population.
1841 (only)	1,413	.17
†1847—50	781	.10
1851—55	1,165	.19
1856—60	1,224	.20
1861—65	1,137	.20
1866—70	1,229	.22
1871—75	1,281	.24
1876—80	1,217	.23
1881—85	1,290	.26
1886—90	1,404	.29
1891—95	1,272	.28
1896—1900	1,324	.29
1851—60	1,194	.20
1861—70	1,183	.21
1871—80	1,249	.24
1881—90	1,347	.27
1891—1900	1,298	.28

* 000 omitted. † Exclusive of the year 1848.

TABLE B.—Showing the Number of PIGS in Ireland, and the Number Exported during each of the Years 1880-1901 inclusive.

Year.	Number of Pigs.	Number Exported.
1880	850,269	372,890
1881	1,095,830	382,995
1882	1,430,128	502,906
1883	1,348,364	461,017
1884	1,306,550	456,678
1885	1,269,692	398,564
1886	1,263,142	421,285
1887	1,408,456	480,920
1888	1,397,825	544,972
1889	1,380,670	473,551
1890	1,570,366	603,162
1891	1,367,712	503,584
1892	1,113,472	500,951
1893	1,152,417	456,571
1894	1,389,324	584,967
1895	1,338,464	547,220
1896	1,404,586	610,589
1897	1,327,450	695,307
1898	1,253,912	588,785
1899	1,363,310	688,553
1900	1,268,521	715,202
1901	1,219,135	596,129

TABLE C.—Showing the Number of PIGS in each County per 1,000 Acres of Total Area, and also the Counties Classified in the order of the Density of their PIG Populations.

COUNTIES.	No. of Pigs per 1,000 acres.	COUNTIES.	Density of Pig Population.
Antrim	83.1	Wexford	One to 8 acres.
Armagh	85.8	Cavan	,, 8 ,,
Carlow	101.3	Monaghan	,, 9 ,,
Cavan	120.3	Carlow	,, 10 ,,
Clare	55.3	Longford	,, 11 ,,
Cork	72.1	Armagh	,, 12 ,,
Donegal	23.1	Antrim	,, 12 ,,
Down	68.9	Louth	,, 13 ,,
Dublin	39.6	Waterford	,, 13 ,,
Fermanagh	48.2	Cork	,, 14 ,,
Galway	47.7	Queen's	,, 14 ,,
Kerry	50.2	Roscommon	,, 14 ,,
Kildare	28.4	Tipperary	,, 14 ,,
Kilkenny	70.0	Kilkenny	,, 14 ,,
King's	54.2	Down	,, 15 ,,
Leitrim	68.7	Leitrim	,, 15 ,,
Limerick	67.4	Limerick	,, 15 ,,
Londonderry ..	67.0	Londonderry ..	,, 15 ,,
Longford	88.4	Sligo	,, 15 ,,
Louth	79.0	Mayo	,, 18 ,,
Mayo	56.3	Clare	,, 18 ,,
Meath	22.0	King's	,, 19 ,,
Monaghan	106.7	Tyrone	,, 19 ,,
Queen's	70.8	Kerry	,, 20 ,,
Roscommon	70.5	Fermanagh	,, 21 ,,
Sligo	65.7	Galway	,, 21 ,,
Tipperary	70.3	Dublin	,, 25 ,,
Tyrone	52.9	Westmeath	,, 25 ,,
Waterford	75.6	Wicklow	,, 26 ,,
Westmeath	39.4	Kildare	,, 35 ,,
Wexford	128.5	Donegal	,, 43 ,,
Wicklow	38.0	Meath	,, 46 ,,
IRELAND ..	62.4	IRELAND ..	,, 16 ,,

THE CONGESTED DISTRICTS BOARD FOR IRELAND.

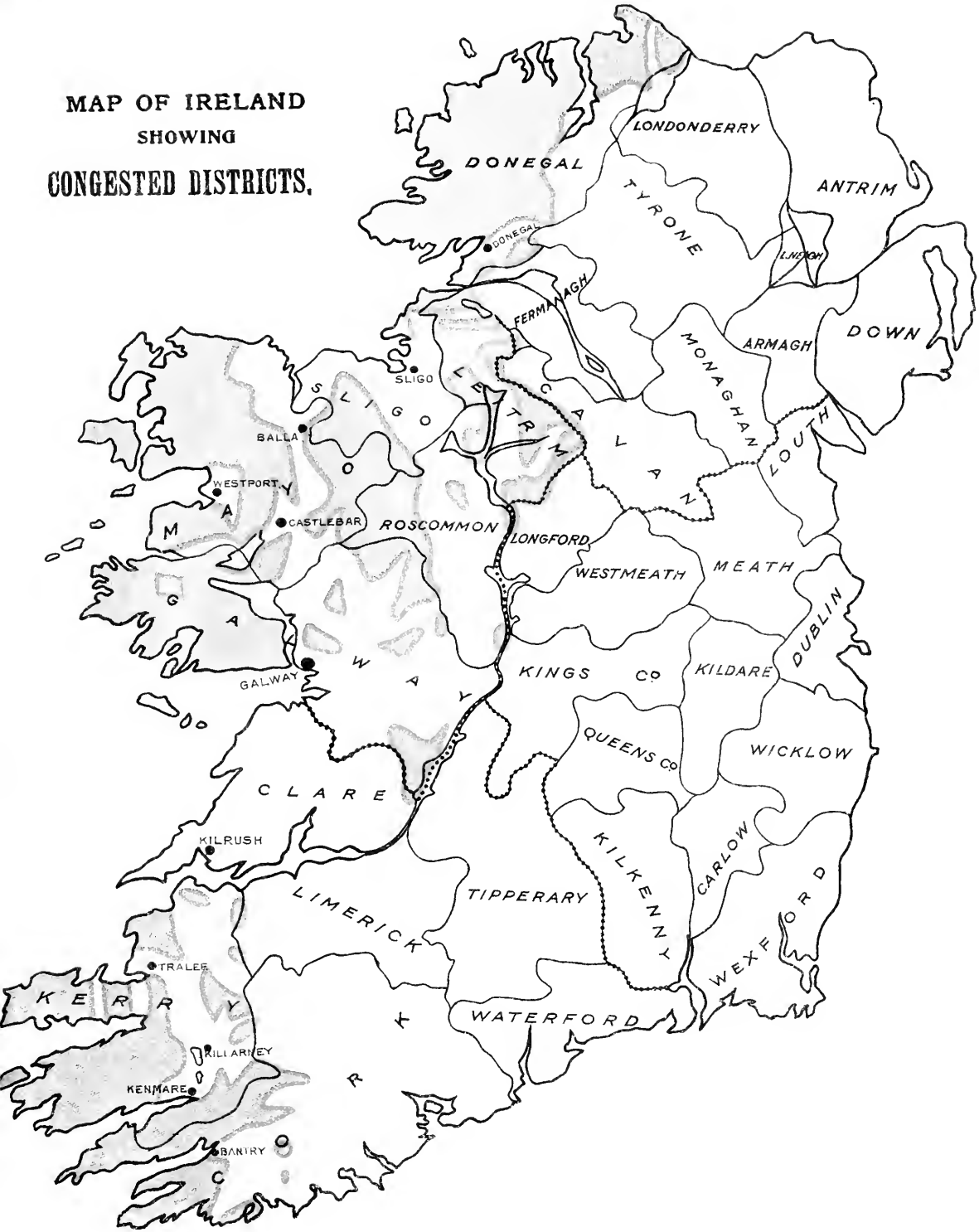
The Congested Districts Board was called into existence in the year 1891 to ameliorate the conditions of life of the inhabitants of certain of the poorest districts of the western coast of Ireland. The 36th section of the Purchase of Land (Ireland) Act, 1891, declared that where more than 20 per cent. of the population of any county in Ireland live in Electoral Divisions of which the total rateable value, when divided by the number of the population, gives a sum of less than thirty shillings for each individual, such Electoral Divisions shall be deemed to form a separate county, known as a Congested Districts County. The districts which accordingly have been declared congested embrace part of each county in Connaught, and part of Clare, Cork, Kerry, and Donegal, with an area of over three and a half million acres, and a population of over half a million; the poor law valuation of these districts amounts to about £1 per individual. It will be observed from these figures that the population is congested not as regards its density, that is, the number of persons per square mile, but rather as regards the insufficiency of the land for their support; the great want is not more land, but rather more good land.

The Board consists of seven permanent and three temporary members, of whom two are *ex-officio* members, one being the Chief Secretary for Ireland for the time being, and in his absence the Under Secretary, and the other a Land Commissioner, who is nominated to especially represent agriculture and forestry.

The annual income of the Board from all sources has hitherto been a little less than £55,000, consisting of £41,250, interest on the "Church Surplus Grant," about £7,000 a year derived from repayments of loans, £1,000 interest from Stock, etc., and £5,600 voted by Parliament in aid of the cost of the staff. From the 1st October, 1899, however, a new Parliamentary Grant of £25,000 was substituted for the former one, so that the annual income of the Board is now nearly £75,000. The Irish Reproductive Loan Fund, amounting to about £66,000 in securities, cash, and outstanding loans, and about £18,000 belonging to the Sea and Coast fisheries Fund were also placed at the disposal of the Board.

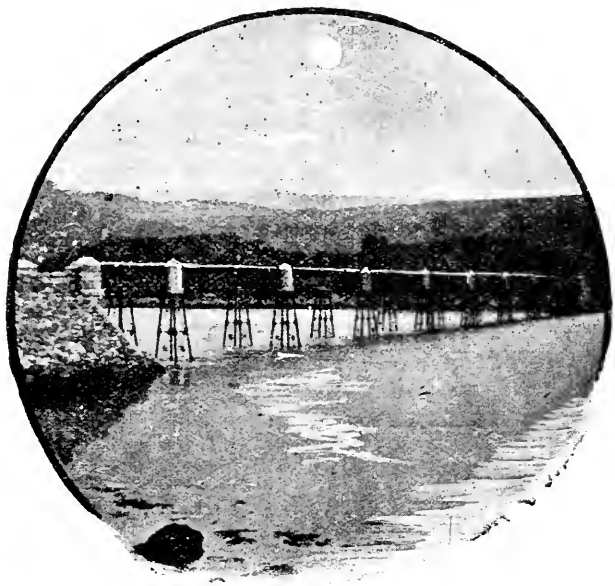
The Board was empowered to direct its efforts first, as regards agriculture, towards increasing the size of small holdings (chiefly by means of the amalgamation of small holdings and migration to available land), improving live stock and methods of cultivation; and in the second place towards aiding and developing, by indirect as well as by direct means, all suitable industries, such as fishing, weaving, spinning, etc.

In order to understand why the Board worked upon certain lines, and to appreciate the efforts that have been made to bring about a progressive and lasting improvement in these districts, it is necessary to examine what was the actual state of affairs with which the Board found itself confronted ten years ago.


MAP OF IRELAND
SHOWING
CONGESTED DISTRICTS.
DONEGAL
LONDONDERRY
ANTRIM
TYRONE
DONEGAL
LONDON
FERMANAGH
ARMAGH
DOWN
MONAGHAN
SLIGO
LEITRIM
CAVAN
LOUTH
BALLA
WESTPORT
MAYO
CASTLEBAR
ROSCOMMON
LONGFORD
WESTMEATH
MEATH
GALWAY
GALWAY
KINGS CO
KILDARE
DUBLIN
QUEENS CO
WICKLOW
CLARE
KILRUSH
KILKENNY
CARLOW
LIMERICK
TIPPERARY
WEXFORD
TRALEE
KERRY
WATERFORD
KILLARNEY
KENMARE
BANTRY

The Struggle for Existence in the West.

The great majority of the inhabitants were in possession of small plots—they could hardly be called farms—generally about two to four statute acres in extent. The rents for these holdings varied from a few shillings to several pounds a year; in most cases rights of turbary (*i.e.*, rights of cutting turf for fuel) and rough commonage grazing rights were appurtenant to the holdings, and frequently the tenants possessed the right of cutting and gathering seaweed for manure or kelp burning. The plots were usually planted with potatoes and oats, and the methods of cultivation were extremely primitive; there was no rotation of crops, no adequate supply of manure, and no proper system of drainage, whilst the breeds of live stock were worn out and of little value. The result was that the inhabitants were forced to depend very largely upon certain secondary sources of income of an uncertain and varying nature. Many "congests," as they are locally known, received occasional gifts from relatives in America, whilst weaving, knitting, and sewing formed other small subsidiary sources of income. The results of sea-fishing helped the families dwelling along the coast to eke out a scanty living, whilst those living inland depended largely upon the wages earned during some months of the year as migratory agricultural labourers in England or Scotland. Thus in



Gweebara Bridge, Co. Donegal.

Built by the Congested Districts Board.

most cases the people did not really live on the produce of their holdings, but rather on some secondary source of income, such as field labour in England or Scotland; they paid a rent for their holding, generally not because of its agricultural value, but rather because it was necessary to have some home for their family. In a "good year" many of the inhabitants were little more than free from the dread of hunger, whilst a bad year,

arising from the complete or partial failure of their crops, produced a condition of semi-starvation.*

The Board collected and published in its first report considerable information as to the income and expenditure of typical families in the congested districts. Four of these "family-budgets" are reproduced below:—

No. 1.

RECEIPTS and EXPENDITURE of a Family *in comparatively good circumstances*, the Receipts being derived from AGRICULTURE, MIGRATORY LABOUR, and HOME INDUSTRIES.

RECEIPTS.	£	s.	d.
Sale of Cattle, ...	6	0	0
,, Sheep, ...	2	10	0
,, Pigs, ...	3	0	0
,, Eggs, ...	4	0	0
Migratory earnings of men...	10	0	0
Children's earnings as servants,	6	0	0
Knitting, sewing, &c. ..	7	10	0
Miscellaneous sales of kelp, butter, fish, fowl, &c., ..	2	0	0
	£41	0	0

EXPENDITURE.	£	s.	d.
Flour or baker's bread, ..	9	2	0
Tea, ...	6	1	4
Indian meal, ...	3	18	9
Sugar, ...	2	3	4
Fish and bacon, ...	2	0	0
Salt and soap, ...	0	10	0
Oil and candles, ...	0	15	0
Clothing (exclusive of purchases by migratory labourers while absent from home)	6	0	0
Rent, ...	1	10	0
County Cess, ...	0	5	0
Church dues, &c.	1	0	0
Tobacco, ...	3	0	0
Furniture, &c.	1	0	0
For replacing or exchanging cattle, ...	2	0	0
Young pig, ...	1	0	0
Bran, ...	1	0	0
Carts, implements, &c. ..	1	0	0
Artificial manures, ...	1	0	0
	£42	15	0

The home produce consumed by the family was valued at from £12 to £20.

No. 2.

RECEIPTS and EXPENDITURE of a Family *in ordinary circumstances*, the Receipts being derived from AGRICULTURE, FISHING, and HOME INDUSTRIES.

RECEIPTS.	£	s.	d.
Sale of heifer or bullock, ..	4	10	0
,, five sheep, ...	3	15	0
,, pig, ...	3	10	0
,, eggs, ...	2	4	4
,, flannel or tweed, ..	3	10	0
,, corn, ...	0	15	0
,, fish, ...	8	0	0
,, knitting, &c.	1	0	0
	£27	4	4

EXPENDITURE.	£	s.	d.
Rent, ...	2	0	0
County Cess, ...	0	5	8
Tea, ...	5	17	0
Sugar, ...	1	19	0
Meal, ...	7	14	0
Flour, ...	1	17	6
Clothing, ...	6	8	6
Tobacco, ...	2	7	8
One young pig, ...	0	15	0
Implements, &c., ...	1	4	9
	£30	9	1

The home produce consumed by the family was valued at from £5 10s. to £10.

* The following significant description of the poverty prevailing in the Congested Districts—compiled from the evidence of Mr. W. L. Micks, given before the Royal Commission on Local Taxation—is incorporated in the Special Report presented by Lord Balfour of Burleigh, and Lord Blair Balfour:—"In the Congested Districts there are two classes, namely, the poor and the destitute. There are hardly any resident gentry; there are a few traders and officials; but nearly all the inhabitants are either poor or on the verge of poverty. . . The people are very helpful to one another—the poor mainly support the destitute."

No. 3.

RECEIPTS and EXPENDITURE of a Family *in very poor circumstances*, the Receipts being derived from AGRICULTURE and FISHING.

RECEIPTS.	£	s.	d.	EXPENDITURE.	£	s.	d.
Sale of calf, ...	2	0	0	Rent, ...	1	10	0
,, two sheep, ...	0	16	0	County Cess, ...	0	2	0
,, pig (profit), ...	2	0	0	Clerical charges, &c., ..	0	6	0
,, fish, ...	3	0	0	Meal, ...	2	0	0
,, eggs, ...	2	0	0	Flour, ...	1	10	0
				Groceries, &c., ...	0	10	0
				Clothing, ...	3	0	0
				Lights, ...	0	5	0
				Utensils, tools, &c.	0	10	0
				Tobacco, ...	1	6	0
	£9	16	0		£10	19	0

The home produce consumed by the family was valued at from £12 to £17.

No. 4.

RECEIPTS and EXPENDITURE of a Family *in the poorest possible circumstances*, the Receipts being derived from AGRICULTURE and LABOUR in the locality.

RECEIPTS.	£	s.	d.	EXPENDITURE.	£	s.	d.
Eggs, ...	1	3	0	Rent, ...	1	0	0
Sixty days' labour at 1s. ..	3	0	0	County Cess, ...	0	2	0
Herding cattle, ...	4	0	0	Meal, ...	5	17	0
				Clothing, ...	0	10	0
				Groceries, ...	4	0	0
	£8	3	0		£11	9	0

The home produce consumed by the family was valued at about £6.

These facts and figures speak eloquently for themselves and show that in some congested districts, at the time the Board was established, the value of the produce of some of the small holdings, together with the earnings and receipts of the family from every other source, did not exceed a total of £15 a year. Even in the less distressed portions of the congested districts the standard of living was low, the diet of the poorest section of the people being altogether vegetable, with the exception of salt fish or bacon at times, which was used more as a *relish* than as an article of food. The houses, furniture, and bedding were too often unhealthy, mean, and comfortless, and the clothing frequently ragged and scanty.

Enlargement of Holdings.

Some of the best work of the Board has been done in connection with the improvement and enlargement of holdings. The Board has, first of all, to arrange with the landlord for the purchase of his interest, Guaranteed Land Stock being advanced by the Land Commission for this purpose. The Board proceeds to re-arrange and enlarge the holdings and then to re-sell them to the tenants. When there is in proximity to the holdings any grazing or other land in the Board's hands as owners, or any land vacated by large tenants who have been bought out by the Board, it is generally utilised for enlarging the holdings that are being re-sold; but this simple

procedure is often impossible, and then the Board has to carve out a new farm from unoccupied land and build a new house for one of the tenants in order to induce him to give up his original farm, which is then divided amongst the adjoining holdings. The difficulties of "re-striping" the estate, *i.e.*, squaring and re-arranging the holdings so as to make them compact and large enough to be of use, are, of course, enormously increased by the way in which farms that were originally compact have been sub-divided from time to time.

On many estates in the West, especially where the land is poor and a dense population—dense, that is for the quantity of the land cultivated—has been in undisturbed possession for many generations, the people have sub-divided the holdings from time to time in their own way, and the result is that often the holding of one tenant does not consist of one or two or even three separate portions of land, but of many detached fields, or plots within fields, lying amongst similar fragments of other scattered holdings. A field of one acre may belong to a dozen persons, each of whom owns his own particular plot, and very frequently matters are still further complicated by "undivided shares" in various fractions of plots, such as three-fourths of one and one-sixteenth of another.

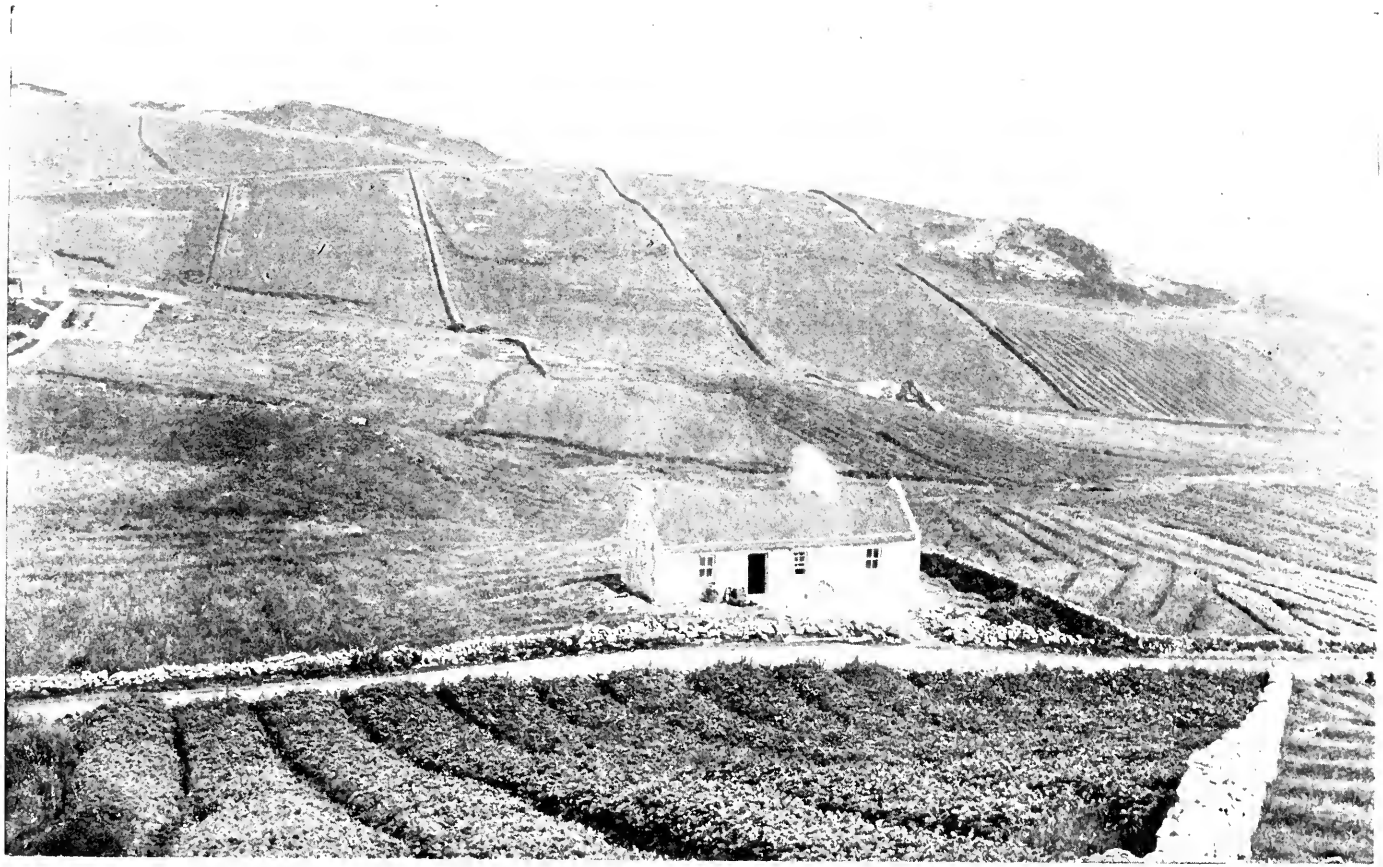
In order to ensure that the new holding which is to be offered to the tenant is of at least the same value as the old, it is not only necessary to estimate the quantity and quality of the land in each plot, but due consideration has also to be given to rights that may be possessed of commonage grazing or of cutting turf and seaweed; and, after all these more or less technical difficulties have been surmounted, the Board may find their plans upset and their progress stopped by some one unreasonable person who refuses to accept the new holding or to give up the old one; thus on one estate considerable trouble arose from such action on the part of an old woman who held a strip of land completely surrounding a small village, each inhabitant of which had houses or land both inside and outside the encircling holding. This action on the part of the tenants is, however, quite exceptional, now that they understand that the measures adopted are for their own good, and, despite other difficulties, the Board has persevered in the work of purchasing, improving, and then re-selling holdings to the tenants, as it wisely considers such a scheme likely to prove the most permanently beneficial measure it can take in order to better the condition of the small occupiers in the congested districts. This is specially applicable to the inland districts, where agriculture must always be the chief industry, and where a very large number of occupiers, beyond all doubt, have not sufficient land, regard being had to both quantity and quality, to give full employment to their labour or to afford them a bare subsistence. Accordingly, from the beginning the Board has recognised that in many cases any scheme which merely fixed these men as peasant proprietors in their holdings without some collateral proposal to improve the farm or to increase its size would but intensify the troubles of the situation.

Clare Island.

Clare Island, which was purchased for £5,000, affords a good example of the Board's procedure. The extent of the island is nearly 4,000 statute acres, with a Poor Law Valuation of £507 18*s.*, and a rental of £495 16*s.* 6*d.* One-fifth of the area was held in commonage and the remainder consisted of holdings occupied by ninety-five tenants. As Mr. Doran, the

CLARE ISLAND.

Wall separating Farm from Mountain Commonage.



CLARE ISLAND.

A New Farm House and "Stripes" running from the Shore to the Mountain Commonage.

Board's Inspector, writing in May, 1894, declared, "From an agricultural point of view, Clare Island is not an inviting place. Nature did little for it, and mankind has robbed it of all it could." The whole island was held in rundale; no one knew where his land began or ended; he only knew that he had certain grazing rights over certain parts. There were no fences, and the cattle strayed practically unrestrained, even over whatever arable patches there were; the holdings were wretchedly small, and over two years' arrears of rent were due. The first work undertaken was the building, at a cost of £1,600, of a strong stone wall, about five miles long, across the island to separate the pasture from the tillage lands. This was necessary as, owing to the fact that there were no fences, cattle and sheep roamed over the whole island, and when the crop was in the ground the tillage land had to be guarded against the cattle by the members of the tenants' families. Under the supervision of the Board's Inspector all this has been changed. Cattle sheds have been built, main drains opened, holdings extended, the striping carried out, and over fifty miles of fences constructed. The wages earned by the islanders engaged on these works enabled them to pay their rent, including the arrears; but now since these wages have ceased, the rent has to be raised out of the holding itself. It is satisfactory to learn from the last report of the Board that the tenants have paid every penny of rent demanded from them during the four years they were the tenants of the Board, and that it is expected that they will in future discharge the lighter burden of purchase annuities, amounting to only £325 a year, with equal punctuality. A useful provision of the Land Purchase Acts which prohibits the sub-division of a holding so long as any of the purchase-money remains unpaid, will, it is hoped, check the propensity, so noticeable in the past, of sub-dividing the land.

The Dillon Estate.

Up to 1899 the Board had purchased estates to the extent of 25,000 acres, and in that year they greatly extended the range of their operations in this direction by the purchase of the Dillon Estate of over 90,000 acres, chiefly in County Mayo, for the sum of £290,000, which amounted to sixteen years' purchase of the net rental. The tenants on this estate number 4,200, of whom more than half pay rents of £4 or less, whilst a still larger majority are migratory labourers whose holdings are too small to support them. Most of the holdings consist of poor land, capable of considerable improvement by reclamation, drainage, and improved methods of husbandry. The first necessity was drainage, some thousands of acres of low land being practically useless owing to constant flooding. The tenants individually could not make the necessary main or arterial drains, or deepen the beds of the rivers—such works could be carried out only by the owner of the estate. In view of these circumstances the Board have conducted extensive drainage operations, and by the expenditure of a few hundred pounds the productive value of hundreds of acres in different parts of the estate, has already been doubled. Although the progress made in the improvement works was such that a large number of holdings were ready for sale towards the end of 1900, no purchase had been completed on the 31st March, 1901, as many difficulties arose in connection with the preservation of the sporting rights—which should form a valuable asset of the newly constituted peasant proprietors—the apportionment of turbary and other questions; but these difficulties have now been overcome and the re-settlement of the Dillon Estate is well on the road to completion.

Migration.

In order to carry out the policy of enlarging holdings and of migration to lands purchased by the Board, it is often necessary to effect a change in some holdings on neighbouring estates which have not been purchased by the Board. To bring about these enlargements it is necessary to induce a tenant to surrender his holding in the "congested" area and to remove to a new holding which has been prepared for him on the Board's land, and his old holding is then divided up among the adjoining farms. By removing a few families from a badly congested district to new holdings in another and less crowded district, it is thus possible to better the condition both of the migrants and of those who are left behind. The action of the Board is confined of course to cases where the landlord will consent to these changes, and the Board have also to arrange so that the landlord shall get from all the enlarged holdings the same amount of rent which he had previously derived from all the original holdings. It will be seen that the selection of migrants, where the changes are not confined to tenants on estates purchased by the Board, is a troublesome matter and requires much careful negotiation. Another point to which the Board has to attend in nearly every case, is that the tenants thus settled have some working capital, without which the land is of little use to them. It is for this reason that the Board have co-operated with the Irish Agricultural Organisation Society in founding and aiding co-operative credit associations. The Board has allowed banks in congested districts to borrow loan capital from it to the extent of £3,000. The amount lent to the individual societies varies from £50 to £200, on which they pay interest at the rate of 3 per cent. These small deposits serve as a nucleus round which other sums gather by degrees, until a sufficient capital will be in time acquired. The Raiffeisen banks thus aided issue numerous small loans to their members—the very poor—who could not obtain credit elsewhere. The profit to the individual borrowers is generally very considerable, and so far no losses have been incurred by the banks—indeed, in every case a small profit has been made and carried to the reserve fund. It is difficult to over-estimate the effect a well organised system of agricultural credit would have upon the West of Ireland. Many of the migratory labourers who go to Great Britain in search of work are landholders whose farms would profitably respond, were capital available, to a very considerable amount of intelligently applied labour. But at present the lack of capital and the inability of a small landholder to wait over a season for the reward of his industry turns the balance of advantage in favour of migration.

Agriculture.

The Board, of course, has paid particular attention to improving the methods of cultivation in vogue in the congested districts. For several years seven Agricultural Inspectors have been employed, and in addition to advising small landholders as to the management and improvement of their land and stock, and lending farm implements, they inspect animals issued under the various schemes, and have had charge of nearly forty example holdings, and about five hundred experimental and example plots. The work on some example holdings consists chiefly of permanent improvements, such as draining, levelling, and clearing away rocks; in others small grants of seeds and manures are made for the purpose of inducing the occupiers to try a better rotation of crops, or to grow crops such

as mangolds or new varieties of potatoes, which may not be sufficiently known in the district. Considerable attention has been given to potatoes, which form the staple crop in large districts, and on which many are entirely dependent for food. In view of the almost invariably beneficial effects of spraying, and of the ever-recurring danger of a wet season, every effort has been made to encourage the practice of spraying, and about £4,000 has been spent in this connection. Numerous experiments are carried out to test the suitability of different artificial manures or the relative merits of different varieties of seeds, and recently investigations have been tried to test the efficiency of certain remedies for the prevention of "smut" in oats. The Board are also taking steps to encourage the planting of fruit trees and the growth of forest trees by small occupiers. In the case of forest trees grants are made to small occupiers on the sole condition that the plantation is properly fenced.

Horse-breeding.

One of the chief needs of the congested districts was an improvement in the quality of the live stock, especially of the horses. In order to promote the horse-breeding industry, the Board bought a large number of stallions which are stationed during the season at different places in the congested districts for the purpose of serving mares belonging to the inhabitants at a very small fee. These operations have been carried out on an extensive scale, and about £48,000 has been expended up to 31st March, 1901, in this direction. The selection of stallions for the congested districts has been considerably criticised, and though it is generally admitted that the state of affairs in the congested districts, especially the small and weedy class of mares so common there, called for different methods from those prevailing in the great hunting centres, the large number of hackney sires bought by the Board renewed "the Battle of the Stallions." Some have objected altogether to the introduction of hackneys, and others, whilst admitting that they might benefit the breed common in the West of Ireland, base their objection on the danger of the hackney strain spreading from the congested districts into the great hunter-raising districts. It is satisfactory to learn from the Reports of the Board that the young stock got by these stallions have been carefully watched, and that in no case has any want of staying power in the half-bred hackneys been alleged. The Board's chief difficulty was, and is, the tendency—not confined to the congested districts—shown by small landholders of selling the best fillies and keeping the worst, generally the unsaleable ones, for breeding purposes. The ninth Report of the Congested Districts Board points out—"It must always be borne in mind that our work in connection with horse-breeding was commenced in a falling market, and that the tide only began to turn about a year ago, a fresh demand for cobs for mounted infantry having arisen since last season. Many of the best of the remounts purchased came from those districts in the West of Ireland which are served only by our horses, and in consequence the applications for horses to be sent to those and other districts have never been so urgent as in the beginning of the present year."

It is stated that owing to the demand for horses and the large number of Irish cobs that have been sent to South Africa the horse-breeding industry in the West has received a great stimulus, and the people are more than ever anxious to breed a foal. It is feared that the good prices have tempted

many to sell their best mares, and, as has been already mentioned, the serious drawback to horse-breeding in the West, as well as in the rest of Ireland, is the wretched quality of the mares, and the belief that any mare will do to breed from if she has the chance of a good horse. This tells most unfairly on the stallions, as only in rare cases have they mares sent to them from which a good foal can be fairly expected, and in the majority of cases the wonder is that the results are so favourable.

Live Stock.

Since the Board commenced its work nearly £20,000 has been expended in aid of the breeding of live stock other than horses. The method of improving cattle found to be most successful is the purchase by the Board of good bulls at an average price of over £30. These animals are then re-sold to farmers in the congested districts at less than half the original price, the money being paid in two or three instalments. The chief condition of sale is that the purchaser shall keep the bull in the congested districts for at least two or three years, during which time it is to be available each year for the service of a stipulated number of cows, belonging to small farmers, at a maximum service fee of 2*s.* 6*d.* The farmer usually receives a subvention of £3 or £4 towards the cost of keeping the bull during the third year. Nearly nine hundred bulls have been sold outright under this system.

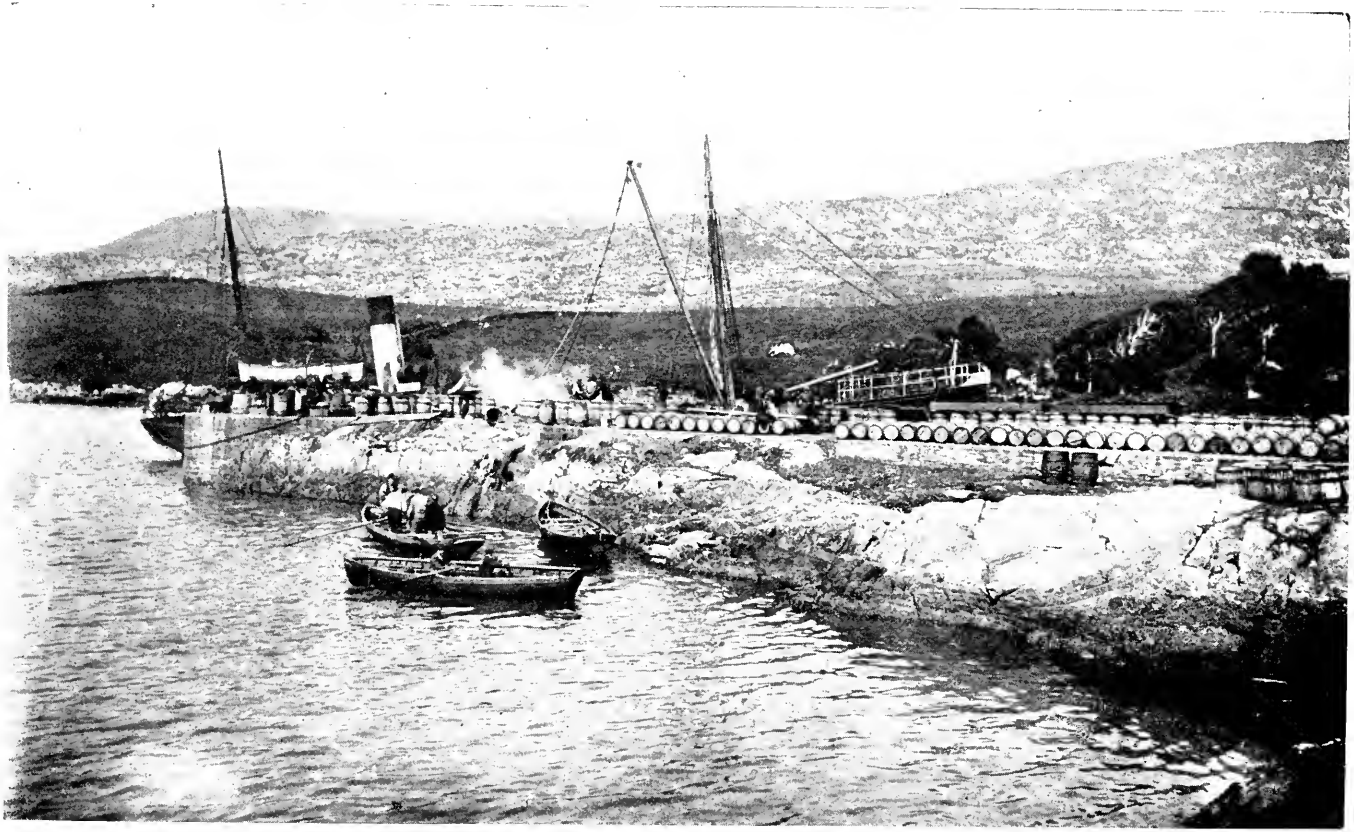
A new scheme has been approved under which owners of approved bulls may arrange with the Board to give the services of their bulls for the benefit of small occupiers in their districts subject to a maximum fee of 2*s.* 6*d.*, the Board undertaking to pay certain subsidies varying according to the breed of the bull and the number of animals served. It is believed that this system will work well in cases where the bull owner wishes to reserve the bull for a large number of his own stock, and it enables those who wish to do so to select their own bulls. It is to be regretted that it is still the almost universal custom for breeders to sell their best heifers, instead of keeping them to breed from; but it is believed that by slow degrees the breeding stock in congested districts will be graded up by the Board continuing to supply pure-bred bulls.

Similar measures have been taken to improve the breed of sheep and pigs, by increasing the number of well-bred rams and boars in the congested districts; and the efforts of the Board to encourage the practice of dipping sheep have met with considerable success.

Poultry.

Over £4,000 has been expended in improving the poultry and egg industry. At first the Board adopted the system of distributing among the people a large number of suitable fowl, but this method was soon found to be both too liberal and too expensive. Under the scheme adopted in 1893 a limited number of birds, generally twenty-two, of an approved breed, are sent out to one selected farmer or cottager in each small district. From the centre thus formed eggs of the pure breed are distributed, for hatching, to as many as possible of the surrounding cottagers. The inducement offered heretofore has been one penny paid by the Board to the distributor for every egg of the good breed issued by him, and, at the same time, he is entitled under the arrangement agreed upon, to get an egg of the common country breed in exchange.

SPRING MACKEREL FLEET IN BEREHAVEN.



MACKEREL, FOR AMERICAN MARKET, BEING DESPATCHED FROM WEST COVE PIER, CO. KERRY, BUILT BY CONGESTED DISTRICTS BOARD.

This system has now been some years in full operation, and in the two years ending 31st March, 1901, over £900 was paid for eggs distributed, the number of eggs issued being about 230,000. The results are seen in the marked increase in the size of the eggs in many districts; and when the new system of grading eggs for market according to size becomes more general, the improvement effected will be better appreciated by the people. It is stated in the ninth Report that arrangements were made for reducing the rate of payment from 1*d.* to ½*d.* per egg issued, but this system of paying poultry farmers for the eggs issued is believed to be in many respects unsatisfactory, and it is therefore proposed that, in the case of all poultry farms to be established in future, the system of paying for each egg distributed will be discontinued, and that in lieu thereof the poultry farmer shall be allowed to sell eggs, subject to a maximum price approved by the Board, or to exchange them for their full value in ordinary eggs. In addition he will receive a small cash bonus each year, provided that the directions given for the management of the poultry and the distribution of eggs are properly carried out.

The Board employs a poultry expert to visit and supervise these small poultry farms, and to instruct the people in the management of fowl, whilst considerable assistance has been given in the direction of marketing the eggs.

Bee-keeping.

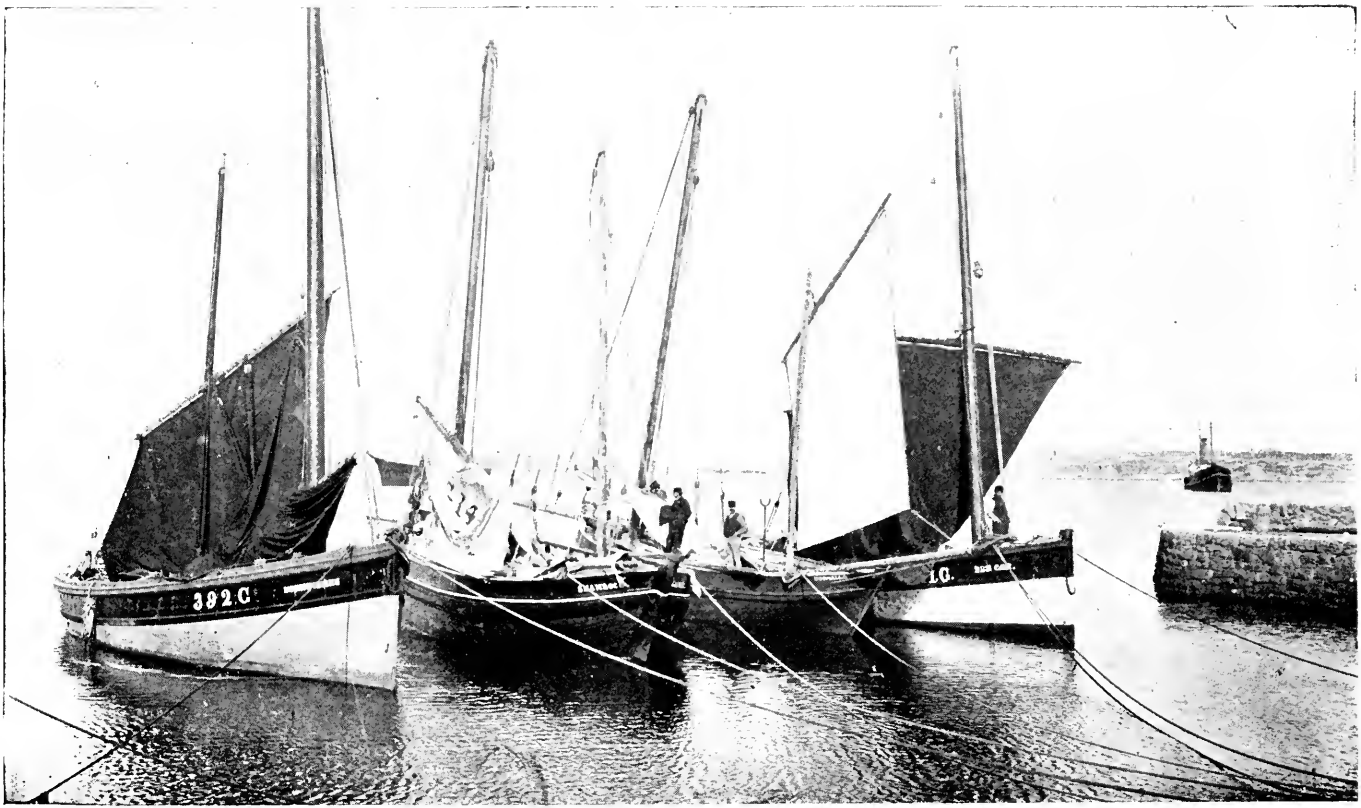
The Board made a start in 1893 towards developing the bee-keeping industry by supplying swarms of bees and suitable bar-frame hives to about a dozen cottagers, who were also instructed in the proper management of bees, and this experiment was attended with considerable success. In the following year the operations were extended, especially in County Donegal, and a number of persons were supplied with bee-keeping appliances and stock, which were paid for on the instalment system. As the industry spread it was seen by the Board that, in order to make the keeping of bees a profitable occupation for people in remote parts of the country, it was necessary, for some years at all events, to assist in marketing the honey of any bee-keepers who were themselves unable to find a purchaser, and this the Board undertook to do. Over eight tons were thus disposed of in 1900, and twelve tons in 1901. A number of local instructors are now spread all over the congested districts, and a series of lectures, with magic lantern views, have helped to spread information on the subject, and to increase the popularity of the industry, the rapid development of which, in the last few years, is shown by the increase in the number of bar-frame hives sold in the congested districts, which has arisen from 80 in 1895 to 246 in 1900. Owing to the unusually long, dry and warm summer the season of 1899 was a most prosperous one for Irish bee-keepers. Many of the bee-keepers were beginners, yet the average produce per hive (nearly 66½ lbs.) was remarkably high, if not unprecedented, and, owing to the rapid growth of the industry, the number of hives in use was much larger than in any former year. The statistics obtained from bee-keepers working in connection with the scheme shows that the total quantity of honey sold by them was 59,936 lbs. In 1898 the production of honey was only 22,925 lbs., and the average only 54½ lbs. per hive, and in neither year do these figures include more than one-third of the honey produced in the congested districts.

The Fishing Industry.

One of the first steps taken by the Congested Districts Board was to develop the resources which in the shape of sea fisheries lay almost at the door of so many of the "Congests." In considering the potentialities and drawbacks of this industry, the sea-coast of the congested districts may be divided into two divisions, in one of which, consisting of Galway, Mayo, and Donegal, transit for fish and marketing facilities were defective; while in the other division, comprising Kerry and Cork, the means of transit both by rail and by steamship were far more complete, and in this district, therefore, a much more profitable market already existed than in the northern congested districts. Speaking generally, the Kerry and Cork fishermen needed landing accommodation for boats more than market facilities, while as regards the coast north of Galway the establishment of a market was the chief necessity, though at the same time piers and boat slips were much wanted at some places.

The requirements of the fresh fish trade were of course different from those of the cured fish trade. The fresh fish trade requires quick and regular means of carriage to the English markets, and expensive plant—such as ice-hulks, ice, and packing boxes—is also necessary. The cured fish trade, on the other hand, involves the erection of fish curing sheds and stores, the hiring of fish-curers, and the purchase of salt, but there is not any necessity for rapid or regular transit to market, and a steamship or even sailing vessel can be chartered occasionally to take pickled or dried fish to the market. A start was made by the Board in Galway Bay, but it was soon evident that even there, where transit facilities were comparatively favourable, little less than the creation of the local industry was the task awaiting the Board; for to promote the fishing industry in such a way as to render it ultimately self-supporting, it was not only necessary to provide boats, but the men had to be shown also, to a large extent, how and especially when to fish. Thus, though the Aran islanders were accustomed to avail themselves in an elementary way, of the Autumn Mackerel Fishery, they scouted the idea of Spring fishing. Another difficulty arose from the fact that most West of Ireland men are not sailors but only boatmen, and consequently are by nature disinclined and unfit for fishing away from home. Fortunately the Board did not start their work of encouraging deep-sea fishing, as was suggested by some, by establishing schools to teach boys how to fish on dry land. Instead of this, seven Arklow crews, accustomed to deep-sea fishing, were subsidised to exploit the Spring Mackerel Fishery, and the Board bought a steamer to help, as well as boats, nets, boxes, and, not least important, a cargo of ice. After much weary waiting the mackerel came, and since then the fishing has flourished and become profitable on a self-supporting basis, for the Board has now ceased to act as the universal buyer, and private traders with their own steamers and agents, have taken its place. The Board still supplies boats by means of loans from the Reproductive Loan Fund, or the Sea and Coast Fisheries Fund, repayable by half-yearly instalments. Two instructors generally form part of the crew, who teach the natives the complete art of fishing, and, above all, how to look after the gear and how to mend the nets.

These methods have been pursued with considerable success in most of the other fishing centres of the congested districts. Recently a new mackerel fishery has been opened at Blacksod Bay, and though the first season's working resulted in a loss of over £1,800, the Board very justly



MACKEREL BOATS, BUILT IN CONNEMARA, OF THE ZULU AND NOBBY TYPES, BY LOCAL BUILDERS, UNDER DIRECTION OF AN INSTRUCTOR.

HERRING BOATS OF THE ZULU TYPE, ISSUED ON THE "SHARE SYSTEM" AT DOWING'S BAY, CO. DONEGAL.

regard this as an investment which may in future years add considerably to the resources of the large and very poor population of the locality; and the fishing last year resulted in considerable profits being earned by the men engaged. The conger, skate, cod, ling, and glasson fishing at Teelin and Aran is very promising, and there is a very important herring fishery off Donegal, where the take last year was quite unprecedented, the net receipts of the fishermen being over £25,000, in addition to which about £5,000 paid to persons on shore for curing and carting.

The curing of mackerel caught in the autumn has been a flourishing industry during the past fifteen years on the south coast of Ireland owing to the constant demand for the American market, but, unfortunately for all concerned in the fishery in this country, the mackerel after appearing in American waters, for many years only in small numbers, suddenly returned in immense quantities in 1900, and the result was that the price fell from 14 dollars per barrel to 9 dollars; and merchants are unwilling to open curing stations and pay the fishermen 4*s.* per hundred for the fish so long as they receive only 9 dollars per barrel in America. In June, 1901, Mr. A. T. Duthie, one of the Board's Inspectors of Fisheries, undertook, on behalf of the Department of Agriculture and Technical Instruction, an inquiry in the United States into the condition and prospects of the pickled mackerel and cured herring market. He subsequently made a very exhaustive and valuable report which must prove of great asistance to both merchants and curers engaged in this trade. The report was printed in full in the Journal of the Department of Agriculture and Technical Instruction, vol. ii. pp. 82, *et seq.*

In the same year inquiries were made through some of the British Consular agents in Spain and Portugal, in the hope of finding a market in those countries for Irish mackerel or herrings, but owing to the cheapness of dried cod-fish and to the customs duty on imported fish, there seems to be little chance of creating a profitable market there for Irish fish.

The Board has since its inception expended over £100,000 in engineering works, including marine works such as piers, harbours, drainage works, and roads and bridges. These works are not of the class known as "relief," but have been undertaken rather with a view to develop and open up the resources of the districts by offering facilities to fishermen and agriculturists.

An important part of the Board's work is concerned with the practical instruction which is given in the industries intimately connected with fishing, viz.:—net making, barrel making, and boat building. Cooperages have been established for many years at Burtonport and Teelin in Donegal, where about 11,000, barrels "half barrels," and carrier barrels have been made annually, which have produced a yearly return of about £2,200. The Board have also imported several large cargoes of Norwegian barrel-staves for their own cooperages and for sale to coopers at various places in Cork and Kerry. Twenty-three decked fishing boats have been built at ship yards on the coast of Connemara and Killybegs in Donegal, where building was first started under instruction provided by the Board. Including these twenty-three boats the total number of fishing boats built to the Board's order in Ireland and elsewhere is ninety-one, which cost, without their nets and gear, nearly £15,000

Home Industries and Domestic Training.

The development of home and cottage industries, such as spinning, weaving, knitting, and other industrial enterprises, constituted perhaps the most difficult duty entrusted to the Board both as regards the selection of fields of work and the carrying out of schemes for affording assistance. Besides the well-known woollen factory at Foxford and the hand tuft carpet making business at Killybegs, knitting, crochet and lace work, kelp making, basket making, carpentry, and other home and cottage industries have all been started or developed. In some cases the Board found it necessary to give some direct assistance to the nascent industry, but in other cases technical instruction was the chief need; and when this was facilitated by the Board the industry required little further assistance. In most of these industries the actual pursuit of the trade and technical instruction in its wider sense seem now to go thoroughly hand in hand.

A great boon was conferred upon girls in the congested districts by the starting of "Domestic Training" classes. These classes have without exception been very well attended, and 435 pupils in all have been instructed. As an instance of the anxiety of the young women to obtain the benefit of this course it may be mentioned that at Sneem in County Kerry sixteen of the pupils at the evening class lived at an average distance of 4¾ miles from the class-room and therefore walked over nine miles a day for four months in the winter. One girl walked sixteen miles a day and attended on seventy-two days out of eighty-one. It was the custom for many of the girls to go to the "hiring fairs" and engage themselves for service in the neighbouring counties. As the cottages in which the girls live when at home give them no opportunity of learning the ordinary work of domestic service, they are quite untrained, and are consequently put to rough work, and can obtain only low wages. Whilst one of the primary objects of the instruction given is to improve the homes and habits of the people by raising the standard of their ideas as to comfort and health, another object which is perhaps more directly attainable is to teach these girls cooking, laundry and general housework and to train them in habits of neatness and order so as to enable them to get better wages.

THE DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION.

Various suggestions had from time to time within the past decade or two been mooted for the establishment of a State Board or Department of Agriculture for Ireland. These suggestions first took practical shape when a number of Irishmen, representative of different political parties, resolved to form a Committee, for the promotion of measures, for the benefit of the country, in support of which a common agreement could be secured. This Committee, which was formed during the Parliamentary recess of 1896, was known as the Recess Committee, and it consisted of the following members:

Hon. HORACE PLUNKETT, M.P., *Chairman.*
The EARL of MAYO.
The LORD MONTEAGLE, K.P.
Right Hon. the LORD MAYOR of DUBLIN.
Right Hon. THE O'CONOR DON, H.M.L.
Right Hon. JOSEPH M. MEADE, LL.D.
Right Hon. THOMAS SINCLAIR, D.L.
Sir JOHN ARNOTT, Bart., D.L.
Sir THOMAS LEA, Bart., M.P.
JOHN REDMOND, M.P.
JOHN H. PARNELL, M.P.
RICHARD M. DANE, Q.C., M.P.
WILLIAM FIELD, M.P.
Hon. Mr. JUSTICE ROSS.
Right Rev. MONSIGNOR MOLLOY, D.D.
THOMAS ANDREWS.
VALENTINE B. DILLON.
C. LITTON FALKINER.
Rev. T. A. FINLAY, S.J., F.R.U.I.
THOMAS P. GILL.
JOSEPH E. KENNY, M.D.
H. BROUGHAM LEECH, LL.D.
COUNT MOORE, D.L.

An Ulster Consultative Committee was formed in Belfast for the purpose

of corresponding with the General Committee. The following were the members of the Ulster Committee:—

JAMES MUSGRAVE, D.L., *Chairman.*
THOMAS ANDREWS.
JAMES DEMPSEY.
Sir DANIEL DIXON, Knt, D.L.
Sir W. Q. EWART, Bart., D.L.
JOHN FAGAN.
MAURICE FITZGERALD (Professor, Queen's College, Belfast).
Rev. R. R. KANE, D.D.
ROBERT MACGEAGH, J.P.
R. J. M'CONNELL, J.P.
ALEX. ROBB.
THOMAS ROE, J.P.
Right Hon. THOMAS SINCLAIR, D.L.
JOHN F. SMALL.

Mr. Horace Plunkett was chosen as Chairman of the Recess Committee, and Mr. T. P. Gill acted as Hon. Secretary. The Committee set themselves to study systematically the methods adopted by the State in other countries for the development of agricultural and industrial resources, and to consider whether these methods might be adopted and adapted to the special conditions of Ireland. As a result of their deliberations the Recess Committee drew up and presented to the Irish Government a "Report on the Establishment of a Department of Agriculture and Industries for Ireland," which made the following recommendations:

(1.) That the administration of State aid to Agriculture and Industries in Ireland on the principles to be described can be most effectively carried out by including the two branches of Agriculture and Industries, and the Technical Instruction relating thereto, under the care of one Department of Government specially created for the purpose; and

(2.) That this Department should consist of a Board with a Minister of Agriculture and Industries responsible to Parliament at its head, and assisted by a Consultative Council representative of the agricultural and industrial interests of the country.

The recommendations of the Committee, were taken up warmly by public opinion of all shades in Ireland, and especially by the bodies representative of agriculture, commerce, and industry. A very important deputation organised by the Chambers of Commerce of Dublin, Belfast, and Cork, and representing the agricultural and commercial interests throughout the country generally, waited on the Chief Secretary, Mr. Gerald Balfour, in January, 1897, who received them graciously, and promised legislation on the part of the Government.

In the Session of 1899 the Chief Secretary introduced and carried through Parliament a Bill for the establishment of a Department of Agriculture and Technical Instruction for Ireland, which embodied the main features of the Recess Committee's recommendations, and adapted them to the new

circumstances created in Ireland by the Local Government Act, which the same Minister had carried through Parliament the previous Session. A brief outline of the varied duties and functions of this new State Department is given here—though it must necessarily be of a very summary character. One side of the duty of the Department is to carry on certain veterinary, fishery, statistical, and educational work, which was, at the time of the passing of the Act, divided up amongst some half-dozen State departments, but a large share of its duties is almost entirely new, so far as State action is concerned, and is connected with the development of "Agriculture and other Industries and Technical Instruction," words which receive a very liberal interpretation in the definition clause. Towards carrying out this work, the Department received a capital sum of about £200,000, and has an annual endowment of £166,000. The salaries and allowances of the staff required for the work of the Department, including the transferred duties, are voted by Parliament and included in the ordinary Civil Service Estimates. The Department consists of a President (the Chief Secretary for the time being) and a Vice-President, who are assisted by a Secretary, two Assistant Secretaries, one in respect of Agriculture and one in respect of Technical Instruction, together with a number of "Inspectors, Instructors, Officers, and Servants."

The very nature of the work which the new Department was called into existence to accomplish made it absolutely essential that the Department should keep in touch with the public opinion of the classes whom its work would concern, and without whose active co-operation no lasting good could be effected. The machinery for this purpose was provided by the establishment of a Council of Agriculture and two Boards, one connected with Agriculture and the other with Technical Instruction. These representative bodies, whose constitution is interesting as marking a new departure in the administrative system of the United Kingdom, were adapted from Continental models. As the Vice-President said in his opening address at the inaugural meeting of the Council last year:—"Similar Councils, to advise and influence similar Departments, have been found by experience in the Continental countries, who are Ireland's economic rivals, to be the most valuable of all means whereby the administration keeps in touch with the opinions of the agricultural and industrial classes, and becomes truly responsive to their needs and wishes."

The Council of Agriculture is mainly elective, and is built out of the newly-established system of Local Government. It consists of 104 members, of whom 68 are elected by the County Councils, and 34 are nominated by the Department. The President and Vice-President of the Department are *ex-officio* members of the Council and of both Boards. The members of the Council are elected for a term of three years, and according to the Act, "shall meet at least once a year for the purpose of discussing matters of public interest in connection with any of the purposes of this Act."

Where the Council differs from its foreign prototypes is, mainly, in the greater amount of direct power which has been entrusted to it. Besides its advisory powers—and the importance to be attached to the deliberate opinion of such a representative body is naturally very great—the Council itself creates the larger portion of the Agricultural Board, and shares with the County Boroughs the appointment of the majority of members of the Board of Technical Instruction, and to these Boards is entrusted the control of the funds with which the Department has been endowed. The two

Boards consist of 14 and 23 members respectively, of whom two, as already noted, are *ex-officio*, four are nominated by the Department, and the remainder are appointed either by the Council of Agriculture or directly by the Councils of the County Boroughs and Urban Districts, whilst the Commissioners of National Education and the Intermediate Education Board each send one representative to the Board of Technical Instruction. The members of the Council and of the two Boards are unpaid, and receive only the usual travelling and subsistence allowances when engaged upon their official duties. In addition to special advisory powers, the two Boards, as was pointed out by Mr. Gerald Balfour, the first President of the Department, occupy precisely the same position in reference to the Department as regards financial matters that the House of Commons holds in reference to the Government of the day. No money can be spent, except as regards a few minor matters, without their consent. Of the Department's annual income of £166,000, the sum of £55,000 is ear-marked for technical instruction. This sum is to be divided into portions, to be determined every three years by the Department, with the concurrence of the Board of Technical Instruction. As regards one portion, the Board's functions then cease. This portion is divided among the six County Boroughs, viz.:—Belfast, Cork, Dublin, Limerick, Londonderry, and Waterford, according to their population, "in or about the time of distribution," and is applied by the Councils of these boroughs (through a Technical Instruction Committee), as they think fit, to any scheme of Technical education which meets with the approval of the Department. The other portion is to be applied for the purposes of Technical Instruction elsewhere than in the County Boroughs, subject to the concurrence of the Board of Technical Instruction, who thus occupy with regard to this portion the position of the Department in reference to the other portion.

The Agricultural Board has a power of veto over the expenditure of the greater part of the Department's funds. As already explained, these funds consist of a capital sum of about £200,000, and an annual income of £166,000. Of the capital sum, £15,000 was assigned by the Act to the Royal Veterinary College of Ireland,* and £10,000 was allocated to certain purposes in connection with the development of the Munster Institute. Of the annual income of £166,000, the sum of £55,000 is, as already mentioned, to be devoted to Technical Instruction, and £10,000 to Sea Fisheries. The residues—about £175,000 (capital sum) and £101,000 (annual sum)—are, after meeting the cost of a few minor items, to be devoted by the Department "for the purposes of Agriculture and other rural industries or Sea Fisheries," subject to the concurrence of the Agricultural Board. It may be noted here that it is specifically provided in the Act that none of the funds thus placed at the disposal of the Department are to be spent in Congested Districts, which is especially provided for by the Congested Districts Board. To prevent, however, any overlapping of the work of this Board and the Department, it is provided that the latter may undertake any of the Board's powers and duties at its request, but any expense which is incurred in performing these functions must be provided by the Board or from local sources.†

* The Royal Veterinary College of Ireland was incorporated by Charter in 1895, but was formally opened only in 1900. It has no power of granting Diplomas, but is affiliated to the Royal College of Veterinary Surgeons.

† The Agricultural and Technical Instruction (Ireland) Bill, 1902, which at time of writing (June, 1902,) awaits the Royal Assent, will remove the difficulties referred to in the text.

It was not at all desired by the members of the Recess Committee, nor was it intended by the Government, that the Department should ever become a body existing merely for the purpose of administering State subsidies: its function was rather in the words of the Vice-President to be that of "helping people to help themselves." Hence the Act expressly prohibited the Department from applying (except in special cases) any of its funds to schemes in respect of which aid is not given out of money provided by local authorities or from other local sources. Accordingly, the Act empowers local authorities to levy a rate of one penny in the pound for the purposes of the Act, and it also provides that, notwithstanding anything in the Technical Instruction Acts, 1889 and 1891, the rate raised for the purposes of those Acts in a rural District may, if the County Council think fit, be applied for any of the purposes of this Act.

The result is that the Councils of every urban district and of every county may levy a rate of twopence in the pound (consisting of one penny levied under the Technical Instruction Acts, 1889 and 1891, and one penny levied under the Agriculture and Technical Instruction (Ireland) Act, 1889), and the sum thus raised may be applied in urban districts for Technical Instruction, and in rural districts for Technical Instruction and for the purposes of agriculture and other rural industries. Extensive borrowing powers for the same purposes are also conferred by the Act upon the local Councils. An universal rate of one penny in the pound all over Ireland would produce a sum of nearly £60,000, and as the Department's contribution to any particular scheme will in general be proportioned to the amount of local aid forthcoming, the local Councils throughout Ireland have the power of setting free a very considerable amount of money to assist in the work of national development.

The powers of the Councils are not confined to deciding whether any district will tax itself, and so become eligible to share in the benefits that may result from the action of the Department. These Councils will be the real executive. To the Councils, or, rather, to committees appointed by the Council to represent the various interests in any district, is entrusted the task of preparing, in conjunction with the Department, schemes for the furtherance of the objects of the Act, and to these same bodies will be entrusted the administration of the schemes. It is thus evident that the successful working of the Act, and, indeed, its working at all, depends mainly upon the co-operation of local bodies.

The transferred powers and duties of the Department, to which reference has already been made, may be considered in five classes:—

1. The powers and duties of the Veterinary Department of the Privy Council. These powers arise chiefly out of various Diseases of Animals Acts the object of which was to stamp out certain infectious disease amongst animals. These powers are very extensive, and include the right of prohibiting the importation into this country of animals from foreign countries; of declaring that any area in Ireland is affected with a particular disease, and of regulating the movement of animals in such area; and of slaughtering every animal affected, or suspected to be affected, with certain diseases; in such cases compensation is made to the owner, partly out of money provided by Parliament, but partly out of a fund raised by local assessments. These measures have

resulted in freedom from pleuro-pneumonia* for over eight years and from foot and mouth disease for about seventeen years, though the latter has more than once made its appearance in Great Britain during this time. Swine fever and sheep scab are the diseases which now cause most trouble, and the estimates for the year 1901-2 include a sum of £12,000 for expenses in connection with the suppression of swine fever. Other duties of the Privy Council which have been transferred to the Department are connected with the supervision of the transit of animals both by land and sea, and with the carrying out of the Destructive Insect Act and the Fertilisers and Feedings Stuffs Act. The former Act was intended to prevent the introduction and spread of the Colorado beetle, which is very destructive to the crops. The latter Act was aimed at securing the purity of substances sold either for enriching the land or for feeding animals, and the Department is authorised to prosecute in cases of fraud and adulteration.

In addition to these transferred powers the Department also possess important powers under the Sale of Food and Drugs Acts, 1875 to 1899. Under the Sale of Food and Drugs Act, 1899, which came into operation on the 1st January, 1900, the Department are empowered in relation to any matter appearing to them to affect the general interests of agriculture in the country, to direct their officers to procure for analysis samples of any article of food, and the result of any such analysis is to be communicated to the Local Authority, whose duty it thereupon becomes to take proceedings as if they had caused the analysis to be made.

The same Act further provides that if the Department, after communication with a Local Authority, are of opinion that such Local Authority has failed to execute or enforce any of the provisions of the Sale of Food and Drugs Act in relation to any article of food, and that their failure affects the general interest of agriculture in the country, the Department may empower one of their officers to execute and enforce those provisions at the expense of the Local Authority.

The Department are authorised to make regulations for determining what deficiency in any of the normal constituents of genuine milk, cream, butter, or cheese, or what addition of extraneous matter in any samples of these substances shall raise a presumption that the milk, cream, butter, or cheese is not genuine or is injurious to health.

The officers of the Department are also empowered to inspect the register required to be kept by manufacturers of, or wholesale dealers in margarine or margarine cheese; and to inspect any process of manufacture of those substances, and to take samples for analysis.

2. The powers and duties of the Inspectors of Irish Fisheries. These inspectors were first appointed in 1869, when they took over the duties of various Commissioners in relation to fisheries, and they have been chiefly concerned with the administration of the rather complicated fishery laws, which are contained in some eighteen statutes, ranging from 1842-1898. Under the 16th section of the Act, an annual sum of

* The Contagious Diseases (Pleuro-Pneumonia) Act, came into operation on 1st September, 1890, and the disease was completely eradicated in two years, During this time over 10,000 cattle were slaughtered, the *net* compensation for which amounted to over £70,000.

£10,000 is to be devoted out of the Department's income to the development of Irish Fisheries, and a special advisory committee has been appointed by the Department to help in this work. A Bill has been introduced into Parliament to extend the Department's powers in connection with trawling, and in consequence of the necessity of having a steamer to carry out fishery investigations and general marine superintendence (work which in Scotland keeps three cruisers belonging to the Fishery Board busily employed), the steam yacht *Helga*, a very speedy steel twin-screw, schooner-rigged boat, with a tonnage (yacht measurement) of 345 tons, has been purchased.

3. The powers and duties of the Registrar-General for Ireland and of the Irish Land Commission with reference to the collection and publication of agricultural and cognate statistics, and the powers and duties of the Land Commission under the Market and Fairs Acts of 1887 and 1891. These Acts impose upon the Market authorities the duty of keeping machines for weighing cattle (except when exempted by the Central Authority), and of furnishing certain returns as to the animals sold in each market.

A Statistics and Intelligence Branch has been formed by the Department, as recommended in the Report of the Recess Committee, to deal with all Irish agricultural and industrial statistics. The Branch carries on the compilation of the general Agricultural Statistics which have been collected by successive Registrars-General, with the assistance of the police, who act as enumerators, for over half a century. A preliminary report is published in the autumn, which shows by provinces and counties the area under each crop, and the number of live stock. A return is published later showing the estimated rate of produce, and finally, the complete report, which contains information as to the division of land, the acreage under crops and pasture, the extent of woods, plantations, bogs, and waste land, and the number of occupiers and the size of their holdings. It gives also details of the produce of the crops and of the number of live stock in the country, and of other matters relating to agriculture. This Branch also prepares the statistics of the imports and exports of live stock, which are embodied in the report of the Veterinary Branch. An annual report upon the Migratory Labourers, a report upon the average prices obtained at the chief markets for live stock, and certain kinds of agricultural produce, and two half-yearly reports upon the banking, railway, and shipping statistics of Ireland are also issued. The 5th section of the Act authorises the Department to make, or aid in making, any inquiries, experiments, and research, and to collect any information that may be deemed important for the promotion of agriculture and rural industries, and this is carried out chiefly by the Statistics and Intelligence Branch, which is in touch with similar institutions in the Colonies and abroad, and which disseminates the information acquired by means of leaflets and other publications, including its Quarterly *Journal* of which eight numbers—forming Vols. I. & II.—have already appeared. The Vice-President of the Department, in his opening speech at the inaugural meeting of the Council of Agriculture, laid particular stress upon the importance of the Intelligence Branch. "Not less im-

portant," he said, "than the statistical work of the Department will be that of its Intelligence Bureau. For we are suffering, not merely from our lack of scientific methods, but also from the competition of State-aided rivals the world over—men who have had the start of us industrially, and who are alert to avail themselves of every assistance that science and Government supervision can bring to their industry. We have the experience of these men and these countries to draw on, and we intend, through our Intelligence Bureau, to draw on it largely. By leaflet, by bulletin, through its *Journal* and other publications the Department will make a constant effort to bring home to every farmer in the country the progress of his rivals, and to interpret for him how the causes of such progress may be applied to his own conditions or modified to meet varying circumstances."

4. The powers and duties of the Commissioners of National Education with regard to practical Agricultural Education. These Commissioners have charge of the Irish primary schools, and at one time carried on a fairly extensive system of agricultural instruction, both in the primary schools and in some twenty provincial model farms. Of these latter, two only have survived, the Albert Institution near Dublin, and the Munster Institution near Cork, and in the primary schools object lessons and elementary science (with special reference in rural districts to the principles underlying agriculture and horticulture) have been recently substituted for the teaching of agriculture itself.

One of the various grants which go to make up the total income of the Department, a sum of £6,000 represents the annual amount hitherto spent on the Albert and Munster Institutions, which are to be carried on and developed by the Department in connection with its great work of developing Irish agriculture, and, as already noted, a capital sum of £10,000 is to be devoted towards the development and extension of the Munster Institution.

5. The powers and duties of the Department of Science and Art in relation to the institutions in Ireland under their control. These are the Royal College of Science, the Science and Art Museum, the National Library, the Metropolitan School of Art, and the Royal Botanic Gardens at Glasnevin. Most of these institutions are offshoots of the Royal Dublin Society, and an account of them will be found elsewhere.

6. The administration of the grants for Science and Art and for Technical Instruction in Ireland, which were formerly administered by the Science and Art Department of the English Board of Education (South Kensington). Some information as to the state of Science Teaching and Technical Instruction in Ireland is contained in the article on this subject,* which gives the history of these grants in Ireland, and points out that they have not been availed of as much as they might have been, largely because the conditions imposed upon classes were not suitable to the needs of Ireland. The Department

* See pages 155—176.

have already issued new Regulations for these grants because, as they state in a circular letter to the managers and head teachers of secondary schools, they consider that the methods of assessing the grants might with advantage be changed in order to render it more directly applicable to existing educational needs in Ireland. In the main, the new Regulations form a scheme of payments, based on the results of inspection, for instruction in Experimental Science, Drawing, and Manual Work or Household Economy. A detailed programme of study which all schools should follow has not been issued, as the Department are of opinion that it is advantageous that the variety of arrangements, made possible by an elastic system of payments, no less than the variety of schools, should lead to variety of programme; and it is hoped that, in this way, opportunities will be afforded to each school to stamp its individuality on the character of the instruction, and, accordingly, managers will be allowed considerable latitude in modification of details.

The various local authorities throughout Ireland, both in the county boroughs and elsewhere, have framed in conjunction with the Department, schemes for the promotion of Technical Instruction, for which, as already noted, one-third of the income of the Department is specifically assigned. The expression "Technical Instruction" includes instruction in the principles of science and art applicable to industries, and in the application of special branches of science and art to specific industries or employments, as well as instruction in the use of tools, and modelling in clay, wood, or other material, but it does not include instruction given in elementary schools or teaching the practice of any trade or industry or employment. These schemes will no doubt be framed with due regard to the desirability of enabling the classes started under them to qualify for these remodelled Science and Art grants, so far as the syllabus of the school coincides with the subjects for which these grants are given, and the sum of £55,000 will of course be also supplemented by the Technical Instruction grant mentioned on pages 160 and 161, as well as by local contributions. A Departmental Committee is at present inquiring into the whole subject of the reorganisation of the Royal College of Science, which will carry on the higher scientific and technical instruction, and form, as it were, the apex of the educational structure over which the Department exercises direct control.

The 23rd section of the Act established a consultative Committee of Education, consisting of the Vice-President of the Department and a representative of the Commissioners of National Education, the Intermediate Education Board, the Agricultural Board, and the Board of Technical Instruction. This Committee is appointed for the purpose of co-ordinating Irish educational administration. It is unnecessary to dwell on the intimate connection between the different educational interests represented on the Committee. The article on Science Teaching and Technical Instruction in Ireland,* already alluded to, shows how this class of education has been affected by the nature of the Primary and general Secondary education in Ireland. Accordingly, the operations of this Committee are of the greatest importance, and already, as a result of their deliberations, an arrangement

* See pages 155—176.

has been arrived at between the Intermediate Education Board and the Department for co-ordinating the Science syllabus of the two bodies. The Intermediate Education Board have decided that Natural Philosophy, Chemistry, and Drawing shall be replaced in their Programme by one subject, viz.:—"Experimental Science and Drawing," and that after the year 1901 the Board shall not, until further notice, hold any examination in this subject, but shall accept the inspection, and where necessary the examination of the Department.

Whilst, as regards urban industries, the action of the Department is restricted to the promotion of technical instruction in connection with them, there are no such restrictions as to developing agriculture and other rural industries, an expression which is defined in the Act as including the aiding, improving, and developing of agriculture, horticulture, forestry, dairying, the breeding of horses, cattle and other live stock and poultry, home and cottage industries, the cultivation and preparation of flax, inland fisheries, and any industries immediately connected with and subservient to any of the said matters and any instruction relating thereto, and also the aiding or facilitating of the carriage and distribution of produce. Special Committees have been formed by the Department from the members of the Council of Agriculture and other experts to deal with important questions, such as horse-breeding, live stock other than horses, fisheries, and flax. These Committees have drawn up special schemes for improving the breeds of horses and other animals, which include the nomination of mares for service, at reduced fees by approved sires, and the awarding of prizes to young stock at local agricultural shows. The Department and the Agricultural Board have allocated over £17,000 out of the Department's income in aid of these schemes, which are also helped in the different counties by contributions out of the rates. The Department secured the services of Professor Nocard, the eminent veterinarian, to direct the investigation which they carried out as to the causes of the excessive calf mortality in Ireland, and an inquiry has been already held into the quality of the flax seed usually supplied to the Northern farmers, and into the suitability of Ireland for tobacco culture. Sufficient time has not yet elapsed for many local authorities to put in force the various schemes which they, in conjunction with the Department, have been preparing, but it is understood that these schemes when fully completed will embrace an extensive system of agricultural education, as well as the establishment of experiment and seed-testing stations, and example plots, with peripatetic lectures to explain the practical bearing of the experiments—in fact, all the methods which experience has shown elsewhere to be most efficacious for developing agriculture in all its phases.

Finally, the Department is given certain powers as regards transit facilities, and is authorised to take such steps as it thinks proper for appearing as complainant on behalf of any persons aggrieved in reference to any matter (other than a matter affecting the Postmaster-General), which the Railway and Canal Commissioners have jurisdiction to hear and determine. These Commissioners have jurisdiction over, *inter alia*, the following matters:—

(i) The failure of any railway or canal company to afford reasonable facilities for the receiving, forwarding, and delivering of traffic upon the railways or canals worked by it.

(ii.) Any undue preference given to any particular person or companies, or to any particular traffic whatsoever.

(iii.) Any failure of a railway or canal company to afford all due and reasonable facilities for receiving and forwarding through traffic, or to fix and establish just and reasonable through rates.

(iv.) Any contravention by a railway or canal company of any enactment contained in their special Act :—

(*a*) Relating to traffic facilities and undue preference ;

(*b*) Requiring it to provide any station, road, or other similar work for public accommodation ; or

(*c*) Imposing upon it any obligation in favour of the public, or any individual.

(vi.) Any neglect on the part of a railway or canal company to publish and keep at its stations and wharves books of rates for public inspection, and printed copies thereof for sale.

(vii.) Any charge sought to be made by any railway or canal company in respect of the carriage of goods or animals, or in respect of terminal services, which such company is not entitled to make.

The Commissioners have power to order any company to fulfil its duty, or to grant an injunction restraining it from disobedience ; and in certain cases they can award damages to the party aggrieved. They are further empowered to direct two or more companies to carry out any order which they may make, and for that purpose to submit a joint scheme for their approval.

In order to give the reader an insight into the organisation and working of the Department, the following passages from the First Annual General Report are appended to the foregoing analysis of the Act of 1899.

1. Council of Agriculture and Boards.

Immediately after the Department came into being the necessary steps were taken to constitute the Council of Agriculture and the Agricultural Board and Board of Technical Instruction, in accordance with the provisions of Section 7 of the Agricultural and Technical Instruction Act. The Department, as empowered by Section 24 of the Act, made and issued to the County Councils and County Borough Councils regulations for the appointment of members of these bodies.

Council of Agriculture.

By the second week of May (1900) the County Councils, having completed the election of their 68 representatives to the Council, and the Department having nominated 34 representatives from the different provinces, the Council of Agriculture was fully constituted.

The first meeting of the Council of Agriculture was summoned for the

29th May, 1900. It was held in the buildings of the Royal University, which the Senate of the University kindly lent to the Department for the purpose. All the members of the Council but five attended, and the keenest interest was taken in the proceedings. The meeting was opened by an address from the Vice-President, in which he explained the general purpose of the new Act, and the procedure to be adopted by the Council. The principal business of the first meeting of the Council was to elect two-thirds of the Agricultural Board, and four representatives to the Board of Technical Instruction. The members representing each province constitute separate Committees on the Council, styled the Provincial Committee of the respective Provinces, and it is the function of these Provincial Committees to appoint, each, two persons to be members of the Agricultural Board, and one person to be a member of the Board of Technical Instruction. For the purpose of this election the Council separated into four Committee rooms, and there appointed their respective representatives. The names of the persons chosen to serve on the two Boards will be given lower down.

The Agricultural Board.

The appointments to the Agricultural Board by the Provincial Committees were made at the first meeting of the Council of Agriculture, as above described. The Agricultural Board, as fully constituted, consisted of the following members :—

Name.	Address.	By whom appointed.
Byrne, James, J.P., - -	Wallstown Castle, Castletownroche, co. Cork.	The Department.
Clark, Alexander L., -	Moyola Lodge, Castledawson, co. Londonderry.	The Department.
Esmonde, Sir Thomas H. Grattan, Bart., M.P.,	Ballynastragh, Inch R.S.O., co. Wexford.	Leinster Provincial Committee.
Everard, Colonel N. T., D.L.,	Randalstown, Navan, co. Meath.	The Department.
Gore-Booth, Sir Josslyn, Bart.,	Lissadill, Sligo. - -	The Department.
Healy, Most Rev. John, D.D. Lord Bishop of Clonfert.	Mount St. Bernard, Ballinasloe, co. Galway.	Connaught Provincial Committee.
Kelly, Most Rev. Denis, D.D. Lord Bishop of Ross,	Skibbereen, co. Cork.	Munster Provincial Committee.
*Magee, Michael J., - -	Ashgrove, Newry, co. Down	Ulster Provincial Committee.
Montgomery, H. de F., D.L.,	Blessingbourne, Fivemiletown, co. Tyrone.	Ulster Provincial Committee.
Moore, Count, D.L., - -	Mooresfort, Tipperary.	Munster Provincial Committee
Nolan, Colonel John P., M.P.	Ballinderry, Tuam, co. Galway	Connaught Provincial Committee.
O'Neill, Patrick J., J.P., -	Kinsealy House, Malahide, co. Dublin.	Leinster Provincial Committee.

* Since deceased.

The Board of Technical Instruction.

The appointment of members to act on this Board was completed by the end of May, and the Board, as thus constituted, consisted of the following :—

Name.	Address.	By whom appointed.
Barbour, Frank, - -	Hilden, Lisburn, co. Antrim.	Ulster Provincial Committee.
Beamish, Ludlow A., -	Ashgrove, Queenstown, co. Cork.	The Department.
Clancy, Most Rev. John, D.D. Lord Bishop of Elphin.	Sligo. - - - -	Connaught Provincial Committee.
Daly, Alderman John, Mayor of Limerick.	Mayor's Office, Limerick. -	Limerick County Borough Council.
Dempsey, Alderman James,	York road, Belfast. - -	Belfast County Borough Council.
Dowd, Alderman Patrick, -	32, South City Markets, Dublin.	Dublin County Borough Council.
Finlay, Rev. T. A., M.A., -	University College, Dublin. -	Leinster Provincial Committee.
FitzGerald, Alderman Edward,	Geraldine-place, Cork. -	Cork County Borough Council.
*Fitzgerald, George F., F.R.S.,	7, Ely-place, Dublin. -	The Department.
Goff, William G. D., -	Glenville, Waterford. -	Waterford County Borough Council.
Harrington, Timothy, M.P.,	6, Cavendish-row, Dublin. -	Dublin County Borough Council.
Jaffé, Sir Otto, J.P.,	10, Donegall-square, S., Belfast.	Belfast County Borough Council.
Lally, Very Rev. P., P.P., -	Galway. - - -	The Department.
M'Learn, Sir William, Mayor of Londonderry.	Carrickmore House, Londonderry.	Londonderry County Borough Council.
Martin, Rev. William Todd, D.D.,	College House, College-green, Belfast.	Intermediate Education Board.
Monteagle, Rt. Hon. Lord, K.P.,	Mount Trenchard, Foynes, co. Limerick.	Munster Provincial Committee.
Musgrave, Sir James, Bart., D.L.,	Drumglass House, Belfast. -	The Department.
Pile, Rt. Hon. Sir Thomas, Bart., Lord Mayor of Dublin,	Mansion House, Dublin. -	Dublin County Borough Council.
Starkie, William J. M., LITT.D.,	Tyrone House, Marlborough-street, Dublin.	Commissioners of National Education.
Taylor, Alexander, - -	46, Agnes-street, Belfast -	Belfast County Borough Council.
Wallace, William, - -	Dunleary House, Monkstown, co. Dublin.	Joint Committee of Councils of the County Dublin Urban Districts.

* Since deceased.

The Consultative Committee of Education.

By Section 23 of the Act provision was made, as has been said, for the formation of a Consultative Committee of Education, consisting of the Vice-President of the Department as Chairman, and one person appointed by each of the following bodies:—The Commissioners of National Education, the Intermediate Education Board, the Agricultural Board, and the Board of Technical Instruction. This Committee was fully constituted early in May as follows:—

Name.	Address.	By whom appointed.
The Right Hon. Horace Plunkett, M.P., Vice-President of the Department.	Department of Agriculture and Technical Instruction, Dublin.	Ex-officio.
The Most Rev. William J. Walsh, D.D., Archbishop of Dublin.	Archbishop's House, Drumcondra, co. Dublin.	Intermediate Education Board.
William J. M. Starkie, LITT.D.	Tyrone House, Marlborough-street, Dublin.	Commissioners of National Education.
Rev. W. Todd Martin, D.D.	College House, College-green, Belfast.	Board of Technical Instruction.
T. P. Gill, - - - -	Department of Agriculture and Technical Instruction, Dublin.	Agricultural Board.

2. ORGANISATION OF THE DEPARTMENT.

Reference has already been made to the essential unity of purpose which underlies and controls the various functions of the Department, and constitutes an intimate relationship between them. This is the leading principle of the Agriculture and Technical Instruction Act. Though the Act creates new machinery and new powers, a large portion of its intention is to bring order and simplicity into branches of administration where co-related action was not properly provided for before. The statutory aim of the Department is to promote, as far as may be proper to such a Department, the industrial development of the country. To that purpose all the various powers entrusted to it not only are capable of being applied, and should be applied, but it would be impossible to exercise any of them thoroughly well in the general interest unless they were all included, as they are here, under a common direction. The amalgamation of analogous functions hitherto scattered amongst several departments was an obvious step towards efficiency and economy, and the manner in which this part of the work has been given its place in the system of the Department will be found explained in the account of the Branches amongst which that work has been distributed. As to the new or more special work, or those of the transferred functions, which have more direct bearing upon the new work than others, such as the administration of the Science and Art grant, and the management of the Royal College of Science, the Metropolitan School of Art, the Museum, at every step the need for co-ordinate administration is apparent. In a country like Ireland, where there are not extensive manufactures, and where the majority of the provincial towns are as much rural as urban in their economic characteristics, the problem of Technical Instruction, for example, must largely be a problem how to provide a population mainly agricultural with a training that will not only fit them to give new developments to agriculture, their chief existing industry, but that will give them in addition aptitudes for industries which do not yet exist, and which their trained intelligence must be the principal factor in creating. Thus it

happens that, from the Science and Art Institutions in Dublin down to the secondary school in a little semi-rural town in the provinces, the agricultural and the industrial features of technical instruction are continuously interwoven, and must be considered with a common thought for both. Similarly with regard to the action of the Department in matters other than educational. In the stimulation of local industrial enterprise in town and country; in the extension of rural industries supplementary to agriculture; in the supervision of the conditions under which cattle, and agricultural and industrial produce are carried by the public companies; in the administration of the laws for guarding the interests of such produce in the markets; in the dissemination of information; in scientific and other inquiries and researches—in all these purposes the same general idea must be constantly operative. It is found to be not less necessary where different industrial interests sometimes clash, and where, without effective co-ordination, one interest might be pursued by its own partisans or its own experts unduly at the expense of another. Thus the Department during the year has been obliged to safeguard before Parliamentary Committees the interests of the inland fisheries as against promoters of enterprises for the use of water power and the generation of electricity, and to do this safeguarding in such a manner that these enterprises should find no obstacle to their introduction into Ireland but those which may belong to the commercial and other difficulties naturally inherent in them.

The organisation of the Department has been devised with a view to giving effect to this administrative principle. The different sections of its work have been allotted to a number of separate Branches, and each Branch is manned by a specially qualified staff, and has at its head an Assistant Secretary or Head of Branch, who is a highly trained expert or administrative officer. Each Branch is thus in a position to concentrate its entire energy and expert skill upon its special task, as if it were a distinct department in itself, while at the same time its work is brought into harmony with the general purpose of the Act, and gains from having behind it the resources of the whole Department. The machinery for general direction and co-ordination of the work of the Branches is provided in the offices of the Vice-President and of the Permanent Secretary.

The clerical work of the Department, and certain administrative work is placed under the general supervision of the Chief Clerk, while its financial work is entrusted to a Clerk in Charge of Accounts.

The Branches amongst which the Department has so far divided its work are the following:—

I. Agricultural Branch.
II. Technical Instruction Branch.
III. Fisheries Branch.
IV. Statistics and Intelligence Branch.
V. Veterinary Branch.
VI. Accounts Branch.

Other Branches will be formed as the organisation of the Department proceeds.

The value of guiding its action by the advice of the best-qualified of those who are directly concerned in the business to which that work relates, is fully recognised by the Department. They have, accordingly, as it seemed advisable, appointed Special Advisory Committees of Experts, and invited conferences of representatives of the classes concerned. Thus Special Committees on Live Stock, on Horse Breeding, and on Flax, have been appointed in connection with the Agricultural Branch, and a special Committee on Fisheries has been associated with the Fisheries Branch.

It will be understood that during the first year of their existence, the Department were largely occupied in constructing and organising their machinery, and planning and laying down the principles of their future action.

3. LOCAL INITIATIVE AND CENTRAL DIRECTION.

Principles of Administration.

In the scope of work and effective powers which have been confided to them, involving a commission to attempt not only to develop the industrial resources of the country, but to influence in vital ways, the education of the people, the Department realise how much may depend for good or ill upon the manner in which they discharge their trust. Feeling the weight of this responsibility, they have resolved to proceed with the utmost possible caution, even at the risk of sometimes taxing the patience of local authorities and others by an insistence on certain principles, and by a hesitation to approve of schemes which have been submitted to them until they have satisfied themselves, so far as may be possible, of their soundness in all particulars. The Department consider that in such matters a false step in the beginning would be dearly purchased by the country. Two principles of procedure are clearly indicated, as well by the situation the Department have to deal with as by the legislation they are required to administer.

1. Administration of this kind must fail in its best result unless it seeks to evoke and fortify the self-reliance, enterprise, and sense of responsibility of the people. Both economic and social laws dictate this principle.

2. In encouraging local initiative and responsibility the danger, on the other side, of an indiscriminate multiplication of unrelated local schemes must be guarded against by a due conservation of the principle of central direction. It is the duty of the Department to keep in mind the national as well as the local point of view, and to bring to bear on schemes and problems that power of co-ordination and that expert aid which the resources of a Central Authority, acting and thinking with and for the whole country, can command. The importance of this principle is well illustrated in the efficiency of the Continental systems of State aid for Technical Instruction and Agriculture, on which the constitution of this Department has been to some extent modelled.

Both these principles are provided for in the Act in such a way as mutually to strengthen each other. The advisory Boards of the Department, who control the expenditure of its Endowment Fund, are mainly constituted by the local self-governing bodies of the country. A Department so constructed should be in a favourable position for guiding, in regard to its work, the action of local bodies over whom it exercises no compulsory powers, and who are entirely free to adopt or take no part in the schemes of which it may approve. On the other hand, the local authorities are empowered by the Act to raise rates and borrow money for the purposes of schemes approved by the Department; and in order to evoke such local effort and co-operation for local schemes, Section 16 (6) of the Act provides that the Department "shall not, in the absence of special considerations, apply or approve of the application of money under this section to schemes in respect of which aid is not given out of money provided by local authorities, or from other local sources."

Relations with Local Authorities.

The Agricultural and Technical Instruction Act is, so to speak, built into, as well as out of, the system of representative local government established by the legislation of 1898. The Department, paying due regard to this fact, has studied, in administering the Act, and in so far as the nature of its functions permitted, to extend the responsibilities of the local authorities, and it looks forward to having their aid in many ways in strengthening the

spirit of economic and social self-help amongst the people generally. The Act contemplates that the six County Boroughs should formulate their own schemes; and the Department desires, in the area outside the County Boroughs as well, to stimulate local initiative in the preparation of schemes of Agriculture and Technical Instruction. It delegates to them, moreover, the local administration of such schemes, and has assisted them to construct a machinery for this administration in the shape of County Committees for Live Stock, and for Agricultural and Technical Instruction, and Urban Committees for Technical Instruction. This course has an educational value of importance, inasmuch as, on the one hand, it gives the Department the benefit of local opinions and experience, and, on the other, it brings the local bodies themselves into contact with the difficulties of the problems to be dealt with. It helps, besides, to produce in the country a sympathetic understanding of the necessarily tedious process by which sound reforms of this kind are accomplished.

With a view to rendering its advice more effective and better informed, the Department consider it wise to establish, through their officers, direct and personal relations with the local authorities, societies, schools, and those classes of the people generally with whom their work has to do. It is felt that correspondence alone would be an inadequate means of explaining a new and complicated Act, and of working out highly technical schemes with bodies who are under no obligation to adopt them. The Department have, consequently, in the person of their representatives, been ready to visit every local authority, confer with them on the spot, and aid them with expert advice after thorough inspection and examination of local conditions. Practically all the County Councils and Urban Councils or Technical Instruction Committees in Ireland have thus been visited by the Department—some of these bodies many times—and very numerous personal conferences have taken place at the offices in Upper Merrion-street between the Department's officers and representatives of local committees. The great majority of the schools and educational institutions in Ireland above the primary grade have likewise been visited by their Inspectors. It is gratifying to have to report that the relations thus established have proved of the most satisfactory kind. While they create a human link between the Department and the local bodies, they keep the Department itself, as no other method could, in intimate touch with the actual conditions of the country. In no other way would it have been possible to make such progress with the local authorities as has been made. Some idea of the nature of this progress may be gathered from the fact that every local authority in Ireland resolved to raise a rate for the purposes of the Act within the first financial year; and that the only large general schemes which the Department issued to the local authorities from itself—those for Encouraging Improvement in the breeds of Horses, and of Cattle, Sheep, and Swine—were adopted by all the County Councils in Ireland, save two. It will take considerable time and a certain amount of inevitable friction before a system of complex and very technical administration is got to work, but it is felt that, in the manner described, a mutual confidence will steadily be engendered between the Department and those with whom it has, locally, to deal.

4. DIRECT MEANS OF ACTION.

It is thus fundamental in the constitution of the Department that the interest and responsibility of the people themselves, through the central Boards and through the local Councils and Committees, should be engaged in its work. The chief means by which it is hoped that work may in time be accomplished will be found indicated in more detail in the account which follows, of what has actually been done during the period covered by this

Report. These means, it will be seen, fall, roughly speaking, into two broad divisions—direct measures for improving agricultural and industrial conditions; and indirect measures, which may be generally summed up in the word, Education. To these may be added a third most powerful agency, the value of which, for the advancement of agriculture, its own experience has demonstrated to the Department, viz., Organisation. Nearly all of these means, it is important to observe, must be slow in their results. Even the direct means involve, for the most part, bringing various applications of science and, in the case of industries, of art as well, to the aid of our agriculture and industries, and that cannot, from the nature of the case, be a simple or rapid process. It will be therefore necessary for the Department, for some years to come, to depend a good deal upon the patience and the faith of the Irish public as regards the work which they will together be endeavouring to do.

Amongst the direct means are such schemes as those for encouraging improvement in the breeds of live stock, for itinerant instruction of the farmers themselves with direct reference to the cultivation of their own holdings, for the development, through itinerant instruction and otherwise, of rural and other industries, and all the efforts which can be made for improving the transit of agricultural and industrial produce and the conditions under which such produce is placed on the markets. Though some subjects, coming within the functions of the Department, such as transit and forestry, would require special legislation for their treatment on comprehensive lines, the Department is able to do much that is useful in connection with them with its present powers. Steps have been taken, and others are in contemplation, for improving the position of the sea and inland fisheries in such directions as opening new markets, the extension of loans for the purchase of boats and gear, the technical instruction of fishermen, the erection of hatcheries for the artificial propagation of salmon and trout, experiments in oyster culture, the protection of the fishing grounds from illegal trawling and poaching. No action of any consequence has, as yet, been taken with regard to tree-planting, but schemes for work with the County Councils in this particular are being matured. There is an important class of industries, which it is hoped may be promoted in Ireland, that require co-operation between rural and urban communities. To the coming together of town and country in such enterprises for their common benefit the Department will attach importance, in view of the peculiar circumstances of Ireland, and the difficulty which the task of establishing a system of technical instruction meets here, through the lack of industries in provincial towns.

The important part which the organisation of a Government Department can play in bringing the manufactures and resources of a country under the notice of capital by means of exhibitions, and in spreading, by the same means, information useful to trade and industry at home, is recognised by the Department. They accordingly, with the concurrence of the Agricultural Board, resolved to take the opportunity afforded by the Glasgow International Exhibition, and to erect there an Irish Pavilion, in which would be shewn a representative exhibit, principally of the smaller, or cottage, industries which have been developed in Ireland of recent years, and of mineral and other resources. The Congested Districts Board co-operated with the Department in this project; and the railway and shipping companies, who found it a valuable opportunity for bringing Irish scenery and travelling facilities to the attention of tourists, aided in the work. The Irish Pavilion was, necessarily, in all the circumstances, conceived on a modest scale, but the authorities of Glasgow have declared it one of the most attractive and successful features of the Exhibition, and it has already brought about a marked increase in the demand for the classes of products exhibited.

Belonging also, rather more to the direct than to the indirect means, are those scientific investigations, surveys, and experiments related to agriculture, fisheries, and other industries, which can only be rightly carried out for a country with the aid of the State. Several undertakings of this kind have been set on foot during the past year by the Department, details of which will be given further on. One of these investigations, which dealt with the terrible and, hitherto, mysterious epidemic amongst the calves of the Munster dairy farms, has already had a strikingly successful result. In this case the Department acted in co-operation with the highest available scientific authority, and the discovery in which the inquiry resulted will be of invaluable utility to stock-breeders, not only in Ireland but in every country. Monsieur Nocard, the French veterinary bacteriologist to whom the investigation was entrusted, has discovered absolutely the cause of the malady, and has prescribed an effectual and simple method for its prevention. When it is borne in mind that the mortality amongst calves in the affected districts has in many years reached an average of 80 per cent., it will be seen that this one investigation, undertaken during the Department's first year of existence, will have been the means, if its lesson be applied, of saving immense annual sums to the farmers of Munster, as well as of making a valuable addition to the stock of veterinary knowledge.

These various direct means of assisting the development of agriculture and industry will be pursued by the Department with careful regard to the limits which it is desirable to observe, even in Ireland, where exceptional action in this respect is justified, in the relations of the State with the domain of private enterprise. It is a chief aim of the Department to stimulate, rather than to weaken, the spirit of industrial self-help, and its action will be governed by this idea. Its endeavours will be mainly confined to removing the obstacles which at present hinder in Ireland the due exercise of initiative in industrial matters, and to creating a state of things in which private enterprise can act with confidence and freedom.

5. EDUCATIONAL POLICY.

To the educational part of its work the Department looks as the most powerful and abiding means of promoting the end in view. In a country which is so industrially depleted as Ireland, and in which the economic drain is still continuing, the direct measures for improving industry above referred to, however valuable, and however they may extend as the work progresses, and as legislation creates new opportunities, cannot by themselves alone produce very great or deep results, and large expectation based upon them may lead to disappointment. But a proper system of education, which, while paying due heed to the training of the character and the will, will train the intelligence to deal with concrete things as well as with ideas, and which will give to the generation receiving its skill and knowledge that which will bring out and make them conscious of their own powers and resources in practical affairs, cannot have disappointing results. Experience has amply proved that it is to the individual and national resourcefulness and the confident character thus developed by an educational system, more than to any other cause, countries which have in recent times achieved marked industrial success owe their progress. The Department, accordingly, feel that however imperfect other forms of effort may be, or whatever the conditions which may prevail in Ireland, if the people be placed in full possession of the benefits of such an educational system, they will have the instrument of their own salvation in their hands. Supplemented by such a system moreover, and directed by a

public opinion instructed on economic subjects, all other forms of State action in relation to industry becomes immensely more effectual. For this reason the Department lay stress on the educational work which they have been commissioned to do in co-operation with the other educational authorities of the country.

The educational duties of the Department include the administration in Ireland of the Grant for Science and Art (an elastic Parliamentary grant the amount of which depends on how far it is utilised by schools and classes ;) the management of institutions for higher teaching in science and art, amongst them the Royal College of Science, the Metropolitan School of Art, the Botanic Gardens, and the Museum ; and the organisation of a system of technical instruction applied to industries and agriculture. In undertaking these duties the Department will act on the view that the education of a country should be considered as a whole, and that it is a grievous fallacy to expect sound results from any special scheme which is not made an organic part of the general educational system. The experience of countries which have given most attention to the connection between education and industrial development shows that the best results in this direction are due to the secondary school and the university or higher technical college. When the secondary school, on, at least, one of its "sides," is permeated with the practical spirit, and deliberately related to the real economic and social needs of the country, it becomes possible to produce leaders of industry, that is, men who have learned to apply intellect and science, as well as enterprise, to the callings of commerce, manufactures, and agriculture ; and when properly-trained leaders of industry are available for a country reforms in all the grades of practical education inevitably follow. Again, that great undeveloped resource, the latent intellect and artistic and mechanical skill of the working classes of the country cannot be rightly got at until the primary schools, rural and urban, fit their pupils to take direct advantage, whether of the general schools or the technical schools of a complete system, with their respective avenues of progression. There cannot be the most useful educational ambition in a country until the pupil of talent in the humblest elementary school feels that the way is open for him, so far as educational opportunities can open it, to the highest careers in industrial, agricultural or academic life. The primary school, the secondary school, and the university are thus regarded as having their part to do for what is commonly called technical education, as well as the specially technical institutions.

The Department enters the secondary schools of the country, as the administrator of the Science and Art Grant, principally from the point of view of general education, which is the first concern of the secondary school, and secondarily from the point of view of those specialised applications of education to which the secondary school should lead. With these objects in mind it has entirely changed the system on which the Science and Art Grants have hitherto been administered, and rendered these grants, it is hoped, more favourable to freedom and individuality in teaching, and more suitable to Irish conditions. The new Programme of Experimental Science, Drawing, Domestic Economy, and Manual Instruction, which the Department has issued, is intended to provide, in the first two years, the secondary school with that minimum of scientific discipline and training of the hand and eye which educationists now generally hold should be a part of any broadly-conceived scheme of general education. This minimum, it is believed, may be given without injury to the essential function of the humanities in the curriculum of every secondary school. The Department do not desire that Ireland, at this period of transition in her educational history, should fall into the mistake which, it is beginning to be recognised, has been committed elsewhere, of

underestimating the value of the human and ethical parts of education even in the direct production of utilitarian results. The Programme, in its subsequent years, will permit of specialisation according as pupils are intended for various practical callings. Most fortunately for Irish educational reform, the Department have had the full co-operation of the Board of Intermediate Education in this matter. That Board have adopted the Department's Programme, made it part of their own curriculum for the current year, and resolved to accept the inspection and examination of the Department in the subjects which the Programme includes. By this means a great impetus will have been given this year to the introduction of practical features into general secondary education, and the way prepared for specialisation at later stages in technical directions. To facilitate the schools in taking up the new programme the Department gave a series of special free courses to teachers, this year, in centres in Dublin, Belfast, and Cork. These courses were attended by teachers from 196 secondary schools.

Besides this development of secondary schools, and the promotion of evening continuation schools, to provide for the education of boys whose schooling has been abruptly cut short by their going into employment, the system of the Department will include the establishment, through the medium of existing schools and otherwise, of special Technical Schools for Industries and for Agriculture. In connection with agriculture—apart from the difficulty of getting teachers, which must continue, with diminishing intensity, for a few years, until a supply of expert agricultural teachers has been trained—the organisation of such technical schools presents a comparatively simple problem. Agriculture is a great and living industry, universally pursued in Ireland, and whether these agricultural schools arise in connection with secondary schools or are independently organised—and probably they will appear in both forms—their problem will be to adapt their teaching to the service of the industry which is at their door. Their chief perplexity will be how, with most economy and practical effect, to diversify their work so as to suit the different agricultural conditions of different parts of the country, and the different classes of service, that of the working farmer, that of the agricultural scientist, for which knowledge is required. It is otherwise with technical instruction intended for the purposes of industries other than agriculture. Outside the large cities where Technical Instruction schemes are being successfully inaugurated, there are few towns in Ireland where any such industries exist. Moreover, a striking difference, which it is most important to appreciate, thus appears between the problem of technical instruction in Ireland and that problem in Great Britain. In the towns of England and Scotland technical instruction has but to adapt itself to existing and flourishing manufactures. In no locality does any doubt or question arise about the industries to be served. The scheme of technical instruction is called on to provide its pupils with skill and knowledge, mainly imparted in the evening, to be applied to industries which they are working at during the day. In the majority of the provincial towns of Ireland, beyond the artisans connected with the building trades, there are seldom workers enough engaged in any industry to which technical instruction could properly be applied to furnish pupils for a class at a technical school. This somewhat baffling difficulty, which confronts the Department in the organisation of its educational system, it is desirable to have fully realised. It means that part of the problem of technical instruction in such localitites must be, how to promote industries to which it may be applied; and that, consequently, through exceptional Irish necessities, the Department may be obliged to give more attention to this mode of action than it might otherwise have found it desirable to do. It means, moreover, that, outside the large cities, that phase of technical instruction which approaches more nearly to the direct teaching of trades or handicrafts

to workers insufficiently prepared in the elements of science and art will for a time have to be resorted to in Ireland than is the case in more developed countries. But this, in its irregular applications at least, will be but a temporary phase. Technical instruction in its true and permanent conception, as a specialised but organic part of general education, whose aim is so to train a man as to render him morally, intellectually, and physically master of his best aptitudes, and able to apply these aptitudes in every fitting direction that opportunity offers, will always be before the mind of the Department. It is from men so trained, from their inventive brains, their skilful hands, their developed and self-trustful personality, conscious of powers, and seeking for opportunities to use them, that the true advancement of a nation's industries must come. This has been the history of technical instruction, even in countries which, like Ireland, have started without industries, and which have also had to try the temporary phase referred to.

For the purposes of higher technical and scientific education, the Department has under its control, maintained from Imperial funds, the institutions already mentioned, which have hitherto been known as the Science and Art Institutions. It is intended by the Department to remodel and adapt all of these institutions to purposes which it was impossible for them adequately to serve under former circumstances, and to make them living factors in the promotion of practical education and the industries and agriculture of the country. The Royal College of Science, as it has been called up to the present, will, it is proposed, be made the chief technical college for Ireland, a real "polytechnicum" or college of science applied to agriculture and industries; and for this purpose it will be re-organised, provided with new buildings, and equipped in such a fashion as to bring it, at least in quality, level with the best technical colleges. Soon after the Act came into force a Departmental Committee was appointed, by minute of the Vice-President, to consider and report as to the best means of carrying out this reform. This Committee consisted of Sir W. de W. Abney, K.C.B.; Mr. T. P. Gill, Secretary of the Department; Captain T. B. Shaw, then Assistant Secretary in respect of Technical Instruction; Mr. S. E. Spring-Rice, C.B., Auditor of the Civil List; Mr. J. G. Barton, C.B., Commissioner of Valuation for Ireland; Sir James Musgrave, Bart., of Musgrave Bros., Belfast; and Mr. W. B. Harrington, of Harrington and Co., Cork. Their labours resulted in a detailed Report which will be a valuable guide to the Department in re-organising this College. The Metropolitan School of Art, when, in due time, it is reconstituted and brought into full activity in the work of the Department, ought to become what Ireland has so long lacked, a centre of life and inspiration for Irish Art, and especially for Irish Art applied to industry. The Irish people are said by those who have special knowledge of artistic handicrafts to possess still the aptitudes which the collection of Irish Antiquities in the Museum shows to have belonged to their ancestors; and it is quite probable that in the class of industries in which the individuality of the worker imparts a special element of value they may achieve particular success. A national School of Art, encouraging local freedom, aiming at distinctive national qualities, having at its hand, as part of its inspiration, the beautiful and suggestive objects in the Museum, taking its place in a system of education in which the teaching of Art was sympathetically encouraged in every part of the country, might have a great influence on Art and Industries in Ireland; and such a centre it is hoped what is now called the Metropolitan School of Art may become. The Science and Art Museum, in Kildare-street, which already possesses collections of great value to the interests of science, industries, and art, and the other Institutions will be developed similarly, so as to assist in their several ways the work with which the Department has been entrusted.

6. Local Organisation.

Finally, the Department is deeply convinced that in Ireland, and especially in relation to agriculture and to industries connected with agriculture, organisation has an essential part to play in the economic and social elevation of the people. Indeed, it would appear as if this agency of progress had, comparatively speaking, greater possibilities here, on account of the racial capacities for associated effort which our people display, than even in countries which, with the aid of organisation, have succeeded for the time being, in driving Irish agricultural produce from its due place in the markets. The Recess Committee, in their enquiries, found that, in the countries whose competition Ireland feels most keenly, Departments of Agriculture had come to recognise it as an axiom of their policy, that, without organisation for economic purposes amongst the agricultural classes, State aid to agriculture must be mainly ineffectual, and even mainly mischievous; and that such Departments devoted a considerable part of their efforts to promoting agricultural organisation. Short a time as this Department has been in existence, it has had some striking evidence of the justice of these views. As will be seen from the part of this Report dealing specially with Agriculture, it was only where the farmers were organised in properly representative societies that many of the lessons the Department had to teach could effectually reach the farming classes, or that many of the experiments intended for their guidance could be profitably carried out. Although these experiment schemes were issued to the County Councils and the agricultural public generally, it was only the farmers organised in societies who were really in a position to take part in them. Some of these experiments—such as that for the trial of new varieties of potatoes, where the societies paid, at cost price, for the samples of the special seed forwarded by the Department—could not be carried out at all except through such societies. In fact, over a large portion of its agricultural administration, it will be impossible for the Department, and it will be impossible for the County Councils, to work efficiently through isolated individuals. To attempt to do so would require a huge official staff, and a lavish expenditure of public money, and the result would be worse than waste, for it would be demoralising to the people and ruinous to that spirit of self-help, without an ample development of which Ireland will never become, in any sense, a progressive country. Thus, for the sake of efficiency in its educational work, and of economy in administration, the Department would be obliged to lay stress on the value of organisation. But there are other reasons for its doing so: industrial, moral, and social. Organisation is itself an agency of the greatest power, and an essential agency, in modern economic conditions, for the advancement of the agricultural industry, and of industries connected therewith, not only rural industries, but undertakings in which town and country share; and by its means capital, as well as directing skill and economic management, is made available both for such undertakings and for the most minute concerns of the smallest farmers and labourers to whom the use of helpful capital is possible through no other channel. Again, organisation is, perhaps, the most direct means of nourishing the self-reliance, and strengthening, so to speak, the moral back-bone of the people; for, through mutual help, it renders the self-help of a community at once effective, and brings the intelligence of the most intelligent to assist in promoting the interests of the most backward individual who engages in the common effort. But not the least important aspect of organisation for Ireland, where the isolation and dulness of rural life have something to do with the continuance of emigration, is its social side. Around every little society through which

the people of a district have been successfully working out their industrial advancement and learning the powers which combination gives the simplest and most remote of communities, even in complicated business affairs, there is an inevitable tendency for combined efforts for other purposes to group themselves. In this way opportunities and means for educational improvement and social amenity are multiplied in places where such means and opportunities did not exist before ; while the faculties of the people are expanded, their hopefulness is increased, and life at home on the Irish countryside is rendered more attractive. The Department, relying, as it does, for the ultimate improvement of the country mainly upon the developed character of the people, will encourage, as far as it may, organisation which is calculated to have such results.

Such are the general considerations which have guided the Department in the first year of its work, and which are intended to guide it in future years.

THE DUBLIN MUSEUM OF SCIENCE AND ART.

The Dublin Museum is one of a great group of institutions surrounding a fine old mansion known as Leinster House, for many years the town residence of the Marquises of Kildare, afterwards Dukes of Leinster. A great part of the gardens on the east side are still kept up as a public recreation ground, bounded on one side by the National Gallery of Ireland, and on the other by the Natural History portion of the Museum; whilst on the west side lies the new Museum building containing the Art and Industrial Collections, and opposite to this the National Library of Ireland and the Metropolitan School of Art. Thus these Institutions of Science and Art form, from the architectural and picturesque, as well as from an educational point of view, one of the most interesting centres of the city. The Museum has to meet the wants which, in Edinburgh, are catered for by two Museums, and in London by five, and the available space has to be economised to the utmost, and every possible effort made to arrange all parts of the Collections in a very systematic manner, or they would soon become almost useless masses of heterogeneous objects. The Collections may be regarded under the following seven principal heads:—Architectural and Decorative Art; Ethnology; Machinery and Mechanical Arts, usually classed as Industrial; Irish Antiquities; Zoology; Botany; Geology and Mineralogy.

ARCHITECTURAL AND DECORATIVE ART.

EGYPTIAN ANTIQUITIES.—This collection, though small, contains many objects of great interest, and readers of books on Ancient Egypt will find in it examples of the Arts of that country from prehistoric to Roman times, which will enable them to understand better, and appreciate more fully, what they read, and an inspection of them may take the place to some extent, of an examination of the larger collections in the British Museum or the Louvre.

GREEK AND ROMAN ANTIQUITIES.—These collections are of very great value, and modellers, jewellers, and workers in silver and bronze may derive from their inspection many useful lessons; while at the same time they should, like the Egyptian Antiquities, enable classical students to take more intelligent interest in their studies.

IRISH ARCHITECTURE.—Of the very interesting Irish Romanesque which flourished from the ninth to the twelfth century in this country, we have, unfortunately, no examples, except photographs; but models are now being taken of the beautiful work in Cormac's Chapel at the Rock of Cashel. Of the Great Irish Crosses there is a very good cast of one of the very best at Monasterboice, and many others will be modelled shortly.

GOTHIC ARCHITECTURE.—There are a few specimens from the grand French cathedrals which should be very useful and instructive to ecclesiastical architects, and many casts of Gothic capitals and other details.

RENAISSANCE AND SUBSEQUENT WORK.—Of the works of the great sculptors of the fifteenth and following centuries in Italy and France there are many important copies in the Museum, comprising statues and other objects by D. da Settignano, Donatello, Michael Angelo, L. Della Robbia, Goujon, Pilon, and others, and carefully coloured models of some of the most celebrated examples of decoration in Italian ecclesiastical buildings. The collections of Gems and Cameos, and of Coins and Medals, are good, and very useful to those who have little opportunity of studying larger collections.

INDIAN AND OTHER ORIENTAL ART.—The fine metal work from various parts of India and from Thibet, the specimens of Needlework and Textiles, and the varied patterns of the delicate relief works of Moghul times in the casts from their ancient seats of government are valuable examples of Oriental taste, design and workmanship.

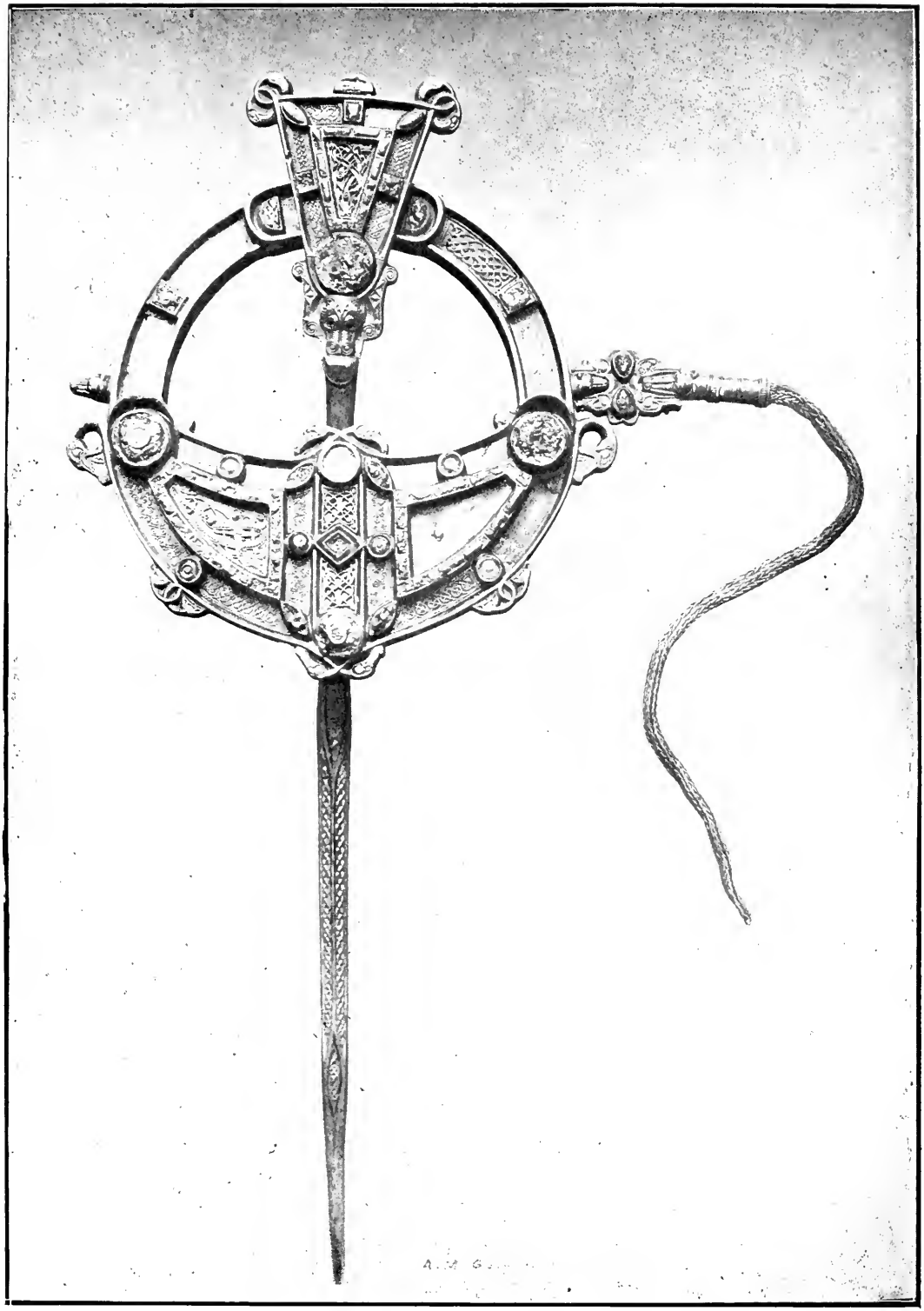
JEWELLERY.—There are four cases of Jewellery: Greek and Roman style, English and Irish, foreign and peasant Jewellery. In the first are a copy of the very fine Greek monile or necklet in the British Museum, and reproductions of some of the very remarkable ancient Etruscan ornaments by the late Carlo Giuliano.

MUSICAL INSTRUMENTS.—Here there are instruments of many primitive and barbarous nations, which are interesting to ethnologists and to those who would study how the percussion, wind and string instruments of the present European orchestra have been evolved from very simple beginnings, and there are more modern instruments, which illustrate the history of their manufacture in Dublin, such as the Irish harp at various epochs, the Irish bagpipes and spinets and early pianofortes made in Dublin.

FURNITURE.—This a branch of the Museum which has been greatly increased during the last five years, and now comprises a number of good examples of Italian furniture of the sixteenth and seventeenth centuries, of French chiefly of the time of Louis XIV., Louis XV., and Louis XVI., and of English of the Stuart and Queen Anne periods, and more especially of the times of Chippendale and his immediate successors. It is hoped that these specimens will not only serve as a high standard of good design and fine workmanship to the furniture makers of Ireland, but will afford, what is much more necessary, examples of good taste to the public, on whom it must utimately depend on what lines the making of furniture will be carried on in future.

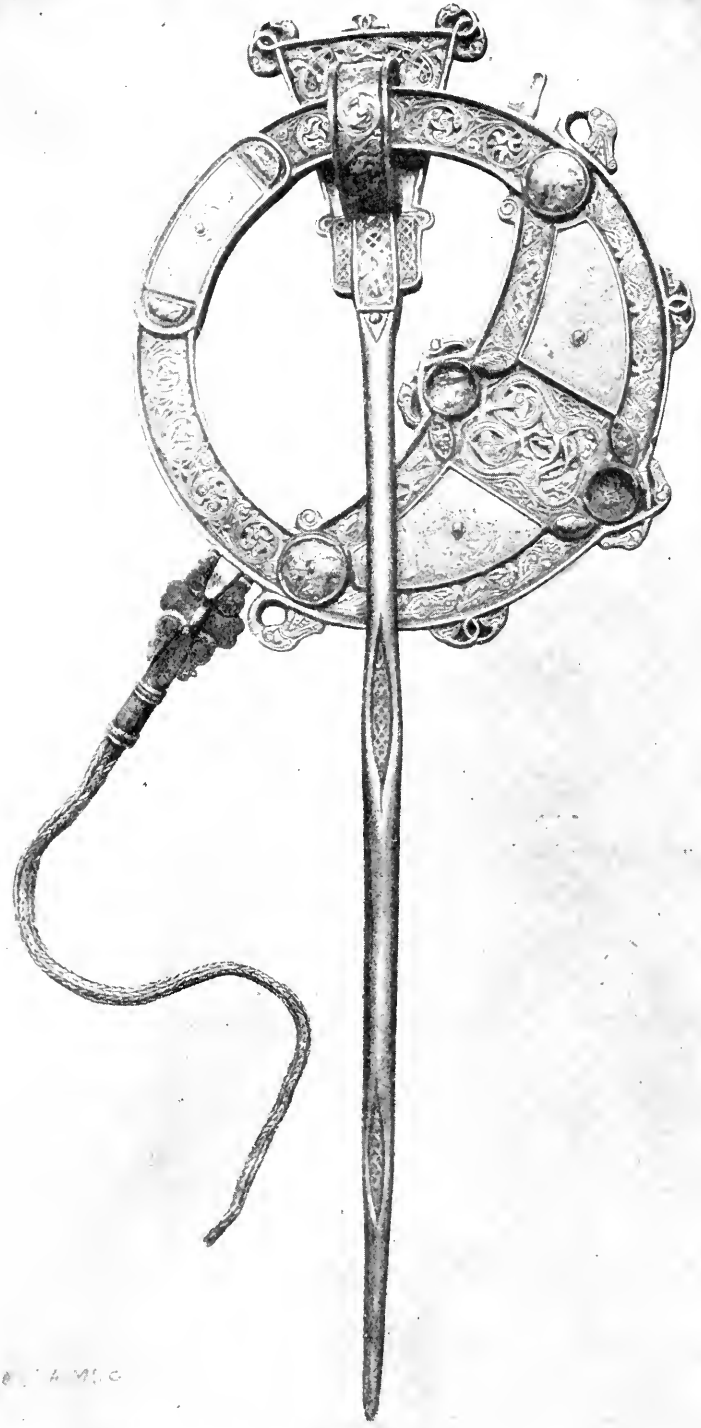
POTTERY AND PORCELAIN.—Of Ceramics there is a fairly complete collection of almost every make, in which persons interested in this artistic craft can see the various materials, glazes, and methods of decorating and colouring, as well as the very different roads by which different peoples at different times have imparted, or tried to impart, artistic value to their productions.

In the collection of GLASS there are numerous specimens of old Venetian of most delicate workmanship, some interesting Persian pieces, and one of the best examples that can anywhere be seen of the fine glass lamps that used to hang in the Mosques of Cairo, and of which several are now the



THE TARA BROOCH.—CIRCA NINTH CENTURY.

White Bronze gilt, filagree in gold, settings of amber, glass, and enamel. Length of Pin, 9 inches, diameter of Brooch, 3½ inches. Found near Bettystown, Co. Louth. History unknown.



BACK OF THE TARA BROOCH.

glory of the Arab Museum in that city. There are several specimens of Irish manufacture, chiefly from the factories which flourished in Waterford during the latter part of the eighteenth century.

ARMS AND ARMOUR.—In this part of the collection there are chiefly reproductions of well-known examples of armour, with some fine swords and curious early fire-arms.

LACE forms an important part of the collections, as this industry has for years flourished in Ireland, and many designers are trained in the Metropolitan School of Art, and afterwards find employment in this country. It is essential, if a high standard is to be maintained in beauty of design and workmanship, that the designers and students should constantly study the finest specimens procurable of every variety.

The EMBROIDERIES are also valuable as examples of style and workmanship to schools and teachers of needlework.

ENAMELS are not in any great number, but the principal kinds are represented, and in the hope that this beautiful art, which has for some years not been carried on in Ireland, may be re-introduced, it is intended to add to the collection as opportunity occurs.

IRON, BRONZE AND PEWTER.—There are some good examples of ornamental wrought iron, several being from the Peyre collection, and also some good locks and keys, bronze castings of various periods, and some good Pewter.

The GOLDSMITH'S and SILVERSMITH'S WORK comprises a fine assortment of electrotypes, procured by the Science and Art Department, of famous examples, and a small, but interesting collection of Silver, Irish (which held such a very high position in the eighteenth century), English and Foreign, with a case of Sheffield plate. To revive and assist this handicraft in Dublin it is intended to add considerably to the number of these examples.

BOOKBINDING is another art which for many years flourished here, and recently many good examples of Irish, English and foreign bindings have been acquired to encourage the craft, and to give ideas to workers.

IVORIES are an interesting part of the collections, and those in Dublin are chiefly reproductions, which are equally useful to Art students.

Photographs of BUILDINGS and ARCHITECTURAL ORNAMENT are of the greatest use, even to architects who have travelled a good deal, and still more to the many men connected with the profession who seldom or never see the buildings of other countries, and for this reason a collection is being formed to illustrate all the principal styles.

CHINESE ART is represented by some remarkably fine old Cloisonné Enamels, Jade Carvings, and Embroideries.

BURMESE ART is shown by some very fine large decorative tiles and other objects.

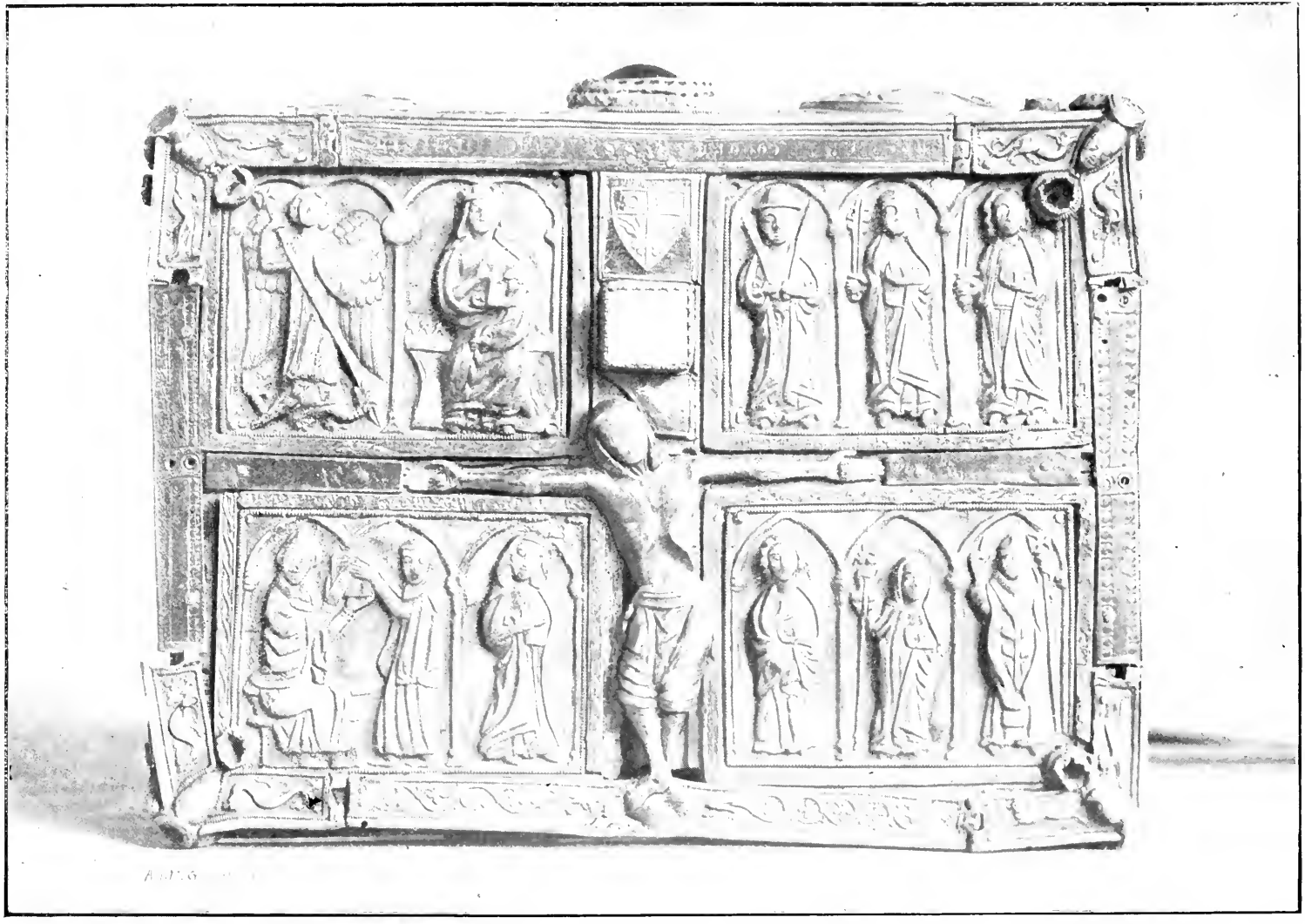
Of JAPANESE ART the Dublin collection is very good indeed, comprising many examples of the highest quality of lacquer and other works of art; it is necessary to show to the public the very best Japanese work, as most of that produced since the extension of European influence in Japan is so inferior, and it is a school of art which is producing a marked effect upon every European school.

ETHNOGRAPHICAL COLLECTIONS.

The ETHNOGRAPHICAL COLLECTIONS are good, the valuable objects lent by Trinity College being such as can no longer be procured. They are being arranged on a special system by which the study of the comparative civilization of the many primitive races of mankind here illustrated is made simple and easy.

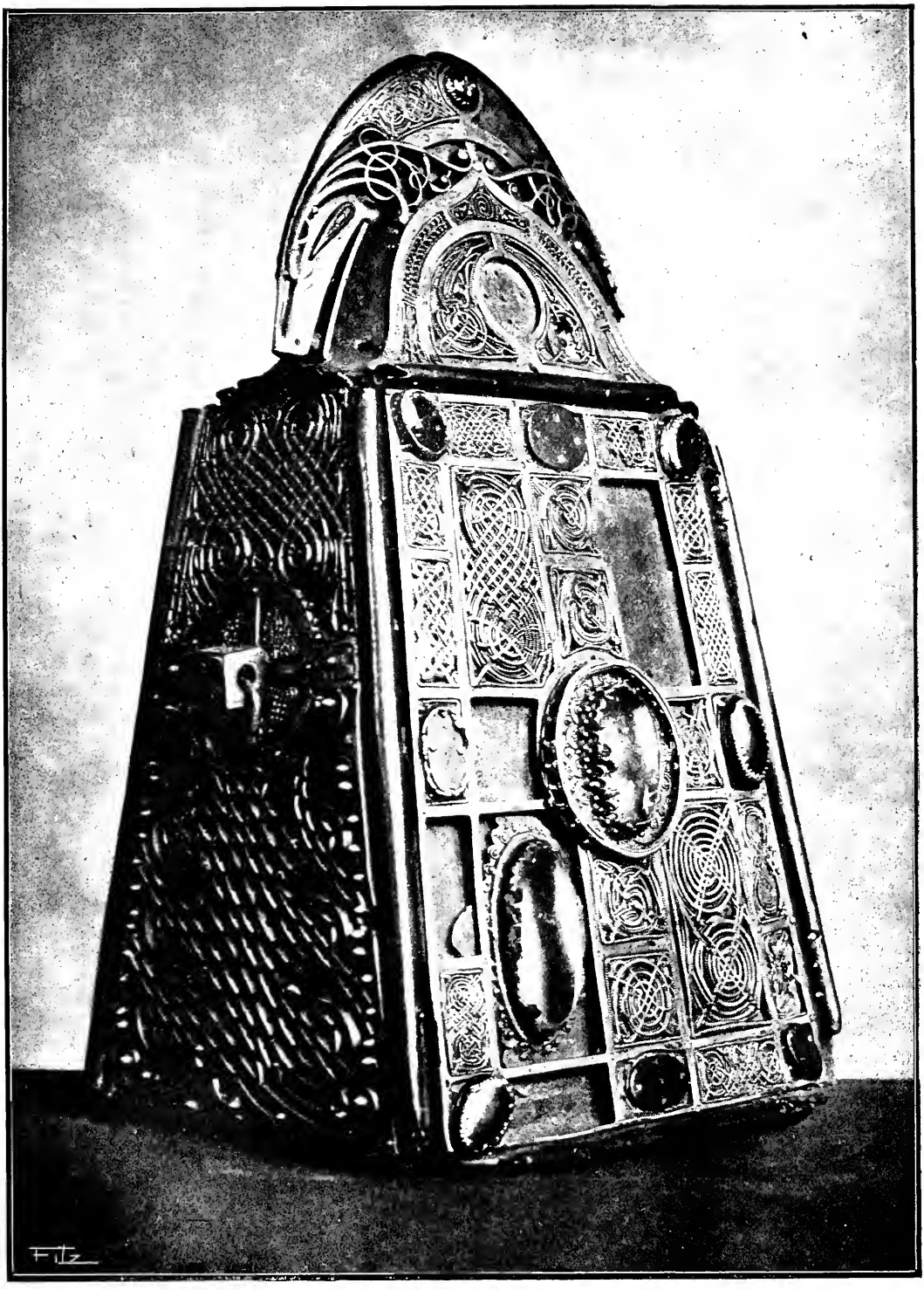
Ardagh Brooch, Silver Gilt.

One of four Brooches found with the Ardagh Chalice, at Ardagh, Co. Limerick. A portion only of the pin is shown in the engraving. This is the largest Brooch of this form that has been found in Ireland. Its measurements are, diameter 5¾ inches, length of pin 13 inches.



THE DOWNPATRICK CROZIER.

Book-Shrine, formerly belonging to the Abbey of Clones, County Tyrone. It consists of (1) an inner box of yew; (2) a bronze covering plated with silver (11th-12th century); (3) an outer case of silver (11th century). Height, 7½ inches, length, 9 inches, width, 4 inches.



SHRINE OF ST. PATRICK'S BELL.—CIRCA A.D. 1100.

Bronze and Silver; ornaments on front in gold, settings of stone and enamel, settings of crystal of later insertion. Made about A.D. 1090 to enshrine the ancient iron bell, traditionally believed to have belonged to St. Patrick, and preserved at Armagh till 1758. Height, 10½ inches, base, 6½ inches by 4¼ inches.

IRISH ANTIQUITIES.

The collection of ancient objects illustrating the life of man in Ireland from the earliest times of which any trace of his appearance in this country can be found will bear comparison with the finest similar collections in any country. The relics of the Stone Age are from every part of Ireland, and no pains have been spared to arrange them so as, with the help of full explanatory labels, to show the circumstances under which they were found, and the knowledge of the customs of those early times which may be derived from them.

The Bronze Age room shows a most interesting series of implements in Bronze, and a few in Copper, and is remarkable for the magnificent display of Gold ornaments which, although they are doubtless but a very small proportion of the objects made of this metal at this early period, show in what quantities it existed, and with what skill it was worked at least from early in the Bronze Age till its close. There is also a room devoted to objects, chiefly ecclesiastical, of late mediæval times, when the artistic workers of Ireland in Bronze, Gold and Enamels produced such precious objects as the Cross of Cong, the Ardagh Chalice, the Shrine of St. Patrick's Bell, and the Tara Brooch

These objects have been collected chiefly by the Royal Irish Academy, and for many years were kept in the Academy's house in Dawson-street; but as it was impossible to exhibit them there in a satisfactory manner, they were transferred, in 1891, to the new Museum building.

ZOOLOGICAL COLLECTIONS.

Though not so extensive as in some of the very large Natural History Museums of Europe, it is believed that these will compare favourably with any in point of arrangement. The ground floor is divided into three sections: the first is arranged to illustrate the history or evolution of animal species, classification, variation, natural selection, structure and instinct, development, etc., and also to show the distribution of some typical species in the several regions into which the earth's surface is divided.

The second and third sections contain the Fauna of Ireland, in the one the invertebrate animals, and in the other the vertebrate; the Irish birds are a notable exhibit, and there are many groups of birds with their nests well set up with very faithful reproductions of their natural surroundings; to many visitors this is the most interesting part of the Museum, and it is believed that it does much to awaken and develop a love of natural history in the young. In the upper floor the chief types of the animal kingdom generally are displayed in regular order, and the adjacent annexe contains the fossil animals, a collection peculiarly rich in the various species of flying reptiles.

In a very conspicuous position are exhibited cases of "Injurious Insects," arranged to show their life history and the means which should be adopted for their destruction.

BOTANICAL DIVISION.

This has been greatly developed during the past few years, and it occupies five rooms.

Room I. is the Index Room to help botanical classes; in the wall cases there are specimens, models, and diagrams illustrating the classification of the Vegetable Kingdom (recent and fossil), the life-history of the different groups of plants (root, stem, leaf, flower, fruit, germination); botanical terms with definitions of the same; coloured drawings and specimens as types of the chief natural orders.

In the floor cases are collections of dried plants of economic or general interest.

Rooms II. and IV. contain the Economic (Botanical) Collection, the specimens being arranged systematically in their natural orders.

1. Specimens of plants and parts of plants (raw and manufactured) of economic importance, *e.g.*, the varieties of willow rods and other illustrations of the Osier industry, Potato-tubers, Turf, Kelp, Flax, Tea, various kinds of Timber, Fungi causing diseases of plants, etc., etc.
2. Specimens of Fossil Plants.

The Economic Collection will, it is hoped, contain ultimately a complete illustration of:—(1) All Irish industries into which plants largely enter; (2) such plant industries as might with advantage be carried on in Ireland; and (3) food plants and other plants of more general interest.

The collections are for general consultation, and are intended to be of use in the development of the industries of Ireland.

Room III. is the Herbarium. This room contains dried plants, illustrating the flora of different parts of Ireland and Great Britain, and less completely of other parts of the world. The chief object of the Herbarium is to be of use to students interested in Systematic Botany, including Field Botany in Ireland, and to those wishing to consult the collections in connection with Economic Botany.

The Herbarium contains a small Working Library, Microscopes, etc.

There is also a large collection of named drugs of use to pharmaceutical and medical students.

GEOLOGY AND MINERALOGY.

The general MINERALOGICAL COLLECTIONS are in cases round a map of Ireland raised in relief, and coloured geologically, and there is also a good collection of Irish Minerals arranged according to counties, and of the Irish stones used for ornamental and building purposes.

There is also a collection of Irish Rocks and Fossils gathered and arranged by the Officers of the Geological Survey, with a series of coloured drawings to illustrate Geological phenomena.

INDUSTRIAL COLLECTION.

The MECHANICAL, or, as usually called, INDUSTRIAL, COLLECTION, is at present very small; but it contains a variety of looms and several fine models of factories and manufacturing plants. Great pains have been

bestowed on the labelling of the latter, an explanatory label being attached to each principal pipe, retort, furnace, etc., etc., in the model, numbered consecutively, so that by reading the labels in order, the visitor may follow the process of the manufacture illustrated from beginning to end.

In the matter of GUIDES this Museum may claim to be a pioneer. For one halfpenny can be bought a well-printed pamphlet on good paper, by which the visitor can easily discover where to find any particular class of objects, and obtain a considerable amount of information concerning many of them.

A General Guide is being brought out in parts and chapters at one penny, each containing a brief general history of the branch of art to which it belongs with references to all the objects in that part of the Collections.

Another special feature in the way of aids to the visitor is the help given in the selection of books bearing upon the arts and sciences which the Collections illustrate. In conspicuous places are hung lists of books in the National Library, which may be useful to visitors to the Museum, arranged for the Art and Antiquities in forty-one classes—Renaissance Art, Gothic Architecture, Jewellery, Fans, Lace, Ethnography, etc., etc.; and there are similar lists for the Botany, Zoology, and Mineralogy, and copies of these lists can be bought in pamphlet form for a penny each.

During the winter months there are frequent Demonstrations, or informal Lectures, by members of the Museum staff and others, for which tickets of admission are distributed free of charge, and by these various means it is hoped that many who would otherwise wander among the objects in an aimless and desultory manner may be induced to take a real interest in some branch of industrial art or of natural science, and that the objects for which the public maintain these Collections may thus be better attained.

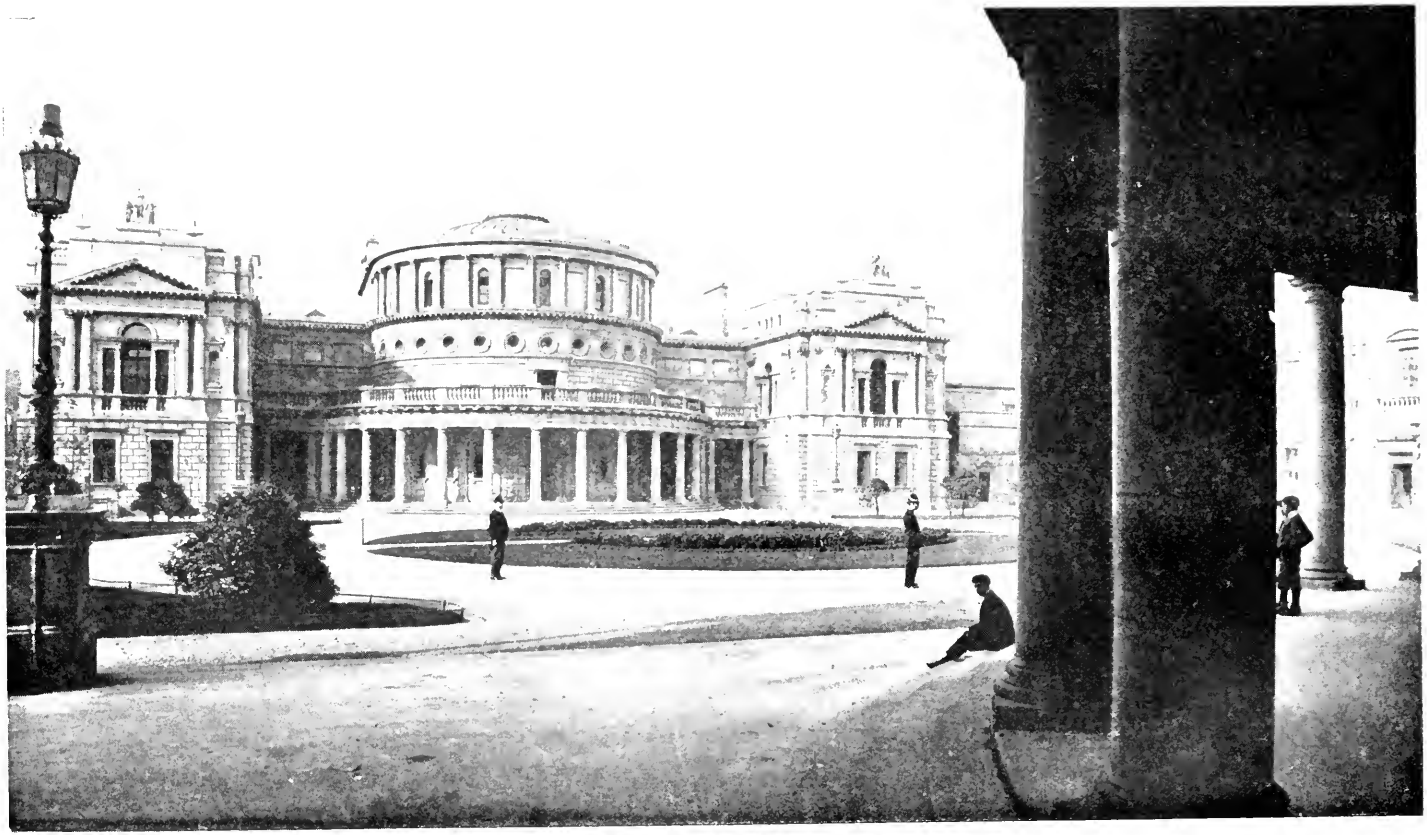
THE NATIONAL LIBRARY OF IRELAND.

The Royal Dublin Society's Library was taken over by the State in 1877, and re-named the National Library of Ireland. The Library had been explicitly a Public Library, free to respectable persons, introduced by members of the Dublin Society, since 1836, when a Parliamentary Commission on the Society had recommended that its Library should be made the National Library of Ireland. Implicitly the Library had probably been free on the same terms since the beginning of the century, for the Minutes of the Library Committee include references to the constant presence of strangers in the Reading Room; and Stewart's Dublin Almanack of 1820, page 181, under "Dublin Society," has the following entry:—"DEPARTMENTS OPEN TO THE PUBLIC.—*The Library*, on introduction to the librarian."

From 1877 to 1900 the Library was administered by the Department of Science and Art. In 1900 (with the Museum and other Institutions of Science and Art in Dublin) it passed to the administration of the Department of Agriculture and Technical Instruction for Ireland. The Library is under the superintendence of twelve Trustees, of whom eight are re-elected annually by the Royal Dublin Society, while four are appointed by the Lord Lieutenant of Ireland. The sum granted for book purchase is £1,000 a year. This has been supplemented by a temporary addition, to last five years, of £300 annually. The officials are—a Librarian, A First, and a Second Assistant Librarian, and twelve library-attendants, these last corresponding to the junior library assistants of the public libraries of England and America.

Though founded in 1877, it was not until 1890 that the Library entered its new building, which is still unfinished. The architect, the late Sir Thomas Deane, formed his plan in constant consultation with Mr. William Archer, F.R.S. The result is a building which, with some faults, is for its size one of the very best in Great Britain and Ireland. Its special points, perhaps, are: the isolation of the large Central Reading Room (shelved to receive a large number of books, which are absolutely free to the public without intervention), and the adoption of the stack system of book-cases in the book-store. A hydraulic lift connects the basement of the book-store with the attic and all intermediary floors.

The books are minutely classified according to subject on the shelves by the so-called Decimal system, invented and developed by Mr. Melvil Dewey, an eminent American Librarian. The essential merit of this classification is that every new book goes to reinforce the books on the same subject already in the Library. A new book on Infinitesimals is so marked that it goes to the place on the shelves where other books on *Infinitesimals* are—not merely to "Mathematics," not merely to "The Calculus." A new life of Cromwell joins other books on *Cromwell*, a new book on Cashmere goes to books on *Cashmere*, not merely Travel, or Asia, or India; the last book on



NATIONAL LIBRARY OF IRELAND, KILDARE-STREET, DUBLIN.

Free Trade joins older ones on the same subject, and so on. The technique of this is simple, but what will interest non-professional minds is the extraordinary value as an instrument of culture gained for the Library by the juxtaposition in clusters, of books on the same subject. The Decimal system was introduced in the National Library by Mr. William Archer, F.R.S., the Librarian from 1877 to 1895. It has been adopted in several admirable English Libraries—at Manchester, Glasgow, Croydon.

The Library is open from 10 a.m. to 10 p.m. daily, except on Sundays, and on three weekdays at Christmas, four weekdays at Easter, and twelve weekdays in August. The attendances of readers in 1878 numbered 27,452. In 1900, the twenty-third year of the Library, the attendances numbered 148,405. The attendances in 1849 were estimated at over 8,000 per annum. The number of volumes is estimated at 130,000. In 1849 the number was estimated at 19,000. The Library is still the only considerable popular Reference Library in Dublin. The collection of printed books is greater than any other in Ireland (except that of Trinity College, where there are probably more than twice as many). An effort is being made to collect, bind, and preserve a considerable number of the newspapers of Ireland, and activity in this, as in many other directions, is conditioned by the desire to make the Library match the title it bears and the responsibilities thus implied. It is the State Library—the tiny British Museum of Ireland.

With the accession of the Joly Collection the Library will be very rich in books on Irish topography, history and biography. From its connection with the Museum of Science and Art, and the Metropolitan School of Art, acquisitions in Botany, Zoology, the Fine Arts and Archæology have always been frequent. There are very few novels on the shelves—practically only the classics of fiction are purchased.

STATISTICAL SURVEY OF IRISH AGRICULTURE.

Division of Land.

The total area of Ireland—according to the figures supplied by the Director-General of the Ordnance Survey to the Census Commissioners in 1891—was 20,327,947 statute acres. The inclusion of 5,397 acres of reclaimed slob in the County Wexford brings the total area to 20,333,344 statute acres. This total—which is that taken in these returns since 1891—includes 129,681 acres under water, but excludes close on half-a-million acres (492,252 is the exact number) under the larger rivers, lakes, and tideways. The following statement shows the distribution of this area in 1900 and 1901 :—

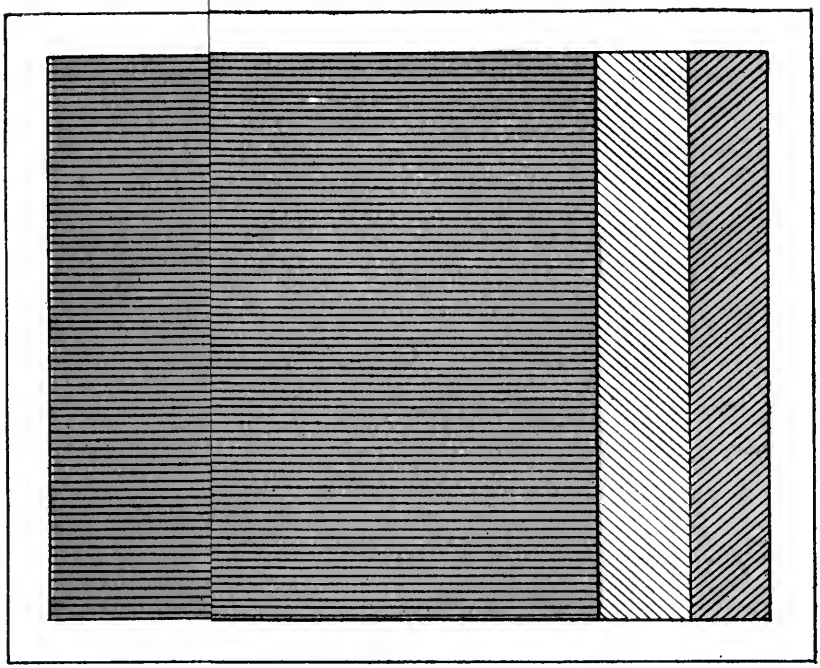
——	1900.	1901.	Increase or Decrease between 1900 and 1901.	
			Increase.	Decrease.
Under Crops, including "Clover, Sainfoin, and Grasses *for Hay*,"	3,100,397	3,069,789	—	30,608
Under Grass, including temporary pasture, and Hay mown on permanent pasture, ..	12,121,707	12,138,500	16,793	—
Under small Fruit and Fallow, ...	12,589	10,886	—	1,703
Under Woods and Plantations, ...	311,648	309,741	—	1,907
Under Bog, Waste, Barren Mountain, Water, and Marsh, ...	4,787,003	4,804,428	17,425	—
TOTAL, ..	20,333,344	20,333,344	—	—

"Hay mown on permanent pasture" and "temporary grasses" *when grazed* are in the above Table put in the category of "Grass" (though technically, of course, as being under rotation, the latter is a "crop"). The idea is to divide off as far as possible arable land from pasture; to distinguish, in other words, land under the plough from land directly given over to stock-raising, or, as it may be called, pastoral land. The division as here given is not quite perfect for the reason just alluded to, that "temporary pastures" would strictly come under the term arable land, but in view of the fact that such lands are often not broken up in many parts of Ireland for three, five, or even ten years, during which time a large percentage of them are grazed, the object of the classification adopted is apparent.

Changes in the use to which the land of a country is put affect its whole social organisation, and of no change can this be said with more truth than of the transfer of land from tillage to pasture. Hence it is important to adopt a classification which throws into bold relief the characteristic features of our rural economy. According to the estimates in the above

Dia each of the years

1901.



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Iain Land, Bogs, &c.

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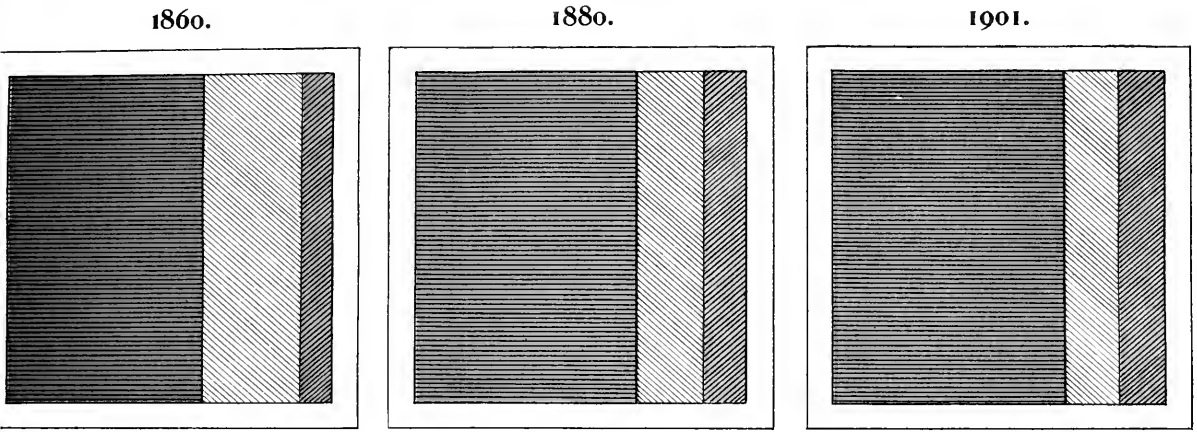
Diagram to illustrate the Division of Land in Ireland in each of the years 1860, 1880 and 1901.



EXPLANATION.

I. The outer squares represent the Total Area of Ireland.

II. The coloured squares represent the Area under Crops and Grass ("Cultivable Area").

III. The uncoloured spaces between the outer and inner squares represent Barren Mountain Land, Bogs, &c. (Uncultivable Area").

IV. Grass.

V. Crops (Cereal, Root and Fibre).

VI. Meadow and Clover.

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statement it would appear that 30,608 acres of land went from under the plough in 1901, as compared with the preceding year, while 16,793 acres seem to have been added to the area under grass. These figures imply that 13,815 statute acres of land went out of cultivation in the year 1901. It is, however, possible that the recorded increase of 17,425 acres in "Bog, Waste, Barren Mountain," is, in part, due to a not unnatural divergence of opinion amongst the Enumerators in the different years as to what kind of land exactly should be described as "Barren Mountain." A tract of mountain-side which carried a few score sheep in one year may not happen to be grazed at the time of enumeration in a succeeding season, with the result that it is entered on the statistical forms in a different column on each occasion. Such indeterminate grazing areas are, doubtless, a source of error in comparative classification; but every effort is made by carefully-worded instructions, by queries to the Enumerators for purposes of verification, and in other ways, to minimise the possibilities of serious error. Moreover, errors of classification of the kind referred to would probably tend to correct each other when a long series of years is taken into consideration.*

* With reference to the question whether waste land is increasing or decreasing in Ireland, the following from Part I. of Dr. Grimshaw's "Facts and Figures about Ireland" (Hodges, Figgis & Co., Limited, Dublin, 1893), may be of interest. On the showing of these figures (to which have been added those for 1901), it would seem that a very large amount of waste land has been reclaimed during the past sixty years.

DIVISION OF LAND IN 1841, '51, '61, '71, '81, '91. and 1901.

Division of Land.	1841.	1851.	1861.	1871.	1881.
	Statute Acres.	Statute Acres.	Statute Acres.	Statute Acres.	Statute Acres.
Under Crops (including Meadow),	13,464,300	5,858,951	5,890,536	5,621,437	5,195,375
Under Grass, ..		8,748,577	9,533,529	10,071,285	10,075,424
Woods and Plantations, ...	374,482	304,906	316,597	324,990	328,703
Barren Mountain Land, ...	6,489,971	5,416,319	4,588,091	4,311,041	2,117,672
Bog and Marsh, ..					1,720,026
Waste Land, &c.,					891,553
					4,729,251
Total, ...	20,328,753				

Division of Land.	1891.	1901.
	Statute Acres.	Statute Acres.
Under Crops (including Meadow), ..	4,818,381	4,631,051
,, Grass, ...	10,298,654	10,577,238
Woods and Plantations, ...	311,554	309,741
Barren Mountain Land, ...	2,211,341	2,223,420
Bog and Marsh, ...	1,743,923	1,574,202
Waste Land, &c.	949,491	1,017 692
	4,904,755	4,815,314
Total, ...	20,333,344 †	

NOTE.—The information for 1841 and 1851, respectively, has been obtained from the Census Report for those years; and that for the subsequent periods from the Agricultural Statistics.

† The difference between the total area entered for 1891 and 1901 and that given for the other years is owing to the adoption in 1891 of revised areas for some counties, and the inclusion of some reclaimed slob lands in the County of Wexford.

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Adverting to the contraction of the arable land of the country—this is, of course, the outstanding feature of these returns, especially when the process is regarded, not from year to year, but as an historical tendency. The tendency is not, however, confined to Ireland alone of the countries of the United Kingdom, though nowhere is its extent so striking. The arable land of Great Britain in the year 1899, for example, was the smallest on record. Since 1872—with four checks in 1875, 1885, 1894, and 1897—the extent of land under the plough in Great Britain has continuously declined. The following statement illustrates the relative position of the countries of the United Kingdom as regards the distribution of the several areas between arable and pastoral cultivation:—

PROPORTION of ARABLE and PASTORAL LANDS in each Country of the United Kingdom.

—	England, (Average 1897–99.)	Wales, (Average 1897–99.)	Scotland, (Average 1897–99.)	Ireland 1899.	United Kingdom.
Arable Lands, ...	11,506,000	903,000	3,508,000	3,146,000*	19,063,000
Pastoral Lands, ..	13,257,000	1,925,000	1,386,000	12,070,000	28,638,000
Total Cultivated Lands,	24,763,000	2,828,000	4,894,000	15,216,000	47,701,000
Arable %, ...	46.5	31.9	71.7	20.7	40.0
Pastoral %, ...	53.5	68.1	28.3	79.3	60.0

*Including 13,086 acres "under Small Fruit and Fallow."

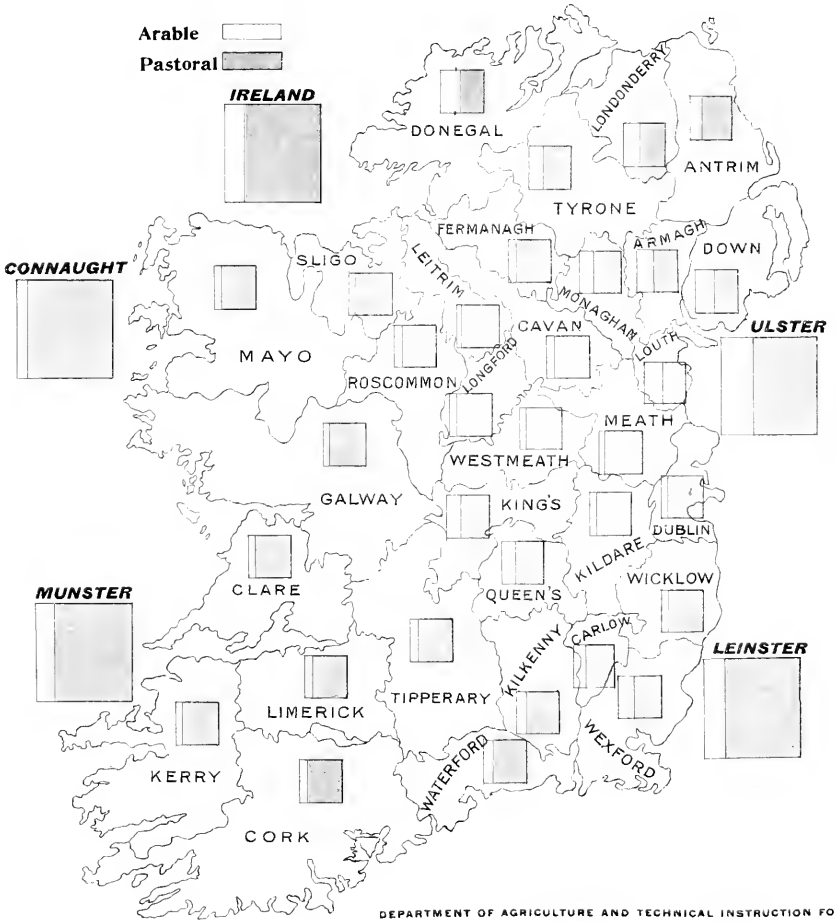
More than half of the cultivated area of England is, it will be seen, no longer under the plough. In Ireland the proportion of pastoral to arable lands is 79.3 to 20.7 per cent.; in Scotland the proportion is 28.3 to 71.7 per 100 statute acres of cultivated land. I shall revert further on to the significance of the very large amount of tillage in Scotland.† The geographical characteristics of Wales explain to a large degree the very high per centage of her pasture lands, which enable her to produce close on 100 sheep more per 1,000 acres of total area than the joint flocks of Ireland and Scotland for the same area.

It is noteworthy, to introduce a comparison with a foreign country, that, while the area under meadows and pasture in Ireland is over eleven times the similar area in Belgium, our herds of cattle number only slightly over three times as many as those of that country. No doubt, it is generally recognised that with a system of small farming, such as is carried on in Belgium, more cattle can be raised to the acre by means of tillage and house-feeding than on the grazing system; but the fact just mentioned points to the conclusion that pastoral farming—which means, so far as Ireland is concerned, the production of meat, dairy products, and wool—great as its expansion has been, has not, so far, developed at the rate at which the agricultural resources of the country have been passing under its control. One obvious feature—in part a cause and in part an effect—of the continued contraction of the arable land of a country is a great displacement of population. The exodus from the rural districts to the manufacturing districts of England and the annual drain of emigration from this country are striking evidences of the diverse operations of this tendency as it affects, on the one hand, a country with great manufacturing resources, and, on the other, a country whose main industry is agriculture. The remarkable growth of

† See page 322.

MAP to illustrate the relative proportions of Arable and Pastoral Land in the year, 1901, in each County and Province of Ireland, and for the whole Country.

N B.—"Arable Land" is here used to describe land under Cereal, Root, and Fibre Crops, and Hay under rotation. "Pastoral Land" includes, for the purposes of this Map, permanent pasture (whether mown for Hay or Grazed) and "Clover Sanfoin and Grasses" (even when described as "under rotation") which are "not for Hay."



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such commercial centres as Belfast and Londonderry affords some proof that where manufacturing industry flourished in Ireland the rural exodus took, to some extent, the same form as it has done in Great Britain—to wit, immigration rather than emigration.

The diagram of squares here given illustrates, graphically, the growth of pasture and the shrinkage of crop areas in the years 1880 and 1901 as compared with 1860.

The following Table forms the basis of this diagram :—

Year.	Total Area.	"Cultivated Area" (Crops and Grass.)	Crops (other than Meadow and Clover.)	Meadow and Clover.	Grass.
1860, ...	20,284,893	15,453,773	4,375,621	1,594,518	9,483,634
1880, ...	20,327,764	15,340,192	3,171,259	1,909,825	10,259,108
1901, ...	20,333,344	15,208,289	2,452,459	2,178,592	10,577,238

I have further prepared a map showing for each county and province of Ireland and for the whole country the proportion of the cultivated area given up to arable and pastoral uses, respectively, in the year 1901. The figures on which the coloured squares in this map are based are as follows :—

Table showing the Number of Statute Acres devoted to Arable and Pastoral uses in each County and Province of Ireland, and for the whole Country, 1901 (see Map).

Counties.	Arable (Statute Acres).	Pastoral (Statute Acres).	Counties.	Arable (Statute Acres).	Pastoral (Statute Acres).
Antrim, ...	173,312	401,828	Clare, ...	46,801	574,884
Armagh, ...	110,827	161,811	Cork, ...	286,503	1,109,981
Cavan, ...	78,179	318,846	Kerry, ...	68,033	611,990
Donegal, ...	172,305	461,971	Limerick, ...	43,797	542,490
Down, ...	245,967	266,493	Tipperary, ...	138,941	734,478
Fermanagh, ...	40,140	308,484	Waterford, ...	68,891	253,267
Londonderry, ..	156,783	249,547			
Monaghan, ...	96,306	187,355			
Tyrone, ...	195,387	377,855			
Total of Ulster,	1,269,206	2,734,190	Total of Munster,	652,966	3,827,090
Carlow, ...	54,500	138,826			
Dublin, ...	34,645	156,528	Galway, ...	111,513	834,798
Kildare, ...	61,534	296,392	Leitrim, ...	26,595	265,862
Kilkenny, ...	101,625	352,649	Mayo, ...	106,259	563,492
King's, ...	70,165	279,410	Roscommon, ..	51,688	430,981
Longford, ...	28,180	177,545	Sligo, ...	39,703	272,341
Louth, ...	70,127	101,680			
Meath, ...	48,354	481,909			
Queen's, ...	88,221	261,580			
Westmeath, ...	36,217	326,257	Total of Connaught,	335,758	2,367,474
Wexford, . ..	166,673	347,181			
Wicklow, ...	51,618	289,789			
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Crop Areas.

When we come to look into the details of the decline in the area of the cropped lands of Ireland, we find, as was to have been expected, that it is the cereals which have decreased most seriously. From the strictly economic point of view, the yearly increasing scarcity of agricultural labour; the fact that the prices of corn crops have fallen since 1870 to a much greater extent than the prices of meat-stuffs or dairy produce; and the splendid natural richness of the pastures of Ireland, point to an explanation of the decay of grain farming in this country. Since 1855 our wheat area has shrunk from 445,775 acres to 42,934 acres in 1901; our oat crop (though still pre-eminently Ireland's great cereal) has decreased by nearly 50 per cent.; while our barley (an industrial crop for which there is always a ready market at home) has declined from 226,620 acres in 1855 to 161,534 acres in 1901. I give herewith a coloured chart, which emphasizes at a glance the tendency just referred to. That the decline of the root crops (including potatoes) has, though serious, not been so marked, will appear from this statement:—

ACREAGE under CEREALS, ROOTS, and MEADOW in 1855 and 1901.

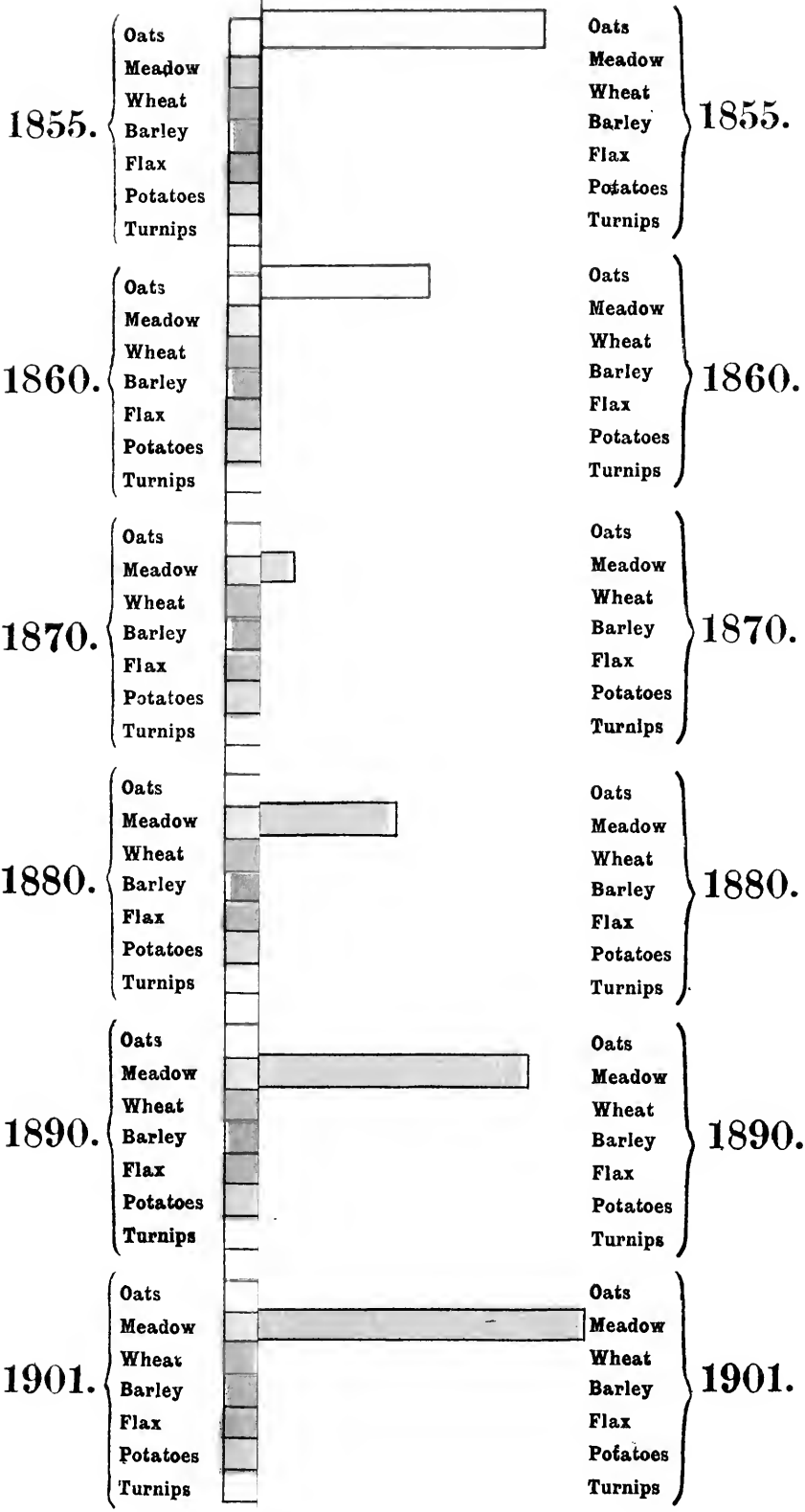
—	1855. Statute Acres.	1901. Statute Acres.	Percentage. Increase.	Percentage. Decrease.
Cereals, ...	2,832,564	1,317,574	—	53·5
Root Crops, ...	1,444,390	1,079,443	—	25·3
Meadow, ...	1,314,807	2,178,592	65·7	—

The details of the changes for the separate crops are clearly brought out in the subjoined Table, with which the chart may be compared:—

TABLE showing the AREA under the principal CEREAL and ROOT CROPS, and MEADOW, in each of the years 1855, 1860, 1870, 1880, 1890, and 1901.

YEAR.	Oats.	Meadow.	Wheat.	Barley.	Flax.	Potatoes.	Turnips.	Mangel Wurzel & Beet Root.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1855, ..	2,118,858	1,314,807	445,775	226,629	97,075	982,301	366,953	22,567	5,574,965
1860, ..	1,966,304	1,594,518	466,415	181,099	128,595	1,172,079	318,540	32,124	5,859,674
1870, ..	1,650,039	1,773,851	259,846	241,285	194,910	1,043,583	339,059	25,400	5,527,973
1880, ..	1,381,928	1,909,825	148,708	218,016	157,540	820,651	302,695	41,515	4,980,878
1890, ..	1,221,013	2,093,634	92,341	182,058	96,896	780,801	295,386	46,457	4,808,586
1901, ..	1,099,335	2,178,592	42,934	161,534	55,442	635,321	289,759	77,457	4,540,374
1901 compared with 1855: Increase or Decrease	Decrease 1,019,523	Increase 863,785	Decrease 402,841	Decrease 65,095	Decrease 41,633	Decrease 346,980	Decrease 77,194	Increase 54,890	Decrease 1,034,591
1901 compared with 1855: Rate per cent.	48·1	65.7	90.4	28.7	42.9	35.3	21.0	243.2	18.5

Restricting our survey to recent years, we find that the area under crops, including meadow and clover, in 1891 was 4,818,381, while in 1901 it was only 4,631,051—a decrease of 3.9 per cent. in the eleven years. Taking 100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Oats
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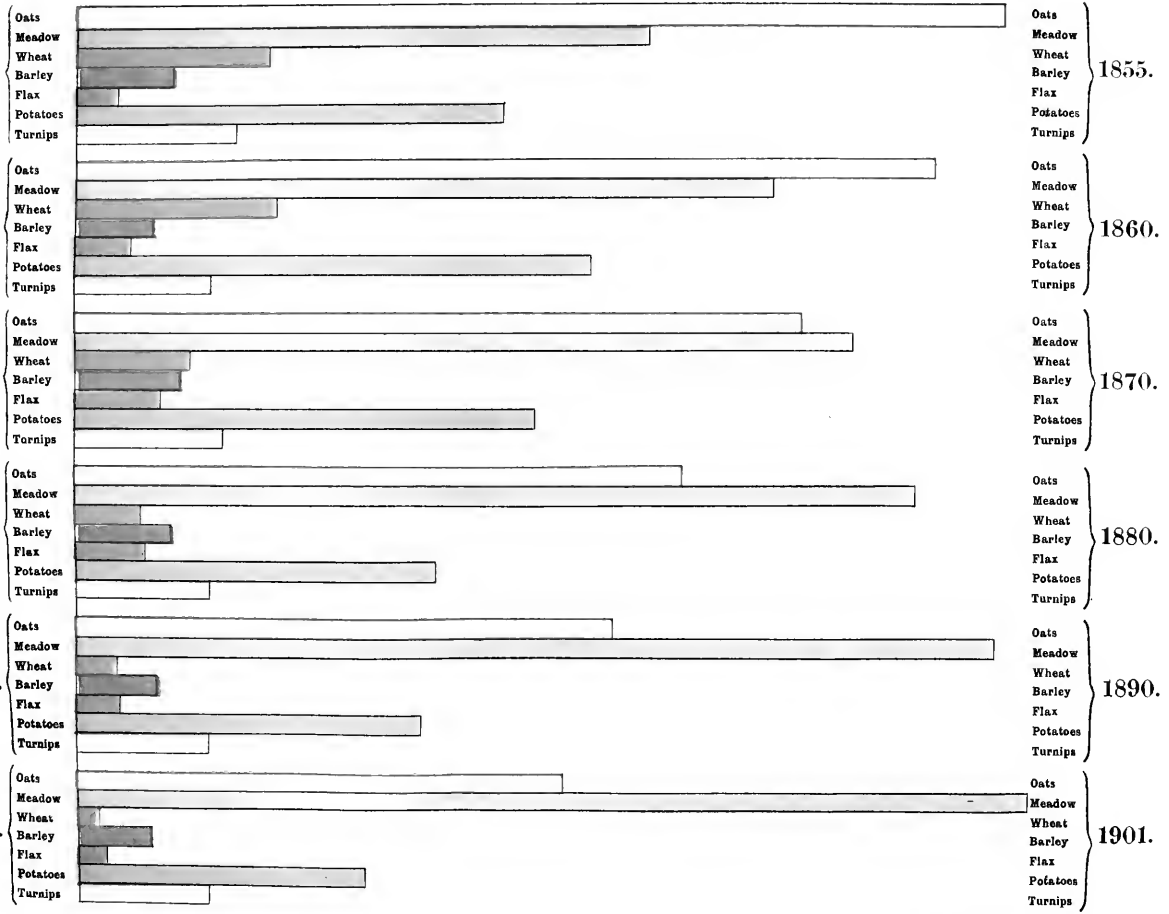
Turnips

Diagram to illustrate the Proportionate Areas under the Principal Cereal and Root Crops and Meadow in each of the years 1855, 1860, 1870, 1880, 1890 and 1901.



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statute acres of arable land as the unit, we find that there were in each such area the following percentages devoted to the several varieties of crops :—

—	Cereals.	Green Crops.	Flax.	Mixed Clover.
1891, ...	31.0	24.7	1.6	42.7
1892, ...	30.6	24.1	1.4	43.9
1893, ...	30.5	23.7	1.4	44.4
1894, ...	30.1	23.6	2.0	44.3
1895, ...	29.5	23.6	1.9	45.0
1896, ...	29.3	23.7	1.5	45.5
1897, ...	29.7	23.5	.9	45.9
1898, ...	29.6	23.5	.7	46.2
1899, ...	29.6	23.8	.8	45.8
1900, ...	28.9	23.6	1.0	46.5
1901, ...	28.5	23.3	1.2	47.0
Net Changes, ...	- 2.5	- 1.4	- 0.4	+ 4.3

Comparing the year 1901 with 1900 in regard to the area under cereals and green crops, we find the following results :—

Cereals—1901 compared with 1900.		Green Crops.—1901 compared with 1900.	
Barley, ...	- 12,462	Potatoes, ...	- 18,758
Wheat, ...	- 10,887	Turnips, ...	- 8,100
Oats, ...	- 5,715	Vetches and Rape, ...	+ 269
Bere and Rye, ...	- 433	Mangel Wurzel and Beet, ..	+ 8,654
Beans and Pease, ...	- 118	Cabbage, ...	+ 607
		"Other Green Crops," ..	- 1,606
Net decrease of Cereals in 1901, 29,615 Acres.		Net decrease of Green Crops in 1901, 18,934 Acres.	

The most noticeable features in these Tables are the decreases in the areas under the cereal crops, barley, wheat and oats (the last-named has fallen continuously from 1,254,837 acres in 1894 to 1,099,335 acres in 1901); and the quite remarkable shrinkage in the area under potatoes. The present year is the thirteenth in succession in which the acreage under potatoes has decreased. In 1888 it stood at 804,566; in 1901 it is 635,321 —a decline of 169,245 acres in thirteen years.

The continuing and serious decline in the area under turnips is also worthy of attention, as is the increasing popularity amongst Irish farmers of mangel wurzel. Turnips and swedes have apparently been found a precarious and, therefore, an expensive crop, both in Ireland and Great Britain, if we may judge from the shrinkage in the areas under this class of roots. Mangel wurzel is less liable to disease, and more and more attention is being devoted to its cultivation in this country. As will be seen the loss in the area under turnips for 1901 was practically identical with the gain in the area under mangel wurzel.

Our industrial fibre crop, flax, shows, in 1901 as compared with 1900, an increase of 7,991 acres, or 16.8 per cent., following an increase of 12,462 acres, or 35.6 per cent., in 1900 as compared with 1899. As usual, the cultivation of flax was almost entirely confined to Ulster, the area covered by the crop being 54,898 acres; in Leinster the extent was only 191 acres; in Munster, 49 acres; and in Connaught, 304 acres, to which amount the County Mayo contributed 273 acres. In regard to our chief cereals, the cultivation of both barley and wheat—though more evenly distributed than flax—is still considerably localised; while the culture of oats, on the other hand, is like that of potatoes, spread over almost every district of the country.

statute acres of arable land as the unit, we find that there were in each such area the following percentages devoted to the several varieties of crops:—

—	Cereals.	Green Crops.	Flax.	Mixed Clover.
1891, ...	31.0	24.7	1.6	42.7
1892, ...	30.6	24.1	1.4	43.9
1893, ...	30.5	23.7	1.4	44.4
1894, ...	30.1	23.6	2.0	44.3
1895, ...	29.5	23.6	1.9	45.0
1896, ...	29.3	23.7	1.5	45.5
1897, ...	29.7	23.5	.9	45.9
1898, ...	29.6	23.5	.7	46.2
1899, ...	29.6	23.8	.8	45.8
1900, ...	28.9	23.6	1.0	46.5
1901, ...	28.5	23.3	1.2	47.0
Net Changes, ...	- 2.5	- 1.4	- 0.4	+ 4.3

Comparing the year 1901 with 1900 in regard to the area under cereals and green crops, we find the following results:—

CEREALS—1901 compared with 1900.		GREEN CROPS.—1901 compared with 1900.	
Barley, ...	- 12,462	Potatoes, ...	- 18,758
Wheat, ...	- 10,887	Turnips, ...	- 8,100
Oats, ...	- 5,715	Vetches and Rape, ...	+ 269
Bere and Rye, ...	- 433	Mangel Wurzel and Beet, ..	+ 8,654
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Barley.

The culture of barley on anything like a large scale was confined to eight counties. The province of Leinster had under barley 72 per cent. of the total area under that crop in 1901, while Munster had 23 per cent. Ulster and Connaught had, respectively, 3 and 2 per cent. of the total barley area. I append a list of the counties in which an area of 1,000 acres or upwards was under barley last year:—Wexford, 31,000; Kilkenny, 19,000; Queen's County, 18,000; Cork and Tipperary, 17,000 each; King's County and Louth, 14,000 each; Kildare, 10,000; Carlow, 5,000; Galway, 2,000; Down and Kerry, 1,700 each.

The following statement affords an estimate of the total production of barley in Ireland:—

YEAR.	Statute Acres.	Yield (Cwts.)	Yield per Statute Acre (cwts.)
Average, 1888–97, ...	174,000	2,935,000	16.9
,, 1898, ...	158,000	2,980,000	18.9
,, 1899, ...	169,000	3,040,000	17.9
,, 1900, ...	174,000	2,779,000	16.0
,, 1901, ...	162,000	2,915,000	18.0

The area under barley last year was 12,462 less than that for 1900, the highest since 1892 when the area under that crop was over 175,000 acres. The imports of foreign barley into the United Kingdom amount to between six and seven times the total Irish produce.

Wheat.

While Ireland produces between one-third and one-fourth of the oats grown in the United Kingdom, her proportion of barley is less than one-tenth, and of wheat only about a thirty-seventh part. Down, Cork, Wexford, Galway, Dublin, Limerick, Tipperary, and Kilkenny are, in the order given, the greatest wheat-growing districts. Taking provinces as the unit, we find that, out of a total area under wheat in 1901 of 42,934 acres, Munster contributed 13,312 acres; Ulster, 12,498 acres (Down alone having 6,344 acres, or 51 per cent. of the total for the province); Leinster, 11,885 acres; and Connaught, 5,239 acres.

Potatoes.

The importance of the potato crop in Ireland is not so paramount as it was three or four decades ago, but the potato still forms the staple food of a large proportion of the poorer population of the South and West and North-west. As already stated, the acreage under potatoes in Ireland in 1901 was 635,321 as compared with 654,079 in the year 1900, showing a decrease of 18,758 acres. Of the acreage under potatoes in 1901, 66.4 per cent. consisted of "Champions," leaving only 33.6 per cent. for all other varieties. From the year 1891, however, the proportion under "Cham-

pions" showed a gradual decline from 79.7 per cent. in that year to 66.1 per cent. in 1900; but in 1901 the proportion shows a slight recovery to 66.4 per cent. Owing to the dryness of the season, the yield per acre (5.3 tons) of the potato crop in 1901 was the highest in the twenty years 1882-1901, following immediately on one of the lowest (2.8 tons) during the same period. The very considerable yearly fluctuations in the produce per acre of this staple crop is shown in the following tabular statement:—

Years.	Tons.	Years.	Tons.	Years.	Tons.
1882, ...	2.4	1889, ...	3.6	1896, ...	3.8
1883, ...	4.3	1890, ...	2.3	1897, ...	2.2
1884, ...	3.8	1891, ...	4.0	1898, ...	4.4
1885, ...	4.0	1892, ...	3.5	1899, ...	4.2
1886, ...	3.3	1893, ...	4.2	1900, ...	2.8
1887, ...	4.5	1894, ...	2.6	1901, ...	5.3
1888, ...	3.1	1895, .. .	4.9	MEAN, ..	3.7

As a general basis for calculating the average annual value of Irish crops, the following Table, prepared by Sir Robert Giffen for the Financial Relations Commission, affords a careful estimate:—

QUANTITY AND VALUE OF IRISH CROPS (1889–1893).

CROP.	Average Annual Produce.	Average Price Assumed.	Annual Value of Crops.
	Thousand Cwt.	Per Cwt. s. d.	Thousand £
Wheat, ...	1,266	7 0	443
Oats, ...	18,345	6 6	5,962
Barley, ...	3,051	7 0	1,068
Bere and Rye, ...	184	6 6	59
Beans and Pease, ...	87	6 6	29
Flax, ...	314	55 0	864
	Thousand Tons.	Per Ton. s. d.	
Potatoes, ...	2,669	60 0	8,007
Turnips, ...	4,287	12 0	2,572
Mangold, ...	722	15 0	542
Hay, ...	4,555	58 0	13,210
Total Estimated Value of the Crops, ...			32,576

Rates of Produce of the Crops.

The estimates as to the rates of produce of the crops are necessarily open to more objection on the grounds of strict accuracy than statistics, for example, as to the areas under crops. The yield of the crops depends not only on the character of the soil and the degree of intensiveness of the cultivation, but also upon climatic and seasonal influences, and consequently it is the resultant of many variants. Hence, no absolutely trustworthy produce figures can be obtained over a large area without such an expenditure of labour and money as the results, when attained, would hardly justify. At the same time, I see no reason to doubt the substantial truth of the produce statistics here given, for, as already stated, they are obtained by the Enumerators from practical farmers and other persons qualified to form an opinion on the subject, and there seems to be no solid ground for attributing any bias, either in the way of exaggerating or underestimating the yield of their crops, to those who kindly supply the Enumerators with the returns.

Comparing the produce of the cereal crops in 1901 with the produce in 1900, we find a decrease in wheat of 113,656 cwts., or 12.6 per cent.; in bere, of 337 cwts., or 13.5 per cent.; in pease of 513 cwts., or 8.6 per cent. with an increase in oats of 271,377 cwts., or 1.5 per cent.; in barley of 136,131 cwts., or 4.9 per cent.; in rye of 3,809 cwts., or 2.6 per cent.; in beans of 3,169 cwts., or 7.3 per cent. In green crops, potatoes show an increase of 1,530,382 tons, or 83.1 per cent.; turnips, an increase of 457,874 tons, or 10.3 per cent.; mangel wurzel and beet-root, an increase of 265,198 tons, or 22.3 per cent.; and cabbage, an increase of 19,677 tons, or 4.4 per cent. Flax shows an increase of 495,148 stones of 14 lbs., or 30.4 per cent. (following an increase of 483,620 stones, or 42.2 per cent. in 1900; an increase of 69,404 stones, or 6.5 per cent., in 1899; a decrease of 87,707 stones, or 7.5 per cent., in 1898 as compared with 1897; a decrease of 483,213 stones, or 29.3 per cent., in 1897 as compared with 1896; a decrease of 304,173 stones, or 15.6 per cent., in 1896, as compared with 1895; a decrease of 1,490,281 stones, or 43.3 per cent., in 1895, as compared with 1894; and an increase of 980,112 stones, or 39.8 per cent., in 1894, as compared with 1893); hay from clover, sainfoin, and grasses under rotation, a decrease of 59,549 tons, or 4.4 per cent.; and hay from permanent pasture or grass not broken up in rotation, a decrease of 414,677 tons, or 10.8 per cent.; the entire hay crop showing a decrease of 474,226 tons, or 9.1 per cent.

The yield per acre of cereal crops in 1901, as compared with that of 1900, shows an increase in wheat from 16.7 cwts. to 18.3 cwts.; in oats from 15.8 cwts. to 16.2 cwts.; in barley from 16.0 cwts. to 18.0 cwts.; in bere from 14.1 cwts. to 14.4 cwts.; in rye from 12.8 cwts. to 13.7 cwts.; in beans, from 19.0 cwts. to 20.8 cwts.; in pease, from 13.5 cwts. to 14.8 cwts. In other crops—potatoes show an increase from 2.8 tons to 5.3 tons; turnips an increase from 14.9 tons to 16.9 tons; mangel wurzel and beet root, from 17.2 tons to 18.8 tons; and cabbage, from 10.4 tons to 10.7 tons. Hay from clover, sainfoin, and grasses under rotation shows a decrease from 2.2 tons to 2.1 tons; and the yield of hay from permanent pasture or grass not broken up in rotation, a decrease from 2.5 tons to 2.2 tons. The yield per acre of flax was 38.3 stones, against 34.3 stones in 1900, 32.7 stones in 1899, 31.2 stones in 1898, 25.6 stones in

1897, and 22.8 stones in 1896, and 20.5 stones in 1895, when the yield was lower than in any year since 1871, with the exception of 1877.

STATEMENT showing the Estimated TOTAL PRODUCE and YIELD per Acre of the principal CEREALS in the year 1901, with comparative Statements for the year 1900, and for the Average of the ten years 1891–1900, for the United Kingdom, and for each country separately. The figures for England, Wales, Scotland, and Great Britain, have been supplied by the Board of Agriculture of England.

WHEAT.

	Estimated Total Produce.		Acreage.		Estimated Yield per Acre.		Average of the Ten Years 1891–1900.
	1901.	1900.	1901.	1900.	1901.	1900.	
	Bushels.	Bushels.	Acres.	Acres.	Bushels.	Bushels.	Bushels.
England, ...	49,882,667	49,528,385	1,617,721	1,744,556	30.84	28.39	29.91
Wales, ...	1,156,673	1,332,299	46,882	51,654	24.67	25.79	24.24
Scotland, ...	1,418,262	1,779,125	36,225	48,832	39.15	36.43	37.08
Great Britain, ..	52,457,602	52,639,809	1,700,828	1,845,042	30.84	28.53	29.93
Ireland, ...	1,470,127	1,682,284	42,934	53,821	34.24	31.26	31.33
United Kingdom,	53,927,729	54,322,093	1,743,762	1,898,863	30.93	28.61	29.97

BARLEY.

	Estimated Total Produce.		Acreage		Estimated Yield per Acre.		Average of the Ten Years 1891-1900.
	1901.	1900.	1901.	1900.	1901.	1900.	
England, ...	49,557,593	50,977,265	1,635,426	1,645,022	30.30	30.99	33.03
Wales, ...	3,016,334	3,341,872	101,907	105,048	29.60	31.81	30.26
Scotland, ...	8,533,696	7,995,373	235,115	240,195	36.30	33.29	35.79
Great Britain, ..	61,107,623	62,314,510	1,972,448	1,990,265	30.98	31.31	33.13
Ireland, ...	6,530,716	6,225,782	161,534	173,996	40.43	35.78	38.34
United Kingdom,	67,638,339	68,540,292	2,133,982	2,164,261	31.70	31.67	33.53

OATS.

	Estimated Total Produce.		Acreage.		Estimated Yield per Acre.		Average of the Ten Years 1891-1900.
	1901.	1900.	1901.	1900.	1901.	1900.	
England, ...	67,863,053	73,604,178	1,831,740	1,860,513	37.05	39.56	40.38
Wales, ...	6,490,336	7,238,305	208,773	216,447	31.09	33.44	33.18
Scotland, ...	35,752,141	34,005,054	956,389	949,128	37.38	35.83	36.19
Great Britain, ..	110,105,530	114,847,537	2,996,902	3,026,088	36.74	37.95	38.47
Ireland, ...	51,069,002	50,289,663	1,099,335	1,105,050	46.45	45.51	43.61
United Kingdom,	161,174,532	165,137,200	4,096,237	4,131,138	39.35	39.97	39.90

The above estimates redound to the credit of our Irish farmers, as well as emphasize the natural richness of certain districts of Ireland for grain raising, and also the differences of soil and climatic conditions between this country and Great Britain. In considering their significance regard must be had to the comparatively small areas under wheat and barley. It will be noticed that Scotch farmers with a still smaller area under wheat, succeed in raising, on an average, fully 5 bushels per acre more than is raised in Ireland; while in the case of barley, of which cereal 73,000 more acres were grown last year in Scotland than in Ireland, the estimated yield per acre for this country was but 4 bushels more than that recorded for Scotland. It is probable, again, that there is no soil in the United Kingdom more suitable for growing good barley crops than certain districts of the County Wexford, the Cloyne district of County Cork, and portions of Lower Ormond, in North Tipperary.

As illustrating the difference of gross yield in the "extensive" farming of a new country as distinguished from "intensive" culture, the following statement showing the estimated yield of the chief cereals in bushels per acre for the United States, the United Kingdom, and Ireland in the year 1897 is of interest:—

AVERAGE YIELD per Acre (Bushels), 1897.

—	United States.	United Kingdom.	Ireland.
Wheat, ...	13.0	29.1	28.7
Barley, ...	23.8	32.9	34.0
Oats, ...	26.0	38.8	39.8

In regard to green crops, while Ireland more than holds her own in the case of turnip production per acre, the estimate of the yield of the potato crop in this country is remarkably lower than that of England. It must be remembered, however, that the area under potatoes in Ireland is, on an average, between three and four hundred thousand acres more than the same area in England.

ESTIMATED YIELD per Acre (Tons) of certain Crops. Average for Ten Years 1889–1898.

CROPS.	England.	Wales.	Scotland.	Great Britain.	Ireland.	United Kingdom.
Potatoes, ...	6.05	5.75	5.74	5.95	3.57	4.58
Turnips, ...	12.69	15.13	15.26	13.43	14.53	13.59

Number of Holdings and Number of Occupiers.

According to the returns for 1901, the number of separate holdings was 590,175, being 3,458 more than in the previous year. The holdings which decreased in number were those "above 5 and not exceeding 15 acres" by 333; those "above 50 and not exceeding 100 acres" by 169; those "above 200 and not exceeding 500 acres" by 33; and those "above 500 acres by 11." The holdings which increased in number were those "not exceeding 1 acre" by 2,480; those "above 1 acre and not exceeding 5 acres" by 701; those "above 15 and not exceeding 30 acres" by 561; those "above 30 and not exceeding 50 acres" by 206; and those "above 100 and not exceeding 200 acres" by 56.

Size of Holdings.	Number in 1900.	Number in 1901.	Increase or Decrease in 1901.	
			Increase.	Decrease.
Not exceeding 1 Acre, ...	71,848	74,328	2,480	—
Above 1 and not exceeding 5 Acres,	62,154	62,855	701	—
„ 5 „ 15 „ ..	154,751	154,418	—	333
„ 15 „ 30 „ ..	133,530	134,091	561	—
„ 30 „ 50 „ ..	74,049	74,255	206	—
„ 50 „ 100 „ ..	57,576	57,407	—	169
„ 100 „ 200 „ ..	23,051	23,107	56	—
„ 200 „ 500 „ ..	8,219	8,186	—	33
Above 500 Acres, ...	1,539	1,528	—	11
Total, ...	586,717	590,175	3,458	—

As in many instances landholders occupy more than one farm, and as in other cases farms extend into two or more townlands—the portion in each townland being enumerated and classified as a separate holding—it has been considered desirable, with the view of ascertaining the number of Occupiers, and of classifying them according to the total extent of land held by each, to obtain a return of the number of persons having more than one farm or holding. Each Enumerator is, therefore, required to furnish the name of every landholder residing in his district who has two or more farms, or whose farm extends into two or more townlands, together with the area of each portion and the locality in which it is situated. From the number of actual occupiers thus arrived at, it appears that in 1901 there were 590,175 holdings in the hands of 543,238 occupiers.

The number of separate holdings and the number of occupiers in each province in 1900 and 1901, respectively, were :—

Provinces.	Number of Separate Holdings.		Numbers of Occupiers.	
	1900.	1901.	1900.	1901.
Leinster, ...	128,325	129,901	116,104	116,721
Munster, ...	134,340	136,168	122,780	123,436
Ulster.	201,280	201,403	189,559	187,904
Connaught, ...	122,772	122,703	116,116	115,177
Total, ...	586,717	590,175	544,559	543,238

The total number of occupiers of land returned in 1901 was 543,238, being 1,321 less than in the previous year. Excluding those holding land "not exceeding one acre," who are to a great extent merely occupiers of small gardens, the landholders numbered 470,004 in 1901, or 3,452 less than in 1900, the number in Leinster having decreased by 505—from 92,039 in 1900 to 91,534 in 1901 ; in Ulster by 2,198—from 170,743 in 1900 to 168,545 in 1901 ; and in Connaught by 830—from 109,646 in 1900 to 108,816 in 1901 ; but increased in Munster by 81—from 101,028 in 1900 to 101,109 in 1901. There was a decrease of 3,750 in occupiers holding land above 1 and not exceeding 50 acres, and the number holding land exceeding the latter acreage increased by 298.

The following statement shows the number of occupiers of land in each year from 1895 to 1901 by provinces :—

Provinces.	Number of Occupiers in the Year.						
	1895.	1896.	1897.	1898.	1899.	1900.	1901.
Leinster, ...	111,573	111,856	112,722	113,687	117,651	116,104	116,721
Munster, ...	116,758	117,170	117,175	117,974	121,604	122,780	123,436
Ulster, ...	187,967	188,337	187,963	187,837	188,742	189,559	187,904
Connaught, ...	115,575	115,680	115,654	115,860	116,157	116,116	115,177
Ireland, ...	531,873	533,043	533,514	535,358	544,154	544,559	543,238

The number of holdings "above 1 and not exceeding 5 acres" diminished enormously between 1841 and 1901. In Leinster the decrease was 64.6 per cent. ; in Munster, 78.8 ; in Ulster 80.2 ; in Connaught, 87.5 ; and in all Ireland 79.8 per cent. In the same period holdings "above 5 and not exceeding 15 acres" diminished ; the decrease in all Ireland was 39.0 per cent. In Leinster the decrease was 45.0 per cent. ; in Munster, 68.3 ; and in Ulster 36.6 ; while in Connaught, on the other hand, these holdings increased 2.1 per cent. Holdings "above 15 and not exceeding 30 acres" increased 6.1 per cent. in Leinster ; 113.3 per cent. in Ulster ; and 486.0 per cent. in Connaught ; they decreased 12.2 per cent. in Munster. In all Ireland they increased 69.0 per cent. Holdings "above 30 acres" increased

119.4 per cent. in Leinster; 245.3 in Munster; 361.5 in Ulster; 427.7 in Connaught; and 238.3 per cent. in all Ireland. The total number of holdings "above 1 acre" decreased between 1841 and 1901 by 22.5 per cent. in Leinster; 30.7 per cent. in Munster; 23.2 in Ulster; 25.5 in Connaught, and 25.4 in all Ireland.

The question of cultivation on a small and on a large scale has always occupied the attention of economists, and is, beyond doubt, one of great social and economic importance. The difficulties of any international comparisons as to size of holding, are, however, very serious. "That the average size of a farm in France is 12½ acres, while in the United States it is 137, shows simply (it has been well said) that the two systems of agriculture are entirely different—nothing more."* This applies not merely to comparisons between different countries, but also, though probably in a less degree, to comparisons of different periods in the same country. The gradual substitution of pasture for tillage which has marked the last half century in Ireland was necessarily accompanied by a consolidation of holdings and a proportionate increase in the number of the larger-sized farms. Not many people, perhaps, realize the full extent of this great transformation in rural Ireland. With a view to bringing out its magnitude and significance, I have prepared a table showing the number of each class of holdings above one acre; the percentage of each class to the total of holdings above one acre; and the decrease by decades in the number of holdings. It will be seen from this Table that, while in 1841 holdings between 1 and 15 acres were 81.5 per cent. of the total of holdings above 1 acre, in 1901 they were but 42.1 per cent. On the other hand, holdings between 15 and 30 acres have increased from 11.5 per cent. of the total of holdings above an acre in 1841 to 26.0 in 1901; and those above 30 acres in the same period from 7.0 to 31.9. In the decade 1841-51—the famine decade—the number of holdings above 1 acre shows the remarkable decline of 120,864—the decrease of those between 1 and 5 acres reaching the extraordinary figure of 222,353. In succeeding decades the decreases are respectively—1,854; 24,342; 17,399; 9,731, and finally 1,165 between 1891 and 1901. From 1851 to 1891 there was a gradual decline in the absolute number of holdings between 15 and 30 acres, though the percentage of this class of holding to the total holdings above an acre has increased from 24.8 per cent. in 1851 to 25.9 in 1891, while between 1891 and 1901 there has been a small increase in number and percentage, viz., 144 and 0.1 respectively. The holdings above 30 acres, have, on the contrary, continuously increased both absolutely and relatively to the total number of holdings above one acre. In 1851 the number of this class of holding was 149,090, and the percentage of the total holdings above 1 acre 26.1; in 1901 the numbers were 164,483, and the percentage 31.9. The increase of large farms (that is, those above 30 acres) between 1841 and 1901 has been at the following rates per cent. in the different provinces:—Leinster, 119.4 per cent.; Munster, 245.3 per cent.; Ulster, 361.5 per cent.; and Connaught, 427.7 per cent. The following comparative statement is of interest in this connection:—

	1841.	1891.
Persons engaged in Agriculture, ...	1,844,000	937,000
Farm Labourers, Farm Servants (Males), ..	1,229,000	258,000
Holdings between One (1) and Thirty (30) Acres,	643,000	354,000

* Mayo-Smith—*Statistics and Economics*, 1899, p. 152.

The following is the Table to which reference is made above:—

TABLE showing the SIZE OF FARMS in IRELAND.

—	Number.	Per Cent.	Decrease in No. of Holdings per Decade.
1841.			
Above 1 Acre and not exceeding 5 Acres, ..	310,436	44.9	—
„ 5 Acres „ „ 15 „ ..	252,799	36.6	—
„ 15 „ „ „ 30 „ ..	79,342	11.5	—
„ 30 „	48,625	7.0	—
Total above 1 Acre	691,202	100.0	—
1851.			
Above 1 Acre and not exceeding 5 Acres, ..	88,083	15.5	—
„ 5 Acres „ „ 15 „ ..	191,854	33.6	—
„ 15 „ „ „ 30 „ ..	141,311	24.8	—
„ 30 „	149,090	26.1	—
Total above 1 Acre	570,338	100.0	120,864
1861.			
Above 1 Acre and not exceeding 5 Acres ..	85,469	15.0	—
„ 5 Acres „ „ 15 „ ..	183,931	32.4	—
„ 15 „ „ „ 30 „ ..	141,251	24.8	—
„ 30 „	157,833	27.8	—
Total above 1 Acre	568,484	100·0	1,854
1871.			
Above 1 Acre and not exceeding 5 Acres ..	74,809	13.7	—
„ 5 Acres „ „ 15 „ ..	171,383	31.5	—
„ 15 „ „ „ 30 „ ..	138,647	25.5	—
„ 30 „	159,303	29.3	—
Total above 1 Acre	544,142	100.0	24,342
1881.			
Above 1 Acre and not exceeding 5 Acres ..	67,071	12.7	—
„ 5 Acres „ „ 15 „ ..	164,045	31.1	—
„ 15 „ „ „ 30 „ ..	135,793	25.8	—
„ 30 „	159,834	30.4	—
Total above 1 Acre	526,743	100.0	17,399
1891.			
Above 1 Acre and not exceeding 5 Acres ..	63,464	12.3	—
„ 5 Acres „ „ 15 „ ..	156,661	30.3	—
„ 15 „ „ „ 30 „ ..	133,947	25.9	—
„ 30 „	162,940	31.5	—
Total above 1 Acre	517,012	100.0	9,731
1901.			
Above 1 Acre and not exceeding 5 Acres ..	62,855	12.2	—
„ 5 Acres „ „ 15 „ ..	154,418	29.9	—
„ 15 „ „ „ 30 „ ..	134,091	26.0	—
„ 30 „	164,483	31.9	—
Total above 1 Acre	515,847	100.0	1,165

No statistics, unfortunately, of the relative portions of the area of culti-

vated land comprised in each of the above group of holdings are available for Ireland. This proportion would have to be taken into consideration before the full significance of the distribution of farms in this country could be appreciated. The following Table, taken from the French *Statistique Agricole*, 1897, brings out the importance of this point, and is of interest in itself. The details given are for the year 1892 :—

—	No. of Farms.	Area in Hectares.	Per Cent. of No.	Per Cent. of Area.	Average Size (in Hectares).
Under 1 Hectare (2½ Acres) ..	2,235,405	1,327,300	39.2	2.7	0.59
1 Hectare to 10 (2½-25 Acres) ..	2,617,558	11,244,700	45.9	22.8	4.29
10 to 40 Hectares (25-100 Acres) ..	711,118	14,313,400	12.5	29.0	20,13
Over 40 Hectares (over 100 Acres,) ..	138,671	22,493,400	2.4	45.5	162.21
	5,702,752	49,378,800	100.0	100.0	8.65

This Table shows that, while nearly two-fifths of all French farms are below one hectare, or two and a-half acres, this class of holding covers only slightly more than two and one half per cent. of the cultivated area of the country. It will further be seen that the most important category of holdings in France seems to be that of farms from one to ten hectares. These farms cover more than one-fifth of the total area under cultivation, and are close on half the total number of holdings. The average farm in France is, it will be noticed, about twenty-two acres; in Great Britain the average farm is sixty-three acres; and in England as much as sixty-five acres. Some interesting results bearing on the size of holdings were brought out by the agricultural statistics of Belgium collected in 1895. From these very full returns it appears that the number of agricultural holdings in Belgium was 572,550 in 1846; in 1866 it had increased to 744,007, or by 30 per cent. From 1866 to 1880 the increase went on by more than 166,000, or 22.4 per cent. But the number of farms, which had increased to 744,007 in 1866, and from that to 910,386 in 1880, falls in 1895 to 829,625, a decrease of nearly 81,000, or 8.8 per cent. On the other hand, the average size of the Belgian farms has increased in recent years. In 1846 the average plot was 4.54 hectares; it fell in 1866 to 3.57 hectares; in 1880 to 2.90 hectares; while in 1895 it rose to 3.14 hectares. It appears further from the official returns of Belgium that, while the number of holdings has been declining since 1880, what may be called the medium farms (five to ten hectares) and large farms (ten to twenty hectares) are increasing, especially the latter. A marked increase in the number of Belgian farms above twenty hectares is also revealed by these statistics, which show generally a significant arrest of that division of property which had gone on in Belgium without interruption till 1880, and a correlative tendency towards the concentration of land in the hands of medium and large proprietors.

Live Stock.

An examination of the tables devoted to Live Stock will show that 64,773 cattle were added to our Irish herds in 1901. This forms the highest total—4,673,323—ever recorded for Irish cattle since these agricultural statistics have been first collected. The increase, it will be seen, has been progressive since 1895. Pigs have, on the other hand, declined very considerably. At the period of the enumeration in 1901, the total number of horses in Ireland was 564,916, being a decrease of 2,062 compared with

the number for 1900. There was a decrease of 17,271 in the number "two years old and upwards," but an increase of 9,243 in the "one year old and under two," and of 5,966 in those "under one year." The number of Mules was 28,882, or 1,796 less than 1900, and the number of Asses 238,980, being a decrease of 3,267. Horses, Mules, and Asses taken together numbered 839,903 in 1900, and 832,778 in 1901, being a decrease of 7,125, or 0.8 per cent. in the latter year; compared with the average number for the ten years 1891-1900, they show a decrease of 28,541, or 3.3 per cent. As bearing on the relative position of Ireland and other countries in regard to the proportion of her flocks and herds to each 1,000 acres of their total areas, the following Table, prepared by Major P. G. Craigie and quoted in a paper read by him as President of the Economic Section of the British Association in 1900, is of interest:—

	Per 1,000 Acres of Total Area.			
	Persons.	Cattle.	Sheep.	Swine.
Ireland, ...	219	230	215	60
Scotland, ...	220	64	390	7
Hungary, ...	232	85	100	92
Denmark, ...	248	186	115	88
France, ...	293	103	164	48
Switzerland, ...	311	132	27	57
Austria, ...	320	117	43	48
Wales, ...	345	147	685	50

On this Table Major Craigie commented as follows:—

"Thus Wales bears easily the palm as regards the total stock of sheep carried, while Ireland, with a population practically bearing a similar ratio to that of Scotland to her surface, has more than three times as dense a stock of cattle and more than eight times as many pigs, although not more than half as many sheep, to 1,000 acres. Although beaten as regards the number of pigs maintained in a given area by Denmark and by Hungary, Ireland's cattle are more than twice as numerous, relatively, as those of France, where the population is not so very different in proportion to the soil."

This is certainly satisfactory so far as the Live Stock columns in the Table are concerned. Taking a wider survey of time, but confining the Table to Ireland, it will be seen that the decline in population has been as continuous as the increase in cattle.

Per 1,000 Acres of Total Area.

Year.	Persons.	Cattle.	Sheep.	Swine.
1851, . . .	315	143	102	52
1861, . . .	279	167	171	52
1871, . . .	260	191	203	78
1881, . . .	249	195	156	53
1891, . . .	226	214	227	66
1901, . . .	219	230	215	60
Net Change, .	−96 = 30·5%	+87 = 60·8%	+113 = 110·8%	+8 = 15·4%

The number of Sheep in 1901 was 4,378,750, being 8,126 less than the

number for the previous year, but 51,947, or 1.2 per cent. more than the average for the ten years 1891-1900, the "one year old and upwards" increased 405, as compared with the number in 1900, while those "under one year" decreased by 8,531, or 0.5 per cent. Pigs were returned as 1,219,935 in 1901, showing a decrease of 49,386, or 3.9 per cent., as compared with the previous year. The "one year old and upwards" increased by 31,145, or 23.0 per cent., while those "under one year" decreased by 80,531, of 7.1 per cent. Comparing the number of Pigs returned in 1901 with the average for the ten years 1891-1900, we find a decrease of 78,782, or 6.2 per cent. The number of Goats in 1901 was 312,409, being 6,331 more than in 1900, and 343 or 0.1 per cent. under the average for the ten years 1891-1900. Poultry numbered 18,810,717 in 1901, being 263,410 more than in 1900, and 1,906,463, or 11.3 per cent., over the average for the ten years 1891-1900. Of the 18,810,717 Poultry in 1901, 1,124,975 were Turkeys; 1,962,359 Geese; 3,040,880 Ducks; and 12,682,503 ordinary Fowl. Compared with 1900 Turkeys increased by 16,333, Geese decreased by 45,360, Ducks increased by 13,770, and ordinary Fowl increased by 278,667.

The following statement shows the number of Milch Cows in Ireland in each year from 1854—the first year in which Milch Cows were separately enumerated—to 1901. The average number for the first five years of the period was 1,579,851, and for the last five years, 1,450,106, being a decline of 129,745, or 8.2 per cent. The highest number in any one year was 1,690,389 in 1859, and the lowest 1,348,886 in 1864. The number for last year was 1,482,483, being 42,915 over the average for the preceding five years, and 24,409 over the number for 1900. The number of Milch Cows enumerated for 1901 was higher than that for any year since 1879.

STATEMENT showing the number of Milch Cows in Ireland in each year from 1854—the first year in which the Milch Cows were separately enumerated—to 1901, with the Proportion per cent. each year to the Total Cattle enumerated.

YEARS.	No. of Milch Cows.	Proportion per Cent. to Total Cattle enumerated.	YEARS.	No. of Milch Cows.	Proportion per Cent. to Total Cattle enumerated.
1854, ..	1,517,672	43.4	1878, ..	1,484,315	37.2
1855, ..	1,561,296	43.5	1879, ..	1,464,818	36.0
1856, ..	1,579,529	44.0	1880, ..	1,398,047	35.6
1857, ..	1,605,350	44.3	1881, ..	1,392,012	35.2
1858, ..	1,635,409	44.6	1882, ..	1,399,005	35.1
1859, ..	1,690,389	44.3	1883, ..	1,402,324	34.2
1860, ..	1,626,453	45.1	1884, ..	1,356,585	33.0
1861, ..	1,545,165	44.5	1885, ..	1,417,423	33.5
1862, ..	1,486,835	45.7	1886, ..	1,418,644	33.9
1863, ..	1,396,924	44.4	1887, ..	1,394,135	33.5
1864, ..	1,348,886	41.3	1888, ..	1,384,771	33.8
1865, ..	1,387,448	39.7	1889, ..	1,363,781	33.3
1866, ..	1,482,616	39.6	1890, ..	1,400,527	33.0
1867, ..	1,521,053	41.0	1891. ..	1,442,268	32.4
1868, ..	1,476,339	40.5	1892, ..	1,451,059	32.0
1869, ..	1,506,038	40.3	1893, ..	1,441,329	32.3
1870, ..	1,529,024	40.2	1894, ..	1,447,441	33.0
1871, ..	1,545,662	38.9	1895, ..	1,433,988	32.9
1872, ..	1,551,784	38.2	1896, ..	1,429,795	32.4
1873, ..	1,528,136	36.8	1897, ..	1,434,925	32.1
1874, ..	1,491,375	36.2	1898, ..	1,431,192	31.9
1875, ..	1,530,366	37.2	1899, ..	1,443,855	32.0
1876, ..	1,532,974	37.2	1900, ..	1,458,074	31.6
1877, ..	1,522,811	38.1	1901, ..	1,482,483	31.7

A more accurate idea of the number of Live Stock produced in Ireland is furnished when we take into account the export trade, the extent of which is shown in the subjoined statement:—

Exports of Live Stock from Ireland to Great Britain.

Average of 3 Years.	Cattle.	Sheep.	Pigs.
1854, 5, and 6, ..	242,280	482,830	241,293
1864, 5, and 6. ..	331,417	367,486	408,740
1874, 5, and 6, ..	634,052	783,007	440,423
1884, 5, and 6, ..	691,234	632,196	425,509
1894, 5, and 6, ..	766,707	782,328	580,925
Year 1901, ..	642,638	843,325	596,129

The growth in the export trade between 1855 and 1875 is remarkable, as is also the expansion in the export trade of sheep and pigs in recent years. Another aspect of the extent of the trade is presented in the Table that follows:—

TABLE showing the Percentage of CATTLE, SHEEP, and SWINE Exported from Ireland to Great Britain to the Total Cattle, Sheep, and Swine enumerated as in Ireland in each of the Years 1891 to 1901.

YEAR.	Percentage of Cattle, Sheep, and Swine Exported to Total Cattle, Sheep, and Swine in Ireland.		
	Cattle.	Sheep.	Swine.
1891, ...	14.2	18.9	36.8
1892, ...	13.8	22.4	45.0
1893, ...	15.4	25.1	39.6
1894, ...	18.8	23.3	42.1
1895, ...	18.2	16.7	40.9
1896, ...	15.5	18.1	43.5
1897, ...	16.7	19.3	52.4
1898, ...	17.9	19.4	47.0
1899, ...	17.1	20.0	50.5
1900, ...	16.2	19.7	56.4
1901, ...	13.8	19.3	48.9

A very large proportion of the export trade in cattle is a store cattle trade. In 1901 the proportion of fat cattle to stores was 261,690 of the former to 344,954 of the latter. About 46.3 per cent. of the total stores exported go to Scotland, while as much as 74.2 per cent. of the total cattle shipped to Scotland are store cattle. In fact it would appear from these figures that a large number of Scotch farmers must have given up breeding stock of their own since they find such a supply of young cattle raised on Irish pastures ready to their hand—a fact that would, in a measure, explain the very high percentage of the cultivated land of Scotland which is under the plough. The extensive pasture lands of this country enable the farmers of Great Britain, and especially those of Scotland, to forego, to a great extent, the trouble and expense of raising young stock. The frames of the store cattle exported from Ireland are built up out of our Irish grasslands—the animals

being fattened and "finished" in Great Britain. This interesting instance of a territorial divison of labour, within the sphere of agriculture, between different countries, affords evidence, for one thing, of the fine bone-producing qualities of the great limestone plains of Ireland. At the same time so great an expansion of the export trade in store cattle as has now taken place involves an exhausting drain on a great natural resource of the country.

Forestry.

Only about 1½ per cent. of the total area of Ireland is under woods, while there is over 23 per cent. of uncultivated land in the country. The woods in England are 5.1 per cent., in Scotland 4.5, and in Wales 3.8 per cent. of the total areas. Dr. Schlich, in his Report on the Afforestation of Ireland, 1885, estimates that about 2,000,000 acres of the total waste land of this country could be made available for plantations. Professor Fisher, of the Royal Indian Engineering College, endorses this view, and adds:—"Tenants and graziers who would oppose the planting of 2,000,000 acres of the waste lands of Ireland, must be extremely short-sighted people; the greatest of all wants in Ireland is an investment of capital of this kind, an investment which will yield an enormous return in affording labour to the people, and in supplying raw material for industries which cannot prosper without it, as well as timber for export, and for the improvement of farms and dwellings."* There is annually imported into the United Kingdom from Sweden, Norway, Russia, and other countries timber valued at over nine millions sterling, of a kind that could be grown in these islands, that is eliminating such exotic woods as teak, mahogany, and the hard woods of Australia. In view of these considerations, it is unsatisfactory to find that there has been a net decline of 30,117 acres since 1880.

Inquiries relative to woods and plantations, showing the extent in acres of each class of timber, were made in connection with the Census of 1841. The following is a summary of the acreage under each kind of tree (exclusive of detached trees) in that year, distinguishing the periods in which the trees were planted:—

Period in which Planted.	Oak.	Ash.	Elm.	Beech.	Fir.	Mixed.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Previous to 1791, ..	22,784	2,677	497	939	1,612	76,587	105,096
1791—1800, ..	1,493	927	135	384	1,243	22,399	26,581
1801—1810, ..	1,327	689	134	342	2,691	31,087	36,270
1811—1820, ..	1,393	679	131	279	5,496	42,878	50,856
1821—1830, ..	1,342	442	140	730	7,684	51,456	61,794
1831—1840, ..	1,197	628	380	600	6,513	55,689	65,007
TOTAL, ..	29,536	6,042	1,417	3,274	25,239	280,096	345,604

Since 1851 (with the exception of the year 1852) the acreage under woods and plantations has been ascertained annually in connection with the Agricultural Statistics; but until the year 1891 the total extent was the only information sought for, no particulars as to the kind of trees having been obtained. In that year returns giving the latter information were collected and the results were published in a Table showing by counties the distribution of the various descriptions of trees.

* See *Lecture on Forestry*, given before the Royal Dublin Society, March 3, 1899.

The following Table shows the acreage under woods and plantations in the year 1851, and in each year from 1853 to 1901, inclusive:—

ACREAGE under WOODS and PLANTATIONS.

Year.	Statute Acres.	Year.	Statute Acres.	Year.	Statute Acres.
1851	304,906	1868	322,258	1885	329,447
1852	No Return.	1869	320,461	1886	329,662
1853	305,221	1870	320,853	1887	329,363
1854	308,352	1871	324,990	1888	331,587
1855	306,476	1872	325,703	1889	326,343
1856	306,086	1873	323,656	1890	327,461
1857	313,817	1874	322,208	1891	311,554
1858	313,271	1875	318,665	1892	309,586
1859	318,874	1876	324,152	1893	307,386
1860	315,324	1877	329,536	1894	309,276
1861	316,597	1878	328,687	1895	308,928
1862	317,345	1879	336,846	1896	307,407
1863	317,134	1880	339,858	1897	307,441
1864	318,983	1881	328,703	1898	307,661
1865	322,152	1882	328,999	1899	308,495
1866	327,890	1883	331,245	1900	311,648
1867	323,420	1884	332,006	1901	309,741

The above statement shows that, during the period 1851-1901, the number of acres under woods and plantations varied from 304,906 in 1851 to 339,858 in 1880, and that, comparing 1901 with 1851, there has been an increase of 1.6 per cent., the extent in 1851 being 304,906 statute acres, and in 1901, 309,741 acres.

The inquiries into forestry operations instituted in 1890, and continued in the nine following years, were repeated in 1901. During the year ended 30th June, 1901, 1,740 acres were planted with trees, 1,111 acres more than the extent planted in the preceding year. In connection with this subject, it may be here mentioned that from the passing of the Act 29 and 30 Vic., cap. 40, to the 31st March, 1901, 137 loans, for £32,005, were sanctioned for planting for shelter, and of this number four loans for £955 were sanctioned in the last year of that period. The number of trees felled, both for clearance and for thinning plantations, amounted to 941,132. The area returned as cleared is 1,212 acres.* Of the trees felled, 462,481 were used for "propping," which appears to have been the chief purpose to which the timber of almost all descriptions was applied. The numbers applied to the principal specified uses comprise also:—13,722 trees for sleepers, 24,712 for paling, 27,101 for fuel, 14,893 for furniture and building purposes, 4,981 for carts, wagons, etc., 8,550 for telegraph and telephone poles, and 3,615 for clog soles.

In addition to the information regarding the total area under woods and plantations, returns were obtained in 1901 showing the proportion of the area entered under this heading occupied by each of the various kinds of

* It will be noticed that while, according to the Table quoted above, there would appear to have been a decrease of 1,907 acres under woods and plantations, from these forestry statistics there would, on the contrary, appear to have been an increase of 528 acres under woods. This is a somewhat serious discrepancy, but there are very considerable difficulties in ascertaining the area under woods and plantations from a very large number of persons, many of whom are imperfectly acquainted with the acreage under timber on their holdings.

trees. According to these returns, 46,175 acres of the total area (309,741 statute acres) under Woods and Plantations were under Larch, 35,020 under Fir, 15,291 under Spruce, 3,377 under Pine, 25,158 under Oak, 7,398 under Ash, 9,826 under Beech, 2,562 under Sycamore, 2,750 under Elm, 4,002 under Other Trees, and 158,182 were returned as under Mixed Trees. The area under Woods and Plantations in Leinster was 95,447 acres; in Munster, 105,411 acres; in Ulster, 57,080 acres; and in Connaught, 51,803 acres.

Bee-keeping.

The inquiries made in the preceding fifteen years relative to the extent to which bee-keeping is followed in Ireland were repeated in 1901, and according to the returns received, there would appear to have been a decrease of 16.4 per cent. in the quantity of honey produced in 1900, as compared with the preceding year, the returns for which showed an increase of 41.7 per cent. as compared with the quantity in 1898. The quantity of honey produced, according to the returns, was 623,559 lbs.; of this, 143,368 lbs. were produced in the province of Leinster; 211,821 lbs. in Munster; 155,962 lbs. in Ulster; and 112,408 lbs. in Connaught. Of the 623,559 lbs., 403,207 lbs. were produced "in Hives having Moveable Combs," and 220,352 lbs. "in other Hives." It was stated that 260,074 lbs. was "Run Honey," and 363,485 lbs. "Section Honey." The number of stocks brought through the winter of 1900-1901 amounted to 33,171, of which 16,754 were in hives having moveable combs, and 16,417 in other hives. According to the returns collected, there were 6,743 lbs. of wax manufactured in 1900, of which 3,394 were from hives having moveable combs, and 3,349 lbs. from other hives. The returns received in 1900 gave the number of swarms at work during the season of 1899 as 23,981; the quantity of honey as 745,692 lbs.; the number of stocks brought through the winter of 1899-1900 as 31,045; and the quantity of wax manufactured in 1899 as 4,873 lbs.

THE IRISH HORSE-BREEDING INDUSTRY.

Irish-bred horses enjoy world-wide celebrity. As "stayers" in the hunting field and as weight carriers in steeplechases, they have won enviable repute, and their great wealth of bone and unquestioned stamina and mettle are to-day, as many years ago, the admiration of equine enthusiasts the world over. To have Ireland as its birthplace is reckoned as one of the best credentials which a hunter can possess, and, all things else being equal, a horse of Irish origin will invariably find a purchaser at a substantially better price than that of any other country.

To what is this universally acknowledged excellence of the Irish-bred hunter due? Much has been written upon the subject, and the number of opinions expressed upon the point have been so varied as to be quite perplexing. Some authorities attribute it to the special suitability of the soil of the greater part of the country for the production of big-boned, light horses; others claim the credit for the Irishman's inherent love of a good horse, and his consequent good judgment and discernment in the selection and perpetuation of animals possessing the best characteristics of the type which he favours. Others, again, will have no other explanation than that the Irishman is naturally partial to "a bit of blood," and, as a result, depends very largely upon the thoroughbred for imparting the necessary quality, pluck, and endurance to the animals bred by him.

In none of these views, however, is the correct solution of the question to be found, though it cannot be denied that all three help to play an important part in the evolution of the Irish hunter. More important than any of them—possibly more important than all three put together—is the influence exercised by the mares by which these hunters are produced. There are other countries than Ireland in which the soil is largely calcareous; there are others than Irishmen in whom the love of a good horse is not an unknown quantity; and there are certainly other parts of the kingdom in which thoroughbred sires are much more extensively employed than in Ireland; yet in none of these countries do we find light horses possessing anything like the grand combination of speed, stamina, and carrying power for which the Irish hunter has always been famous.

Why this failure elsewhere to breed hunters able to hold their own with those emanating from Ireland? In the opinion of the writer, the explanation is to be found in the lack of the mares which form the foundation upon which the structure of Irish hunter-breeding rests. It is customary to accord the credit for much of the admitted excellence of the Irish-bred hunter of the present day to the thoroughbred sire by which he is, in a good many cases, got; and no one with any knowledge of the subject will for a moment question the beneficial influence exercised by the thoroughbred sire in this connection. But, in considering this matter, it should not be overlooked that long before the thoroughbred had been heard of Irish hunters had acquired an international celebrity, and had been largely exported to different European countries for use in the studs of the noble

and the wealthy there. This shows that the reputation of the Irish hunter is not of to-day or yesterday, and that it has been acquired not altogether so much through the medium of the thoroughbred, as is sometimes supposed.

The "Old Irish Mare."

What manner of mare, it may be asked, is this famous "old Irish" dam to which the Irish hunter is said to owe so much? Broadly speaking, she is of medium size, 15.1 to 15.2 in height, short in her back, powerfully knit across the loin, and well-developed in her hind quarters. In general outline she is of the low and roomy type; she stands close to the ground, is very muscular in her fore-arm, and clean and flat in her bone below the knee. Though so deep and well balanced in outline as to give the impression of being on the small side, she covers a lot of ground, and her legs are devoid of anything approaching the nature of "feather." As a rule, the head is fine and clean cut in outline, though "coarseness" is more frequently seen in this than in any other part of the body. The neck is long, the shoulder well laid, and, as becomes mares specially adapted for the production of high-class saddle-horses, the withers are high and the ribs well sprung. The brief outline thus given of her general appearance would not go to represent the Irish mare as possessing many special attributes calculated to distinguish her as a hunter-breeder. Thousands of mares possessing the same points in equal perfection are to be met with all over the kingdom, yet they do not possess any claims to special recognition as hunter breeders. But it is not to her looks alone but to a natural hardihood of constitution, begotten of the conditions under which she is kept and the work at which she is engaged, that the progeny of the Irish mare are indebted for many of the good qualities possessed by them. Quite a large percentage of the mares by which Irish hunters are produced are the property of small farmers, who use them for every class of work on their holdings—for ploughing or harrowing one day, for hauling heavy loads of farm produce the next, and on the third, perhaps, for driving to market at an eight or nine miles an hour trot. The land being for the most part light, the farms small, and the number of purposes for which the horses are required varied, it naturally follows that the type cultivated is of medium size and "handy" at the performance of such work as the animals are called upon to perform. Seldom very generously fed, and usually obliged to "rough it" in all weathers these mares have acquired a hardiness, a staying power, and a physical fitness which stands to them in good stead in their capacity as breeders. The result is the evolution of the clean-limbed, hardy, active, and spirited type of horse which has done so much to help the Irish hunter in establishing its great reputation.

Unfortunately for the country, the breeding of these "old Irish" mares has not hitherto received the attention which it merited. Numbers of them have a dash of thoroughbred blood in them, but the majority are got by sires of such mixed breeding that from the standpoint of pedigree they are but mere mongrels. This has told very much against the development of the hunter-breeding industry in Ireland, because it has rendered the business so precarious as to deter many from entering upon it. The uncertainty of hunter-breeding as at present carried on is proverbial. But it is only natural. Stockowners of experience do not require to be reminded that, in breeding animals of any kind, no definite results can be counted on unless the materials used—the sires and dams employed—are purely bred. A

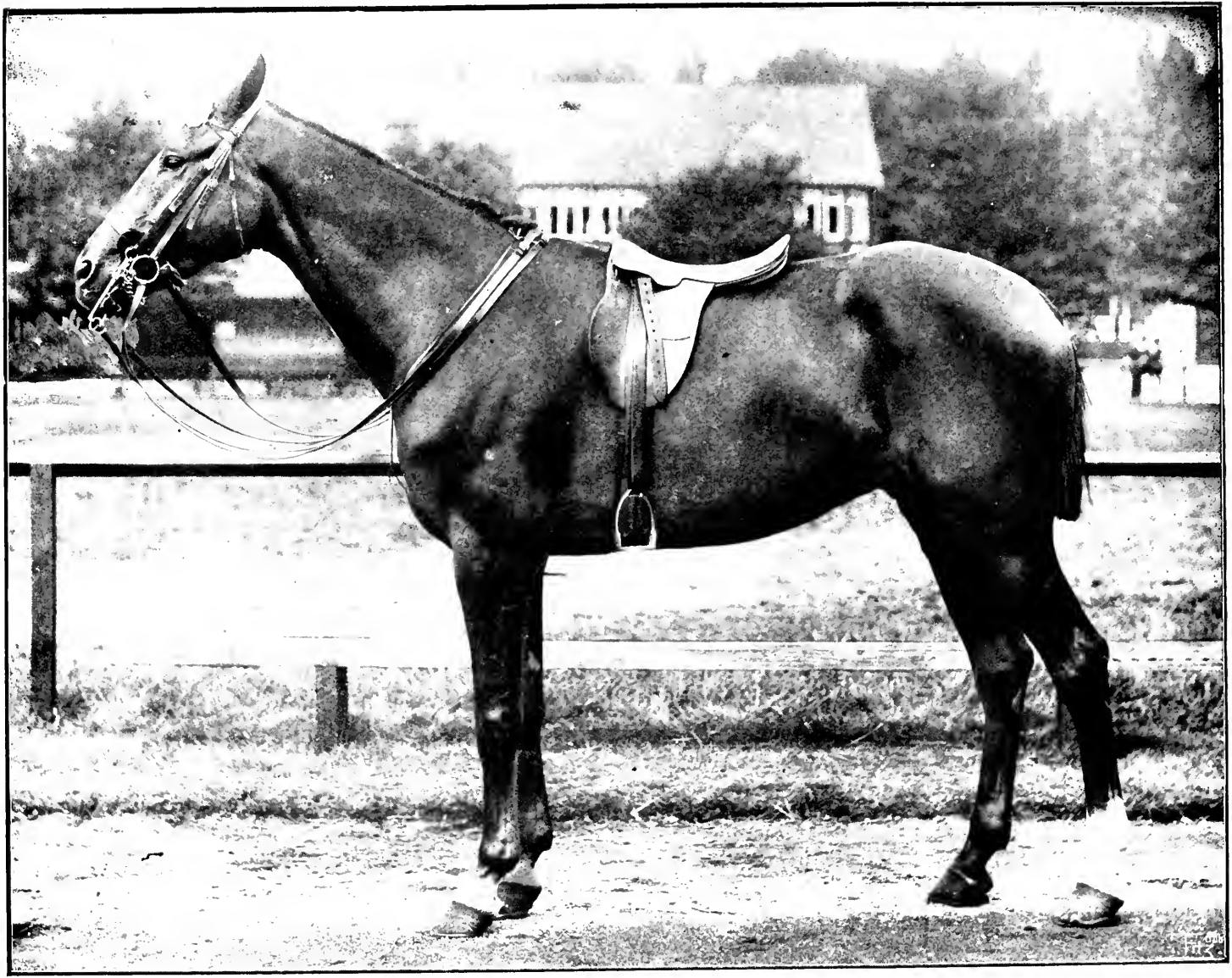
breeder can never tell what type of animal he will have presented to him as a result of the union of unpedigreed parents; the progeny may "throw back" to an ancestor of several generations previously, and thus present points or characters altogether at variance with those which might have been expected from the appearance of the sire and dam. So it is with hunter-breeding; and so it will be unless steps are taken to found or establish a breed of mares possessing the necessary pedigree, and capable of imparting size and substance to their progeny—points in which Irish mares have always excelled.

Because of the great reputation which the Irish-bred hunter has earned abroad, there is a very general impression that it is only for the production of hunters that Ireland is worthy of notice as a horse-breeding country. This is far from being the case. Famous though the country is for its hunters, the number of animals of this class annually produced bears but a small proportion to the number of other horses bred. Last year [1901] the number of horses in Ireland was about 565,000, and of these it may be assumed that 100,000 were brood mares. Of the 70,000 odd foals produced by these mares, it is safe to assume that not more than ten per cent. will ever change hands as hunters; of the remainder, the great bulk will become vanners, troopers, carriage horses, or animals retained for general purpose work on the thousands of small farms which stud the country. A certain percentage will also be of the heavy, cart-horse type; but the number of heavy horses bred in the country is very small—remarkably so in comparison with the corresponding figures for England and Scotland.

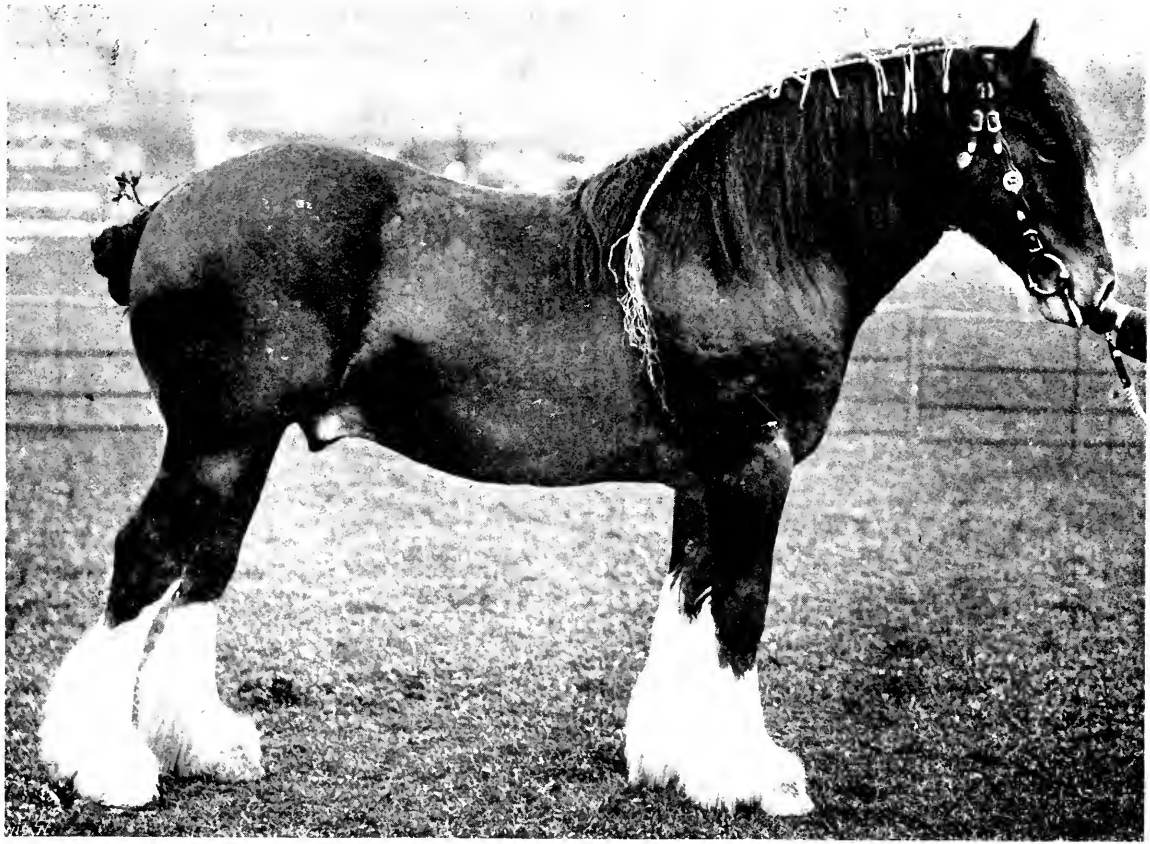
Except in a few districts in the neighbourhood of the larger towns, the breeding of cart-horses of the Clydesdale and Shire type is but little carried on in Ireland. Sires of these breeds have been tried in many districts, and in some places they have been found to give good results by imparting more substance to the native stock; but the advantage of the influence exercised by them in this direction has been confined to localities in which the soil is heavy and the farms of fairly large size. Over the greater part of the country neither of these conditions holds, and wherever the farms run small and the land light the smaller, smarter, and more generally useful native cart-horse continues to more than hold its own against its massive rivals, the Clydesdale and the Shire.

These native cart-horses are of very mixed breeding. They are got, for the most part, by common "country sires," and the latter are bred *every way and anyway*. Some of them have a dash—often very remote—of the thoroughbred in them, and in many districts some are not altogether free from an admixture of Clydesdale or Shire blood; but, whatever their breeding, it is generally conceded that for whatever merits they possess as stock-getters they are principally indebted to the strong infusion of "old Irish" blood which they inherit. It is to this that their progeny chiefly owe the strong, clean bone, the hardy constitutions, and the great grit and determination which Irish-bred horses are noted for displaying when called upon to perform any particularly trying class of work.

It is from the ranks of these "promiscuously-bred" light horses that the majority of the animals which are sold every year at Irish fairs as troopers, vanners, and carriage horses are recruited. Many of these, troopers, vanners, and general purpose light horses, are, it is true, got by thoroughbreds; when the gets of thoroughbred sires fail to pass muster as hunters they are sent to join the common throng, and are known in the trade as "mis-fits."



TYPE OF WEIGHT-CARRYING HUNTER.



TYPE OF HIGH-CLASS AGRICULTURAL STALLION.

Occasionally, very fine heavy-weight hunters are got by these common sires when mated with half-bred mares, but, as is well known, tip-toppers of this type are distinctly the exception. The majority of the animals owning these country stallions as sires are usually found wanting in one or other of the prime essentials of a high-grade hunter, and when they come to be marketed they have to take their places, not with the chosen few likely to run into three figures, but with the less aristocratic, if not less useful, group to be sold as troopers, vanners, and general purposes light horses.

Though the Hackney has come very much to the front in Great Britain during the past fifteen or twenty years, it cannot be said to have yet made very much progress in the country. That there is a great prejudice against it in the principal hunter-breeding districts is indisputable. A five minutes' conversation with any one practically interested in hunter-breeding in Ireland usually suffices to afford convincing evidence of this. So far, the Hackney's sphere of influence has been almost entirely confined to the North. The breed is practically unknown in the South: the writer has been a regular visitor to all the Shows held in Ireland during the past fifteen years, and in that time he does not remember to have even once seen a Hackney at a Show held South of Dublin. Some years ago the Congested Districts Board for Ireland introduced a number of Hackney sires with the object of improving the horses and ponies kept by the small farmers and cottiers living along the western coast, but the results do not appear to have altogether justified the expectations entertained by its admirers regarding the usefulness of the Hackney for that purpose. For the present the influence of the breed may be said to be confined to a few districts in Ulster, and even there the extent to which it is kept is but small in comparison with other breeds.

Irish Ponies.

In addition to the thoroughbred, the Shire and Clydesdale, the native cart horse, and the Hackney, there are also to be found in Ireland several races of ponies or small cobs. Among these special mention deserves to be made of the Connemara and the Cushendall ponies—the first-named, a native of the bare, bleak moors of Western Galway and Mayo, and the other a native of the mountainous districts of North Antrim. Neither of these has, unfortunately, been bred on systematic lines: both may, indeed, be described as the natural products of evolution and environment. Of the two the Connemara is the best known. Animals of this breed are inclined rather to the cob than the true pony in the matter of size. In their native haunts many of them stand up to 14 hands 1 inch and 14 hands 2 inches, and when sold as yearlings and transferred to good land they frequently grow to a height of fully 15 hands. Connemara ponies are to be obtained in all colours: grey seems, however, to be the prevailing shade. On account of the lack of systematic selection in their breeding they cannot be described as of a fixed or definite type. Some are long and loosely made in outline, while others are short, stout, and quite cobby in build. They are all, however, remarkably hardy, and are possessed of more speed than is usual in animals of their class. They are also noted for their staying powers: in this respect, indeed, they excel. One of them will go through a long and fatiguing day's work, in saddle or harness, and will turn out next morning in as fresh and fit a condition as if it had not been in harness for a week. Though not noted for any brilliancy of action (showy action could not reasonably be looked for in view of the conditions

under which the breed has been developed), Connemaras are proverbially sure-footed, and there is reason to hope that, with the exercise of more care and attention in their selection and breeding, they may yet work their way to the front as one of the most generally useful of the larger breeds of ponies in the kingdom. Already good results have been obtained by crossing them with small thoroughbreds for the production of polo ponies: when they come of the right type from this breeding, they have the reputation of being second to none for smartness, lasting power, and "general intelligence" in the polo field.

According to the official returns, there were in Ireland last year (1901), 565,000 horses of all kinds. Horse-breeding has long played a very important part in Irish farming systems; but considering the great change which has taken place in the agriculture of the kingdom at large during the past half century, the position of this industry in Ireland must be regarded as having undergone very little alteration in that time. In the year 1850, the number of horses in Ireland was 526,757, and at no period in the intervening years did the numbers fluctuate to any remarkable extent, though the usual influences of supply and demand led to repeated variation in the numbers bred from decade to decade. High water mark in the country's history as a horse-breeding centre was reached in 1895, when the official returns show Ireland's equine population to have amounted to 630,287. The subjoined Table shows the average numbers of horses in the country at each decennial period since 1851:—

Year.	No. of Horses in Ireland.
1851,	521,706
1861,	614,232
1871,	538,095
1881,	548,354
1891,	592,819
1901,	564,916

The official returns do not give any clue to the respective numbers of the various breeds or types of horses in the country. All the information as to classes available is that a certain number were employed for agricultural purposes, a certain number for traffic and manufactures, and a certain number for recreation and amusement. The figures given under this heading for last year are as under:—

Agricultural purposes,	354,750
Traffic and manufactures,	46,443
Recreation and amusement,	27,043
One and under two-year olds,	73,691
Under one-year olds,	62,989
Total,	564,916

Though no particular county or district can be said to enjoy special distinction for the production of any of the breeds of horses already referred to as bred in the country, Ireland may be divided into four separate horse-breeding areas. These may be arranged as under:—

(1.) The eastern seaboard from Wexford to Londonderry, for heavy cart horses;

(2.) The midland and southern counties—in fact the whole country south of the Boyne—for hunters;

(3.) The greater part of Ulster, for "general purpose" horses; and,

(4.) The western seaboard—principally Galway and Mayo—for ponies.

These divisions must not be regarded as at all absolute, for many good hunters are bred in the North, just as some good heavy horses are produced in some of the best hunter-breeding districts in the South. Speaking generally, the following counties may be regarded as most noted for the production of the different types:—

HUNTERS.—Cork, Limerick, Tipperary, Waterford, Wexford, Carlow, Kildare, Meath, Westmeath, Galway, and Roscommon.

HEAVY CART HORSES.—Dublin, Louth, Antrim, Down, and Londonderry.

GENERAL PURPOSES LIGHT HORSES.—The whole country.

PONIES.—Western Galway and Mayo, and North Antrim.

Though complaints about the decadence of the Irish-bred hunter have been frequently heard during the past twenty years, there is reason to believe that at no date within the memory of the present generation was the horse-breeding industry of the country in such a healthily vigorous condition as at the present time, and there is also good reason for the assertion that at no period for many years was the outlook for the future so full of promise. Through the medium of an annual public grant of £5,000 heretofore administered by the Royal Dublin Society, much has been accomplished in the direction of encouraging breeders to pay more attention to the selection of their mares and to the use of a better class of sires, and as the Department of Agriculture and Technical Instruction for Ireland is making the improvement of horse-breeding one of the principal planks in its platform, still further advance in the same direction may be looked for within the next few years. The Department have already formulated a comprehensive scheme of stock improvement under which small farmers will be supplied with the services of sires which they could not otherwise obtain; in the case of thoroughbred sires these services will be obtainable to three guinea horses at the nominal fee of *2s. 6d.* This scheme is being worked in conjunction with the various local bodies throughout the country, and it speaks well for the enthusiasm with which the work of general stock improvement has been taken up, that all the County Councils have adopted the scheme, and are actively engaged in giving it effect in their respective localities.

THE PONIES OF CONNEMARA.

I.—THE DIFFERENT TYPES OF PONIES.

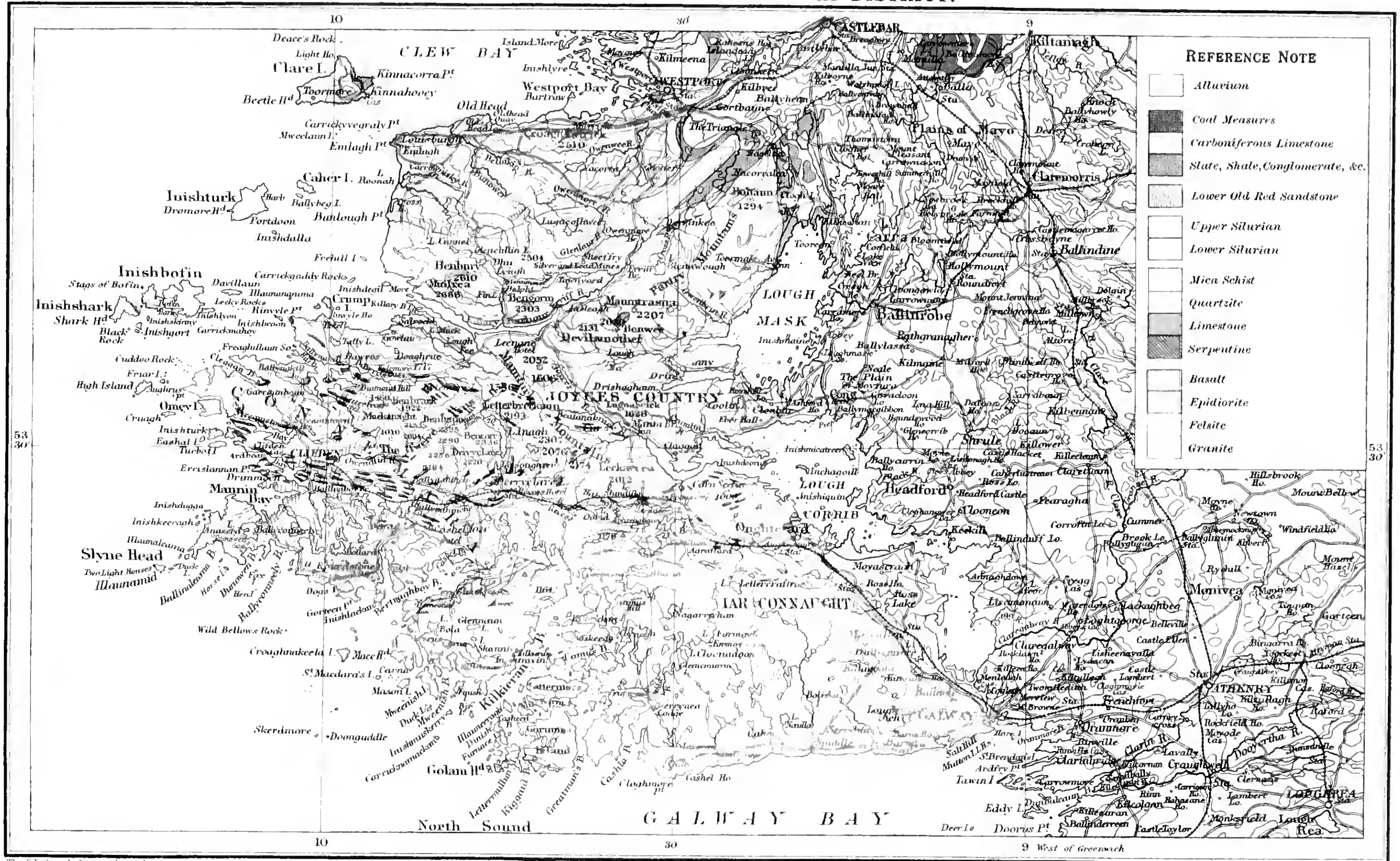
One of the first questions to be considered on proceeding to study the horses of any given area is—Do they form a distinct indigenous breed, or are they to a large extent a mixture of several imported breeds? Hitherto it seems to have been commonly taken for granted that the Connemara ponies—like some of the ponies of the Western Highlands, and Islands of Scotland—have descended from Andalusian horses which escaped in 1588 from the ships of the Spanish Armada; and further that they deserve to rank as a distinct breed side by side with the Iceland, Shetland, and Exmoor ponies. An indication of the prevailing opinion as to the ponies in question may be gathered from a recent paper* by Sir Walter Gilbey. In describing the ponies ("Hobbies") of Connemara, Sir Walter states that they are from 12 to 14 hands high, generally of the prevailing Andalusian chestnut colour, delicate in their limbs, and possessed of the form of head which distinguishes the Spanish race. "It must be regarded as remarkable," he adds, "that these ponies should retain the characteristics of their race for so long a period in a country so different from that whence they were derived. They have merely become smaller than the original race, are somewhat rounder in the croup, and are covered in the natural state with shaggy hair . . . From mere neglect many of them are extremely ugly, yet still conforming to the original type." But while regarding these ponies as essentially Spanish, Sir Walter believes they were introduced, not through the wreck of a ship, but direct by importation from England.

Had the horses of Connemara been isolated since the time of the Armada, or even since the middle of the seventeenth century—when Spanish horses, common in England, might have found their way to the West of Ireland—they would doubtless have formed ere this a perfectly distinct and fairly uniform breed. However uniform and Andalusian-like the Connemara hobbies may have been in the past, there is an amazing want of uniformity about them to-day, and as a result of this there is in the West of Ireland a complete absence of agreement as to what is or what is not a true Connemara pony.

This is exactly what might have been expected, for, in the first place, long before the Congested Districts Board set about providing hackney and other stallions, foreign blood seems to have been again and again introduced; and in the second place, no one has yet done for the Connemara ponies what the late Mr. Knight did for the ponies of Exmoor, or what Lord Londonderry and others have done for the Shetland ponies—

* Ponies (their past and present history), "Live Stock Journal" Almanack, 1896, p. 45.

GEOLOGICAL MAP OF CONNEMARA DISTRICT.



Scale 10 Miles to an Inch

0 5 10 15 20

The Edinburgh Geographical Institute

J. G. Bartholomew.

no one has yet blended the more marked characteristics of the various kinds of Connemara ponies into a distinct strain or breed.

During a recent visit to the West of Ireland I had the opportunity of seeing something of the native ponies, the conditions under which they are reared and maintained, and the kind of work they are called upon to perform. Soon after reaching Connemara, I was struck with "the strength, endurance, and easy paces" of the ponies, with their intelligence and docility, and with the capacity for work under conditions which would speedily prove disastrous to horses reared under less natural conditions. But, as already indicated, I ascertained that even amongst the so-called real Connemara ponies (*i.e.* ponies which claim no kin with what are familiarly known as "Congested" horses recently introduced), there is an all but complete absence of uniformity alike in size, make, colour, and disposition. From what I saw of the ponies between Maam Cross and Leenane and at, or on the way to Cashel, Carna, Clifden, and other centres, I have come to the conclusion that the Connemara ponies, instead of forming one breed, may be said to belong to five fairly distinct types, which may be known as—

(1.) The Andalusian type;
(2.) The Eastern type;
(3.) The Cashel type;
(4.) The Clydesdale type; and
(5.) The Clifden type.

1.—The Andalusian Type.

This group includes what some would probably call the original or old Connemara breeds. In many ways the members of this section resemble ponies still to be seen in Andalusia, but they also bear an even more striking resemblance to some of the New Forest ponies. They vary from 12 to 13 hands; some are black, others grey or chestnut, but the most characteristic specimens are of a yellow dun colour. Fig. 1 represents the most typical member (a yellow dun) of the Andalusian type I came across; Fig. 2 a pony of a somewhat richer yellow tint also belongs to this section, though finer in the bone and with the long pasterns often seen in New Forest ponies, while Fig. 3 is a light grey with shorter pasterns, and a measurement below the knee of 7 inches. The pony represented in Fig. 1 measures 50½ inches (12.2½ hands) at the withers, the girth is 60 inches, the length from the point of the elbow to the ground 30 inches, from the point of the hock to the ground 20 inches, and the circumference below the knee is 6½ inches. From the top of the head (occipital ridge) to a line connecting the upper margin of the nostrils is 20 inches; from the inner corner (*canthus*) of the eye to the upper margin of the nostrils 9½ inches, and between the inner angles (*canthi*) of the eyes 7 inches. The ear measures 5½ inches.

The ponies represented in Figs. 2 and 3 closely agree in size with the one described. All three appear to be slightly roach-backed, but this is perhaps due to their being decidedly out of condition. In many horses there is a slight rise in the back, a short distance in front of the croup, but as a rule this elevation is obscured by the spinal muscles. Barbs are sometimes

decidedly roach-backed. It is quite possible that the Connemara ponies have inherited this tendency from their Spanish ancestors.

Compared with a Barb or a Spanish Genet the three ponies described are relatively shorter in the neck and legs, deeper in the ribs, shorter in the ears, and provided with more powerful jaws. If, as commonly alleged, the Irish ponies are simply stunted Andalusian horses, they ought, one would think, to resemble fairly accurately the descendants of the Spanish horses, which some centuries ago regained their freedom in the New World. Fig. 4 represents a mouse-dun pony, believed to be a lineal descendant of the horses introduced into Mexico by Cortez early in the sixteenth century. If this figure is compared with Figs. 1 to 3 it will be evident that though constructed on the same general plan, the Connemara ponies essentially differ from their New Mexican relatives. It would hence hardly be accurate to describe the Connemara "Hobbie" as a small edition of an Andalusian horse, and yet it is quite unlike an ordinary Norwegian, Iceland, or Highland pony, and it decidedly differs from an improved Norwegian, *i.e.*, a Northern pony, that by being well fed and sheltered during colthood has reached a size of from 13 to 14 hands. It might, perhaps, best be described as a small horse, made by mounting a slightly altered Barb on pony's legs. Where, it may be asked, has this pony got its small ears, strong jaws, and short legs? Is it the result of a cross between an Andalusian sire and a native pony? Hybrids bred by crossing mares with a Zebra horse almost invariably in their ears, teeth, muzzle and legs, resemble their sire. In other respects they may be nearly intermediate in their characters, or take after their respective dams; the structures which count most in the struggle for existence being most faithfully transmitted, doubtless because they have been most thoroughly burned in. If the Connemara ponies under consideration are not, as generally assumed, stunted Spanish horses, the probability is they are the descendants of crosses between Andalusian horses and indigenous Irish ponies. It is extremely unlikely that the West of Ireland was destitute of ponies until Spanish breeds were introduced during the sixteenth or seventeenth centuries, and it is quite as unlikely that when Spanish or other breeds found their way to Ireland, they would completely displace, without intercrossing with, the native breeds.

We know that during the early "Stone Age" horses were common in Europe—the dismembered remains of thousands that served as food for Palæolithic man, lie buried in the Rhone valley—and we know that horses were common in Britain before the Roman Invasion, hence it may safely be assumed that if the horse failed to reach Ireland during the "Great Ice Age" it found its way thither soon after.

It has been long known that in Miocene times two varieties of the three-hoofed "fossil horse" Hipparion (which was sometimes 14 hands high) flourished in south-eastern Europe, and as already indicated, we know that at a later period true horses (of about the same size as Hipparion) were represented by at least two varieties in south and central Europe. It is also known that as the Glacial epoch came to an end, and the ice sheet was gradually rolled back, horses, antelopes, and other mammals pushed their way further and further north, until the area now occupied by the British Islands was eventually reached.

But in at least the case of the horse the migration northwards was accompanied by a gradual reduction in size, with the result that in the more northern areas only stunted forms survived—the ancestors of the Shetland,

FIG. II. CONNEMARA PONY AND FOAL (RICH YELLOW DUN)—ANDALUSIAN TYPE.

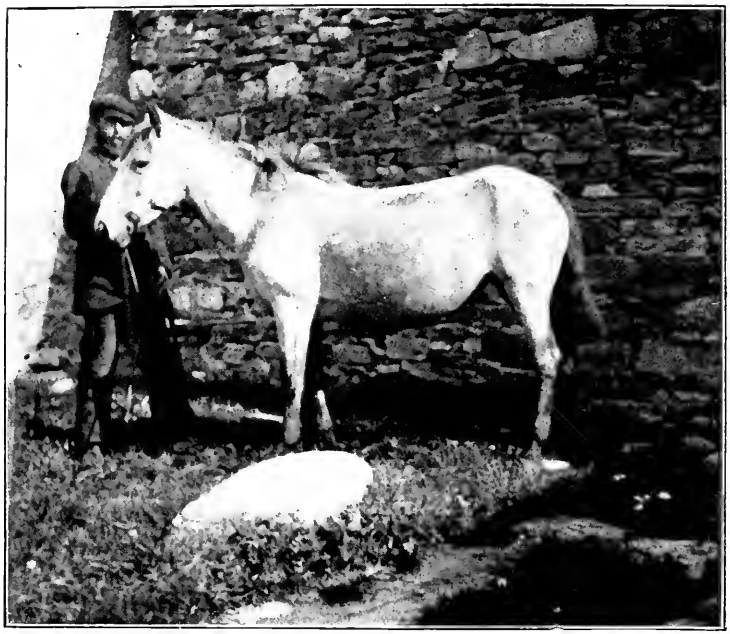


FIG. I. LIGHT GREY CONNEMARA PONY—ANDALUSIAN TYPE.

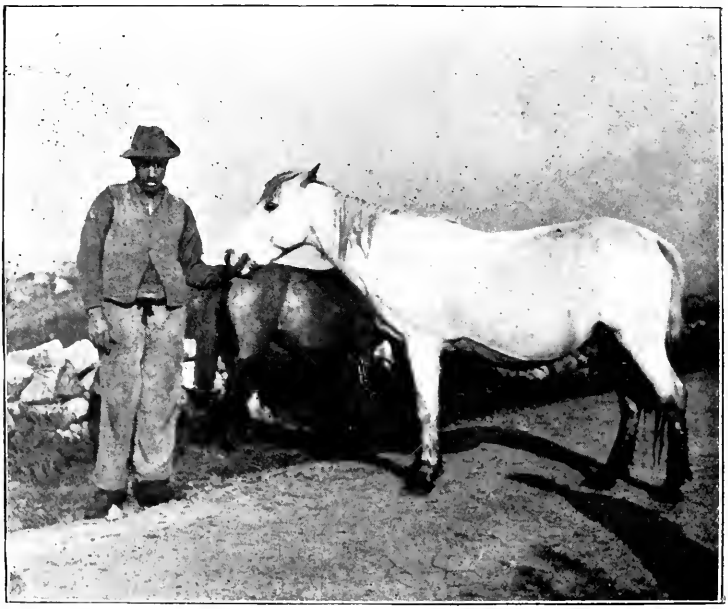


FIG. III. CONNEMARA PONY (YELLOW DUN)—ANDALUSIAN TYPE.

Iceland, and Norwegian ponies, and of various other breeds until recent times common in the more isolated portions of Great Britain and Ireland.

One of these stunted or dwarfed horses is represented in Fig. 5. It in no way either resembles a Barb or an Arab; but in the short neck,* small head, stout limbs, and relatively great girth, it strongly suggests a cart horse, of the Clydesdale rather than of the Shire breed.

The pony in Fig. 5 is a yellow dun from Iceland, measuring 48 inches (12 hands) at the withers, and 49 inches at the croup, with a girth of 62 inches. From the elbow to the ground it measures 28 inches, from the hock to the ground 17½ inches, and below the knee, 6¼ inches. The head, however, is short (18 inches from the occipital ridge to a line connecting the upper margin of the nostrils), and the ears measured along their inner surface are only 5 inches. Between the eyes the distance is 6 inches. As it happens the *mean* of the measurements of this pony and of a 14-hands Barb very closely agree with the measurements given above of the yellow dun Connemara pony. It may hence, I think, be taken for granted that the Andalusian-like "Hobbies" of Connemara are not stunted Spanish horses, but the result of a more or less perfect blending of the aboriginal West of Ireland ponies with horses introduced from the East during the mediæval times, or from Spain during the sixteenth or seventeenth centuries.

That the ancestors of all the recent *Equidæ* (Horses, Zebras, and Asses) were of a yellowish dun colour, and more or less richly striped is extremely probable.† On the other hand, it is unlikely the foreign horses introduced into the West of Ireland, either during the present or earlier centuries, were of a dun colour,‡ and though it is true that some of the descendants of the horses introduced by the Spaniards into America are duns (Fig. 4), it is more likely that the prevalence of yellow ponies in the West of Ireland is due to the majority of the aboriginal horses being of a dun colour, and, like some of the Iceland ponies of to-day, sufficiently prepotent to hand on their colouration to the majority (or to a very considerable proportion) of their descendants.

It may be added that the yellow dun-coloured Connemara ponies are highly prized in some districts, not only because they are hardy and easily kept, but also because in staying power and vitality they are more like mules than pure bred horses. Of the ponies built on the lines of the three represented (Figs. 1-3) only a remnant seems to be left, and I was informed that all the survivors at present in Connemara are mares. Two of the three ponies figured have had foals; but neither the foal (Fig. 2) said to be by a

* In mammals there is usually an intimate relation between the length of the neck and the weight of the head. In the elephant, *e.g.*, in which the head is huge, that the trunk and tusks may be effectively wielded, the neck is extremely short—relatively shorter than in any other land mammal. In the same way in the Imperial Zebra of Somaliland, in which the head is of great length, the neck is also short. The long neck in the Eastern and other horses is mainly a product of artificial selection. It has been made possible by a shortening and lightening of the jaws, and in some cases an increase in the length of the spines of the dorsal vertebrae in the region of the withers. In areas where, during part of the year, the food of wild or semi-wild horses consists of coarse hard material, only those provided with powerful jaws can survive, but where all the year round the food is comparatively soft and easily obtained the necessity for a long head and a short thick neck does not exist. In this way we may account for some of the Norwegian ponies having long coarse heads, while the Iceland ponies (where fish takes the place of coarse dry herbage and woody fibres during winter) have generally small well-moulded heads.

† *See*—"The Penicuik Experiments," by J. C. Ewart. A. & C. Black, 1899.

‡ In Southern Europe, as in Arabia, there seems to have long been a prejudice against dun-coloured horses.

Welsh Cob ("Express") nor the grey mare's foal (by "Golddigger") is a very promising specimen.

Before proceeding to refer to the other types of Connemara ponies it may be as well to indicate in what respects a pony may be said to differ from a horse. While we have no evidence that Palæolithic man possessed either horses, sheep, or cattle, there is no doubt that their Neolithic successors were accompanied in their wanderings by horses, sheep, goats, and cattle, and by at least three kinds of dogs, one built on the lines of the Irish wolf-hound. The horse that found its way into Europe (perhaps from Siberia) in primeval times was of a considerable size—which implies that the Shetland, Iceland, and other small horses have sprung from fairly large ancestors, that they are dwarfed or stunted horses, and not special creations, as was once supposed, each adapted for a definite habitat. From this it follows that a pony is nothing more or less than a small horse. Sometimes one hears it said of a particular breed that it consists more of small horses than ponies, this generally means that were the legs longer they would rank as horses. In such ponies the dwarfing has mainly affected the legs (as in Basset and some other hounds), or, as in the ponies already described, the body of some fairly large foreign breed has been mounted on the legs of a somewhat small indigenous breed. That the Shetland, Iceland, and some of the Norwegian ponies are stunted horses is at once evident if a comparative study is made of their skeletons. In the skeleton of a 38-inch Shetland pony, *e.g.*, I found that the bones of the legs were of relatively the same length as "Eclipse" and "Hermit," which, like the modern thoroughbreds, were after all only overgrown ponies. This is, however, not true of crosses between horses and ponies, in some of which the bones of the limbs are relatively too long, while in others they are relatively too short.

In some standard works a pony is defined as a horse not exceeding 52 inches (13 hands), while a horse over 52, but not exceeding 56 inches (14 hands), is classed as a Galloway. Now-a-days, mainly owing to the influence of polo, we often regard a horse measuring 58 inches at the withers as a pony. Sometimes these 14.2 hands ponies are dwarf thoroughbred or cross-bred horses, sometimes they are true ponies that by selection and improved surroundings have not only reached, but actually surpassed the size of their interglacial ancestors. If a horse measuring 58 inches, or even 56 inches, is a pony, then all the unimproved domestic and semi-wild horses of the old world may be said to be ponies, and all the wild horses striped and plain, with the exception of the Imperial Zebra (*Equus grevyi*) of Somaliland might also be classed as ponies. Evidently, in dealing with ponies, it will be found useful not only to note their size, but also to make out if possible whether they are the stunted descendants of primeval horses, *i.e.*, true ponies, or the descendants of improved horses—of thoroughbreds, Arabs, Clydesdales, etc., or half-breeds as, *e.g.*, Montana and Argentine ponies, which are often crosses between the descendants of the old Spanish horse and English thoroughbreds.

2.—The Eastern Type.

This section includes ponies which stand in very much the same relation to the desert Arab that the Andalusian section does to the Barb—an African variety of the Arab breed.

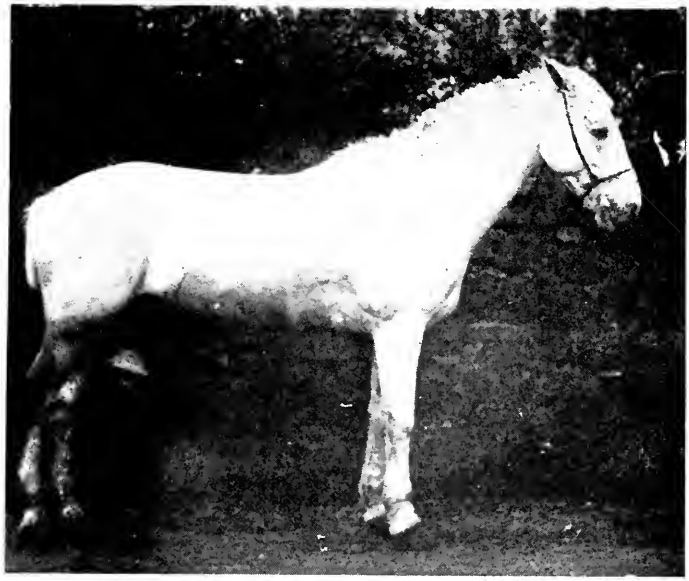


FIG. V. CONNEMARA GELDING—CASHEL TYPE.

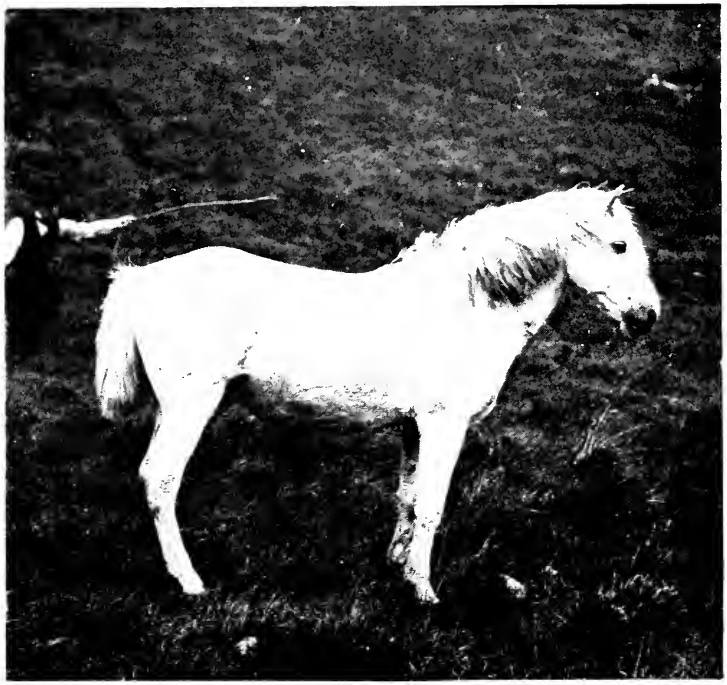


FIG. VI. CONNEMARA PONY, BRED IN THE VICINITY OF CLIFDEN.

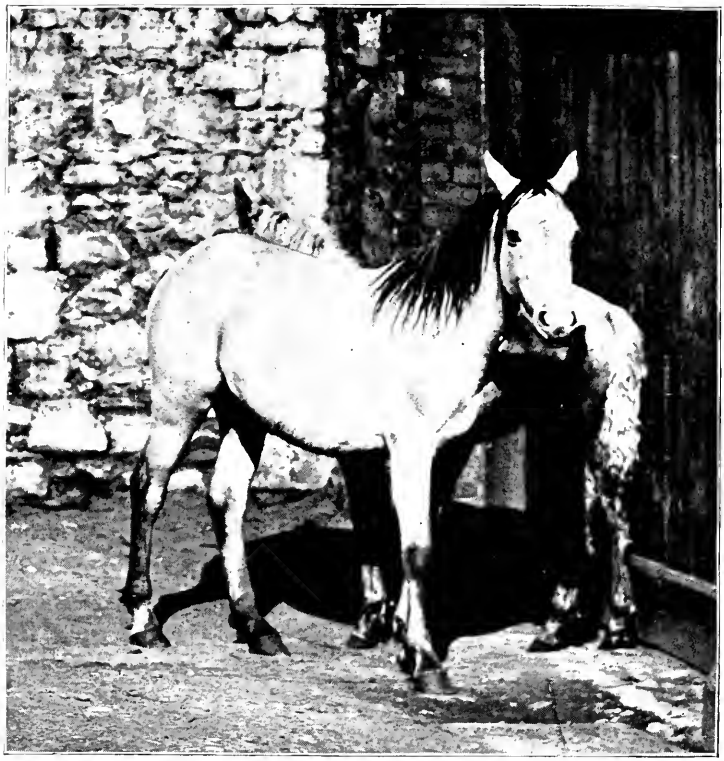


FIG. IV. LIGHT GREY CONNEMARA FILLY, RISING THREE YEARS—EASTERN TYPE.

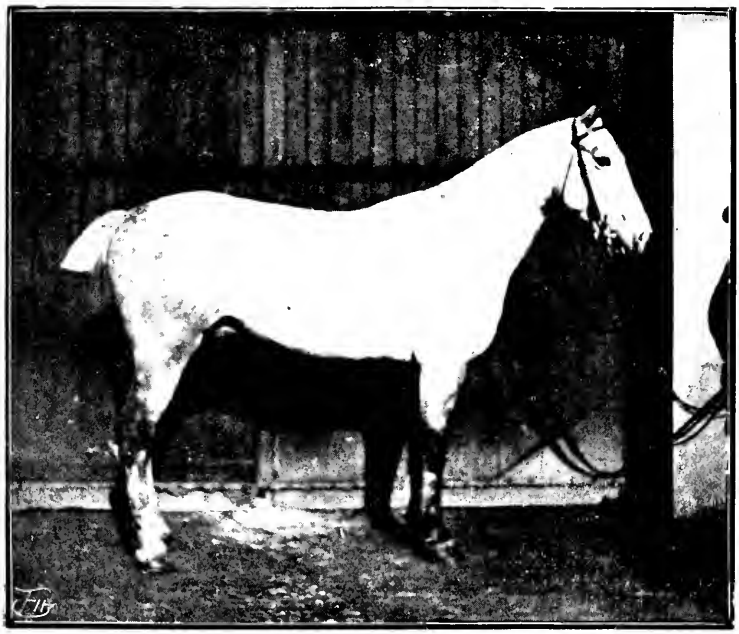


FIG. VII. A CONNEMARA PONY THAT HAS DISTINGUISHED ITSELF AS A HUNTER.

In a former generation most of the "Hobbies" of Connemara may have been of a chestnut colour; but to-day, greys, if not the prevailing colour, are at least far more common than chestnuts. That the grey colour persists when once introduced into a district is widely recognised both in England and on the Continent, more especially when it is the flea-bitten grey of an Arab.

The numerous greys in the New Forest are believed to count Arabs amongst their ancestors, while the greys so frequent amongst the Orlof trotters sometimes reproduce the characters of the Arab (Smetanka), largely concerned, more than a century ago, in establishing this famous Russian breed.

When the history of Irish horses is studied it will probably be found that Arabs were introduced into Connemara about the end of the eighteenth century, and now and again during the nineteenth century. Otherwise the resemblance to Eastern horses so often noticed in Connemara ponies could hardly be accounted for. Fig. 6 represents a light grey filly brought into the Clifden market during my visit in September. This filly, now rising three, reminds me strongly of a small Arab (Bernabit) I received some years ago from Mr. Wilfrid Scawen Blunt, and she in many ways agrees with another Arab (Fatimah), also received from the famous Crabbet Park stud.

Compared with the high-caste Arab filly, the Connemara filly is 1½ inches lower at the withers and 2 inches lower at the croup. This difference is partly due to the Arab measuring one inch longer from the elbow and half-an-inch more from the hock to the ground. In the ears, width between the eyes, length of the head, and girth, and in the hair of the mane and tail, the two fillies are nearly identical. The Arab, however, measures half-an-inch less below the knee, and is finer in the lower part of the face.*

One other difference between the two fillies ought to be mentioned, viz., the greater relative length of the neck in the case of the Arab; but in the Irish filly the tail is characteristically Arab, while the mane is lank, and clings closely to the neck; moreover, she is quite as intelligent as the Arab, as the width between the eyes so eloquently suggests.

But the Connemara filly not only seems to take a thoughtful interest in her surroundings, she is extremely gentle and good tempered. Until her arrival in Clifden she had never been handled. Haltering proved a difficult problem—she fought bravely in defence of her freedom—but when once subdued all resistance ceased, and after a few minutes' handling she was mounted.† Intelligence, good temper, and courage seem to characterise the majority of the Connemara ponies. These traits are doubtless the result of careful selection, for, as a native said, a bad-tempered, stupid pony that requires to be constantly looked after is worse than useless.

* The difference in the face is chiefly due to a difference in the teeth. The Arab filly was extremely well done during her first winter, and had plenty of hay during her second. The Connemara spent, I understand, both winters on the mountains, with the result that in the one case (the Arab) the central milk incisors of the upper jaw have been displaced by permanent incisors, while in the other all the milk incisors still persist.

† If horses are intelligent enough to have confidence in their masters, in other words, if the element of fear is eliminated, it is surprising what liberties may be taken with them even when unbroken.

A somewhat different member of the section is represented by a 14-hands, four-year-old, dark grey stallion. This horse in his head and limbs resembles the light, grey filly; but while the filly suggests a Syrian Arab, the dark grey stallion in some respects agrees with an Orlof trotter, in others with the Arab-Barb crosses often seen in Algiers. Neither the light nor the dark grey could very well have been obtained by crossing old Connemara duns (Figs. 1 and 2), with an Arab; such a cross would refine, rather than increase the bone. The Orlof trotters having mainly sprung from an Arab horse and certain Dutch mares, it occurred to me that the Syrian-like Connemara ponies might include in their ancestry not only Arabs and native ponies, but also large, strong-limbed horses belonging to other parts of Galway or to some of the adjacent counties. On making inquiry, I learned that both the dark grey stallion and the light grey filly had descended from an old grey horse still living at Cashel. This horse bears more resemblance to an Irish hunter than to an Arab, and essentially differs from the typical Connemara breeds. The history of this horse has not yet been ascertained; but that it has amongst its ancestors large-boned horses, such as Roscommon is famous for, may be safely assumed. In the size of the head, make and length of the limbs, he is not unlike a first cross between a Connemara pony and an Irish thoroughbred.

The dam of the nearly white filly is a small, grey Connemara pony; the dam of the dark grey horse is a bay Connemara pony, the sire a grey son of the old grey Cashel stallion. While in the one (the filly) Arab ancestors seem to have mainly controlled the development, Barb ancestors seem to have prevailed in the other.

With the four-year-old stallion and several carefully selected mares, it would be an easy matter to fix and perpetuate this particular type of Connemara pony, should it be thought desirable.

3.—The Cashel Type.

Two members of this type have already been alluded to—viz.:—(1) the old Cashel stallion; and (2) the sire of the dark grey stallion.

A third member of this section is a gelding. This gelding also a son of the old Cashel Stallion, has been regarded by some as one of the best and most typical living examples of a Connemara pony. It is, however, very different from the old-fashioned dun-coloured ponies (Figs. 1 and 2), and it neither forcibly suggests an Arab nor a Barb, nor yet the short-legged, highly characteristic ponies (Clifden variety) described below. The gelding figured is a very hardy pony, strong and willing when in harness, and pleasant and safe to ride.

The typical members of the Cashel group are characterised by a long head, high withers, and long forelegs, in all of which points they differ from Arabs. They also differ from Arabs in having short ears—in this only may they be said to agree with typical ponies. In the gelding the measurements are as follows:—Ears, 5¼ inches; head, from occipital ridge to line between upper margin of nostrils, 21 inches; between the eye and the nostril, 11 inches; between the eyes, 7½ inches; height at withers, 56

inches; length from elbow, 34 inches; and from hock, 22 inches; girth, 60 inches; and circumference below knee, 7½ inches.

In measuring 11 inches from eye to nostril, and 34 inches from elbow to ground, and in having a girth of only 60 inches, the Cashel type departs decidedly from the pony standard, and in having fairly high withers—a result of a large head, and not of a greater obliquity of the shoulders—they are unlike typical Eastern ponies. At the present moment a considerable proportion of the Connemara ponies are the offspring of the old Cashel stallion. When at his best he seems to have been noted for his strength, speed, and great staying power, and for his impressiveness as a sire. Of his direct descendants I only heard of two stallions of any note; but both, like their aged sire, are past their best.

Were enquiry made it might be found that there are a considerable number of mares belonging to this section of the Connemara ponies. Carefully selected mares built on the Cashel lines would, I believe, produce excellent stock if put to a good Arab. One of the great advantages of the Connemara ponies is that they have not suffered from in-and-in breeding, hence—unless they happen to be naturally prepotent—they readily assimilate the more marked points of other breeds. Mares built on the lines of the yellow-dun would probably produce excellent stock to a not over-potent Arab, or a stout, short-legged, hardy-reared seven-eighths thoroughbred.

4.—The Clydesdale Type.

In a run through Connemara one sees at rare intervals stout, cob-like ponies that seem to combine the characters of a deer-stalker's pony and of the now all but lost Douglas breed of horses—ponies capable of carrying heavy loads, and when occasion requires covering great distances at a fair speed.

One of these ponies is represented in Fig. 11, a second and a better stallion I saw in the Joyce country, and a third in Clifden. They are said to inherit their strong limbs, great girth, and powerful loins from Clydesdale sires introduced thirty or forty years ago. This explanation is supported by the wealth of hair at the fetlocks, by the small head, and by the offspring varying considerably—sometimes presenting gaudy colours—*e.g.*, a white bald face, such as one frequently sees in even fashionably-bred Clydesdales.

All the three seen were black, or nearly black, and of about the same size. One of them measures 14 hands, and has a girth of 70½ inches. The head is small (20½ inches), with relatively short ears (6 inches). The length from the elbow to the ground is 35 inches; from the hock to the ground, 22½ inches; the circumference below the knee is 8 inches.

As two of the three cob-like stallions have been at stud for some years (one in the Clifden district, the other in the Joyce country), they have, doubtless, like the old Cashel horse, helped to considerably influence the character of the Connemara ponies.

5.—The Clifden Type

The ponies included in this section, though but little larger than the members of the Andalusian (old Connemara) type, are very different in build. The head is beautifully moulded, and the face highly suggestive of marked intelligence, the ribs are well arched, the shoulders good, and the loins and hind quarters well developed, while the short legs are so constructed that they stand an enormous amount of wear, often looking as perfect after a score of years' continuous work as in a three-year-old colt. These short-legged, stout Connemara ponies, though differing from Spanish ponies, undoubtedly belong to an old strain.

Those best acquainted with Irish ponies would probably regard the members of the Clifden section as representing the best kind of Connemara ponies, as deserving to be regarded as the most typical Connemaras existing at the present day. It is conceivable that these short-legged horses—for though sometimes barely 13 hands, they are not true ponies, *i.e.*, they are not merely stunted horses, like the Iceland and Shetland ponies—owe their characters to the blending of all the types already described; but it is also possible that while the Andalusian-like ponies sprang from a light, indigenous variety, the aboriginal ancestors of those under consideration belonged to a larger and heavier variety. If heavy horses of the Clydesdale type were only introduced some thirty or forty years ago, it is hardly likely the Clifden ponies owe their great girth and stout short legs to the introduction of Clydesdales. That they are largely saturated with the blood of the ordinary long-headed Irish horse is extremely unlikely, and it is as unlikely that they have been much influenced by recent importations of Arab blood. Hence, although their origin will probably remain a mystery, the evidence, such as it is, points either to (1) their foreign ancestors differing from the imported ancestors of the Andalusian section, or (2), to what is more likely, that there existed in the West of Ireland, as in other parts of Europe, during primeval times, a heavy as well as a light variety of the wild horse from which the indigenous ancestors of the "real Connemaras," as they are often called, originally sprang.

A typical member of this section measures 54 inches (13.2 hands) at the withers and an inch more at the croup. The head from the occipital ridge to the level of the upper margin of the nostrils measures 20½ inches, the distance between the inner canthus and the margin of the nostril 10½ inches. The ears, Arab-like in form, are 6½ inches along the inner surface. The girth is from 66 to 68 inches—the ribs being well arched. The fore-leg from the point of the elbow to the ground measures 31 inches, while from the point of the hock to the ground the length is 20 inches. Below the knee the circumference varies from 7½ to 8 inches. Judging from the ponies I saw during my visit to Connemara there is considerable variation in size amongst the members of this group. One of the most typical specimens, an old grey mare, with a remarkably intelligent face, was only 12.3 hands at the withers, while another was nearly 14 hands. It is more than likely some of the larger ponies, though conforming on the whole to the Clifden type, are related to the old Cashel horse.

That, as this mare suggests, there is a considerable blending of types in the Clifden breed, becomes more and more evident the more it is studied. Striking evidence of the blending we have in a very typical 12.3 hands flea-bitten grey mare—of her three foals one was a yellow dun, one a light grey, and one nearly black. The dun foal was said to be the best of the three; it perhaps reproduced fairly accurately the traits of the indigenous ancestors of the Clifden section of the Connemara ponies.

That the foal of grey parents is sometimes dun seems remarkable enough, but it is really no more remarkable than that the offspring of white wild cattle should be sometimes red, or the offspring of white rabbits grey, or of blue fantails being white—it is probably in most cases due to reversion to the remote ancestors controlling the development. Darwin in discussing the colour of the horse, says, "I have endeavoured, but with poor success, to discover whether duns, which are so much oftener striped than other coloured horses, are ever produced from the crossing of two horses neither of which is dun."* Had inquiries been made in the West of Ireland, many instances of dun foals from parents neither of which was of a dun colour would doubtless have been heard of.

During my visit to the West of Ireland I saw quite a number of short-legged mares that presented the more striking characters of the Clifden strain; but I neither saw nor heard of any pure-bred foals or stallions of this, in many ways, the most valuable of all the types of Irish ponies. The Clifden breed seems to me to be well worth preserving, not only because well adapted for the country, but also because it would prove invaluable for crossing with other breeds. There are nowhere else, as far as I know, in the British Islands, ponies with so much stamina as those I have included in the Clifden section. As already indicated, they are more horses on pony legs than true ponies, which implies they can be readily "improved" either by better treatment during the first winter or by crossing. Some of them crossed with Arabs would give, I believe, ideal ponies for mounted infantry, while others crossed with carefully selected hunter sires, or with hardy, non-impressive thoroughbred horses, would produce remounts for light cavalry as large as are likely to be of use in, or capable of surviving under the trying experiences of, actual warfare. When the mild climate and the extent of the moors and mountains of Connemara are taken into consideration, it may, I think, be safely asserted that Connemara could produce ponies—say one thousand annually—suitable for mounted infantry (alike in size, hardiness, staying power, and intelligence), at a lower figure than any other district in Great Britain or Ireland.

Before concluding what I have to say of the different types of Connemara ponies, I ought to refer to a small breed in process of formation in the vicinity of Clifden. The owner of these ponies informs me that he has always bred from small mares, with the result, as the figure suggests, that his stock presents all the characters of true ponies, and are hence in their build more like Shetland or Welsh ponies than the smaller members of the Clifden breed, and though about the same size, they differ considerably from the old Connemara duns (which are supposed to bear the greatest resemblance to Andalusian horses) and from upland ponies with large heads sometimes seen in the Carna district.

* "Animals and Plants under Domestication," vol. i., p. 59.

TABLE giving MEASUREMENTS of an ICELAND PONY and of the VARIOUS TYPES OF CONNEMARA PONIES

TYPE OF PONY.	Number of Figure.	Height at Withers.	Height at Croup.	Girth.	Head from occipital ridge to line between upper margin of Nostrils.	Width between Eyes (*inner canthi*).	Face from inner *canthus* of Eye to upper margin of Nostril.	Ear along inner surface.	Length from point of Elbow to ground.	Length from point of Hock to ground.	Circumference below knee.	Colour.	Sex.	Age.	Mane and Tail.
		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.				
Iceland, ...	4	48	49	62	18	6	$8\frac{3}{4}$	5	28	$17\frac{1}{2}$	$6\frac{1}{4}$	Yellow dun,	♀	6	Yellow and dark hair intermixed.
Old Connemara or Andalusian.	1	$50\frac{1}{2}$	—	60	20	7	$9\frac{1}{2}$	$5\frac{1}{2}$	30	20	$6\frac{1}{2}$	Yellow dun,	♀	aged,	Yellow and dark hair intermixed.
Eastern + Clifden, ..	6	54	$55\frac{1}{2}$	66	$19\frac{1}{2}$	$7\frac{3}{4}$	$10\frac{1}{4}$	6	33	22	$7\frac{1}{4}$	Light grey,	♀	$2\frac{1}{2}$	Fine black silky hair.
Eastern + Cashel, ..	7	56	—	65	20	8	$10\frac{1}{2}$	$5\frac{1}{2}$	33	$22\frac{1}{2}$	7	Dark grey,	♂	4	Coarse black hair.
Cashel, ...	8	56	—	60	21	$7\frac{1}{2}$	11	$5\frac{1}{4}$	34	22	$7\frac{1}{2}$	Nearly white,	Gelding.	aged,	White hair of medium strength.
Cashel + Clifden, ..	9	$54\frac{1}{2}$	—	65	21	$7\frac{1}{2}$	11	$5\frac{1}{2}$	33	21	$7\frac{1}{2}$	Dappled grey,	♀	aged,	White hair of medium strength.
Cashel + Eastern, ..	10	55	56	66	20	$7\frac{1}{2}$	10	6	$33\frac{1}{2}$	22	$7\frac{1}{2}$	Yellow dun, showing dappling & white hairs.	♀	6	Yellow brown hair of medium strength.
Clydesdale, ...	11	56	—	$70\frac{1}{2}$	$20\frac{1}{2}$	$7\frac{3}{4}$	$10\frac{1}{2}$	6	35	$22\frac{1}{2}$	8	Dark brown,	♂	?	Strong dark hair.
Clifden (Typical Connemara),	—	54	55	68	$20\frac{1}{2}$	8	$10\frac{1}{2}$	$6\frac{1}{2}$	31	20	8	Bay,	♀	aged,	Dark hair of medium strength.
Clifden + Cashel, ..	12	56	—	67	$20\frac{1}{4}$	$7\frac{1}{2}$	10	6	34	22	$7\frac{1}{2}$	Light grey,	♀	aged,	White hair of medium strength.

II. THE ENVIRONMENT OF THE PONIES.

Size and Uniformity.

In addition to considering the races or breeds to which the ponies of any given district belong, it is necessary to take into consideration, amongst other things, the conditions under which they are bred and reared—to take cognizance of the environment as well as the ancestry. But before discussing the external conditions, I ought, perhaps, to insist again on the fact that, whatever may have been the case in the past, a distinct breed of Connemara ponies does not now exist. Amongst Arab and other Eastern breeds there is a considerable range of variation, just as there is variation amongst the oldest strains of Norwegian and other Western breeds. Nevertheless, it is generally possible at once to say whether any given horse is an Arab or a Norwegian. It is, however, difficult—in most cases impossible—to decide whether any given Irish pony has been bred in Connemara. There is uniformity amongst the desert Arabs, because, to begin with, they have almost certainly sprung from the graceful, lightly-built Eastern horse of the Post Pliocene (Diluvial) period, and because for some thousands of years the descendants of the "Al-Khamseh" ("the Five"), the so-called mares of the Prophet, have been mainly, if not exclusively, used for breeding.

Again, the Norwegian Yellow-duns are fairly uniform, because they are in all probability the direct descendants of the Western race of the Post Pliocene horse—of the sturdy, short-legged, long-headed race which ranged over the plains and valleys of Europe after the Great Ice Age came to an end.

A century ago the Connemara "hobbies" may have been a fairly uniform blend of the slender Oriental and stout Occidental races, but to-day there is a complete want of uniformity, doubtless because the people of Connemara, unlike the Anazah and other desert Arabians, have long been breeding from all sorts and conditions of mares, and have been, as a rule, strangely indifferent as to the pedigree of the stallions.

But, though more than ever uniformity is worth striving after (especially by districts ambitious to supply small horses for mounted infantry), it is not everything. Unless it is the product of centuries, or the result of extremely careful selection, it may be a positive evil. When it is the outcome of close in-and-in breeding, it but serves to cover a multitude of sins. Size, uniformity, shapeliness, and fine action are excellent, indeed indispensable, in horses taking part in pageants and in park parades, as well as in horses harnessed to well-appointed carriages, but in the small horses by which the world's work is mainly done, hardiness, endurance, nimbleness, intelligence, and docility count for infinitely more than make or action, good looks or a long pedigree. Make, docility, intelligence, and speed are largely a matter of inheritance, while endurance and hardiness are mainly the products of the surroundings. It is for this reason that active, hardy horses are found in the less barren uplands of nearly all temperate and sub-tropical areas, and that degenerate forms are often met with in certain parts of India, and in areas within the tropics where the conditions are unsuitable, and wherever there are neither sufficiently trying summer droughts nor winter frosts to eliminate the weaklings.

Have we, in the West of Ireland, and more especially in the west of Galway, an environment likely to produce, without the help of man, ponies

as large, hardy, and vigorous as the Galloways, so indispensable in many parts of England and Scotland until railways revolutionised our modes of travelling and transport?

That the size of horses, wild, feral, and domestic, is intimately related to the surroundings is widely recognised. We know, for example, that horses left to find their own food and shelter seldom exceed 44 inches in Shetland; 48 inches in Exmoor; and 50 inches in Dartmoor; and that though on the more fertile Welsh hills (as in the New Forest and some of the western islands of Scotland) a height of 52 inches is sometimes reached, yet on the more exposed and barren Welsh hill the ponies rarely measure over 48 inches at the withers.

If in England and Wales the native moor and mountain ponies, left to find their own food and shelter, are, as a rule, considerably under 13 hands, *i.e.*, are rarely within the reach of the mounted infantry standard, is there any likelihood of Connemara—in virtue of its mild winters, moist climate, and rich pastures—being able, without man's interference, to produce ponies from 13 to 14 hands, ponies which, with but little outlay during the first two winters, might easily reach a height of 58 inches?

A satisfactory answer to this question can hardly be attempted without a brief reference to the more recent ancestors of the Equidæ, and to the geology and physical features of Galway.

The more recent Ancestors of the Horse.

Up to the end of Miocene times, the ancestors of the recent Equidæ were still three-toed, and still provided with relatively short and simple molars. The three hoofs plainly indicate that the Miocene horses lived near lakes, rivers, and marshes, while the short crowns of the teeth as plainly show that they fed throughout the year almost exclusively on soft, easily crushed plants.

In the course of time the three-toed Miocene horses gave place to their larger and more highly specialised one-hoofed Pliocene descendants.

As the outer hoofs dwindled in size, the crowns of the molars (the six large cheek teeth) increased in length and complexity, with the result that the Pliocene horses were eventually splendidly adapted for moving rapidly over wide open arid plains, steppes, and plateaux, and among the foot-hills of great mountains, and for dealing with coarse dry shrubs as effectively as with grasses and soft herbage.

Since the various living breeds of the domestic horses are practically identical with their Pliocene ancestors, it follows, that in considering the suitability of any given area as a centre for breeding and rearing an active, hardy variety, it must be borne in mind that the Equidæ, far more than sheep or cattle, are adapted for leading a wandering, unfettered life, feeding, during at least a part of the year, not so much on soft grasses (which more often improve the condition than the fitness) as on various kinds of coarse, dry plants (heaths, gorse, roots, twigs, and the like) so hard and fibrous that they gradually wear down the hard enamel ridges of their long-crowned complex teeth.

The Physical Features and Climate.

To understand the physical conditions of the west of Galway, one must bear in mind that Ireland is especially characterised by a great central

plain, which occupies about two-thirds of the total area. The central plain might be described as a huge, shallow, irregular basin, floored with carboniferous limestone, and surrounded by an irregular, highly-embossed, mountainous rim, wide at some parts, narrow at others, or altogether absent (as at Galway and between Dundalk and Dublin).

Connemara forms part of the rim of the great central plain. Reference to a map shows that the outer edge of the Galway section of the rim or fringe is indented by numerous bays and channels, many of them studded with rocks and islands. In the north a long narrow channel (Killary Harbour) separates Galway from Mayo, while on the east two rock-basins (Lough Corrib and Lough Mask) separate the great plain from the most western part of its rim.

A survey of the interior of Connemara shows, in the north, a remarkable plateau—the table-land of Slieve Partry or "Joyce's Country"—and ledges and terraces, extending from Lough Mask towards Muilrea (2,688 feet high) on the Mayo side of Killary Harbour. Between the Partry table-land and Clifden lie the dome-shaped Twelve Bens or "Pins," which in Benbaun reach an elevation of 2,395 feet. East of the Pins are the Maumturk Mountains.

Between Clifden and Galway Bay in the south, hills and mountains occur in every direction. Between the mountains are numerous valleys, which sometimes expand into wide moors, often divided into irregular patches by small lakes and streams. Numerous lakelets form the meshes of an intricate network to the south of Clifden, and they are also abundant in the vicinity of the deep indentations of the south-western shore. It thus appears that, in having numerous hills and uplands, well-watered valleys, and wide moors often but little above the sea-level, Connemara provides sufficient space and variety for many wandering herds of horses.

It is, however, not so much the configuration of the country as the climate that claims consideration. The average winter temperature is said to be about the same as that of the south of Europe (44° Fahr.). This high average it owes to the Gulf Stream, which extends into the many bays and channels, and from the warm surface of which, throughout a considerable part of the year, soft moisture-laden breezes penetrate far inland, not only in the direction of Lough Mask and Lough Corrib, but also beyond the "Pins," towards the Partry table-land. The high temperature, together with the moisture, implies that grasses, heaths, and other plants begin to grow early in the Spring, remain fresh and green throughout the Summer, and retain their nutritive properties almost undiminished during the Winter. It is largely for this reason that Connemara has the advantages over the New Forest, Wales, and other pony districts in England, and also over Sardinia, Sumatra, and other Southern Islands, in which, notwithstanding the high average temperature, the naturally-reared horses are little larger than the dwarf ponies of Shetland.

The Soil and Underlying Rocks.

In selecting a district for breeding ponies under natural conditions, it is as necessary to consider the underlying rocks and the soil covering, and in most cases derived from them, as it is to direct attention to the climate and physical features.

Had all the rocks in the west of Galway consisted of quartzite like the Twelve Bens, or of granite such as occupies a wide area to the north of Galway Bay, or of metamorphosed rocks such as underlie and predispose to the formation of the extensive bogs of Mayo, Connemara would never have been famous for ponies. Green plants are incapable of growing unless supplied with lime, and they only flourish when lime is present in the soil in sufficient quantity and when it is accompanied by certain other chemical substances, such as potash and phosphoric acid. In most cases the soil is indebted for its lime to the rocks over or near which it lies. It is, however, well to remember that some limestone districts are extremely barren, while some districts destitute of limestone deposits are highly fertile, and that in some areas the whole of the soil is of foreign origin.*

In the west of Galway, notwithstanding abundant evidence of glaciation and the presence of numerous glacial deposits in the uplands as well as in the valleys, the soil has, to a very large extent, resulted from the weathering of the native rocks. According to the geological survey, a considerable number of glacial deposits occur between Lough Mask and Killary Harbour and over the low-lying area extending between the wide upper portion of Lough Corrib and the Atlantic, *i.e.*, in Connemara proper. Other patches of boulder clay occur in the southern granitic area between Connemara proper and Galway Bay. Some of these deposits doubtless consist of drift boulder clay carried from the great central plain, but the majority are of local origin—relics of district and local glaciers. The boulder clay from the central plain is likely to be rich in partially disintegrated carboniferous limestone, while the local deposits north of the granitic area are doubtless rich in lime-salts derived from the schists and basic igneous rocks in the vicinity of Lough Inagh and other centres from which the ice radiated during the latter part of the glacial epoch.

In the extensive granitic region north of Galway Bay the patches of boulder clay are mostly small—they often form fertile spots in an otherwise unproductive district. There is, however, a glacial deposit of considerable extent near the centre of the southern section, but owing to its being in great part covered by bog, it is of little value.

With the exception of the boulder clays, alluvial deposits and belts and mounds of wind-blown sand, the soil of Connemara has almost entirely been derived from the weathering of schists and igneous rocks.

A glance at a geological map of Ireland shows that a wide central band of Lower Silurian rocks extends right across Connemara from the upper part of Lough Corrib to the Atlantic. To the north of this, occupying the uplands, there is a somewhat crescent-shaped mass (about 150 square miles in extent) of Upper Silurian rocks, while the south, as already indicated, consists almost entirely of granite. A more careful inspection reveals the fact that the Lower Silurian and, to a less extent, the Upper Silurian areas include a large amount of limestone and numerous igneous dykes. The limestone mainly occurs in narrow, often nearly parallel, bands; but there is a considerable stretch of carboniferous limestone occupying a triangular area between Lough Corrib and the railway from Galway to Oughterard. The limestone bands are especially abundant between Oughterard and Clifden, to the north of the Maumturk Mountains, and

* A striking instance of this we have in the southern states of New England, where over an area of nearly 4,000,000 square miles the soil, with the exception of a few insignificant patches, consists of boulder clay carried thither by ice during the glacial epoch.

between these mountains and the Twelve Bens. They are also plentiful between the Bens and Lough Kylemore and to the south-east of Ballynakill Harbour.

The igneous dykes (which often yield soil rich in phosphates) occur in great numbers in the western portion of Connemara, more especially to the west of a line between Ballynakill Harbour and Cashel Bay.

In addition to the igneous dykes there are great masses of basic igneous rocks south of the railway between Oughterard and Clifden, but especially to the south and east of Ballynahinch. The importance of igneous dykes and of basic igneous rocks can hardly be over-estimated. In Norway, *e.g.*, the villages string themselves along igneous dykes, being especially crowded where the dykes are most abundant and richest in phosphates.

The uplands extending between Lough Mask and Killary Harbour in many ways agree with the Ochills, Pentlands, and the Southern Uplands of Scotland. They owe their fertility to the limestone schists, and other phosphate-yielding rocks of the Upper Silurian series. To the south of the crescent-shaped Upper Silurian area, which includes the Partry table-land and Joyces' country, lies the area (comprising Connemara proper) consisting almost entirely of Lower Silurian rocks. These rocks extend from Lough Corrib to the Atlantic, and separate the uplands in the north from the extensive granitic area in the south. On the east the Lower Silurian rocks reach the lower end of Lough Mask; south of Oughterard they come into contact with the triangle of carboniferous limestone lying to the east of the railway. On the Atlantic side they all but extend to Killary Harbour in the north, and in the south they come into contact with the granitic area in Bertraghboy Bay, not far from Carna. In the lower Silurian area to the north of Ballinahinch lie the Twelve Bens; further east the equally barren Maumturk Mountains. With the exception of these sterile quartzitic mountains, the soil of the Lower Silurian section, wherever it exists in sufficient quantity, is wonderfully fertile. The presence of limestone bands, igneous dykes, and various kinds of schists ensures a plentiful supply of lime, potash, and phosphoric acid. The granitic area extending from the Lower Silurian section to Galway Bay, though, as a rule, but little above the sea-level, and though crowded with lakelets, intersected by numerous streams, and deeply indented on the west by bays, channels, and creeks, is of little value for agricultural purposes. This is partly due to the presence of extensive bogs, but chiefly to the rocks being incapable of yielding suitable soil.

When the climate, physical features, and geological formations of the west of Galway are taken into consideration, there is no escape from the conclusion that Connemara is in many respects well adapted for the breeding and rearing of stout, active ponies, as large as the feral horses once so abundant in the New World, and as hardy as the wild horse (the *E. przewalskii*) of Central Asia.

The Food of the Ponies.

During the greater part of the year horses seem to prefer short young grasses, and soft, easily-cropped herbs; but, as already mentioned, the length of the crowns of the teeth, together with the great length and strength of the jaws, indicate that they are well adapted for feeding on hard, dry plants, which require to be well crushed before they give up their nutritive constituents.

In various parts of Africa, as in Central Asia, where wild horses still survive, ordinary grasses during the dry season are conspicuous by their absence. During this dry period horses and other non-migratory ungulates would be exterminated—as it is they are probably often decimated—were they unable to sustain life on shrubs, roots, and such desert plants as manage to show themselves above the parched dry ground. The instinct to feed on hard fibrous plants during part of the year survives in the domestic horse. In temperate regions, for at least some weeks before the advent of spring, horses living in a semi-wild state prefer hard shrubs to the rough and probably tasteless grasses still available. During this trying period, when the spring coat is preparing to take the place of the winter one, hill and moorland ponies may be seen eating gorse, heaths, and other shrubs. In the absence of shrubs, they devour the bark of beech and other trees, or dig up and deliberately eat various kinds of roots and underground stems. In a mixed herd of Equidæ some prefer gorse and heaths, others as readily take to bark and the smaller branches of fallen trees, while others direct their attention chiefly to underground stems. Recently I came upon a mixed family, all in excellent condition, busily engaged digging up and eating, apparently with great relish, the underground stems of nettles. Not far from this group some zebra hybrids were cutting off and devouring branches (over an inch in circumference) of a fallen beech tree, and in an adjoining paddock several ponies, instead of feeding on the excellent hay provided, were directing their attention to the fences. In Shetland the ponies are said to consume sea-weeds, while in Iceland, when the usually scanty supply of hay comes to an end, they readily take to eating cod-heads specially reserved for them during the fishing season.

It might be said that in the case of the domestic horse the instinct to feed on shrubs, underground stems, branches, leaves, etc., might well have been allowed to lapse. It should, however, be borne in mind that, without this instinct, thousands of horses in Europe, and a countless number in Africa and Asia, would annually perish, and that our semi-wild ponies probably owe their hardiness and their freedom from various diseases largely to their feeding on shrubs and other fibrous substances during the interval between winter and spring. Without a wide range of frequent change of pasture, it is difficult to rear vigorous, hardy horses; but the wild herbs and the dwarf shrubs that occur so plentifully on uncultivated moors and uplands may be quite as essential during colthood as a free and unfettered existence.

III. THE WORK OF THE CONNEMARA PONIES.

Ponies are as essential to-day in Connemara as "Galloways" were a century ago in many parts of England and Scotland, and owing to the wild and rugged nature of the country, and the all but inaccessible position of many of the homesteads and cabins, the pillion and pack-saddle are not likely soon to disappear from the West of Ireland.

In England, as the result of the revolution effected in travelling and transport by railways, the existence of hardy, active ponies had almost been forgotten until the South African War proved how invaluable they were for mounted infantry. In Connemara, as in the East, interest in ponies

for purely practical reasons has continued undiminished for centuries. One important result of this has been that Connemara, by sending all over Ireland "colts" reared under natural conditions, has helped to gain for Irish horses their widespread reputation for vigour, hardiness, and intelligence—through Connemara Irish horses have, as it were, kept in touch with Mother Nature.

Without a pony the peasant farmer in the west of Galway is all but helpless. Fortunately, except the original cost, there is but little outlay. A two-year-old filly having been purchased, usually at a very low figure, a bridle is soon woven out of horse-hair—after the fashion, but without the artistic feeling that prevails in Arabia—and a primitive pack-saddle constructed out of four pieces of wood. The only additional pieces of furniture needed are mats or sacks to place under the saddle, and a cushion or pillion for the hindquarters, on which the owner at times sits when on the way to market, horse-hair or ordinary ropes hold the various trappings in position. The work of the ponies varies with the season of the year. At one time they may be seen climbing steep hillsides heavily laden with seaweed, seed corn, or potatoes; at another they convey the produce to market. Sometimes it is a load of turf, oats, or barley; at other times creels crowded with a lively family of young pigs.

During summer and autumn the ponies are often seen trudging unsteadily along, all but buried in a huge pile of hay or oats, each with a puzzled foal thoughtfully bringing up the rear.

Returning from market each pony generally carries two men, one in front and the other on the pillion behind. A good pony can easily carry two men thus disposed for a considerable distance at the rate of ten miles an hour. The women seem to be quite as much at home on the pillion as the men. In Clifden and other centres, as on the larger holdings and some of the small farms close to the main roads, cars, turf, and other carts take the place of the pack-saddle and pillion.

IV. THE CONSTITUTION, TEMPERAMENT, AND CAPABILITIES OF THE CONNEMARA PONIES.

In Arabia, where horses are prized above all other possessions, and in England, where so much is sacrificed to appearances, make and action are often the chief points looked for; but in Connemara strength and staying power, hardiness, and tractability are the main considerations. If the ponies happen to be fast and shapely, so much the better.

All are agreed that the better Connemara ponies are strong and hardy, and possessed of great endurance. But all ponies reared under natural conditions and in a suitable environment have, or in course of time acquire, these attributes.

Though hardiness, endurance, and strength, are of vital importance, they often pass unnoticed until ponies have the opportunity of working alongside delicately-reared thoroughbred and large half-bred horses. It then becomes evident, as Sir Richard Green Price has pointed out, and as recent experiences in South Africa have so abundantly proved, that ponies "beat moderate horses of double their size," and have "twice the constitution and thrice the sense."

The reason of this difference is that large horses are highly specialised products of artificial selection, quite incapable of maintaining themselves in adverse circumstances. Nature makes short work of large horses, and in a very few generations mercifully reduces to the pony standard any offspring they may happen to leave.

While one may fail to appreciate fully the grit and stamina of the Connemara ponies, it is impossible to miss noticing their intelligence and docility. In these respects they agree with Arabs, and contrast favourably with thoroughbreds. Their docility is in part hereditary, and in part the result of their upbringing. From the first, as in Arabia, they often form one of the family circle, and in course of time court rather than shun human society. Ponies which have during their youth acquired confidence in man are, except in rare cases, far more docile than ponies that run wild during the first year, or that have a chance of developing all their wild instincts before they are pressed into the service of man, as is the case with most of the Argentine horses.

Seeing that the ponies of Connemara belong to several fairly distinct types, it will be more profitable to consider what kind of pony breeders should aim at producing in the future, than to discuss the points of those now in existence. In doing this, it is important to bear in mind (1) the kind of work that falls to the lot of the average Connemara pony; (2), that each mare is expected to produce annually a foal that will fetch a good price when six or eight months old; and (3), that some of the cross-bred foals will be expected, under generous treatment, to reach a size of sixty inches, and develop into light-weight hunters.

From what has already been said, it will be evident that many of the ponies in the west of Galway do the work of pack horses, and require to be as strong, agile, and tireless as battery mules. In mountain battery mules one expects to find powerful loins, great girth, a fairly long body, and short strong legs. Many of the old "hobbies" appear to have had all the best points of a battery mule, united to the temperament and much of the grace of an Arab, while some of them, if one may rely on Berenger and other writers, were fleet enough to outrun the best of the Eastern horses on the English turf at the end of the eighteenth century. To combine in one breed the strength of a pack horse and the fleetness of an Arab may seem impossible; but, after all, the difference between a long, low hobby and an Arab-like racer may be mainly a difference in the length of the legs and of the parts correlated to the legs—the hobby may have been sometimes a stunted Eastern horse.

If this is the case, it may still be possible, out of native material, to produce a breed of ponies fairly uniform in make, size, and colour, and capable not only of performing the arduous work of a small upland farm, but also, under favourable conditions, of developing into hunters, or, at least, of producing hunters to hunter sires, remounts or riding ponies to Arab sires, and hardy ponies with good action to Hackney and Welsh cob sires. That this is more than probable will be admitted, when it is remembered that during recent years many excellent light hunters and riding and driving ponies have been bred in Connemara. This has been possible partly because the ponies are, as a rule, non-impressive, and partly because many of the mares, though unshapely and deficient in bone, belong to a good stock, and are seldom wanting in stamina.

Before attempting to indicate the points that should characterise the ideal pony of the future, it will be well to submit evidence in proof of the fact that Connemara has produced excellent ponies during quite recent years. Fig. 7 represents a pony bought in 1894 out of a herd of Connemara foals. This pony, having been allowed to run at grass until he was four years old, reached a height of 15 hands, and in course of time developed into an extremely clever hunter, hard to beat as a jumper. Had he remained amongst his native wilds at work before reaching his second birthday, he would most probably have grown into a very ordinary-looking hobby. From Mr. W. Webber, of Kellyville, Athy, and others, I have received photographs of quite a number of ponies with a history and record similar to the one figured. One of these, bought out of a herd of foals in 1890, Mr. Webber informs me, is perfectly gentle, extremely intelligent, hard to tire, and able to jump anything a horse can jump. Another, bought in 1892, has been hunted regularly since it was three years old, and not only jumps well, but is very fast, and goes regularly in harness during the summer. Last autumn I puchased a six-year-old yellow-dun pony, which was reared, as well as bred, in Connemara. It is a blend of the Eastern and Cashel types. This pony, though only 14 hands, would make an ideal small war-horse. As might be expected from her beautiful head, she is extremely intelligent and docile, and an experienced breaker says he never had a more clever or more pleasant hack in his hands. When out with other ponies she carries herself well, and is as spirited and keen as an Arab. Yet in a show of riding ponies this yellow-dun would entirely fail to find favour in the eyes of ordinary judges, for in her withers, and in the position of the tail, she falls short of the sentimental standard. In make she closely resembles some of the Arab-Barb crosses specially bred for military purposes at the St. George's Stud in Algiers.

Turning from pure-bred to half-bred ponies, I may first refer to Mr. William Pallin's "Bog of Allen." This is an extremely clever hunter out of a Connemara mare by the well-known thoroughbred horse "Favo." Though only 58½ inches at the withers, this horse has won a three-mile steeplechase carrying 14 stone, and several jumping prizes.

A long list of equally famous half-bred Connemara ponies could easily be given. Quite a number of crosses between Connemara mares and Eastern horses have been bred; but I have only had the opportunity of examining three, one by a Barb ("Awfully Jolly"), and two by an Arab. The Barb cross was generally regarded as a failure, but the larger of the two half Arabs is a marked success. This pony is now five years old, of an iron grey colour, and decidedly Arab-like in make and disposition. Like many Arabs, she measures 56 inches at the withers, has fine clean legs, well let down hocks, and a short, well-rounded trunk, the girth being 67 inches. Though in make unlike Mr. Pallin's half-thoroughbred, she is as intelligent, and has already given evidence of very considerable speed and great jumping powers.

During recent years, in addition to crossing Connemara mares with Arab, Barb, and thoroughbred horses, experiments have been made with Welsh cobs and hackneys. If Welsh cob sires are widely introduced, in a few years the Connemara ponies will be crossed out of existence; and it by no means follows that their cross-bred descendants will be adapted to the unique surroundings of the West of Ireland, or be capable of producing,

either to thoroughbreds or Arabs, foals likely to attract buyers from far and near.

Regarding crosses got by hackney sires, very different views are held, doubtless because, like all other crosses, they vary profoundly, some being hackneys, pure and simple, others differing but little from their native dams. That some of the Connemara-hackney crosses gallop and jump well and are stayers is as certain as that they are, as a rule, tractable and intelligent. I am able to speak from personal knowledge of a light grey three-year old filly purchased in Clifden. This filly, out of a stout grey mare by a bay hackney, promises to be an excellent, docile, and intelligent driving pony. In being as intelligent, self-contained, and tractable as a desert-reared Arab, this Connemara-hackney cross very decidedly differs from some of the Connemara-thoroughbred crosses, which are sometimes less characterised by sense than by excessive sensitiveness. Another Connemara-hackney cross deserves mention, partly because she has won many prizes at Hackney Shows, but chiefly because she has produced a number of very famous hackney colts.

Though, during recent years many excellent ponies have been reared or at least bred in Connemara, it would be a mistake to suppose that even a fair percentage of the present mares would, under more favourable conditions, have made light hunters, or, when crossed with thoroughbred stallions, produced high-class shapely foals. A visit to the Clifton Winter Pony Fair makes it all too apparent that the mares from the upland farms are, in most cases, unshapely and deficient in "bone," and that in make, at least, there is room for considerable improvement in the vast majority of the foals. How gradually to improve the mares all through Connemara is still a pressing question.

V. HOW TO IMPROVE THE CONNEMARA PONIES.

In some districts an improvement in the native horses can be gradually effected by the introduction of carefully selected stallions. The circumstances in the West of Ireland are, however, so peculiar that the placing of thoroughbred stallions at the disposal of the natives may diminish rather than increase the number of good mares.

On the majority of small farms it is difficult, if not impossible, to keep a foal as well as a mare throughout the winter; hence, nearly all the foals got by stallions sent into Connemara during recent years are disposed of long before they reach maturity. Recently the demand for half-bred Connemara foals has attracted buyers from beyond the confines of Ireland, with the result that some of the best mares, as well as the best foals, have been carried off. It is, doubtless, true, that what is a loss to Connemara may be a gain to other districts; but as the demand for Connemara-bred foals is likely to increase, unless the leakage is checked, both Connemara and the rest of Ireland will eventually suffer. What makes matters worse is that when it becomes necessary to replace a mare, instead of selecting a filly belonging to a well-known local strain, as often as not a yearling or a two-year-old is purchased (often beyond the County of Galway) regardless alike of make and pedigree.

If an attempt is to be made to recover for the ponies of Connemara the

reputation they enjoyed up to about the middle of the nineteenth century, something more is obviously needed than sending high-class sires into the district.

In France there were last year over 3,000 stallions (including 262 thoroughbreds, 265 Arabs and half-Arabs, and 251 half-breds) maintained by the Government in twenty-two separate depots, at a cost to the State of £93,000.*

Notwithstanding this large expenditure, only indifferent results, it is said, have been obtained during recent years, owing partly to the common mistake of supposing that a good sire makes up for all sorts of deficiencies in the dam, and partly to the fact that it is not yet sufficiently realised that, given a good dam, the less the sire counts in the offspring the better. Recognising the necessity of having a good stock of brood mares, as well as good sires, an effort is now being made in New South Wales to have Government stud farms established for breeding pure stock. Something of this kind will be necessary in the West of Ireland if it is considered desirable to perpetuate the best characteristics of the once famous breed of Connemara ponies.

There is in Arabia a tradition that all the best Desert Arabs have descended from seven mares—sometimes spoken of as the "Mares of the Prophet." A like number of Connemara mares might be selected to start a new and improved strain of Connemara ponies.

Given a number of mares, the extremely difficult question arises—"What kind of sires should they be mated with?" An answer to this question can only be obtained by means of experiments, by breeding with native and other sires, then intercrossing in various ways the best of the pure and mixed progeny.†

An experiment of this kind implies that we have formed some idea as to what should be the chief "points" of the Connemara pony of the future.

VI. THE POINTS OF AN IDEAL PONY.

The ideal pony has often been described. One of the latest descriptions is by Sir Richard Green Price (late President of the Polo Pony Society). He assumes that an ideal pony should, amongst other things, be capable of playing the part of a small war-horse. Sir Richard says we can only picture him "as an animal about 14 hands 2 inches, with courage written on his countenance and docility in his eyes, strong of neck, with shoulders well set into a short, powerful back and loins, wide in the hips, and thick-set in the buttocks, a full well-set on tail (undocked), his legs short and straight, with clean bone and sinew throughout, and feet to match—in fact, a diminutive dray-horse with the activity of a high-class hunter." (*Live Stock Journal Almanac*, 1901, p. 65.)

In the main this picture agrees with that of a recent Australian writer, who tells us the riding pony should not be under 15 hands, with a good head well-set-on, broad forehead, large brilliant eye, wide-open nostrils, round in the barrel, short in the back, tail set well up, deep in the chest,

* The total sum (including prizes and premiums to owners of approved stallions) expended in providing suitable sires in France, amounted in the year 1900 to £647,000.

† There already exists a considerable amount of material (apart from the native mares) for experiments of this kind in the West of Ireland.

shoulders set well back, fine in the chine, standing over a lot of ground, and, above all, firm, wiry, wear-and-tear legs. (*Sam. Ainsworth, Perth, West Australia, December*, 1900.)

It will, I think, be at once admitted that some of the best horses that ever lived were far short of these ideals, and, further, that many horses which in make all but realise the ideal conception are of little actual use.

Nature never made a horse combining the "points" set forth in these and other ideal conceptions, and as ponies are liable to be exposed to all the hardships of their wild relatives, it is not wise to insist too much on non-essential characters.*

I have seen wild or semi-wild horses with a lean head well-set-on, a light neck, high fine withers, very oblique deep shoulders, a straight croup, and a well-set-on tail. These are the products of artificial selection, and most of them rapidly disappear when natural selection comes into play.

If hardiness and endurance are the chief considerations, we must be prepared to give up any "points" of a sentimental kind that directly or indirectly tend to diminish these essential traits. In wild horses there is an intimate relation between the head, neck, and shoulders. The size of the head (or, to be more accurate, the length and strength of the jaws) depends mainly on the food. As the head increases in size, the neck must either be shortened or the spines of the dorsal vertebræ (which form the ridge known as the "withers") lengthened; sometimes both things happen. In the old long-headed Irish horse, there seems to have been a lengthening of the vertebral spines, as well as a shortening of the neck.†

When the withers are not only high, but extend well along the back, a horse is sometimes said to have a good shoulder, and it is frequently assumed that high withers indicate speed or jumping power. The withers, however, have little or nothing to do with the shoulders, any more than they are in any way related to speed. On the other hand, when the withers are unusually long as well as high in riding ponies, the weakest part of the back is apt to be strained, or the effective action of the great muscles of the loins interfered with. Every inch added to the length of the neck, by shunting forward the centre of gravity, increases the strain on the forelegs.

As the obliquity of the shoulder (*scapula*) increases, the arm bone (*humerus*) becomes more vertical, with the result that the trunk is raised from the ground. While very oblique shoulders may facilitate galloping over a flat surface, they are not well adapted for the rough work in a hilly country, or for supporting a heavy weight. In some famous racers and fine movers the shoulders have been thick and straight. This is true of "Touchstone," and of the pony "Mars"—one of the finest movers ever bred in Scotland.

Great stress is often laid on having the croup nearly horizontal. Whether the tail is set on high up, as in many Arabs, or low down, as in moor and mountain ponies, is, as far as I can see, a matter of but little moment. We owe, I believe, the high position of the tail in many thoroughbreds to the influence of some of their Arab ancestors. Many Arabian horses are said to be descended from a mare that carried her tail unusually high. The tradition is that an Arab, being pursued, "loosed his cloak to relieve his mare from every impediment." On reaching his tent he was surprised to find his

* Witness the large head, short neck, straight shoulders, and drooping quarters of moor and mountain ponies, which for generations have lived in adverse circumstances.

† The high withers so often seen in hunters have probably been inherited from the old Irish horses that in olden times occupied the great central plain.

cloak caught by the mare's tail, which she carried in her gallop high to a degree. (*Upton; Gleanings from the Desert*, p. 327.) That a tradition of this kind might predispose Arab breeders in favour of horses that carried the tail high—which implies its being well set-up—is quite possible. In the Barb the tail is, as a rule, not "well-up." Whether this is due to the Barb being a cross between the Arab and the primeval unimproved horse of North Africa, or to the "Abyan" (the mare of the cloak) strain never having reached Ethiopa, it is impossible to say.

In the plain and striped *Equidæ*, specialised for life among the mountains, and among most mules there is a decided drop from the croup to the root of the tail. Notwithstanding this apparent weakness of the hind-quarters, both asses and mules are relatively extremely powerful and well adapted for moving both up and down hills. The same may be said of the majority of the unimproved Eastern ponies (the Pegu and others not yet crossed with the Arab), many of which, notwithstanding straight shoulders and drooping, weak-looking quarters, gallop and trot well, and, doubtless owing to their great girth and powerful loins, carry day after day enormous weights over long distances.

Other points often insisted on are an Arab-like forehead, good girth, and plenty of "bone."

In the remote three-hoofed ancestors of the horse the orbits occupied a lateral position—*i.e.*, the eyes were less adapted for looking ahead than sideways. In the old Irish and certain other European breeds, the eyes were more or less lateral in position; while in Arabs, doubtless as the result of artificial selection, they are large and well to the front.

In the former case the space between the eyes is decidedly convex; in the latter it is usually nearly flat. Perhaps inquiries might show that, though horses with laterally placed eyes may be shortsighted, they are not less intelligent than horses with full prominent eyes.

All other things being equal, the greater the girth and the stronger the loins the better. Ponies with weak loins and a small girth may do wonders; but strong-loined, deep-ribbed ponies last longest and recover fastest. The lean, light, wiry Australian Walers are excellent while in condition, but when once out of form they are slow in recovering; while ponies without a drop of thoroughbred blood—Syrian, Tartar, Mongolian, Burmese, etc.—but with strong loins, have often not only marvellous endurance, but as marvellous recuperative powers.

The term "bone" is apt to be misleading. The circumference of the actual bone is little more than half the circumference of the leg midway between the "knee" and the fetlock, *e.g.*, in a pony measuring 7½ inches in circumference below the knee, the cannon bone (third metacarpal) may measure only four inches. It is, doubtless, important to have large, ivory-like cannon bones, yet when the forelegs give way, the cause (unless there are "splints") is generally due to a breakdown of the ligaments and tendons. The legs of ponies probably last better than the legs of tall horses, not only because they are shorter, but also because the short neck tends to relieve the strain on the forelegs, and because the constant slight jars and strains incidental to a semi-wild life during colthood tend to make the tendons and ligaments as strong as fine-tempered ropes and bands of steel. It thus appears that ponies which very decidedly fail to reach the ideal of Sir Richard Green Price and others, and which are not so well adapted for galloping as a race-horse, may be extremely well adapted for the work of

an upland farm in the West of Ireland. During the last seven years I have had under constant observation a great many cross-bred ponies. Only one of these crosses can be said to realise Sir Richard Green Price's ideal. This is a 14.1 bay pony by a bay Arab out of a grey-ticked mare, which resembled in many ways the Galloways once so common in the South of Scotland. This cross-bred bay pony might be taken for a somewhat stout Arab with high withers, well let down hocks, and wide open hoofs. The grey dam resembled the Cashel type of pony in the shoulder and withers; in other respects she resembled some of the larger yellow-duns still occasionally seen in the vicinity of Maam Cross and Clifden.

Though this half-Arab is in many ways an ideal pony, she is not, it seems to me, the kind of pony wanted in Connemara. This is not because she is wanting in constitution (since 1896 she has been living out-of-doors, 700 feet above the sea level), but because she is not sufficiently like a pack mule in build, and because she has failed to produce either to thoroughbred or Arab sires the kind of foals likely to fetch a good price in the West of Ireland; they are not likely to make hunters, and besides being expensive to rear, they are too fine for remounts.

If the aim is to produce a pony that will be easily kept and easily handled, and capable of doing the work of a small farm, as well as of producing light hunters to thoroughbred sires, good riding ponies to Arab sires, it will, I think, be admitted that a pure-bred Galloway would prove far more suitable than a Galloway-Arab cross.

It may now be asked—"Are thoroughbred sires more likely than Arabs to produce the kind of pony wanted?"

Connemara thoroughbred crosses sometimes make excellent light hunters, and are often very fast; but they are seldom adapted for the rough life of a small moorland or upland farm. For many generations breeders of thoroughbreds have directed their attention almost exclusively to speed, and some have deliberately practised close in-breeding. One result of breeding in-and-in is a marked increase in the impressiveness; another is the gradual refinement of all the organs and tissues, more especially of the nervous system.

In the case of the horse, the closer the in-breeding the more sensitive he is to all kinds of stimuli, and the greater the waste of vital energy, and, as a consequence, the greater the susceptibility to changes of habitat, temperature, etc., and the need of a rich, highly nutritive diet. Owing to the increase in the impressiveness induced by in-breeding, thoroughbred crosses, though sometimes wonderfully hardy and vigorous, have often (especially when out of light pony mares) all the characteristics of their long-pedigreed pure-bred ancestors. It would, doubtless, be possible by careful selection to create a race of hardy Connemara thoroughbred crosses (for in thoroughbred, as in other strains, reversion to stout ancestors now and again occurs); but, for various reasons, this would be extremely costly, and not altogether satisfactory. I find that in the vicinity of the poor lands, while half-Arabs, after the third or fourth year, are hardy enough to live out-of-doors all the year round, half-thoroughbreds, unless stabled during winter, invariably succumb. Further, compared with half-Arabs, thoroughbred crosses are less intelligent, less tractable, have less endurance, and are altogether less like ponies; and there is always a danger of their throwing back to some of their highly sensitive, delicate, and, it may be, unsound, pure-bred ancestors. Again, some of the foals out of half-thoroughbred ponies by thoroughbred

sires might develop into excellent polo ponies, but they would hardly suit the buyers that at present frequent Clifden and other markets, or make light hunters.

The Walers, so much in evidence in India and more recently in South Africa, are said to be the "produce of the Arab, the English thoroughbred, and the Clydesdale." In Australia, where horses naturally tend to become lean and wiry, Clydesdale blood may prove useful; but, if one may judge by what has already occurred in Ireland, the less Clydesdale and Shire blood infused into the Irish ponies the better. A cross I recently made between a small Clydesdale mare and a well-bred pony is far from shapely. By the time the defects in make are removed from this cross, probably all the Clydesdale blood will have been eliminated. In most Walers the original Clydesdale blood has probably been completely lost by repeated crossing with the English thoroughbred.

It hence follows that the evolution of an ideal Connemara pony is an extremely difficult problem. It is not merely a question of settling whether thoroughbred, hackney, or Arab sires should be used, but rather how all the good points in the present ponies may be combined, the weak points eliminated, and the improved blend perpetuated. Intercrossing, unless great care is exercised, almost invariably results in the loss of the good points of at least one of the breeds. A violent cross may shake both breeds to their foundations, and destroy all that has been gained by careful and prolonged artificial selection. On the other hand, without intercrossing a condition which is perhaps best described as staleness supervenes. The art of breeding consists mainly in realising when the rejuvenation of a strain is required, and in using the right kind of blood for renewing the youth, *i.e.*, getting rid of staleness due to inbreeding or to an unsuitable environment.

The Connemara ponies being, as a rule, non-impressive, they would be easily swamped by either Arabs or thoroughbreds. On the Continent the necessity of using non-impressive sires seems to be fully recognised (a considerable number of the French Government sires are half breeds); but, for some unaccountable reason, we have not yet got the length of establishing a breed of hunters, *i.e.*, a breed containing a more or less definite proportion of thoroughbred blood.

In order to improve the Connemara pony, two things seem imperative—(1) to increase the "bone," and (2) to improve the make without destroying the hardiness, stamina, and docility. The "bone" might be increased in various ways, but care should be taken to maintain the pony characters—the small head, short legs, etc. Probably the best plan would be to use stout, active pony sires. Had the once famous Galloways of the Scottish Lowlands been available, they would have answered admirably; but there are still powerful, large-boned ponies in various parts of the world. The "bone" having been increased, the problem will then be to infuse just enough Eastern blood to give character and shapeliness to the breed. The Eastern blood may be obtained from the fountain-head—the Desert Arab, or from a somewhat contaminated source—the English thoroughbred—or perhaps, better still, from an Arab thoroughbred blend, such as is largely used in France.

One of the lessons of the South African War is that steps should be taken to encourage the breeding of hardy ponies in every part of the empire. It has recently been pointed out (*Scottish Farmer*, April 20, 1901,

p. 307), that for the breeding of ponies we want "cheap, rough land, a mild climate, necessitating little expenditure for hand-feeding in winter, and a hardy, useful type of brood mare," and further, that "grazing among rocks and bogs makes the animals active, sure-footed, and clever in extricating themselves from tight places, a very essential thing for mounted infantry." I have endeavoured to show that all the necessary conditions for the breeding of stout, active ponies especially exist in the West of Ireland, and I may, in conclusion, add that Connemara is in a sense already a huge stud farm, which annually produces a large crop of foals.

With a little organisation, the number of foals might be considerably increased, and arrangements made for the best of the colts running on the Connemara moors and mountains until they are old enough to be trained for mounted infantry. In this way remounts could be provided for a relatively small sum, and, what is of even more importance, they would begin their life-work with a constitution able to withstand all ordinary hardships. The only danger would be that, by rich food, much grooming, and warm stables, they would ere long be as delicate as ponies reared in the ordinary way. All that healthy, hardy ponies require is shelter from wind and rain. A shed completely open on one side, but with a wide roof, is sufficient; but at several centres a sort of equine Pantheon, with or without galleries, might be constructed to serve as winter quarters.

P.S.—Readers of the above article will be interested to learn that the Congested Districts Board have now (February, 1902), at Lough Glynn, County Roscommon, a stud of fifteen Connemara pony mares and two Erris ponies. Nine of the Connemaras are in foal to an Arab, two to a Connemara stallion, and the two Erris ponies to a thoroughbred. This season ten of the mares will be put to the Arab, and seven to a young and very promising Connemara pony, and all the results will be watched and carefully noted.

THE IRISH CATTLE INDUSTRY.

During the past century every acknowledged breed in England and Scotland has been resorted to with a view to improve the cattle of Ireland. Shorthorn sires have been so largely used during the past century, that the ordinary cattle of the country may be said to be crosses of that breed. Of late years, Aberdeen Angus and Hereford cattle have been increasing in favour in those districts where the production of beef cattle is the principal industry of the farmers. In other districts, where the farmers have to depend upon dairy produce and calf-rearing, the Shorthorn sire is still looked upon as being the most suitable for the production of general purpose stock. The following records of the number of entries of the above three breeds at the Spring Shows at the Royal Dublin Society in 1891 and 1901, indicate the increasing popularity of the Hereford and Aberdeen Angus breeds amongst the Irish breeders:—

In 1891 there were 233 Shorthorn,
36 Aberdeen Angus,
and 19 Hereford Bulls entered.
In 1901, 387 Shorthorn,
129 Aberdeen Angus,
and 67 Hereford Bulls were entered.

The number of Irish breeders making entries of animals in the several Herd Books during:—

1895 were 97 entering Shorthorns,
34 „ Aberdeen Angus,
and 9 „ Herefords;
while in 1900 132 entered Shorthorns,
81 „ Aberdeen Angus,
and 11 „ Herefords.

It is satisfactory to see the increasing number of owners of pure-bred herds, seeing that it may be safely assumed that every such herd is adding to the agricultural wealth of the country.

Kerry and Dexter Cattle.

During the nineteenth century, while efforts were being made in the majority of counties in Ireland to improve the cattle by the introduction of fresh blood and new breeds imported from England and Scotland, few, if any, of these cross-Channel animals were introduced into the mountainous parts of Kerry. Such was the state of matters in 1890, when the Royal Dublin Society with a view to stimulate improvement of native breeds of cattle, purchased the copyright of a record of the breeding of a small number of Kerry and Dexter Cattle, which had been compiled by the *Farmer's Gazette*, and resolved to publish the "Kerry and Dexter Herd Book." A system of annual inspections was organised, and such animals as

were considered eligible by competent judges, together with those qualified by previous entry in the Kerry Register, were accepted for Registration. Nine annual volumes of this publication have been issued. They contain pedigrees and other particulars of 492 bulls and 2,870 cows and heifers of the Kerry breed, and 443 bulls and 1,682 Dexter cows and heifers. The publication of the Herd Book has led to a large number of home breeders in many parts of Ireland being induced to devote increased attention to the matter of selection and systematic breeding, with a view to the improvement of their cattle, while both breeds have, of late years, become popular in many parts of England. It has been a source of regret that there has been, and still is, a disposition on the part of the breeders of Kerry to record such animals only as were meant to be sold, and now, with the restricted conditions of entry for the Herd Book, it is to be feared that many, perhaps purely-bred, good animals may fail to qualify for registration through the past neglect of their owners. No doubt, the Department of Agriculture and Technical Instruction for Ireland, through the influence at its command, will be able to bring before the breeders in the remote districts of Kerry the great advantage of care and attention to the breeding and registration of their stock.

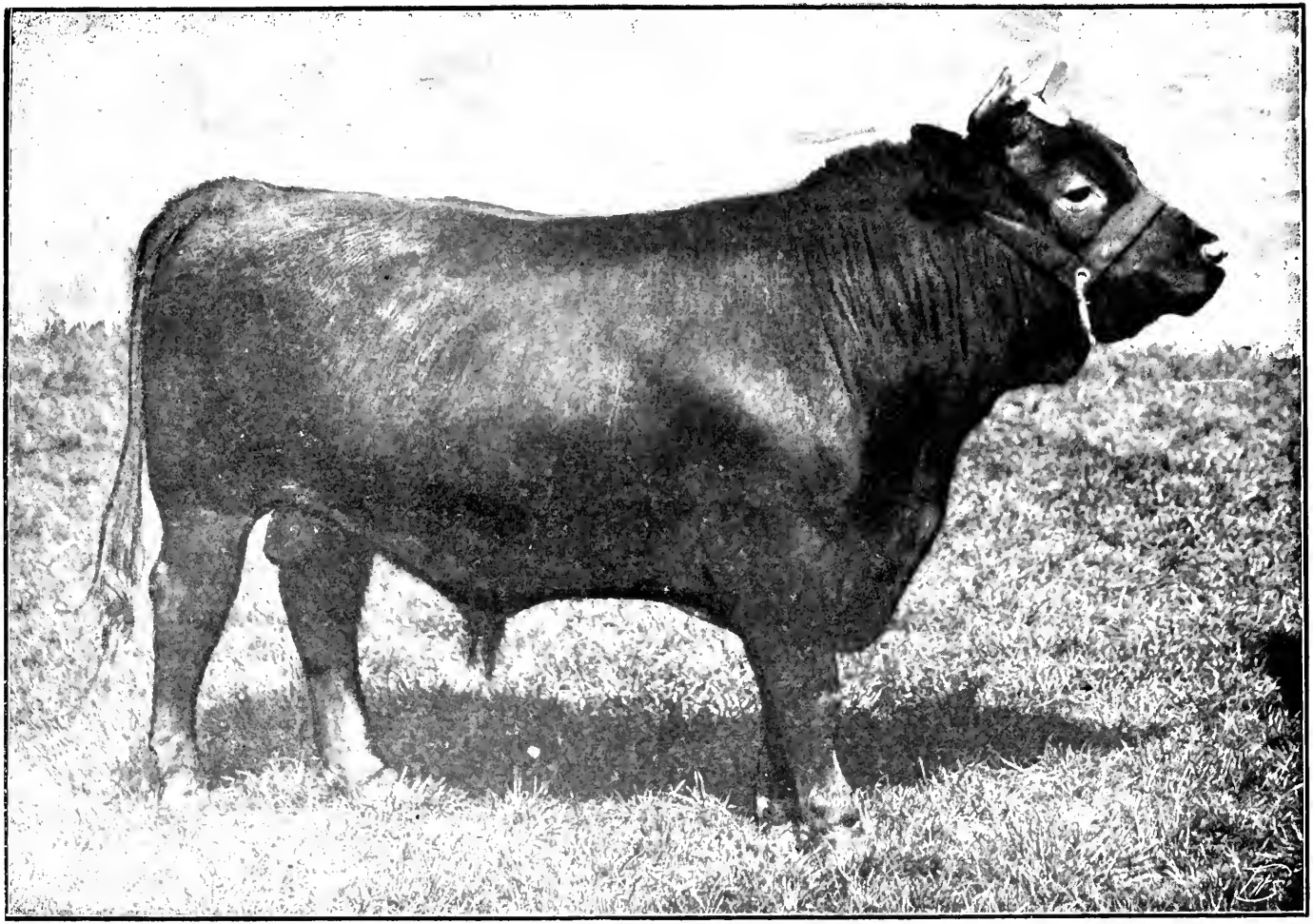
The following interesting extracts are from the introduction of Volume I of the Royal Dublin Society's Herd Book for Kerry and Dexter Cattle:—

"Writing in 1870 about the mountainous regions of West Kerry, Isaac Wild says: —

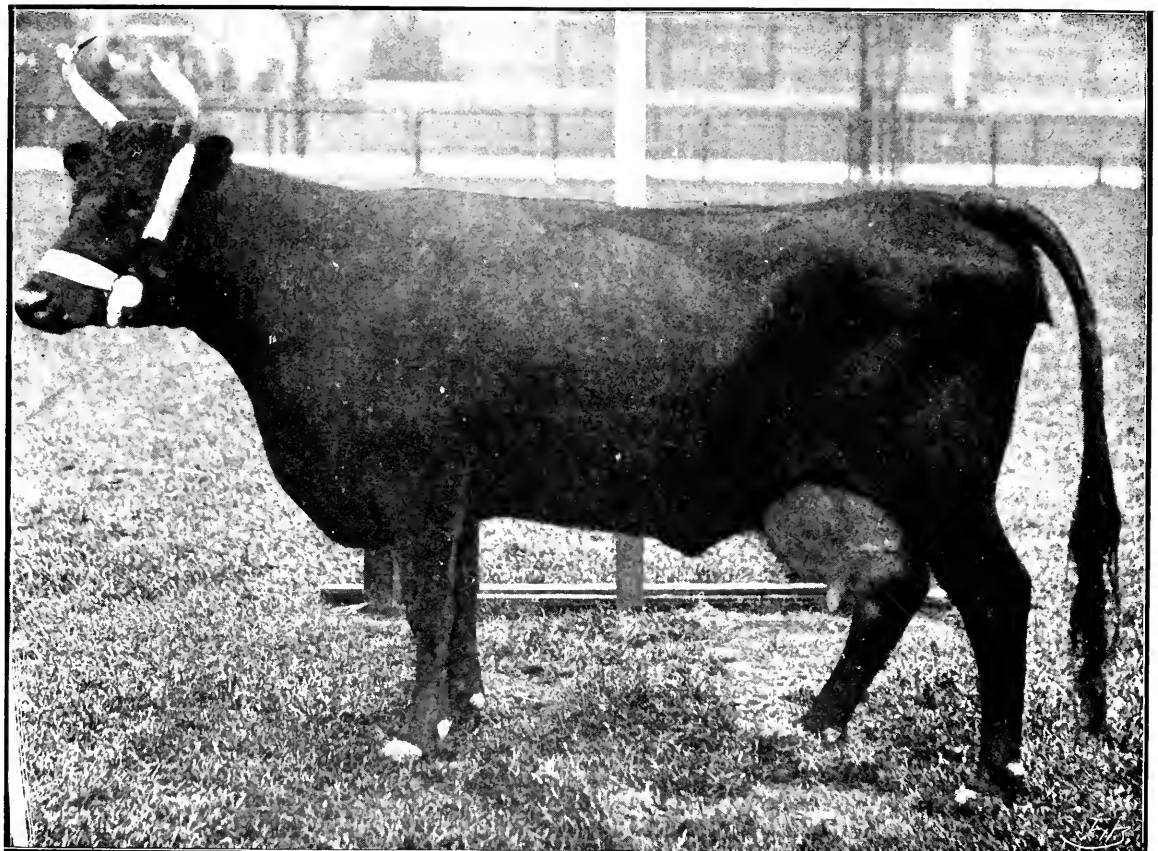
"'This country was formerly remarkable for a very small and beautiful breed of black cattle; but the people have been seized with the spirit of improvement, and the true Kerry cow, as it is called, is now rarely to be found, excepting in the mountains in the vicinity of Bantry Bay. The size of this animal does not exceed that of an ordinary yearling calf. From the prevalent inclination of the people to discard the native stock of their hills, it is presumed that they derive more profit from the enlarged breed; but there are some of a contrary opinion, who still maintain their attachment to the ancient race, and who contend that, from their hardy character and the abundance and richness of their milk, they are peculiarly adapted to the situation and circumstances of the country.'

"In the early part of the present century, the Royal Dublin Society undertook a general survey of Ireland, for the purpose of developing the industrial resources of the country. The County Kerry was not separately surveyed; but the adjoining County of Cork was surveyed for the Society by the Rev. Horatio Townsend. The author refers frequently in the course of his survey to the partiality of the farmers for the small breed of cattle for dairy purposes. These cattle seem to have been closely related to the Kerries of the present day. Referring to the cattle of Carbery, in the south-west of the county, he says:—

"'The cattle of this district, except those possessed by gentlemen, are of a small size, seldom weighing more than three hundred and a-half weight, and frequently not more than two. The breed is now a mixed one, of various colours; formerly they were all black. In the more remote and mountainous parts of the district this colour still predominates; but few, I believe, of the pure native breed at present remain. They are, in general, good milkers—eight pottles or sixteen quarts a day being no uncommon produce from a cow of three hundredweight. The usual price for a new milch cow of this description is from eight to ten guineas. Small beasts of all kinds are preferred by the



DEXTER SHORTHORN BULL.



KERRY COW.

farmers, as being better suited to the circumstances of the country, and more capable of enduring hardship, and more easily subsisted.' "

The views expressed by David Low about Kerries, nearly half a century ago, are of special interest at the present time. He says :—

" These cattle are hardy and capable of subsisting on scanty fare. Although stunted in size when brought from the bogs and sterile pastures on which they are reared, they make a wonderful advance in size, even though several years old, when supplied with suitable food. The fat of their beef is well mixed with the muscular parts, or, in technical language, marbled ; and they fatten well in the inside, a character which renders them valuable to the butcher, and distinguishes them in a remarkable degree from the long-horned breeds of the lower country.

" But the peculiar value of the Kerry breed is the adaptation of the females to the purposes of the domestic dairy. In milking properties the Kerry cow, taking size into account, is equal, or superior, to any in the British Islands. It is the large quantity of milk yielded by so small an animal which renders the Kerry cow so generally valued by the cottagers and smaller tenants of Ireland. She is frequently termed the poor man's cow, and she merits this appellation by her capacity of subsisting on such fare as he has means to supply.

" This fine little breed has been greatly neglected ; scarce any means have been used to produce a progressive development of form by supplying proper nourishment to the breeding parents and the young, and no general care has been bestowed on preserving the purity of the stock. In almost every part of Ireland, the breed has been crossed with the long-horns ; and a great proportion of the cows of the country known under the name of Kerries are the result of crosses of this kind, and have so deviated in a greater or lesser degree from the native type, and almost always for the worse.

" A few honourable exceptions, however, exist to this general neglect of the mountain dairy breed of Ireland. One attempt has succeeded to such a degree as to form a new breed, which partially exists with the characters communicated to it. It has been termed the Dexter breed. It was formed by the late Mr. Dexter, agent to Maude Lord Hawarden. This gentleman is said to have produced his curious breed by selection from the best of the mountain cattle of the district. He communicated to it a remarkable roundness of form and shortness of legs. The steps, however, by which the improvement was effected have not been sufficiently recorded ; and some doubt may exist whether the original was the pure Kerry, or some other breed proper to the central parts of Ireland now unknown, or whether some foreign blood, as the Dutch, was not mixed with the native race. One character of the Dexter breed is frequently observed in certain cattle of Ireland, namely, short legs, and a small space from the knee and hock to the hoofs. This has probably given rise to a saying, sometimes heard, of 'Tipperary beef down to the heels.' However the Dexter breed has been formed, it still retains its name and the roundness and depth of carcase which distinguished it. When any individual of a Kerry drove appears remarkably round and short-legged, it is common for the country people to call it a Dexter. . . . The Kerry cows afford admirable first crosses with Shorthorns, Herefords, and other large breeds. Of these crosses, that with the Shorthorn is the most general, and appears to be the best. The crosses are found well adapted to fattening as well as to the dairy ; and the profit from this system is so immediate, that it is to be believed that it will be more largely resorted to than a progressive improvement of the parent stock.

"Nevertheless, the cultivation of the pure dairy breed of the Kerry mountains ought not to be neglected by individuals or public associations. The breed is yet the best that is reared over a large extent of country, from its adaptation to the existing state of agriculture and to the humid mountains and bogs in which it is naturalized. Were it to be reared with care in a good district, the form would be gradually more developed, and the Kerry breed might then bear the same relation to the mountain breeds of Ireland that the Castle Martin does to those of Wales, or the West Highland to those of the North of Scotland."*

The Kerry Breed of the Present Day.

Kerry cows bear a strong resemblance to the Channel Island cattle in general formation, having a hard, clean-cut head, thin muscular neck, oblique shoulders, narrow crops, and long, thin thighs. Wherever care has been bestowed in a selection and breeding, the udder of the Kerry cow is nicely shaped and the teats well set, indicating great milking capacity, and giving her a right to be termed a typical dairy animal. As a dairy breed Kerries have, no doubt, suffered to some extent from the stringent colour rules as drawn up by breeders and observed by inspectors while admitting foundation stock for the Herd Book. Under these rules white markings on any part of the body other than a small amount on the udders are sufficient to destroy an animal's chance of being accepted as being eligible for registration.

It may justly be questioned if such stringent rules regarding the colour of a breed of cattle, justly valuable as dairy animals, can have any real practical value, while their observance must, in many cases, debar what in other respects may be typical animals, simply because a few white hairs may appear, as they often do, on some other part of the underline beyond the udder. For her size and the quantity of food she consumes, the Kerry cow holds a high position as a dairy animal. In full profit she gives from three and a half to four gallons of rich milk per day, while she will thrive and milk well upon a poor pasture which would be utterly unfit to maintain animals of the so-called improved breeds. Although the Kerry cannot be termed a beef breed the quality of meat of a well-fed animal is exceptionally good, being fine in the grain, the fat and the flesh well mixed, and without that objectionable yellow colour of fat peculiar to Channel Island cattle.

The Dexter Breed.

No one interested in cattle could fail to appreciate the many good and striking points of an average specimen of the Dexter breed. There have been many theories regarding the origin of this breed, but nothing definite can be said on the subject. That these cattle owe their diminutive size and great "prepotency" to in-breeding cannot be questioned, and it may be that the great neglect and extreme carelessness of the small farmers in the wilds of Kerry in the matter of fresh blood have led to the production of a type of animal now known as the Dexter.

Crossed with any one of the larger breeds, the "prepotency" of the Dexter is such as to regulate the size and transmit other peculiarities belonging to the Dexter in a remarkable degree. In shape the Dexter differs much from the Kerry, resembling in many points a diminutive Shorthorn. With

* "The Breeds of Domestic Animals of the British Islands." By David Low. London, 1842. Vol. i.

a short, broad face and nicely set horns, a broad level back, long deep quarters, good flanks, and wide chest, a Dexter in good condition may be termed a perfect specimen of a butcher's animal. While this is so, the milking powers of the ordinary cows of the breed are indeed great. Many of these small animals, not exceeding forty inches in height, give a milk record of four gallons per day, and continue to do so for months after calving.

Being small food consumers, good milkers, and possessed of a quiet, docile disposition, they have been often spoken of as "perfect villa animals." With a wider chest and a stronger constitution than the Jersey, they are gradually displacing the more delicate Channel Island cows in many suburban districts in England.

Their colour may be black or red, with white markings.

Dexter Crosses.

"A most interesting and valuable experiment in the matter of cross-breeding, or rather up-grading, has been carried out for many years at Straffan House, County Kildare, Ireland. Some thirty years ago Major Barton became possessed of a small Dexter cow, and, the animal being a deep milker, her female calf by a pure-bred Shorthorn bull was retained in the herd. From this foundation a small herd of beautifully shaped deep-milking cattle has been bred, the present-day specimens being the fifth, sixth and seventh generations from the original Dexter cow. The grading-up has been invariably carried out by means of Shorthorn bulls; and while the animals to-day have all the shapes of high-class Shorthorns, they stand very little higher than the foundation Dexter cow. As milking cattle they are, for their size, truly wonderful, several of these small cows giving five gallons of rich milk per day when in full milk."*

* "Food Supply." Charles Griffin & Co., London, 1898.

SHEEP-BREEDING IN IRELAND.

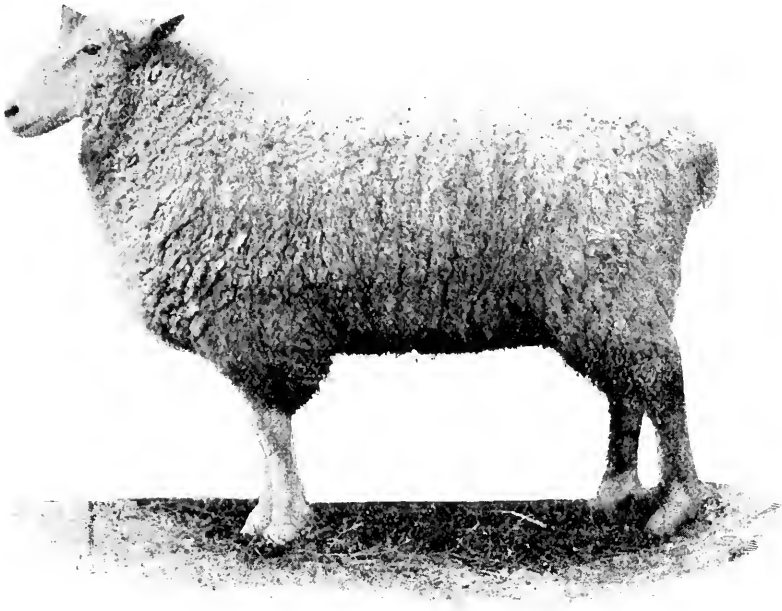
The great September and October fairs of Ballinasloe, the September fair of Banagher, the October fair of Tuam, and the autumn sales in Dublin Market, may be considered the chief centres of the sheep trade of Ireland. At these marts the western breeders display their store sheep, and find purchasers in the graziers of eastern, midland, and southern counties. The system under which the trade is carried on is an interesting division of labour. The western graziers, who own the lighter lands, breed the sheep, and rear them to two and three-year old, and then sell them to the eastern, midland, or southern graziers, either as ewes for breeding purposes, or as wethers to be fattened off. The grass lands of the East, Middle, and South of Ireland are capable of fattening sheep of any age or class—whether lambs or hoggets—ewes or wethers.

Strictly speaking, the big autumn dispersals above referred to are not confined to two and three-year old sheep. They include also lambs and shearlings. The bulk of the sheep sold, however, are two and three-year olds—ewes and wethers, the former—ewes for breeding purposes—largely predominating. Of the districts immediately around Ballinasloe, the counties Galway, Mayo, and Roscommon, furnish much the largest proportion of these store sheep. Smaller drafts come from the County Clare, King's County, and the portion of Westmeath adjoining Connaught; but it is from the flocks kept in the former counties that the majority of the sheep sold in Ballinasloe, Tuam, Banagher, and the Dublin autumn sales are derived. Hence it follows that the district around Ballinasloe, inasmuch as it supplies all the other grazing districts of Ireland with breeding and store sheep, may be said to be the headquarters of the native breed of Irish sheep.

Of these western counties, Roscommon takes the lead in the matter of sheep-breeding. The sheep bred in this county have always been regarded as a distinct type and of superior quality, and they have been so much sought after for the purpose of infusing new blood into the native sheep of the surrounding counties, that the name "Roscommon" is now applied to all the native Irish sheep sold in Ballinasloe and the other centres of the annual autumn dispersals. They are the only native breed which Ireland can claim, and though Roscommon is the birthplace of these sheep, they are now practically distributed all over Ireland. Fundamentally, the type is the same in all these sheep, but they vary as regards size and quality, according to the nature of the pasture and soil on which they are fed, and it must be said that a great deal of mixing and crossing of the breed has in recent years taken place in the South and East of Ireland. Unlike other parts of the country, Roscommon has confined, and still does mainly con-

fine its attention to this breed. For generations, and even centuries, no other sheep have been bred in several districts in the county. In 1895, breeders of Roscommon sheep formed themselves into an association called "The Roscommon Sheep Breeders' Association," with the object of maintaining the purity of the breed, and for the promotion of its interests generally. They adopted a thorough system of registration and marking. All sheep entered in the Flock Book must be registered and marked with the shamrock perforated in the right ear, which is a trustworthy guarantee of purity. Fixity of type is the key to success in pedigreed stock-breeding, and the establishment of a Flock Book has done much in fixing the type of the Roscommons in every flock, and has enhanced the value of the breed far beyond its native county.

It is held by some authorities that the present breed of Roscommons is the result of crossings of the native Irish sheep with English blood—



Roscommon Ewe.

notably the Leicesters. In 1776, Arthur Young visited Strokestown, and in describing his visit there, says:—Mr. Mahon's breed, both cattle and sheep, are improved by a bull and a tup, which he bought from Mr. Bakewell, and has bred from them with great success." Later on Youatt says:—"They (*i.e.*, the Roscommon farmers) bred from this valuable selection, and were soon acknowledged to be in possession of a flock of sheep not inferior to that of the most successful English breeder." The first effect of the Leicester cross was a marked decrease of size in the progeny, but this was more than counterbalanced by the enhanced quality, better general conformation, and more early maturing properties which the combination of blood produced.

This crossing with the Leicesters would appear to have taken place previous to 1800, and since then the flockowners in the country have kept the native breed intact, improving it by judicious blending of the various predominant qualities of the sire with the flock—that is, by taking advantage of all valuable characteristics, encouraging their development, and by degrees rendering them more permanent. This breed, like all classes of stock bred in the West, is kept in a more natural way than other breeds of sheep bred elsewhere, and it is doubtful if they have undergone as much forcing and pampering as the latter, either for the show-ring or the butcher's block.

As stock ewes, the Roscommons are excellent nurses and milkers, and, consequently, their lambs increase very rapidly in size and condition when the flock is not pastured too thickly together. Writing on this breed of sheep in 1895, Mr. Davison, of Esker, Timahoe, Queen's County, says:—"I hope there will be no tampering with the type of those sheep in their native soils, for if this ewe was altered in her present size, milking qualities, and robust constitution, it would be a national loss." Early development has never been claimed for the Roscommons; but like most slow-maturing breeds of sheep, their mutton is of excellent quality, well-grained, and evenly mixed. The leading characteristics of the breed are plenty of size, with a good round rib, strong bone, and fine, long, staple wool. A feature of the Dublin Show last August was the magnificent display made by the Roscommons in the sheep section. The larger proportion of the sheep of this breed exhibited were considered excellent as regards symmetry and general conformation. Amongst the most successful exhibitors was Mr. M. Flanagan, of Tomona, Tulsk, County Roscommon—the efficient and courteous Hon. Sec. of the Roscommon Sheep Breeders' Association—to whom the writer is under many obligations for his kindness in giving him all information as regards the breed.

The Wicklow Cheviots are called after the county of that name, to which they are indigenous. They are much the best class of mountain sheep bred in Ireland, and are akin to the Scotch Cheviot. They are a closely made, short-legged type, with clean, hardy-looking, bony heads. They are not so slow to fatten as the other mountain breeds, and they carry a better finish and make more weights, and the mutton they produce is of the primest quality. They are especially nice sheep to breed a market lamb when removed to the good grazing districts, and crossed with a pure bred ram—particularly the Shrop. or Oxford Down. For this latter purpose, these sheep are coming into more favour each year; they are excellent nurses and very thrifty to feed, and when judiciously mated with a good Shrop. or Oxford Down ram, and fed in the good grazing districts, they produce lambs of fine size and prime quality. It must be said that the breed is capable of improvement, and that an expenditure in the direction of breeding and feeding would repay the cost.

The mountain sheep of the County Mayo are still more of the Cheviot type than those of the County Wicklow; they are smaller in size, longer in the neck, and much less symmetrical, and are slower to fatten. There are a great many poor animals among these County Mayo mountain sheep, due to their being too much inbred, and not getting proper attention in the matter of feeding, and other respects. The Scotch Hornies predominate in the North of Ireland—in the Counties Down, Tyrone, Armagh, and

Londonderry. They vary much in size and quality, and, taken as a whole, the breed is capable of a good deal of improvement. Drafts from these northern mountain flocks are purchased annually by the Leinster graziers—ewes for crossing with a Shrop. ram to produce market lambs, and wethers and lambs to be fattened off. These latter make the highest class mutton, but they are very slow to fatten when taken off the mountain. The Kerry mountain sheep resemble the Scotch, but are somewhat inferior in size and quality, and they are shorter in the wool.

Of the pure breeds of English sheep there are numerous flocks in Ireland, but these flocks are only of limited extent, and are kept exclusively for the purpose of breeding rams for sale. These rams are usually sold as shearlings, either by public auction at the owner's residence, or at the Dublin Autumn sales, or by private sale, either at home or at the fairs. To ensure purity of type in the different flocks, and for the general harmonious working of the trade, an association, called "The Irish Ram Breeding Association," has been formed, and a number of rules laid down to regulate the sale of rams at the annual Dublin auctions. One of these rules states that:—All sheep for sale must be *bona fide* the property, and have been in the possession of the member of the association in whose name the entry is made for six months prior to date of entry, and must be entered, or the flocks from which they came must be entered, in the respective Flock Books of their breeds.

It is a matter of essential importance with these ram breeders to maintain the purity of their respective flocks, and at the same time not to allow their sheep to degenerate in size, which is a characteristic usually attendant on the continued inbreeding of pure breeds of English sheep in this country. To obviate the latter, drafts of new blood are imported each year, or every alternate year, into the flocks, either from England or from the flocks of noted Irish breeders. Some forty or fifty years ago the Leicesters were the most favoured of the English pure breeds for crossing purposes; but they were found to grow too small, and the mutton they produced was considered too fat, and being open in their fleeces, they were found rather delicate for our moist climate. For all these reasons their breeding was discontinued, so that latterly they would appear to have almost entirely disappeared in Ireland as a pure breed. The Shropshires have taken their place, and of all the English pure breeds they are now the most extensively bred in Ireland, particularly in the good grazing districts, where they are largely used as rams to cross with native Irish ewes, for the production of early market lambs. The other English pure breeds used for ram breeding are the Lincoln, the Border Leicester, the Oxford Down, the South Down, and the Hampshire Down. The rams from the pure English breeds are used by the Irish graziers for crossing with the native ewes, and the Shrop. is the most extensively used. The Oxford Down ram is considered an excellent cross with the Mountain or Cheviot ewe, for the production of market lambs, the Border Leicester ram being considered a better cross with these sheep for breeding store lambs, fed on stony mountain or rocky pasture, the latter breed having harder feet to wear than the Shrop. These pure bred flocks are to be found indifferently all through the country—the eastern, midland, and southern counties, where the good grazing lands are placed, being the chief centres of the breeding; while Connaught is an exception, the breeders in that province still holding true in their allegiance to the lordly Roscommon.

The following Table shows the number of sheep in each county of Ireland in 1900:—

No. of SHEEP in each COUNTY, 1900.

COUNTY.	Number.	COUNTY.	Number.
Antrim, ...	103,351	Longford, ...	31,621
Armagh, ...	24,073	Louth (and County of the Town of Drogheda),	50,099
Carlow, ...	97,945	Mayo, ...	361,978
Cavan, ...	25,562	Meath, ...	234,676
Clare, ...	117,864	Monaghan, ...	17,753
Cork, ...	320,361	Queen's, ...	74,182
Donegal, ...	194,707	Roscommon, ...	192,459
Down, ...	122,166	Sligo, ...	72,572
Dublin, ...	69,578	Tipperary, ...	251,202
Fermanagh, ...	11,942	Tyrone, ...	77,680
Galway, ...	653,456	Waterford, ...	64,504
Kerry, ...	137,943	Westmeath, ...	139,613
Kildare, ...	155,157	Wexford, ...	208,423
Kilkenny, ...	102,283	Wicklow, ...	228,820
King's, ...	101,730		
Leitrim, ...	17,521		
Limerick, ...	58,334		
Londonderry, ...	67,321	TOTAL for all IRELAND,	4,386,876

The following statement gives the number of sheep in Ireland for each year in the period 1880-1900:—

YEAR.	Number.	YEAR.	Number.
1880, ...	3,562,463	1891, ...	4,722,613
1881, ...	3,256,185	1892, ...	4,827,777
1882, ...	3,071,755	1893, ...	4,421,455
1883, ...	3,219,311	1894, ...	4,105,180
1884, ...	3,245,212	1895, ...	3,913,449
1885, ...	3,478,056	1896, ...	4,080,711
1886, ...	3,366,043	1897, ...	4,157,906
1887, ...	3,377,826	1898, ...	4,287,551
1888, ...	3,626,669	1899, ...	4,364,507
1889, ...	3,789,187	1900, ...	4,386,876
1890, ...	4,323,395		

As regards wool, that of the Downs, Shrop., Oxford, South, and Hampshire, is at present the most prized. Good Roscommon hogget comes next, much depending on how the sheep are fed. The wool of Roscommon hoggets, fed in Meath, Westmeath, and neighbouring counties, is worth a halfpenny per lb. above the same class of wool from sheep fed in other districts. Mountain and Cheviot wool are worth about the same price in this country; but in Scotland wool of the same breeds is worth more, as they seem to breed and feed the sheep better in that country. The wool of Cheviots and Mountainies, when fed on the lowlands—Meath, Kildare, etc.—is called "Seaside;" the same wool off sheep fed on the mountains is called "Mountain." The Scotch Horny, which is bred in the North of Ireland, produces the lowest grade wool. The Border Leicester and Lincoln wool is considered rather too long and coarse in texture. The wool of aged Roscommon sheep does not vary in price as regards the lands on which they are fed so much as in the case of hoggets of the same breed. Foreign competition is the cause of the decline in the price of wool.

THE SEA FISHERIES OF IRELAND.

I.—HISTORICAL SKETCH.

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 so-called kitchen middens, or shell mounds, frequently found close to where oysters, mussels, or cockles abound. The remains of fish are not so readily preserved as are these shells, but it is probable that these primitive people must often have been attracted by the shoals of fish which ever and anon make their appearance, and that they would soon have learnt how to catch them.

The Christian hermits, who in the fifth and sixth centuries settled on remote islands off the coast, must have taken count of the fishing possibilities of their locations, and St. Enda, of the Isles of Aran, definitely refers to the fishermen of Galway Bay. Later on, when large abbeys came to be built, how often do we find that the grey old ruins stand close to a point on a river where a salmon weir exists, or where salmon fishing is profitable. About this time inland fisheries came to be dealt with as valuable property, and in old monastic deeds they are frequently referred to. This value was probably of a very local character, as in those days, when salt was difficult to obtain, and the climate too humid for drying on a large scale, there can have been no great trade in river-caught fish.

The Scandinavians who, for centuries prior to the Anglo-Norman Conquest, occupied the principal coast-towns of Ireland, probably carried on a trade over-sea in fish. Their interest in fishing is testified to by the structure of stone fishing weirs, and even their language is still perpetuated in the great "Lax Weir" near Limerick, "*Lax*" being the Danish and Norsk word for salmon. In 1437 Irish sea fish and salmon were exported to Brabant. But the earliest references of important sea-fish trade in progress are those dealing with the fishing off the West of Ireland, by Spaniards, in the fifteenth and sixteenth centuries. Philip II. paid £1,000 into the Irish Treasury for permission to fish on the Irish coast; but for how long a time these Spanish fishing boats had made a practice of coming to the coast of Ireland it is difficult to say. In the reign of Queen Elizabeth it was a long-established institution; but, for obvious reasons, after the loss of the great Armada, the Spanish fishing fleets ceased their visits. The extent to which this business was carried on may be judged from a report written to the Queen by Sir Humphrey Gilbert, in which he stated that 600 Spanish fishing vessels were then fishing, and he mentions Baltimore and the Blaskets as centres of the industry; and he also states how the Spaniards complained that their cables were often cut by the natives. It would appear from this that there was but little sympathy between the Irish and the Spanish visitors, or, perhaps, the temptation of wrecking was too great to

allow room for any finer feelings, which, in the absence of education, and of wealth, it might be unreasonable to expect.

It is curious how little real history there is of these times; but, besides a stray note, such as the above, the impress of the Spanish type on the people in some parts of the West, the legends that hang about the sites of the permanent Spanish fishing establishments, the foundations of a pier still called by the people a "Spanish pier," and such like indications, give us some idea of this period of great fishing activity.

In the reign of Charles I. the Dutch were granted a licence to use the Irish fisheries on payment of £30,000, and in 1650 a similar licence was granted to Sweden.

In the seventeenth century among the chief fishers of the Irish coast were the French. One of many places where the French established themselves was Portrush, now famous for its golf links:—"The Bretons came every season thither for dogfish and rays, which, being well handled, are a very great commodity in Spain, especially in the Condado. The rays, likewise, sell well in the river of Nantes." Rays are still a commodity at Portrush and Portstewart, but the taste for dog-fish awaits revival. Fishing vessels from Yarmouth also came to the Irish coast, looking for cod, ling, and herrings, and English merchants cured thousands of barrels of herrings on the coasts from Wexford to Kinsale for export to the Continent.

On the whole, these were, for fishermen, troubled times, as "pecharoons," or pirates, continuously infested the coast, making their headquarters at Leamcon, in West Cork; while in time of war the Dutch fleets held command of the seas, and Anglo-Irish merchants wrote in vain to the English Government for protection of convoys, which the King was unable to give.

As far back as the fifth year of Edward IV. attempts were made to profit by this foreign fishing by Flemings and others by putting a tax of 13*s.* 4*d.* on every foreign fishing vessel of over six tons, or large enough to carry a small boat, and 2*s.* for every boat less than that size that visited the Irish coast. These were small craft to come from foreign ports; but the terms of the Act points to their having done so. "An office was erected" for the collection of these dues. Queen Elizabeth conferred the right of collecting them on a faithful servant and an intelligent leaseholder, under this title, in the following reign, attempted to exact the tax from English vessels, which naturally led to an outcry on their part. They appealed to the King, who thereupon ruled that the law should not apply to any of His Majesty's subjects.

During intervals of peace the Hollanders strengthened their position on the coasts of Ireland, and went so far as to attempt the purchase of the port of Galway. The price said to have been offered was as many coins as, placed side by side, would cover the quays. The King accepted the offer, provided the coins were placed on edge. This terminated the negotiations. With more congenial excitements, such as Tyrone's Rebellion and Civil War, it seemed difficult to get the Irish to interest themselves in fishing. No doubt "the trade," so well understood by the foreigners, and by the English, which enabled them to turn the products of the fishery into money value, was quite unknown to the native Irish. The want of business instincts so often bemoaned in Ireland was then far greater than in our time, while the Hollanders were the most skilful traders that the world has ever produced. In these times Scotch fishermen fished for herrings in Dublin Bay, and Sir John Temple states that in 1641, 500 of the Scotchmen

then fishing offered their services to the State, but, "They were so strangely affrighted one evening by a false alarm, as that in the night, on a sudden, the entire Scotch host put to sea, and quite disappeared from the Irish coast until the following year."

About 1625 the Lord Deputy appears to have visited Mayo, and conceived the idea of developing the fishing industry there by applying for "a patent for thirty years to some forty gentlemen willing to undergo the charge of fishing, and to have a grant of the district from Achill to the Stagges of Broadhaven. They doubt not they will build fair towns, and employ large numbers of people to the benefit of the British Isles." The projectors of this scheme calculated that they would, in four years, have 20,000 people employed. "The Hollanders return home to repack, and, perhaps, they may be retarded by foul weather, in which they cannot fish, while they, the projectors, will not need to sail four leagues out of the harbours before they apply themselves to fishing. This fishing borders on the County of Mayo, the inhabitants the most barbarous and dangerous in all Ireland."

History is silent as regards the civilizing and pacifying efforts of these forty gentlemen, nor does it say how far they took the gains from the Dutch, nor whether it led to any important development of industry in Blacksod Bay.

Schemes to suppress foreign fishing continued, and in 1667 an Act was passed against importing fish taken by foreigners. In 1673 Sir W. Temple proposed to Lord Essex that no one should be eligible for the House of Commons or for the Commission of the Peace who had not taken a practical part in the fisheries. Times, however, again changed: England's policy was influenced by the desire to develop the Newfoundland fisheries, and bounties were actually paid on the importation of fish, caught and cured there, into Ireland.

With the opening of the century which has just closed, we come to a period when prosperity, decline, and revival of the Irish fisheries follow one another in rapid succession. The latter half of the eighteenth century was the great period for bounties; various Acts were passed establishing them, or when frauds reached too high a level, regulating them. Vessels were built to catch the bounties rather than the fish. Possibly the frauds in the Scottish fisheries exceeded those in Ireland; but a good illustration of how the bounties worked out is given by Adam Smith, writing in 1759, where he says, that the Buss fishery of Scotland in that year, resulted in only four barrels of herrings, which in bounties alone, cost the Government £159 7*s* 6*d*. per barrel. This, no doubt, was an extreme case. In Ireland the bounties, at first given for the capture of all deep sea fish, were subsequently restricted to fish for curing. This drove the boats that used to fish for the local markets on the east coast to the west of Ireland, where fish was more abundant. The Skerries, Balbriggan, and Howth wherries went round the coast of Donegal and as far as Mayo, while hookers from Kinsale and other ports of Cork and Waterford, went round the south-west coast, and were frequently found as far as the Coast of Mayo, where Achill Sound was their favourite resort.

These Cork boats carried long lines, hand lines, and herring nets, and were in those days the only boats fishing with mackerel drift nets on the west coast. The harvest fishing was the only mackerel fishing attempted. When the fishermen complained of being forced by the bounty law to avoid

the fresh fish markets of the east coast and bear the hardships of the Atlantic storms in the winter season, the law was relaxed and permission was again given to supply *fresh* fish to the Dublin market.

Under the bounties the number of men engaged in the Irish fisheries increased from 36,159 in 1820, to 64,771 in 1829. This was, of course, a great period of activity in the fisheries, but the inflation brought about by the payment in bounties of £87,989 of Government money made no lasting impression: the prosperity was fictitious because it depended on an artificial market, and there was a complete collapse when the bounties ceased in 1829, and the fisheries had to come down to their commercial value.

It may not be out of place here, to contrast the creation of an artificial market by public expenditure, with the policy of later days, which by expending public money on railways, brought the natural markets within the reach of the fishery.

The Commissioners' Report of 1835 describes a sad state of things, everything on the decline, the curing houses going into ruin, and the large decked boats, brought into existence by bounties, rotting in the harbours. In these days, however, other influences profoundly though indirectly affecting the Irish fisheries were at work, and it is only by glancing at these circumstances that the various fluctuations which followed can be thoroughly understood.

In the sixteenth century the potato was introduced into Ireland, and, as is generally understood, was planted by Sir Walter Raleigh in the South of Ireland, on the banks of the Blackwater. Up to that period the Irish peasants appear to have been a flesh-eating people. They lived, as contemporary writers tell us, on the produce of their flocks and herds. Campion writing expressively, if not elegantly, in 1571, says that "oatmale and butter they crame together. They drink whey, milke, and beef broth. Flesh they devoure without bread. Corne, such as they have, they give to their horses." He further says they "swill in aquavitæ by quarts and pottles." With such a complete *menu*, varied in some places by an abundance of salmon, sea-fishing was an unnecessary employment, and could not have been attractive to a population mainly pastoral. This, I think, accounts for the sea fisheries being left in the hands of Spaniards or Dutchmen, who were encouraged by an over-sea demand for the products of the Irish fisheries.

For a long time the potato was only cultivated as a garden product, as a delicacy for the few; not until the eighteenth century did it become the food of the people. The population of Ireland, then about three and a-half millions, sprang up by leaps and bounds, until, in 1840, it was over eight millions. The "butter, beef broth and flesh" were now a thing of the past. Such living might have been possible for three million people, when cattle were not turned into money by a cross-channel trade; but it was clearly impossible for the potato-eating millions which had come into existence. All the resources of the country had now to be drawn on, and, as fish and potatoes go well together, the Irish sea fisheries began for the first time to be worked with vigour by the native population. In the early days of the nineteenth century this demand, as well as the bounties described above, helped to keep up the fine fleets of fishing boats which sailed from the Irish harbours, and the hardy race of men which formed their crews. Cod, ling, hake, and herrings were caught and cured for the local demand, and to add

to the other causes of prosperity, herrings visited the coast at this time in immense numbers.

After two or three premonitory symptoms the awful crash of the great famine came in 1846. The potato crop failed. Thousands of people died of starvation and disease resulting from it. Thousands more emigrated, and, during the ten following years, the population dropped from over eight millions to less than six millions.

In those dark days the Dungarvan fishermen who went to America introduced there the system of long line fishing which has ever since been practised on the New England and Newfoundland fishing banks.

In the reports of the Fishery Commissioners for the years after the famine we note the decline of the fishing fleets. The old order of things had changed, and until the new came in we see the vain efforts of philanthropic people and of the Government to better matters. These efforts were futile, because a great tide in the affairs of men was setting against them and there was no stemming it.

While these tragedies, profoundly affecting the Irish people, were being enacted, problems of an entirely different class were being worked out elsewhere. Folks of those days might have found it hard to imagine that matters, mostly scientific, could have any practical bearing on the Irish fisheries, and yet it was out of such experiments and discoveries that the new developments were to arise. George Stevenson, in these days, was trying to adapt steam to railways; while Bell and Symington were planning the first steamers. The electric telegraph followed in due course, and the latter half of the nineteenth century saw fresh sea fish delivered everywhere —fish packed in ice was sold in towns and localities where nothing but salt or smoked fish was seen before. It saw special fish trains, special steamers —steam on land and steam on sea—used in the carrying as well as in the catching—ice factories driven by steam, and the wants of millions provided for and arranged by telegraph.

With all these facilities the demand for fresh fish increased by rapid bounds, and the Irish fisheries, for a time lost to sight, were once more looked to for a supply. Irish herrings were sought for by fishing boats, and in some years not in vain; but the herring was not on the coast in the quantities of former days. Herrings are fickle fish: they come for years and go for years, and are not always forthcoming where the best reception has been prepared. One year, however, while fishing for herring, the Manx men at Kinsale reported that there was an abundance of mackerel—fine plump mackerel—on those south coasts, 2½ lbs. weight. The herring nets were cast aside, ice provided instead of salt, fast steamers engaged, many others built for the service, and in three years from the first venture "the great Spring Mackerel Fishery" was established. Boat-building then *boomed* in the Isle of Man; boats from Arklow, County Down, Campelton, Lowestoft, Cornwall, and France flocked to Kinsale, so that on one day as many as 700 splendid first-class boats, which, with nets, would be worth over £600 a piece, have been seen in that harbour. As the years passed the boats began to work more to westward. Owing to the munificence of the Baroness Burdett-Coutts, acting under the advice of the late Father Davis, the Cape Clear fishermen got mackerel boats, and Baltimore became a centre to which some of the buyers moved on. Then part of the fleet wandered on and made Berehaven a centre, then Valentia, Smerwick, Fenit, and the Shannon were reached. Smerwick and the

Shannon were soon abandoned as inconvenient, and for years Kinsale, Baltimore, Berehaven, and Valentia were the chief centres of the industry. All this time a local fleet was growing up along the coast, the boats being obtained on Government loans, until at last the number of Irish boats exceeded that of all the visitors put together. In 1890, the Royal Dublin Society began to investigate the seas off Galway and Mayo, and in their report for that year it was stated that "no place seems so admirably suited for a fishing station as the Aran Islands." In 1892 the establishment of the Spring Mackerel Fishery at the Aran Islands by the Congested Districts Board opened up new possibilities, and these remote parts of the coast as far as the north of Mayo are now rapidly developing new centres of the trade.

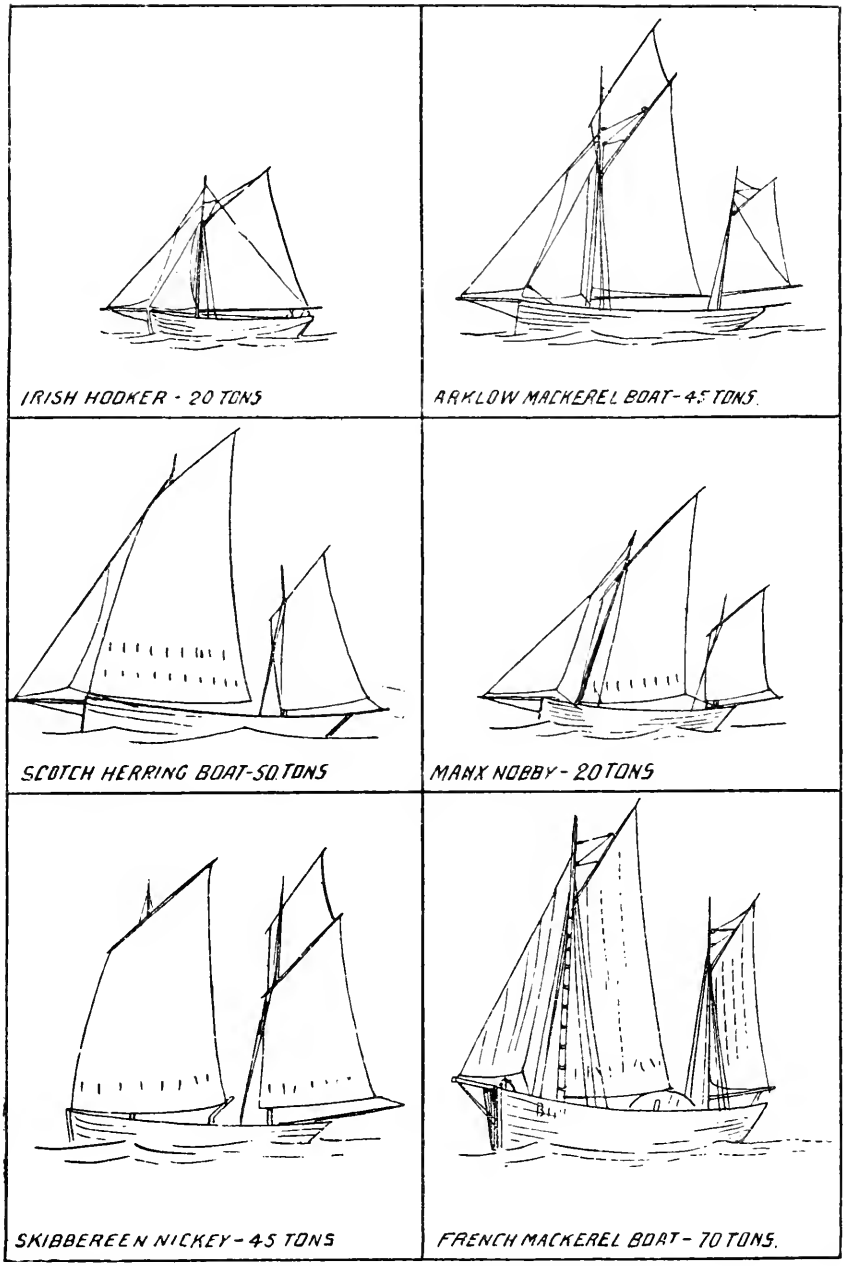
II.—FISHING GROUNDS.

The Atlantic sends in its shoals of mackerel with fair regularity twice every year. Herrings, too, appear in varying numbers. Pilchards used to come, but have not done so for many years, and, unfortunately, dog-fish follow the pelagic fish in millions. The fishing grounds around Ireland produce sole, turbot, plaice, cod, ling, haak, haddock, conger, and ray, with a sprinkling of halibut, and in the deeper waters tusk. Owing to the contour of the submarine plateau on which Ireland stands, these fishing grounds on the western side of the island extend to only a short distance from shore, whereas on the south, north, and east they extend as far as boats can go. The water which bathes the Irish shores is brought thither by the great drift from the ocean known as the Gulf Stream, and, being replete with living organisms, an abundance of food is always coming in from outside the fishing area. While an immense area is thus available for these fishes within the depth limits at which their existence is possible, it is a very common mistake to think that fish are distributed equally over it. For certain reasons, only partially understood, these various classes of fish have their favourite haunts. In one region at a certain season, haak arrive in great numbers, at another plaice or sole; in one place ling predominate, in another cod or haddock, but between these haunts, lines may be set with most tempting bait, or trawls shot, and the takes be worthless. The stock of fish, therefore, in the fishable area is thus often over-estimated, and calculations made where area is taken into account may be quite erroneous.

On the Western Prairies at one time herds of buffalo roamed, which reasonable men held to be interminable, and yet in one short year modern weapons and an organised attack swept them off the face of the earth.

The difficulty of getting at the herds of fish is greater than in the case of the buffalo. Their numbers, too, are vastly greater, and consequently they may stand line fishing, with its many delays and its desultory attacks, for ages to come, as they have done in the past; but when the modern steam trawler, knowing the season when fish crowd into very limited haunts, gets at these grounds with his persistence and effective gear, it is not a too prejudiced view to take when we say that an exterminating hunt has begun. A good deal of the line-fishing grounds around Ireland have thus been invaded, but within the areas where line-fishing is safe and possible, there is still room for very considerable development.

Ray and conger have in Ireland generally been treated more or less as worthless, or only fit to bait lobster pots, but nowadays the fishermen have



Types of Fishing Boats.

been taught that, when got across channel fresh, there is more trade in them than in cod and ling.

In the development of line-fishing, the bait difficulty is very great, and provision to meet it calls for further organisation.

The Spring Mackerel Fishery.

In the early days of the spring mackerel fishing, the fish were generally expected to appear off the South-west coast about the 17th of March. Of late years they are rarely caught by the large boats before the first or second week of April, and the fishing closes about the middle of June.

Stormy weather frequently prevails in April, thus reducing what is under any circumstances a short season, to one which leaves little time to pay expenses and make a profit.

The expenses, in all directions, are heavy. The merchants must lay in immense stores of ice and boxes, and keep expensive steamers in waiting. The fishermen have their long trains of nets to prepare, nets useless except for this one venture, and in many cases the boats' crews count on this season alone to give them any profit above what is necessary for the weekly support of their families.

The fleets of large deep-sea fishing vessels which congregate on the south-west of Ireland, have recently been made up in about the following proportions:—

Irish 350, Manx 160, English and Scotch 50, and French 70,

while on the coasts of Galway and Mayo about 75 large boats owned and fished locally, have recently come into existence. All these vessels use drift nets, forming trains of from one and a-half to two miles in length, and many of them have steam capstans for hauling in their gear. The value of the boat and her outfit varies from about £300 to £600.

The mackerel nets are shallower than herring nets: 6 score of 3-inch meshes deep being about the standard size, and they are set at the surface, carrying the boat with them as they drift with the tide.

A great number of row boats and canvas canoes join in the spring mackerel fishery, and they usually get the fish close to shore, earlier in the season than the larger vessels can capture them in the offing. After a short time the fishing moves off seaward, and the small boats, which have secured the high prices of the early fishing, are then compelled to give it up.

The largest vessels which join in the spring fishing are those from France. They carry longer trains of nets, much larger crews, and salt the mackerel on board until they have a full cargo, when they sail for home.

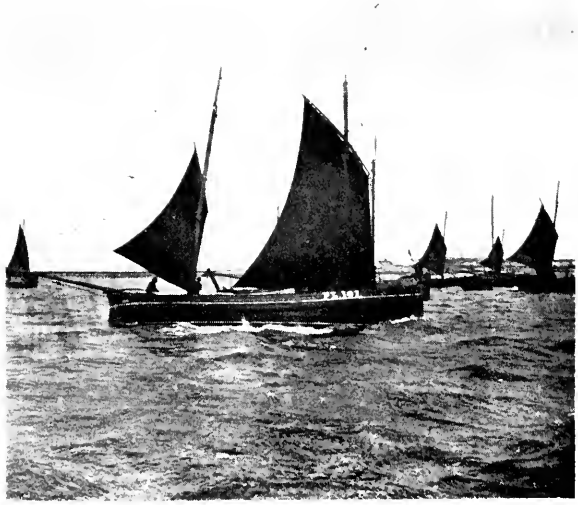
Drift net boats propelled by steam are the latest innovation.

The Autumn Mackerel Fishery.

The spring mackerel fishery lasts, as we have seen, for about two months, and is mainly a large-boat fishery. The autumn fishery, which begins in the end of August, often lasts on, when weather permits, into the winter, and up to Christmas. It is a row-boat and canoe fishery, the fish as a rule lying too close to the coast for large boats to approach them with safety. It is also

TYPICAL FRENCH MACKEREL BOAT.

ARKLOW MACKEREL BOAT.



MANX MACKEREL BOAT.

wide spread in its distribution, almost every creek from the south of Cork to the north of Mayo taking part in it. On the south-west coast the fishery opens with seine fishing, and in September the seines—with which often immense hauls have been made; (in Garinish in West Cork, 50,000 mackerel have been taken at one sweep of the net)—are discarded for gill nets. These gill or meshing nets are sometimes drifted, or else anchored out at sundown, and visited during the night or in the early morning. The fish are then taken in hand by the curers. They are split, washed, salt rubbed in, and packed, an abundance of clean, fresh water for washing determining the site of the curing station, as it also does to a great extent the quality of the cure. When the final packing takes place, 210 lbs. of fish are carefully weighed out for each barrel, which is then filled up with clear pickle, and the weight of fish guaranteed by the merchant's brand on the outside. Where railway facilities are good a certain amount of this autumn mackerel finds its way fresh to the English markets, but the great bulk of the trade is with America. The price obtainable there has fluctuated since 1887, when this trade began, from ten to twenty dollars per barrel. The size of fish preferred in America is that which counts about 300 to the barrel. The mackerel caught on the American coast run to a larger size than this. Efforts have been made to place pickled mackerel on other markets, but up to the present no better market than the United States has been found.. Crushing of barrels and consequent leakage of pickle during the voyage to America, is one of the difficulties the trade has to contend with.

Cod and Ling.

Cod and ling frequent the coast in considerable numbers, and from almost every creek where fishing boats can be kept men proceed to neighbouring "banks" or grounds where, from the nature of the bottom and the presence of suitable food, these fish congregate during the winter and spring.

The fishing is carried on by means of long lines, and the success of the industry depends largely on the supply of bait.

The difficulty of obtaining herring bait is one of the greatest that besets this fishery, and the consequence is that the men who could only obtain lug worm or mussel bait, took to using very small hooks on their lines, thus hoping that small haddock or whiting would take the hook, and in turn be swallowed by a cod or ling. In the reorganisation of the fisheries, the matters of first importance to inculcate have been the procuring of proper bait, and the use of large hooks, such as are used on the *great lines* in the North Sea, together with a great extension of the lines. On some portions of the coast there is considerable local sale for the catch, but on the West coast the difficulty and expense of quick transit makes it frequently more profitable to cure the fish, and at the stations opened by the Congested Districts Board this curing is done according to the most approved methods.

Herring Fishing.

The policy adopted by king herring, in his treatment of the Irish coast, has been most aggravating, as he has shown a fickleness quite different from his course of action on the Scottish coast. The only explanation is

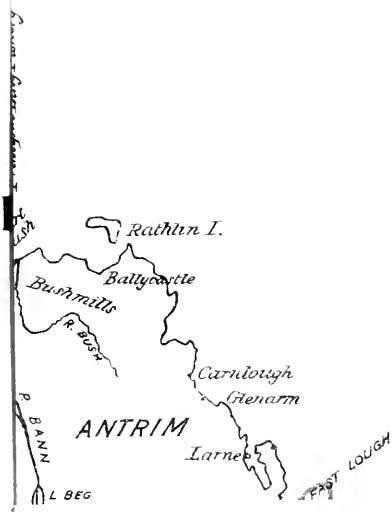
that Ireland being, as it were, the south-western outpost of his territory, it has not always been necessary to maintain a concentration of his forces in that direction. Not being admitted to his councils, we can do no more than feel the great inconvenience of herrings turning up in their thousands at one place for five, ten, or twenty years, and then taking themselves off for half a century. The buildings prepared for their reception fall into ruin, and these dilapidated, roofless stores adorning some of our ports, the grass-grown quays, and the hulls of boats cast aside to rot, are the only monuments that remain of days when the herring fishery was in full swing, and the now half-deserted wharves a scene of bustling industry. All the same, it is better for herrings to come in force occasionally than not to come at all, and they are always, to a certain extent, with us.

Herrings turn up in April off Kinsale, on the coast of Cork, and are in May only fished for by large herring boats, which come for this particular venture from the East coast of Scotland; all the large Irish boats at this time being engaged in the spring mackerel fishing. This is a wholly "freshing" business, the fish being despatched quickly by rail or fast steamers to market. Later on in the season herrings appear farther to the eastward, and in July there has been in some years a heavy fishing on the east coast off Howth, and about thirty years ago that part of the Irish Sea between Dublin, the Isle of Man, and Ardglass, in the County of Down, was the scene of a herring fishing, to which boats congregated from all parts of the United Kingdom, and large earnings were made. During the last two years an attempt, promising success, has been made to open a Spring Herring Fishery on the coast of Donegal. The fish were cured, and fetched the highest price in the Continental markets. Whether the shoals of herrings which appear off the coast in April or May, and those upon which this autumn fishery depended, are in any way related, has frequently been the subject of warm discussion, and in the present state of our knowledge it is wise to express no opinion. For a great many years the herring fishery in this part of the Irish Sea has failed, although recently it gives promise of revival.

Turning to the North and West coasts we have to go back seventy years and more to find a great herring fishery. The extensive buildings now indicated by fragmentary ruins which stand on the islands of the Rosses in Donegal were erected in 1786, when a prosperous herring fishery was in progress. Anderson, in his "Annals of Commerce," in 1780 states:—"The Irish have a great advantage as their herring fishery, so precarious on the coast of Scotland, is certain on the coast of Ireland. The Irish take a larger quantity of fish in the same space of time."

From 1822 to 1831 there was great fishing activity at Killybegs; the herrings then "took off" for a few years, but in 1836 the fishery resumed, and the harbour was crowded with from 700 to 800 boats, many of them from the East coast, being of large size and capable of carrying to market 200,000 cured herrings, which they bought in Killybegs fresh at ten shillings per thousand. The local boats were of about three tons and measured nineteen feet on the keel. The boats used by the Skerries fishermen were about eight tons and measured twenty-four feet on the keel, seven feet ten inches beam. They worked with eight pieces of net, thirty fathoms long and seven fathoms deep. The local boats used much smaller nets.

On the Mayo coast off Achill, there was good herring fishing from 1800 to 1810, then the arrival of the shoals became later and later, until in 1829


Rathlin I.
Ballycastle
Bushmills
R. Bush
Carnlough
Glenarm
ANTRIM
Larne
EAST LOUGH
R. BANN
L BEG

MAP
TO ILLUSTRATE THE
IRISH FISHING INDUSTRY.

EXPLANATION.

- Steam Trawlers.
- Open Boats only.
- Sailing Trawlers exceeding 5 tons.
- Herring Boats exceeding 5 tons.
- Mackerel „ „ „
- Mackerel and Herring Boats exceeding 5 tons.
- Approximate outer limits of Spring Mackerel Grounds.
- „ extent of Harvest Mackerel Grounds.
- Grounds worked by Sailing Trawlers.
- Approximate extent of Herring Grounds.
- Sprat Fisheries.

Symbols on Land.

herrings vanished not to return until 1836, when again there was a big fishing.

In Galway, in 1820, 300 boats daily lined the quays, landing from 10,000 to 20,000 herrings each. At this time herrings were selling from 6*s*. to 10*s*. per thousand.

In 1835 and for some years previous to that date the best winter fishing for herrings was off the coast of Connemara.

After the famine years the herrings vanished, and the revival on the Donegal coast, in the Rosses and Sheephaven, goes back for only eight years or less. Now it is big enough to attract the consideration of well-known curing firms, chiefly from Scotland, and it is a strange anomaly of trade to see fast steamers daily starting for Glasgow with Irish herrings, both cured and fresh, and at the very same time fish merchants in Ireland importing barrels of herrings in large numbers from Scotland. The herrings of the West of Ireland are of a very high class, and have taken top prices in the North German and American markets.

Besides the revival of herring fishing on the Donegal coast, West Mayo is coming under its influence; while Galway, Dunmore East, and other areas, which seem to have their own peculiar herring fisheries, good seasons as bad ones have come and gone, while far greater fluctuations have characterised the fishing on the outer coast. Constancy, however, is unfortunately conspicuous by its absence from the Irish herring fisheries.

Fluctuations in Fisheries.

The fluctuations indicated by these details are of importance because they point to the fact, which must not be lost sight of, when development of the fisheries is undertaken, that certain species of fish have periods or cycles of abundance and of scarcity. In the case of the herring these cycles are discoverable in old records, but in regard to other species, history is not so helpful. For two hundred years the supply of mackerel on the coasts of the New England States has been duly recorded, and it was fairly constant until 1886, when it for some unexplained cause utterly failed. This fishery on the Irish coast has no history beyond the memory of old men still living; but according to some of them mackerel, like the herring, have had their periods of scarcity as well as cycles of great abundance. Abundance, disappearance, and recurrence of haddock is a remarkable instance of fluctuation in our coast fisheries well known to sea fishermen whose memories can take them back for forty years.

Trawling.

Trawling has been practised on the Irish coast certainly for a century, and it is difficult to say for how long before. The most primitive form is the pole trawl, still used on the South coast. In this case the net consists of a bag and wings, the latter being kept distended by poles projecting from each side of the hooker to which the ends of the warps are attached. In large hookers the spread given by the poles is about fifty feet, but the distance apart of the "hammers" or weights at the ends of the wings of the net, could not, in ten fathoms of water, be more than twenty-five feet, and in deeper water much less. About thirty-five years ago otters came into

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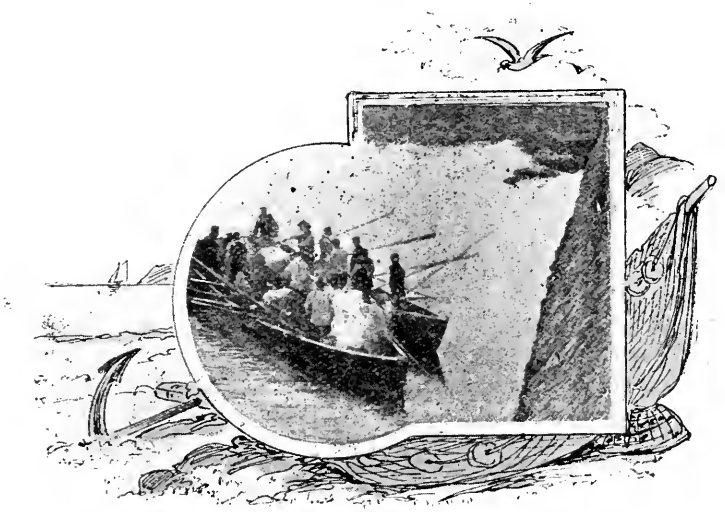
general use, giving a much greater spread to the net, but poles in the larger boats are used as well. On the coasts of Ulster the otters approved of are larger in proportion to the size of the boats, and poles are unnecessary. In Dublin, Galway, and Dingle there are fleets of beam trawl boats varying from forty to seventy tons, many of them being purchased in Brixham, Lowestoft, or Grimsby, and a few steam trawlers are also owned in Ireland.

The greater part of the Irish sea is a trawling ground, and is more or less a sheltered area. Soles and plaice migrate within it according to season, and were followed to their favourite haunts by the sailing trawlers from Dublin, Liverpool, and the Isle of Man. Spells of calms and of storms gave the fish a chance of rest, the number of days in the year that trawlers could be on their track being comparatively few. Now the whole business is changed, and the steam trawlers ceaselessly prowl to and fro—no calm



Mackerel Seine Boat and "Follyer."

can stop them, and only exceptionally severe storms. The steam fleets are growing, the demand for fresh fish appears to be increasing, the business is a thriving one, and the only question is—how long can it last? The returns of fish landed at the great fish ports of Grimsby, Hull, Aberdeen, Liverpool, and Milford show big figures, and a casual glance has led many to the conclusion that the fishing grounds of the United Kingdom are bearing the strain fairly well; but closer examination shows that these returns are kept up by hosts of steamers arriving from the coast of Ireland (for which Irish statistics show nothing), from Iceland, Faroe, the Bay of Biscay, and the coast of Holland, the areas fished being a hundred times greater than they were fifty years ago.

To the south and north of Ireland are great areas good for trawling, but exposed to the Atlantic swell, and in the west of Ireland are particularly rich grounds, but of small extent, on account of the rapid deepening of the ocean in that direction.

Fish in paying quantities for the steamers, and in some cases for the

sailers, are still to be found in all these grounds; but in the Irish Sea the stock of fish, particularly of soles, is declining, and it is difficult to believe that in the ultimate interest of the steam trawling industry itself, as well as that of the public at large, it is not desirable to have protected areas where fish, whose numbers are limited, may have sanctuary, and an opportunity to propagate their kind.

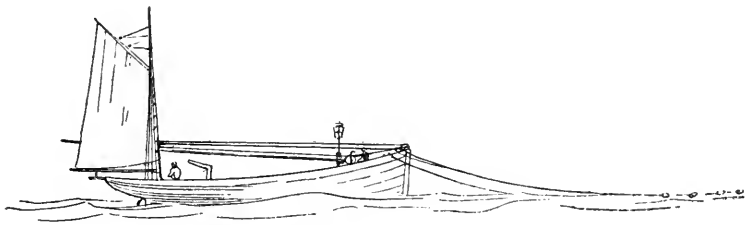
Other Fisheries.

Lobsters are found in considerable numbers wherever the coast is rocky, and at certain places firms have made ponds for storing them.

Oysters occur in the sea off the coast, and on the much-indented west coast there have been famous oyster beds. Some are still worked, but there appears to be room for effort in the direction of restoration of stock where the natural beds are absolutely free from pollution.

Mussels in some districts are largely exported, but for want of means of despatch, fine beds are in some places unworked.

A very large quantity of periwinkles are exported to England, and to a very small extent, a prawn fishery is carried on.



KINSALE MACKEREL BOAT riding to her nets.

III.—TYPES OF IRISH FISHING BOATS

The fishing boats to be found around the Irish coast are of a variety of types. Some are relics of bygone times, and survive because they possess those qualities which make them specially suitable for the work they have to do. Others are of new types, introduced from England, Scotland, and Norway, and provide for the requirements of the new and more elaborate modes of fishing.

The boats in use in all countries are more or less the result of evolution going on for ages, and the type is determined by its environment. The class of fishing vessel most suitable on one part of the coast may be quite unsuitable on another. When, therefore, the physical conditions and market facilities have been ignored, attempts to introduce new methods of fishing have often resulted in failure.

In the days when saws were unknown, planks were not easy to make, and primitive man, when he wanted to get afloat, had to do one of two things: he had either to make a canoe by scooping out a solid log, or else to construct a framework of branches of trees and cover it with raw hide. The early Irish, being a pastoral people, found hides ready to hand, and

consequently they constructed for sea use the Curragh or Canoe. When canvas came within their reach it afforded a still better covering, and it stimulated further development.

There are many places on the west coast of Ireland where the great Atlantic rollers break in such volume and fury that it does not do merely to haul a boat up clear of the water, and leave her there. Boats, to be safe, must be placed high above the sea level. The light and buoyant canvas curragh has, amongst others, this great advantage: that when the men come in from fishing they need not go looking for help, but simply turn their canoe over their heads and walk up the rocky path or over the boulder beach, and place her in a safe nook where no angry billows can harm her. The lightness and buoyancy of the canvas canoe is unsurpassed, and, consequently, on those parts of the coast where these qualities are of the first importance, the canoe still holds its own. In some places the primitive one-man canoe lingers, but in most districts the curragh has developed into a shapely canoe for four men. And as they are designed to go over the water rather than through it they are, when properly handled, safe in the most stormy sea, and can face a surf where any wooden boat would be swamped. On the Kerry coast the canoe has reached its highest development.

The Pookawn of the Connemara coast also represents an early type of craft. This coast, on account of its extraordinary indentations and channels safe from the ocean, is the natural home of the sailing boat. Here the necessity for hauling up does not exist, and deep sail boats, from the hooker of twenty tons to the pookawn of three, may be found stowed away in creeks close to the cottages of the owners. The pookawn, or the glothogue (a small hooker), take the place filled by the donkey and cart in districts not so cut up by arms of the sea. The peat is taken to market, the weed gathered for kelp, or for manure, by these boats; in them, also, the supplies of flour and meal arrive, the cattle go to the fair, and the people to Mass. The youngsters quickly become sailors, and for excitement, smart sailing, and close contest, nothing can beat a pookawn race at one of the local regattas. All these craft—hookers, glothogues, and pookawns—are built on exquisitely graceful lines under water, but the "tumble home" above water and the immense strength of their frames tends to give them a clumsy appearance. The rig of the pookawn is a high-peaked dipping lug, with a peak halyard to support the outer end of the yard, and a jib. This lug-sail is evidently a modified lateen, the peak halyard testifying to the alterations made in or after the seventeenth century, when jibs were invented; therefore it seems as though the pookawn is a relic of Spanish influence, the sails in other parts of the British Islands being chiefly referable to the Scandinavian type. In the Mediterranean the modified lateen of the pookawn may frequently be seen.

Glothogues and hookers are rigged in the ordinary smack or cutter rig of the present day. The sails of all these craft are made of strong calico soaked in a composition of tar and butter, and when freshly coated are almost black.

The clever boatwrights of this Connemara shore took quickly to the new models presented to them by the Congested Districts Board, and, with little instruction, after being taught the necessity of bending planks by steam, have turned out Nobbies and Zulus as well as the best.

The managers of the industrial schools of Killybegs and Baltimore have

also established building yards to meet the demand awakened by the opening up of new centres of fishing.

Leaving the Connemara coast for Donegal, we meet with a good class of four-oared yawl, pointed at both ends, of great beam, and easy to manage under two spritsails and a jib. They are generally known by the herring fishers and line men all along the north coast as "Greencastle yawls"; but at Greencastle and its neighbourhood, the point from which the type has radiated, they are called "Drontheim Boats," indicating clearly enough that they have been introduced from Norway.

In West Cork and Kerry a long narrow six-oared boat has become prevalent, great speed being required for working the large mackerel seines.

At the mouth of the Shannon the salmon fishers of the Cashen river have adopted a highly specialised class of surf boat. The heavy Atlantic swell breaking on the bar frequently renders ingress or egress for any ordinary boat impossible, but these boats with flat floor amidships, and sheered up to five feet off the ground at either end, can make the passage when nothing else could.

On the flat shores of Wexford flat double-keeled boats are used; but in the rest of Ireland the boats employed are for the most part the antiquated hooker, but more generally the modern trawler or herring boat, or ketch-rigged mackerel boat similar to those in use in other parts of the United Kingdom.

With so many types of boat in use it is possible that some one may ask —why cannot some type be found to be less special, and consequently more generally useful? Some dependence of the type on physical features has already been pointed out; but there is one more point. Taking boats of large size alone, some are wanted for drift-net fishing, others for line-fishing, and others for trawling, according as the facilities for following any of these fishings predominate. And it often becomes a most delicate calculation to find out what qualities should, with a view to profit, be aimed at. The diversity of requirements between an ideal mackerel boat and a trawler may thus be stated in illustration: a mackerel boat, besides needing good sea-going qualities, which she must have in common with a trawler, must be constructed to carry a bulky load of nets and of fish, and to put the minimum strain on her gear when in the water. A trawler, on the contrary, must be constructed to put the maximum strain on her gear, and carrying capacity for her is of little importance. Generally speaking the qualities desired are as numerous as the types of craft in use.

Steam has for many years been used in the ordinary mackerel boats to give power to the capstan which hauls in the long trains of nets. During the last twenty years the steam trawler has become more and more the craft on which the permanent markets depend; and quite recently the steam drift-net boats are coming to the front and may now be found in the springtime landing their catches of mackerel in our south-western ports.

IV.—DEPARTMENTAL MARINE LABORATORY.

Equipment for Fisheries Investigations.

Although Ireland can show a long and honourable record of work in the field of marine biology, it is only within comparatively recent years that the

practical utility of such work in connection with the administration and development of our fisheries has received public recognition.

The first step in this direction was the organisation in 1890 and 1891 by the Royal Dublin Society of a survey of the fishing grounds on the west coast. For this purpose a steam yacht was chartered in each of the years mentioned, and was equipped for all descriptions of fishing operations, and for biological and physical observations. The grounds were surveyed in as thorough a manner as possible, and the results carefully recorded.

Towards the expenses of the survey Her Majesty's treasury contributed a sum equal to half of the estimated cost; but as the estimate was considerably exceeded, much more than half the actual cost was defrayed by the Society. One of the Inspectors of Irish Fisheries acted as director of the survey, and other gentlemen were employed in the capacity of naturalists and physicists.

At the time of the survey there were practically no fisheries of importance on the west coast, and the great development which has since taken place may be attributed in large measure to the information which was obtained by the survey.

In 1898 the Royal Dublin Society once more entered the field of fisheries research, and, having obtained from Her Majesty's Treasury a grant of money equal to half the proposed cost, proceeded to establish a Marine Laboratory for the purpose of studying, for a period of five years, the various problems affecting the mackerel fishery and the proceedings of salmon in the sea. The laboratory commenced work in February, 1899.

Its management, subject to the control of a Joint Committee in regard to the branches of research mentioned above, has since been handed over to the Fisheries Branch of the Department of Agriculture.

As the field of observation was not intended to be confined to one particular district, it was essential that the laboratory should be capable of being moved from one place to another. Frame houses fulfil this condition, but are understood to be generally more easy to take to pieces than to put together again. Moreover, in the case of any building on land, fresh difficulty and expense in regard of site and supply of sea water would have arisen whenever the *locus* was changed.

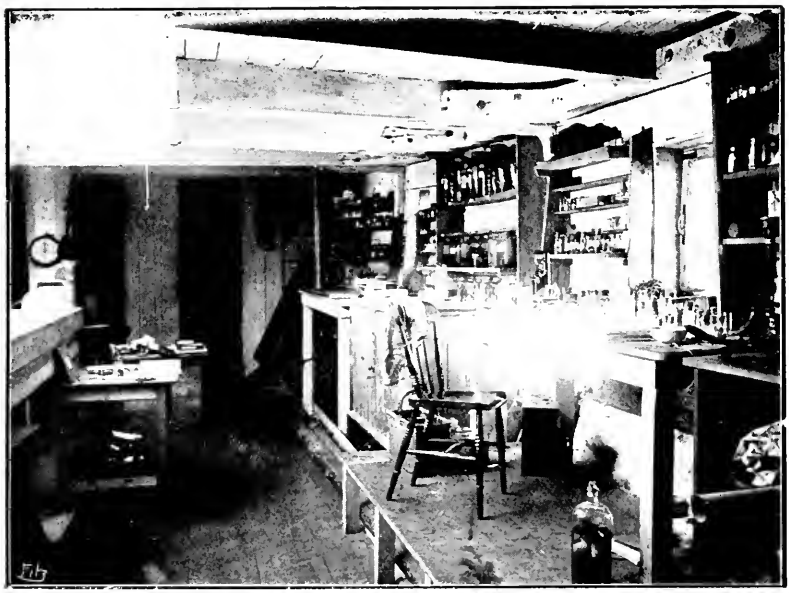
A floating structure is free of these disadvantages, and, if moored in sheltered water, is almost always sufficiently stable for the use of delicate scientific instruments.

The Fisheries Department of the Danish Government have for some years used a floating laboratory, chiefly, if not entirely, within the fjords. It is a specially constructed floating house. In Scotland trial was made of a much smaller structure of a similar kind, but, possibly from want of care in the selection of a site for mooring, the experiment was not considered a success, although no similar difficulty appears to have been encountered by the Danish investigators.

Considerations both of sea worthiness and economy suggested the conversion of a sea-going ship into a laboratory, and the Society accordingly purchased the brigantine *Saturn*, of Galway, of about 220 gross tonnage.

To ensure the maximum of stability when at anchor, it was necessary to sacrifice all means of locomotion by removing all overhead gear, except the lower fore-mast, which was required to take a derrick.

The hold was floored throughout, and divided by a partition into two apartments. The larger of these, about 35 feet by 20 feet, was fitted as a



TWO VIEWS OF THE INTERIOR OF THE MARINE LABORATORY OF THE DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.

laboratory, with four tables for workers, and a large central table, ledged and covered with sheet lead, for aquaria. Overhead light is obtained from a skylight, which occupies the whole of the main hatch, while each worker's table is lighted by a window cut in the ship's side.

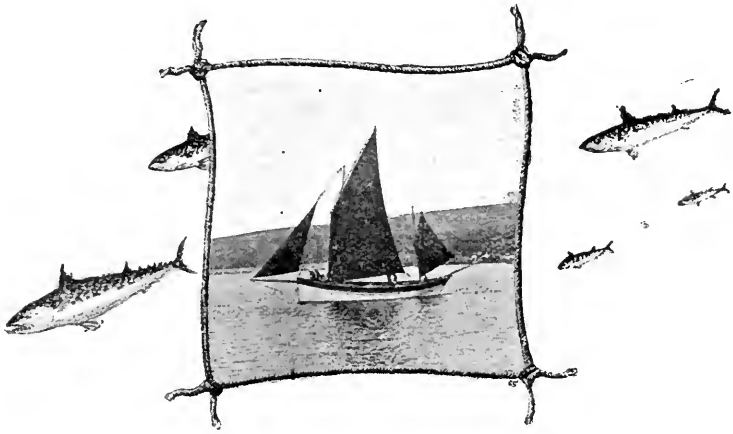
Sea water for the aquaria is led by a pipe, fitted with a series of cocks, from a reservoir on deck, which is filled by means of a semi-rotary hand pump, the waste water draining by a pipe into the bilge. The wall space of the laboratory is occupied by bookcases, cupboards, and shelves for jars, bottles, etc.

The other division of the hold is fitted as a state-room for the scientific staff. A deck-house, erected aft of the pumps, serves as a dining-room, and is also found convenient for the recording of the routine meteorological observations.

The cuddy, which, as is usual on ships of similar size, is of rather limited dimensions, is used as a store-room, while the captain's cabin has been converted into a photographic dark room.

The crew occupy the forecastle, which has not been altered in any way.

While the laboratory serves as headquarters, fishing operations are carried on by a number of boats. The largest of these is the *Monica*, a



The Department's Nobby, "Monica."

nobby-rigged mackerel boat, thirty-six feet on the keel. She carries a train of forty nets, and, in addition to the usual accommodation for the fishing crew, has a small state-room, with two bunks and cupboards and lockers for the scientific instruments. She carries a small punt.

The *Marion*, a sloop-rigged, half-decked boat of twenty-two feet l.o.a., the *Conger* and *Mule*, open boats, with standing lug-sails, and a small nameless dinghey, complete the flotilla.

The Laboratory has hitherto been moored at Ballynakill in the winter, and Inisbofin in the summer, being towed from one place to the other by the steamers of the Congested Districts Board.

These sites were selected on account of their proximity to Cleggan, which is the headquarters of one of the principal mackerel fisheries of the country.

They have also been found convenient for the study of the movements and habits of the salmonidæ in salt water.

In regard to both mackerel and salmonidæ, observations have been made continuously, while the hardly less important study of the general fauna has been by no means neglected.

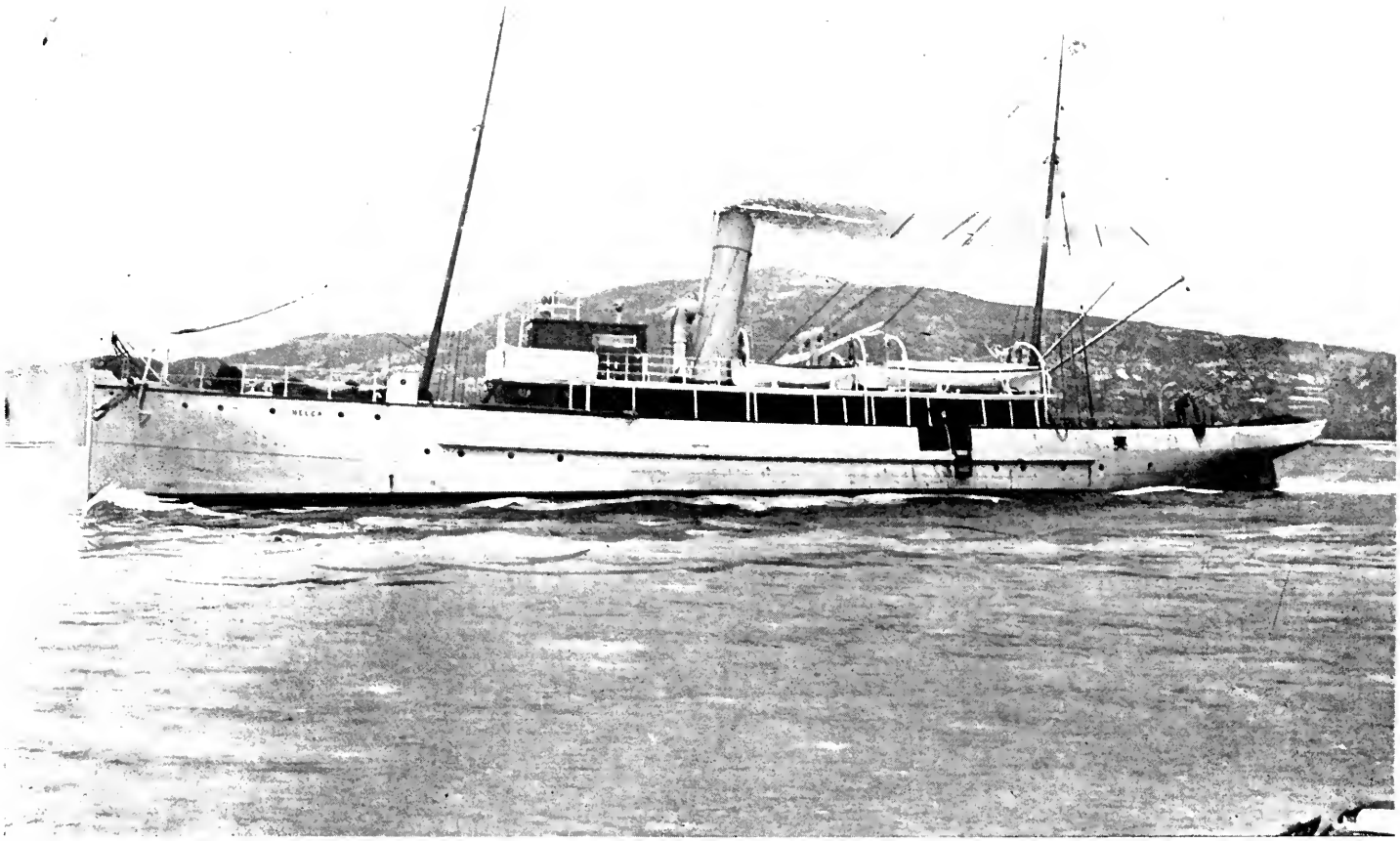
The equipment of the Fisheries Branch of the Department for scientific research is efficiently completed by the steam cruiser *Helga*, a twin-screw steamer of 375 tons. She is a boat of excellent sea-going qualities, and capable of maintaining a high rate of speed, while her low free board renders her most suitable for fishing operations.

For her duties in patrolling the waters closed to trawling, and in generally enforcing the provisions of bye-laws relating to sea fisheries, she has special fittings, with which we are not here concerned.

For the purposes of scientific investigation of the fishing grounds, she is completely equipped as a trawler, carrying a number of trawls of different patterns, the largest having a beam of forty-one feet. Her winch has two barrels, one holding a stout warp for trawling at moderate depths, the other being occupied by a fine warp for use with lighter gear at great depths. She is also provided with dredges and tow-nets, including self-closing nets for use at different depths, a deep-sea sounding apparatus, and all necessary instruments for physical and microscopical observation.

"STEAM DRIFTERS" ENGAGED IN MACKEREL FISHING AT FENIT.

CAPE CLEAR HARBOUR.



THE TWIN SCREW CRUISER "HELGA" OF THE DEPARTMENT OF AGRICULTURE AND TECHNICAL INSTRUCTION FOR IRELAND.
For the purpose of protecting the Irish Fishery Grounds against illegal Trawling, and for the purpose of scientific marine investigation.

INLAND FISHERIES.

The inland fisheries include the Salmon fishery, though this is largely carried on at sea, and appear to be worth, in pecuniary return, rather more than the sea fisheries. The Salmon fishery is by far the most valuable, its annual return being estimated, even in the present somewhat depressed condition, at £300,000, while the number of professional fishermen employed in it appears to be about 12,000 or 13,000, a number which, with their families, constitutes a respectable proportion of the entire population.

The commercial Salmon fishery is prosecuted, as may be supposed, chiefly at or near the mouths of rivers, the engines most used being draft-nets or seines (659 in 1901) and drift-nets (360 in 1901). Fixed engines, such as weirs, bag-nets and stake-nets, being restricted by statute, are comparatively few in number, but in some cases of great value. Snap-nets (224 in 1901) are confined to the Waterford, Lismore, Limerick, and Drogheda districts.

In Ireland, under common law, the public have the right of fishing for salmon with moving nets in the sea and in the estuaries at any place more than half a mile above or below the defined mouth of a river, except where several fisheries have been granted by charter, and it follows that professional fishermen have a very substantial interest in the industry. In some places, where a several fishery exists, fishermen net on their own account under license from the owner, and probably in every case of a private net-fishery the employes receive a certain sum for every fish caught in addition to whatever may be their regular wage.

The greater proportion of the drift-nets are in the hands of fishermen of the poorest class, who also hold most of the snap-nets and a large proportion of the draft-nets. In consequence the number of these nets which are used fluctuates considerably from year to year in proportion with the success of the fishery and the prospect of enough being earned to leave a margin of profit after payment of the license duty.

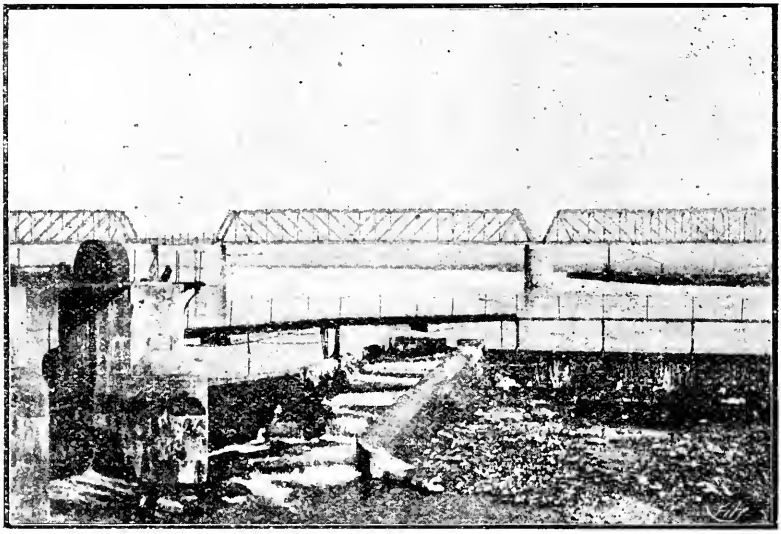
It would be difficult to attempt to localise the commercial salmon fishery, since it is prosecuted with more or less success on all parts of the coast, but the mouths of the Shannon, Corrib, Erne, Foyle, Bann, Boyne, Nore, Suir, Barrow, and Blackwater may be cited as among the most important centres.

Sea Trout, always called White Trout in Ireland, are of considerable commercial value to the country, the chief fisheries being on the west coast. Brown Trout, including the large varieties found in certain lakes, and the Slob Trout or "luogues" of estuaries are also netted for market in a good many places, while the Pollen fishery engages the attention of many of the inhabitants of the shores of Lough Neagh. The Eel fishery is prosecuted chiefly by means of weirs and is of great commercial value. The Shannon, Bann, Erne, and Corrib are important rivers in this connection.

Angling can hardly be regarded as of great value from the commercial point of view, though a large proportion of salmon and white trout caught

by rod and line find their way to market, and there are a number of professional anglers who fish solely for commercial purposes.

As a sport, angling is of the greatest importance to the country, since nowhere else in the three kingdoms can the sportsman obtain such good angling at so small an outlay. Famous fisheries of course command high rents, but almost every river holds salmon, and in the remoter parts of the country good sport can often be obtained at no charge beyond the very moderate bill of the hotel which has leased the fishery. The complaints, so frequent in past years, that the excellence of the fishing was marred by the uninhabitable nature of the hotels has no longer much justification in fact, existing hotels having been improved and new ones having sprung up in all directions. The rivers, of course vary in their season and in the

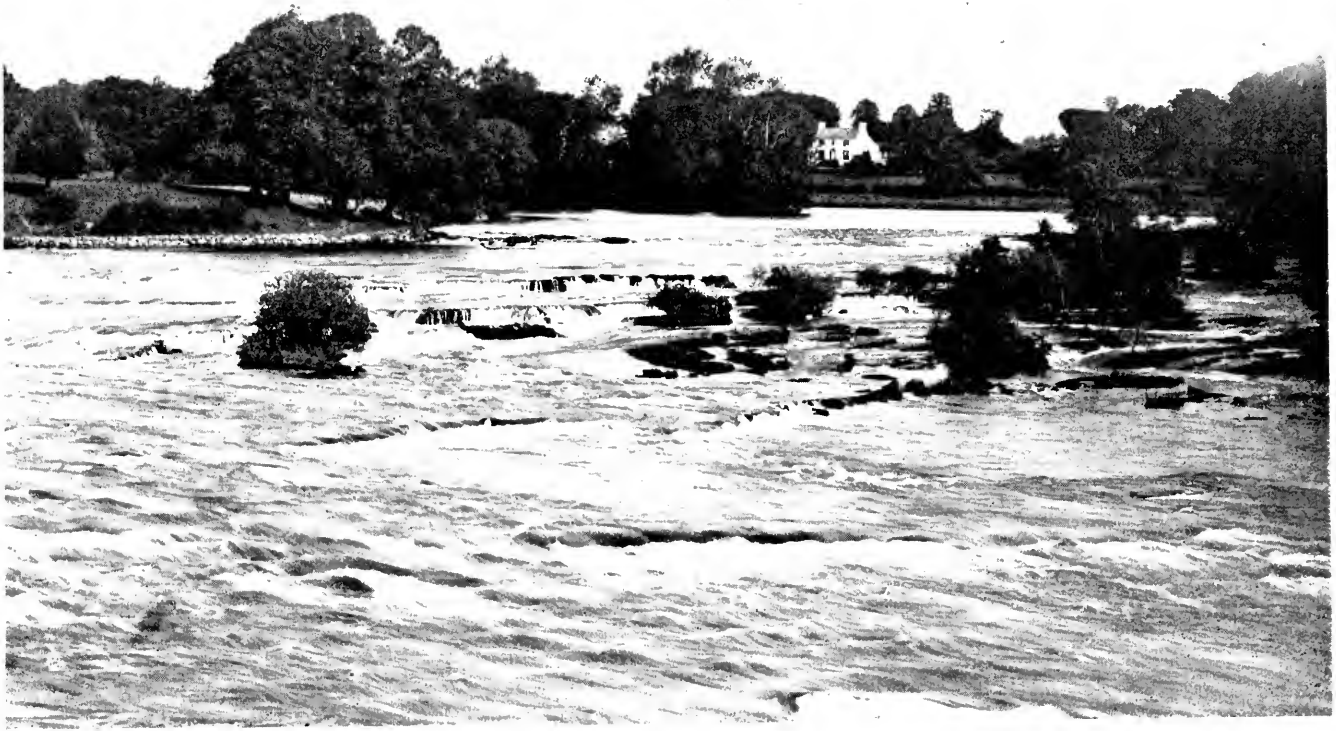


Salmon Pass, Galway.

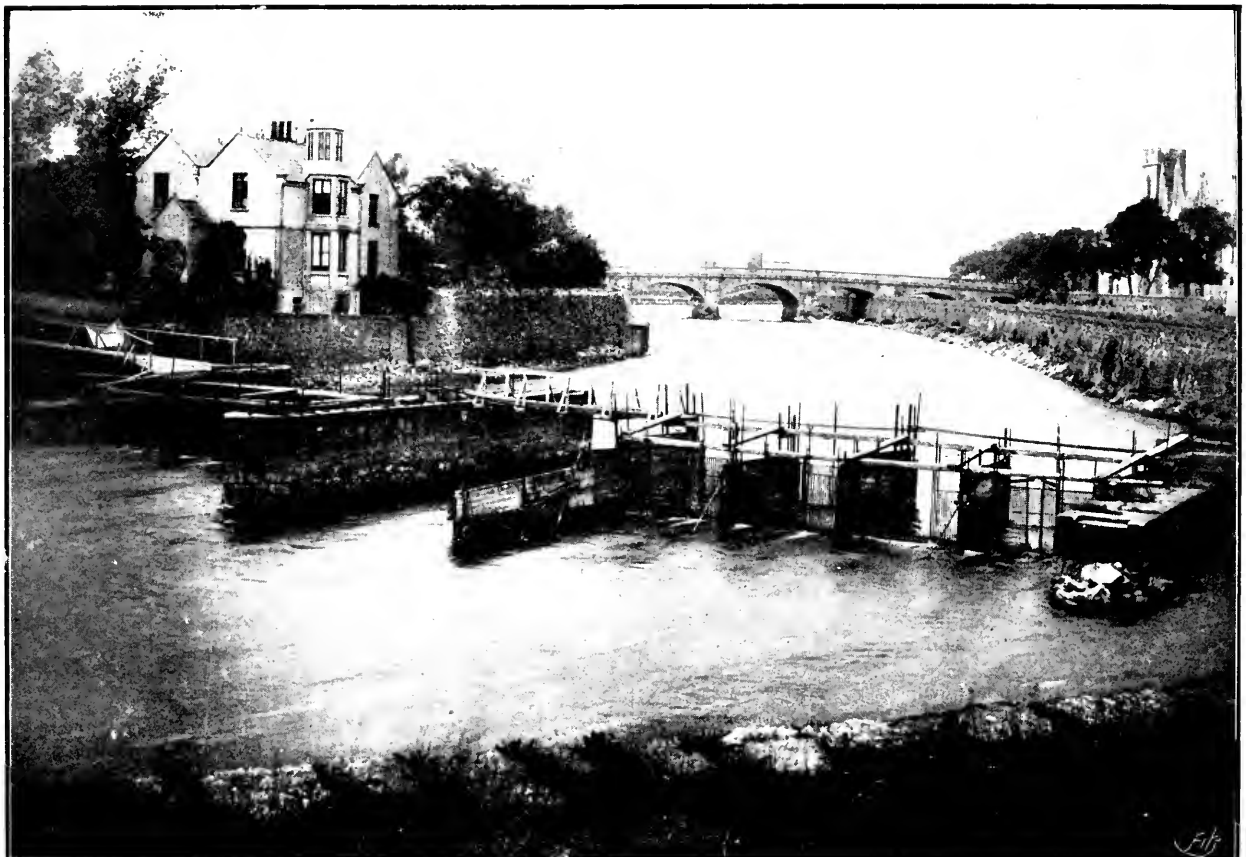
quality of fish which they hold, and while a man may hope to land a forty-pounder in the Shannon he need expect nothing but "peal" (grilse) in many of the smaller rivers. In the summer the white trout angling is excellent and accessible to the most moderate purse in many rivers and lakes in the West. Brown trout are in every lake and stream, and leave to fish for them may usually be had for the asking, where they happen to be preserved at all. In the larger lakes they grow to a great size and give proportionate sport. No licence is required for brown trout angling, a licence of £1 being payable for salmon or white trout angling and applying to the whole country.

Char are to be found in several lakes, but are little troubled by anglers.

Unfortunately those who are interested in Pike need have no difficulty in finding them, and there is a substratum of truth as to the size of the Irish pike quite sufficient to support a considerable edifice of piscatorial romance, though it may not be every day that one catches a monster in whose mouth "the spoon-baits are jangling like the bells of Armagh cathedral."



FALLS OF THE SHANNON, NEAR CASTLECONNEL.

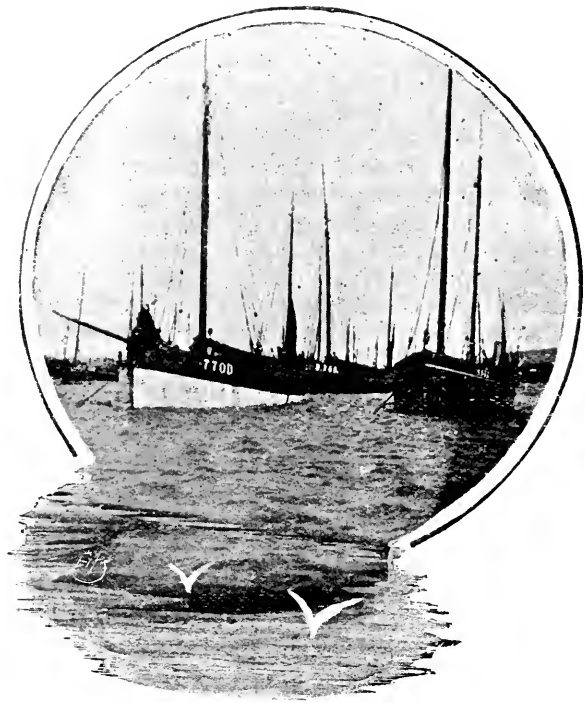


THE SALMON WEIR AT GALWAY.

Artificial Propagation.

The artificial propagation of salmon is carried on at a number of hatcheries, of which fourteen are on a fairly large scale, and the hatching of white and brown trout is not altogether neglected. The hatcheries vary a good deal in structure, from the elaborate modern establishments on the Bann, Boyne, and Foyle, to the somewhat primitive but quite efficient open air hatcheries of Kerry.

Formerly these hatcheries relied for support entirely upon the enterprise of private individuals, but during the last two spawning seasons the Department, recognising the public value of the salmon fishery, offered a subsidy in respect of the output of fry. This offer was accepted in a number of instances, and the output shows a considerable increase. Under a ten years' agreement with the owners the Department has also provided the cost of enlarging and improving several hatcheries.



Arklow Mackerel Fleet.

THE WOOLLEN INDUSTRY IN IRELAND.

Origin of the Textile Art.

It is generally believed that the textile art had its origin in plaiting, and the implements used for weaving among savage races seem to confirm this belief. The way to manufacture some kind of cordage out of rushes or grass must have been very early discovered, and it must have been soon found out that cordage could be turned, by plaiting, into a thin, flexible sheet of material capable of being used for a great number of purposes, and of being richly ornamented. Weaving, in the proper sense, occurs when there is a fixed warp held in a state of tension while a weft consisting of a continuous thread is carried backwards and forwards across and among the strands of the warp, forming a selvage at the side of the web. It may also, perhaps, be considered as essential to the true conception of weaving (as distinguished from "darning") that there should be the device known as the "heddle-leaves," for separating the strands of the warp so as to permit the thread of the weft to pass between them, and then re-crossing them so as to grasp that thread and form an opening or, as it is technically called, a "shed" for the next one.

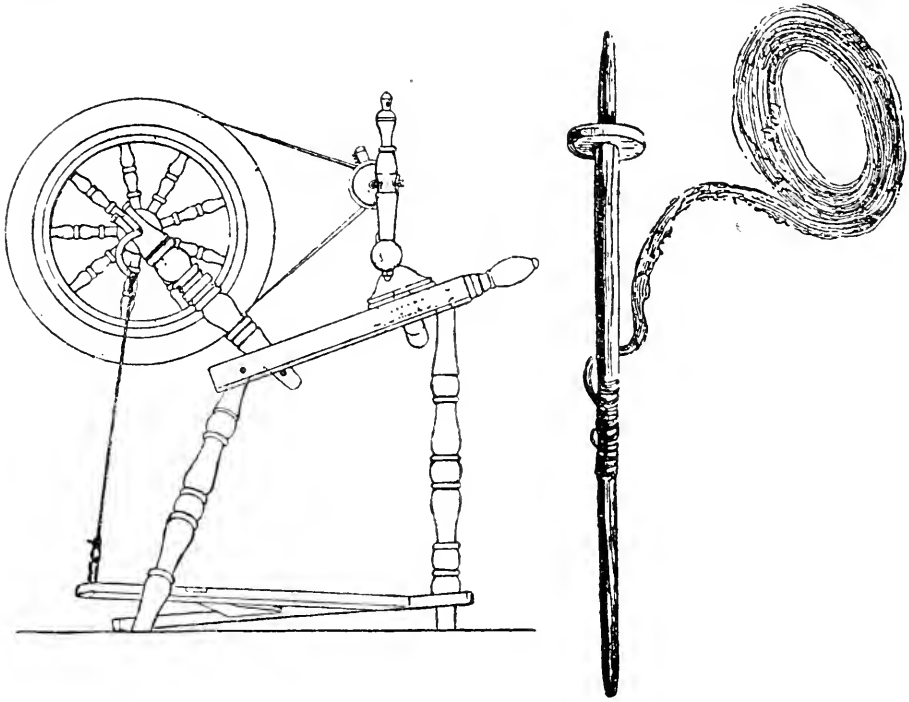
Spinning.

But before we deal with weaving we have to consider how the thread intended to be woven is produced, or, in other words, the art of spinning. To obtain the fibre and to bring it into a proper state for spinning, it is necessary, in the case of vegetable materials, such as flax or cotton, that some process of maceration should be gone through, while wool has to be cleansed and separated from dirt; and, whatever the material be, it has to be "carded" in order to reduce it to a soft, fluffy state, without lumps or knots, so that it can be readily twisted into an even thread. The "cards" consist of two implements, something like wire hairbrushes, between which the wool is combed out and then by a dexterous movement turned off in the form of a little fluffy roll, which, under the manipulation of the spinner, resolves itself into an even thread. In machine-carding, rollers set with wire bristles take the place of cards, but the principle is quite the same.

Spinning can be done by the hands alone by merely taking up some of the fibres of the material and twisting them. But at some period, far earlier than any record can help us to fix, two devices were introduced to meet the two grand requirements of the spinner—a means of making the rotary or twisting action more or less *continuous*, and a means of readily *winding* up the spun yarn. These were provided by means of the combined spindle and whorl, of which an illustration is here given (p. 391). The spindle is simply a piece of wood about a foot long, and the whorl a circular disc of stone, clay, or metal with a hole in the centre into which the spindle is firmly inserted. A piece of yarn twisted with the fingers is first attached to the spindle, a twirl is then given to the apparatus which hangs

suspended by the thread which it spins, and when twist enough has been given, the thread is held at right angles to the spindle, and the thread is wound up. This primitive method of spinning is still in vogue in parts of Brittany, Italy, etc., and can be carried on whilst the spinner is walking about and minding other business.

The next step in advance was to separate the whorl from the spindle and to fix the latter horizontally in certain bearings so that it should not have to be supported by its own thread. The spinner was then not so much at a loss if the thread broke, and she could regulate its tension as she pleased. We now find the whorl transformed to a large fly wheel connected with the

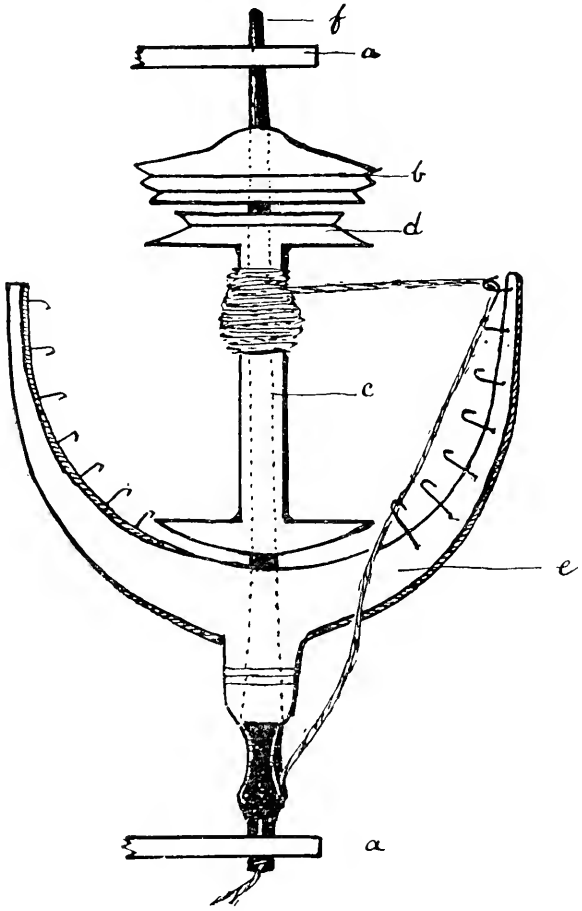


Treadle Wheel, and Spindle with Whorl.

spindle by means of a continuous band or cord, and set in motion by the hand. The whole arrangement is set up on a sort of wooden bench. Examples of this "large" spinning wheel, which is the next step in evolution to the spindle and whorl, may frequently be seen in cottages on the west coast of Ireland. The spinner first lets the spindle twist the thread sufficiently, and then, holding the thread at right angles to the spindle, lets it run up.

The improved or "small" spinning wheel, which can likewise be seen in operation in Ireland, especially in County Donegal, represents the final step in the perfecting of spinning appliances until the introduction of steam machinery, and is a far more ingenious and complex piece of mechanism than anyone would suppose who had not studied its various parts. The most obvious advance on the hand-wheel is the fact that the rotary motion is

given by the foot, by means of a treadle connected with the axle by a crank. This makes the motion continuous and even, and allows the spinner to apply both her hands to the manipulation of the wool. The Donegal spinner frequently adds little dashes or blobs of varicoloured wool to the thread she is spinning, and some of the most attractive patterns are produced in this way. Furthermore, the feed of the fresh material to the



Plan of the Winding and Twisting Apparatus of a Treadle Wheel.

a—a. Projecting lugs of leather in which the apparatus revolves. *b*. Spindle-pulley. *c*. Bobbin revolving loosely on spindle-shaft *f*. *d*. Pulley of bobbin. *e*. Fly or "hack." The whole apparatus can be disengaged by pulling aside the lugs of leather. The pulley, *b*, is fixed tightly on the shaft, *f*, but can be drawn off so as to permit the bobbin to be removed when full.

twisting thread is now more regular, because the change of position, to turn the twisting motion into a winding one, is no longer necessary. This improvement is attained by separating the implement which twists from that which winds. At the same time, although the instruments are separated,

the movements which were formerly two now go on simultaneously. Both instruments whirl on the same axis, one, the twister, or spindle, passing through the winder, or bobbin, which revolves loosely on it. But the bobbin and the spindle are connected by separate cords with the fly wheel, and the grooved wheel, or pulley, round which the cord passes is in each case of a different diameter. The bobbin must revolve more quickly than the spindle, for if it did not, the thread would only twist and would not wind. The pulley wheel of the bobbin is therefore smaller in diameter than that of the spindle, and the object is thus attained. The twisting is really done by means of a "fly" attached to the bobbin which also keeps the thread at right angles to the latter. The spindle pulley wheel (as here illustrated) sometimes has two grooves of different diameters. This is to enable the spinner to give a closer or a looser twist to the yarn. The nearer the spindle pulley and the bobbin pulley approximate in size to each other, the closer will be the twist and the slower the work. The fly is set with little hooks along which the thread is shifted according as it gets sufficiently wound up on one part of the bobbin.

Nothing more ingenious and complete could well be devised than the arrangements of the "small" spinning wheel, which is now in general use in the Donegal hand-weaving industry, though it has not as yet ousted the large wheel in the other districts of western Ireland. In these devices the germ of all later improvements, whatever the motive power may be, is fully contained. The spinning-jenny invented by Hargreaves is merely an arrangement for enabling a single wheel to turn a number of spindles at once.

Weaving.

The development of the art of weaving was affected in recent times by one striking and epoch-making invention—that of the Jacquard appliance for pattern weaving—but apart from this, the methods in use at the earliest times, and among savage races at present, show, in principle, but little difference from the perfected looms of the present day. There is a Greek vase painting of about the year 400 B.C., showing the famous loom of Penelope, on which she wove day by day, and picked out night by night, that web of rich and fair design at the completion of which she had promised to make her choice among the suitors who besieged her during her husband's long wanderings after the fall of Troy. The loom there depicted is very similar to the Gobelins tapestry looms used at the present day. In this form of loom, and in early looms generally, the warp is usually set vertically to the ground, not horizontally as is usual at present in all except tapestry looms. Disregarding the latter, which relate to a very special and peculiar branch of the industry, we may say that the modern hand-loom has to provide for three distinct actions in order to produce a woven fabric. There has to be, in the first place, a method of separating and recrossing the threads of the warp, without which the shuttle bearing the thread of the weft would have to be laboriously *darned* in and out among them. This is done by means of the "heddle-leaves" already mentioned, which are practically sets of strings, arranged on a wooden frame, with eyelet holes in the middle of each through which the threads of the warp are passed. Each set or "leaf" of the heddles is under control of a lever actuated by a treadle below the weaver's foot, by means of which he can raise or depress all those threads of the warp which pass through the eyelet holes in that particular leaf. If two leaves only are used, half the

threads of the warp going through each leaf, the only cloth that can be woven is plain flannel, without pattern of any kind. But if the number of leaves is multiplied it is evident that by throwing up now some, now other threads of the warp, and doing this in a certain order of succession, patterns of much variety can be produced. When warp and weft are of different colours, these patterns of course are much accentuated. It is in this way that twills, herring-bones, hopsacks, and other varieties of textile patterns, including the elaborate designs of damask weaving, are produced.

Secondly, there has to be some convenient means of conveying the thread of the weft from side to side of the warp. This is done by means of a shuttle. A shuttle is really a huge needle, hollow in the centre, and having in that hollow a bobbin or "pirn" on which the thread of the weft is wound, unwinding as the shuttle goes on its journey. The old way of passing the shuttle from side to side of the warp was simply by throwing it from hand to hand, and this method can be seen in the old-type hand-loom in the West of Ireland. The new and much superior and quicker method of jerking it across by means of a cord, attached to pieces of wood or horn that strike the shuttle from side to side, has now been introduced there. The weaver uses one hand only in this operation, and keeps the other for the sley.

The latter is simply a sort of swinging frame in which a comb is set. The threads of the warp pass through the teeth of this comb or "reed," and when each thread of the weft has passed across the warp the reed is swung up against it so as to press it firmly home and make the texture sufficiently close. When a few inches of cloth have been thus woven they are rolled up on the "cloth-beam" which is placed under the web close to the weaver's knees, and a corresponding amount of yarn is unrolled from the "yarn-beam" at the other end of the loom. In the type of hand-loom introduced into Donegal in 1894 by the Irish Industries Association, with the aid of the Congested Districts Board, this combined rolling and unrolling action is performed by means of an attachment which enables it to be done automatically by the mere motion of the sley without stopping the loom.

The Jacquard Loom.

The explanation already given of the way in which patterns are produced by working a number of heddle-leaves will enable the reader to understand the principle of the great invention of the Jacquard loom—the greatest stride in advance that weaving has taken since the very origin of the art. It dates only from the beginning of the nineteenth century, and the discovery must be largely credited to the French Government, which commissioned M. Jacquard, a well-known inventor in the textile industry, to produce an appliance which would enable patterns of any degree of complexity to be produced by one single unvarying action on the weaver's part, just as a tune is ground out by turning the handle of a barrel-organ—the old method of weaving patterns being comparable to the way in which a tune is played on the piano, only with the drawback that a single wrong note, that is to say, a single thread going where it ought not, meant the irretrievable defacement of the pattern. The Jacquard invention consists simply of a number of perforated cards which are pressed in succession, by the action of throwing the shuttle, against a number of points of wires controlling the raising or depressing of the threads of the warp. The perforations are different in each card, and in these perforations and the proper succession of them, the pattern is contained, as a tune is contained in the arrangement of spikes on the cylinder of a musical box. Wherever a wire

LARGE OR HAND SPINNING WHEEL—ARRAN ISLES.

comes opposite one of these perforations it passes through it—where it finds no perforation it is forced back—and the result with each fling of the shuttle, is respectively an engagement or disengagement with certain levers which control certain threads of the warp. The weaver, therefore, has no more to do with making the pattern than the organ-grinder has with the tune he grinds out. The tune or pattern in each case has been thought out beforehand and placed upon the mechanical appliance furnished complete to the executant. It may be added that this invention has never found its way into the cottage weaving industry of the West of Ireland, nor are the patterns of homespun complex enough to need it.

We are here concerned, at present, with the hand industry, the technical details of which may be seen practically illustrated in numberless cottage homes in the West of Ireland. They are not only interesting in themselves, but are worthy of observation as containing the germs of the whole textile industry, which, under the influence of steam power and the Jacquard loom, has attained such mighty proportions. It may surprise many to learn that the hand-loom and the spinning wheel are still capable of holding their own against steam machinery in any quarter of the United Kingdom, but such is the case in some districts. Hand-spun and hand-woven cloth, dyed with the lichens and plants* which the Irish peasant has understood how to use from time immemorial, is not only a peculiarly pleasant material to wear, but has a certain artistic character of its own—one which is so well recognised in the trade, that attempts more or less unsuccessful, are constantly being made to imitate by machinery the effects of genuine homespun, and power-loom cloths are sometimes even fumigated by peat smoke in order to further the illusion that they have been produced in a peasant's cottage. We speak here of woollens chiefly, for in linens the power-loom has practically supplanted the hand-loom save as regards the very finest cambrics, while the linen spinning-wheel has entirely disappeared from Ireland, though in France it is still in use for the production of yarns whose delicacy no existing agency of a purely mechanical kind can approach. But hand-weaving and spinning in wool still hold their ground in Donegal, Connemara, Kerry, Mayo, and many other districts where there is mountain grazing for a hardy breed of sheep, and where there is much labour running to waste during the winter months as well as an hereditary aptitude for dealing with wool. It is principally in County Donegal that we find homespun cloth produced not merely for local use, but for sale outside the district—the local dealers having agents in the principal cities of Great Britain and Ireland. The Irish Industries Association, which buys at the monthly fairs at Ardara and Carrick, has ascertained that in the southern promontory of County Donegal—a very barren and desolate region lying west of a line drawn from Ardara to Killybegs, and measuring some fifteen by twelve miles—a sum of about £8,000 is annually paid for home-spun cloth, of which the Association accounts for about one-seventh. The cloth is sold at the monthly fairs, to which it is brought in large rolls or webs, measuring generally from twenty-five to sixty yards in length, and about twenty-eight

* "Crotal," a lichen found on rocks, yields a beautiful red-brown dye. Heather gives bright yellow. Peat soot, which is largely used, gives a duller tone of yellow. Blackberry root gives a black-brown; the roots of the iris a very dark blue; bog-ore, or ʊubaċ, gives a dull black. These, with madder and indigo, form the principal Donegal dyes. In Kerry, spurge (*Euphorbia Hibernica*), hemlock and fuchsia are used, and black is got by logwood and copperas. The latter is said to be very injurious to the cloth.

inches in width Double-width cloth is practically never made on hand-looms in Ireland, as a loom of the requisite size could rarely be accommodated in a peasant's cottage or weaving-shed. It may, therefore, be safely concluded that the term "home-spun" means imitation home-spun, and not the genuine hand-made article, if applied to any Irish cloth of fifty-six inches wide or thereabouts.

Every home-spun district in Ireland produces cloth of its own special character. In North Donegal, about Glenveigh and Gweedore, a heavy, well-woven, substantial cloth is made, generally dyed in dark colours, often with check or striped patterns. The market is mostly a retail one, and the sale of this excellent cloth has in recent times been largely promoted by the efforts of Mrs. Adair of Glenveigh Castle. The Castlebar industry, which owes its success to the Countess of Lucan, produces a similar cloth to that of north Donegal, but with brighter colouring. In Connemara and other parts of County Galway (especially Gort, where the Convent of Mercy fosters the industry), a great deal of white flannel or báinín, pleasant to look at and most durable in texture, is produced for local use, and finds its way occasionally into the drapers' shops in Galway. This material is sometimes made with a thick loosely spun yarn, and the surface then teased up, producing the napped cloth known as "Galway flannel." It is often dyed red, dark blue or black; and the Galway peasant woman with a hooded cloak of this woolly material, dyed a rich black, and with a scarlet petticoat showing underneath, presents a study in vivid colour not often seen out of Spain. The County Kerry homespuns are well spun and woven, but poor in colouring and pattern. Vegetable dyes are little used—a black is obtained with logwood and copperas, and a grey-brown cloth is made by a mixture of natural brown and white wool; but little more is attempted except in one small centre on Lough Currane, where a few webs are made with some attempt at artistic effect, for sale to summer visitors at Waterville. At Dereen, on the Kenmare estuary, a good deal of white and grey cloth is made in connection with the Countess of Lansdowne's industry, and is afterwards piece-dyed and sold for dress materials in London and elsewhere.

In all the above cases the output which finds its way into the public market is merely the overflow of a much greater body of production intended for local use. In South Donegal, however, we have an example of an extensive home-spun industry conducted almost entirely for an outside wholesale market and carried on upon regular business lines. From the fairs of Ardara and Carrick nearly £700 worth of hand-made cloth goes every month to London, Glasgow, Huddersfield, Vienna, Paris, Melbourne, New York, Boston, and other centres of trade. It is not a decaying industry, nor is it in any degree dependent on the social influence of wealthy patrons. Prices have rarely been so high or demand so keen as at the present moment. At a recent fair in Carrick a single dealer bought fifty-five webs of cloth, representing nearly £300, and in about a fortnight afterwards had disposed of almost all of them.

The present flourishing state of the South Donegal Industry must be attributed largely to the operations of the Congested Districts Board undertaken in the year 1893. The district was visited that year by the Countess of Aberdeen, President of the Irish Industries Association, and from reports drawn up by the agents of the latter body, and also by Mr. Townsend Gahan, an Inspector of the Congested Districts Board, it appeared that the

industry was threatened with a serious decline. The younger generation was not taking it up, the looms were antiquated and unserviceable, and though then, as now, the colouring and patterns of the cloth showed much artistic feeling, there were many technical defects apparent in the product, especially the "shading" of the cloth, *i.e.*, bars of darker or lighter colour running across the web owing to unevenness of texture or of spinning. The principal measures recommended were as follows: (1) The introduction of improved looms; (2) provision for instruction in the use of them; (3) inspection and stamping of the cloth by a competent judge to be appointed by the Congested Districts Board, with a small bonus or prize to be paid for all webs of first-rate quality; (4) the establishment of carding machinery so as to get rid of the extremely toilsome and lengthy process of teasing and carding large quantities of wool by hand. With the exception of the last, all these recommendations were immediately carried into effect. At the request of the Irish Industries Association, Mr. W. J. D. Walker (now Inspector of Industries under the Congested Districts Board), devised, after many experiments, a strong and simple form of hand-loom with fly shuttle and automatic take-up motion, which could be delivered in Donegal for a sum of £6. Loans were granted by the Board, repayable in six half-yearly instalments, to weavers who wished to adopt these looms, which were exhibited in operation at Ardara and Carrick. With one of these looms it was possible to weave twenty to twenty-five yards of cloth in a day—they have indeed been known to do as much as forty yards—as against eight to twelve done by the old looms. They were rapidly taken up by the people and have now almost dispossessed the old-fashioned looms throughout the South Donegal weaving district. Loans for spinning wheels were granted on similar terms. The following instructions were drawn up, printed on cards suitable for hanging up on the wall, and circulated by the hundred among the people who came in to sell cloth at the monthly fairs:—

"Makers of Homespun Cloth in South Donegal are strongly urged to attend to the following instructions, both in order to obtain a good price for their Webs and to extend and improve the industry. They are reminded that while every good Web sent out helps to spread the reputation of Donegal Cloth and to increase the demand, every inferior Web has the contrary effect, and helps to spoil the future market even for good cloths. Particular attention is required for providing hard wearing cloth, without which the Donegal Industry will certainly decline.

INSTRUCTIONS.

Wool should be well scoured before Dyeing.
Mix and card the wool with great care so as to avoid shading.
Avoid all Aniline, and other shop dyes, except Indigo, Madder and Log-wood.
Spin both Weft and Warp on the Small Wheel. *Let the Weft be firmly twisted, to ensure good wear.* Weft and Warp should be equal in Weight and Twist.
Make the Cloth at least 34 inches wide in Reed.
For Twills, use no Reed coarser than a 16 Reed, 2 in Split, or an 11 Reed, 3 in Split, with 20 Picks of Weft to the inch.
For Plains, use the same Reed with 18 Picks of Weft to the inch.
Use good Olive oil, and clean the Web with Ammonia.

Have a large Window in a suitable position in the Weaving Room. It is impossible to make good and evenly coloured Cloth without good Light. With fancy colours, to avoid shading, it is much better to have two shuttles in Sley."

The effect of these operations, coupled with the extensive buying on the part of the Irish Industries Association, was to put new life into the industry. It has now been found possible to discontinue the special arrangements for instruction, for stamping, prize-giving, etc., and the industry is making good progress without these aids. It must be said, however, that much of the cloth is still far from what it should be in point of wearing quality. The twills, herring-bones, and checks intended for men's wear are certainly much improved, but the plain-textured flannels, which exhibit the most beautiful and characteristic colouring—the most beautiful fabrics made of woollen material, for ordinary wear, in Europe—are still often so loosely spun and woven as to be suitable only for ladies' costumes. A great market lies before this class of cloth if, to the hereditary knowledge and taste in colouring possessed by the Donegal peasantry, could be added the admirable spinning and weaving found in County Galway.

The utilization of the abundant water power at Ardara and Carrick for carding machinery would also unquestionably prove a great boon to the industry. In Galway and Kerry machine carding is very largely made use of. I am informed that one mill in the City of Galway sometimes earns £5 in a day for carding the wool of countrywomen who mean to spin it on their wheels at home.* Wool is sent up there for that purpose from places so distant as Gort. Carding machinery is also common in the weaving districts of the Highlands. It is totally unknown in those of Donegal; and it is a matter of surprise that the Donegal industry succeeds in coping with the enormous difficulty of teasing, carding, and mixing by hand labour the large quantities of wool used. The provision of suitable carding machinery, which would get rid of all the drudgery, and enable a better thread to be spun, would seem to be directly on the path of advance for this industry. Associated with this might be the erection of a simple dyeing plant, in which wool could be dyed in larger quantities at a time than the people can manage in their own iron pots. This, if only the native vegetable dyes were used, would in no way interfere with the special artistic quality of the Donegal hand-made cloth, and would, no doubt, be largely made use of.

The Congested Districts Board is at present extending the use of the new looms into the more southern centres, a school of instruction having been lately established at Leenane. With this great advantage, and with instruction in pattern making and dyeing, the County Galway and Kerry home-spun manufacture should easily find a much larger market than it does at present.

The weaving of machine-spun yarns by hand is not properly a branch of the home-spun industry. The cloth produced is quite similar in effect to factory goods, while a piece of genuine home-spun differs from the latter in the same way, let us say, as a page of manuscript differs from a page of print. Still, although the handloom in dealing with machine-made yarns has to compete directly with the factory, it continues to maintain itself

* Prices are 2*d.* per lb. for white wools; 3*d.* for mixed colours. Oldfashioned piecing machines, which are discarded from modern factories, are the best for preparing wool for hand-spinning.

in some districts. About Drogheda a good deal of woollen weaving is carried on by hand on these lines, and Lurgan is a centre of hand-weaving in linen. The weavers in these cases, unlike the West of Ireland man, who is half farmer, half artisan, are craftsmen pure and simple; and the low rate of wages current, as compared with that which prevails in steam factories, is steadily reducing the area of this industry. This low remuneration, however, does not depend so much on technical as on economic causes. The difference in speed of production is not so great as might be supposed. But the workers are scattered, and have little opportunity for effective combination, while the employer, who purchases and gives out the yarns, is not handicapped by the knowledge that he has a costly plant to keep up which must always be either making money or losing it. A Donegal weaver in full work can easily earn up to 20*s.* a week and more, and this is cheerfully paid him by peasants as poor as himself or poorer. Weavers who could purchase their own yarns, either individually or as members of a co-operative society, and who could invent and produce saleable patterns, might find that their ancient industry has less to fear from the competition of modern machinery than is commonly taken for granted at present. The example of the weaving district of Laichingen in Würtemberg, shows how much can be done by the cultivation of technical knowledge and artistic taste in the individual to counterbalance the economy of force produced by the massed and highly specialized labour and mechanical motive power of the factory.

The Woollen Factory Industry.

When we leave the modern peasant industry and turn to consider Irish wool-working as carried on upon a larger commercial scale we find that the manufacture of woollens was one of the historic industries of Ireland. The minute regulations of the Brehon Laws regarding the colours to be used by different classes, and the description in the early literature of ornamental textures of various kinds show a considerable development of the industry, dating back at least to the eighth century. In later days an export trade sprang up. Irish "frisages" were so much in favour in England in the time of Edward I., that they were specially exempted from the prohibition ordered by that King against all importation of foreign textiles. "An Italian writer of the fourteenth century," writes Mr. Bowes Daly,* "mentions a white serge which was much esteemed, and which was called *Sain d' Irlando*." The exportation of wool, however, was for long a more important branch of commerce than that of manufactured cloth, and the Irish wool was so much esteemed that it practically supplied the great woollen manufacture of Holland. In the thirteenth and fourteenth centuries it was said of Holland, "Ireland is her sheepwalk;" and this state of things continued down to the time of the great struggle between the Netherlands and Spain, in the course of which the manufactures of the former country were laid waste, and the market for Irish wool ceased. By the time that peace and freedom returned for the Netherlands, England had obtained a firm hold on the woollen markets formerly supplied from Holland. The Dutch promptly turned to other branches of manufacture—the delft industry was among those which sprang up at this period—while the Irish, with equal industrial alertness, immediately began to utilize their water power for tuck mills and to set up

* "Glimpses of Irish Industries," p. 137.

factories for spinning and weaving, so as to turn to account the great sheep-breeding industry which had grown up, and which now found itself without an outlet. A flourishing home trade now sprang up, and an export trade began to attain dimensions which aroused the commercial jealousy of England.

At this point we come to the first systematic attempts on the part of the English Government to repress this growing industry. An Act of Charles I. prohibited the export of Irish wool (unmanufactured) except to England and Wales. This, of course, was aimed at Holland, but it was followed by Charles II. 12, c. 4., laying prohibition duties on the import of Irish woollen goods into England, while other Acts restrained or suppressed trade with the colonies and the import of dye stuffs into Ireland.

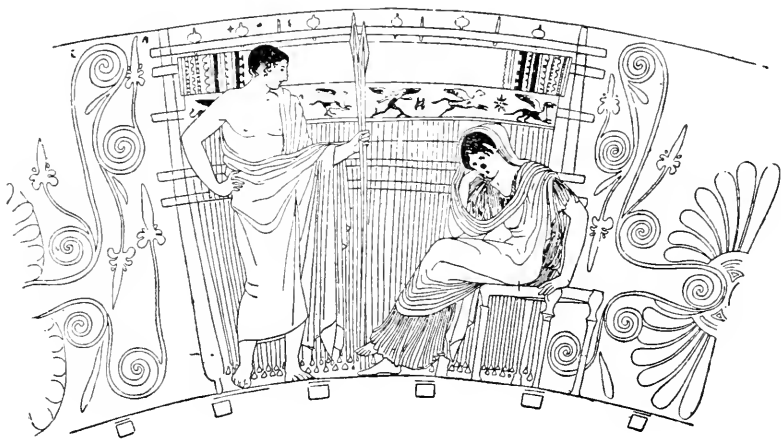
These Acts, together with the devastation wrought by the Jacobite wars, brought the Irish export trade very low. In 1697 the exports of manufactured woollens amounted only to £23,617.* In the following year came the well-known compact between the English and Irish Parliaments which is so often, and justly, referred to as the cause of the destruction of the Irish woollen trade. The English Parliament were determined to have no interference with the woollen trade which they had established as the staple industry of England, and they accordingly proposed to Ireland that the latter country should practically abandon all export trade in woollens, in return for certain very favourable enactments as regards linen goods with which England did not desire to compete. Irish linen was to be admitted free of duty into England, while a duty of 25 per cent. was imposed on foreign linens, and a bounty was given on Irish exports from England.

The Irish Parliament was of course in no position to make a free choice in the matter, and probably their acceptance of the above terms was the wisest course they could have followed under the circumstances. During the next seven years the Irish linen export trade expanded nearly thirty-fold. The anti-woollen legislation of 1698 and 1699 had no reference to manufactures for the home market, but a home trade could not flourish when hampered by the unfair conditions under which it was obliged to compete with English imports. The better classes of material ceased to be made, and sheepwalks were turned into tillage, to such an extent that the price of wool in Ireland became considerably higher than in England.† A temporary revival took place under the auspices of Grattan's Parliament, but it did not endure. Having lost the foreign market the Irish, like the Dutch a couple of centuries previously, were unable to recover it. The industry had ceased to attract enterprise and could display no adaptability to new conditions. Consequently, when the great era of the development in mechanism set in, the Irish manufacture, free though it now was, had neither the moral nor material resources necessary to meet it, and the ruin which followed from the operation of free competition was more speedy and complete than any which had been produced as the direct effects of repressive legislation.

Since the full development of the mechanical epoch this ancient Irish industry has, however, begun to show considerable recuperative power. "Authentic statistics on the subject are scanty," as the late Registrar-General, Dr. T. W. Grimshaw, observes,‡ but from reliable statistics

* "Memoirs of Wool," Rev. Joseph Smith, ii., 34, 244.
† Hutchinson: "Commercial Restraints," p. 73.
‡ "Facts and Figures about Ireland," p. 38.

furnished by him it appears that from 1874 to 1889 the number of power looms employed in the industry increased from 307 to 925. There are also no small number of looms engaged in the home weaving industry, both for export and for local use. This is an industry which has escaped statistical record, but the importance of which ought not to be underestimated. From the investigation made by the Irish Industries Association and by the writer, it is certain that the County of Donegal at this day exports home-made cloth mostly for foreign markets, amounting to nearly half the total exports of Ireland at the date of the Williamite legislation of 1698-99. Since 1889 the factory industry has held its own, but not much more. Factories at that date numbered 82—they are now 114. The hands employed numbered 3,443—they are now 3,323. Irish tweeds are noted for their durability and honesty of workmanship, but have hitherto suffered from the defect in designing power which has beset all modern Irish industries into which an artistic element enters, and which have been cut loose from the traditional style that still guides the Donegal wool-workers. Irish manufacturers have generally shown themselves much more alive to the necessity of having modern machinery than to that of employing competent designers. This defect, however, is being largely remedied in the present day. Irishmen, unfortunately, have seldom received the training in applied art necessary to enable them to fill the position of designers to woollen factories, and at present, a factory which is not content merely to watch the English output and copy what is going there, has usually to import an English or Scotch designer. In some cases a marked expansion of business has followed from this step, and there are now mills in Ireland which can and do turn out goods, particularly in cheviots, equal in every respect to the finest woollen manufactures of Great Britain. Even in the latter there is a very large field for improvement and new invention in the matter of designing, and if Ireland, where labour is good and cheap, and where adulteration and shoddy are unknown, could develop original designing power in this branch of industry, the latter might yet rival the linen manufacture of the North as one of the main sources of Irish prosperity.



The Loom of Penelope.
(From a Vase Painting 400 B.C.)

THE IRISH MILLING INDUSTRY.

In reviewing the present condition of the Irish Milling Industry, and its history during the past thirty years, two salient facts present themselves, a revolution in the process of manufacture of flour, and a gradual and constant decline in the industry during that period. The change in the method of manufacturing flour was so complete that, before examining the causes of the decline, it will be desirable to describe briefly the system of milling in vogue thirty years ago, and that practically in universal use to-day.

In Ireland, up to the years 1875 to 1880, the only method of manufacturing flour was by grinding the wheat between two flat circular-shaped stones, about four feet in diameter. These were of a very hard silicate, and were formed of several wedge-shaped pieces cemented together and bound with iron hoops. The surface of each stone was cut into a series of alternating ridges and furrows radiating from the centre, and the lower stone was fixed while the upper was caused to revolve. The wheat was fed from the centre, and by means of these furrows and ridges was pushed to the circumference, being ground into flour and bran in the operation, and the bran was separated from the flour by means of "separators," which were at first made of wire and subsequently of silk gauze.

The use of iron rollers instead of stones was first tried in Buda Pesth as far back as the year 1840, but it was a very long time before the "Roller System," as it is called, came into general use. By the year 1870 it was in general use throughout Hungary, and, the superiority of the new process being very great, Buda Pesth soon became the great milling centre of the world. Briefly, the principle of the new system was to reduce wheat to flour and bran, not by a single grinding, as was the case in the old method of grinding by stones, but by passing the grain through a series of sets of rollers to reduce it *gradually*. The wheat is first put through a process of thorough cleansing or "smutting," and the cleaned grain is then passed through the first series of grooved chilled-iron rollers, between which it is slightly broken. The product is then sifted, and a proportion of flour is separated, mixed however with a granular substance, composed of small pieces of the floury part of the wheat, and commonly known as "semolina." As the flour produced by this first grinding is generally of a low grade, the object of the miller is to extract as little flour and as much semolina as possible in the first break of the wheat. The broken grain is sent to the other rollers, and is again broken up and its products sifted as before, and this is repeated from four to seven times till as much as possible of the flour

has been separated from the husk or bran. The semolina is separated from the flour, and the latter is then thoroughly cleared of all particles of bran by machines called "purifiers." The flour is then ground between a series of smooth iron rollers, and the product of this grinding is sifted, and the flour thus produced is of the highest quality. The great superiority of the new over the old process lies in the different grades of flour, some being of very superior quality, which it is possible to obtain thereby. In the old method of grinding by stones it was only possible to obtain one quality of flour, and the tearing of the outside of the wheat berry by the stones produced a small quantity of dark powder, which mixed with the flour and tended to discolour it. It is unnecessary to go further into details, the above description being sufficient to show the differences between the two systems, and the superiority of the new over the old.

The roller system was introduced into Ireland between the years 1875 and 1880, and the millers who hesitated about adopting it soon found that they were being outclassed by their more enterprising rivals. Unfortunately for some manufacturers there were several competing roller systems, and, information as to which was the best being difficult to obtain, many of them adopted a system which was defective. The faulty system was soon found to be worse than the old process, and many millers in different parts of the country were utterly ruined by it, while others after a short trial of it threw out their new and costly machinery, and reinstated the stones. Those who had the good fortune to adopt the proper system at first, or who, having found that the first machinery which they had put in was defective, had the courage to face the situation, and to replace it by the right system, soon reaped the benefit of their enterprise. Its superiority was so great that those who, from want of the necessary capital, or from lack of enterprise did not adopt it, were year by year gradually driven out of the trade. Owing to the lack of industries in the country, most of the mills which were thus thrown idle have remained idle since, thus causing a tremendous waste of capital sunk in the buildings and the machinery with which they were equipped.

Let us now endeavour to analyse the causes which led to the decline in the industry, which, as we have already pointed out, has been a constant feature during the last twenty years. The chief reasons of the decline were two—the steady decline in the population of Ireland, which has been going on since 1845, and the keen competition of imported against Irish-made flour. Of the two, the first, the falling off in the population of the country, has undoubtedly been the more potent cause of the decline in our milling trade, inasmuch as this meant a falling off in the numbers of the consumers. Up to about the year 1877 Ireland, and especially the South of Ireland, actually had a considerable export trade in flour, and sent large quantities annually to Wales, Liverpool, and other places in the West of England, and even as far north as Glasgow. Up to that period these localities had not sufficient milling capacities of their own, and Ireland, which was then growing nearly five times as much wheat as at the present time, supplied the deficiency. America had, however, adopted the roller system before it had been introduced into the United Kingdom, and by 1875 it had been generally adopted in the great wheat-growing States of that country. The mills which were erected had a capacity far beyond the requirements for home consumption, and were getting good prices for what they sold at home, and they were thus enabled to employ their surplus

produce in opening up a foreign trade. With their great advantages in being situated in the heart of one of the greatest wheat-growing districts in the world, having ample supplies of the best qualities of grain at low prices, and with a market at home for the bulk of their produce in which they were getting very remunerative prices, it is little wonder that they were able with their surplus produce to cut out from those markets in England and Scotland, to which we have already referred, the Irish miller, who had to import practically all the wheat he required. Moreover, these districts gradually erected mills to supply their own requirements, so that Ireland soon lost all her export trade in flour. The cutting off of this outlet left our millers only the home market for their product, and this market was being every day contracted owing to the decline in the population of the country. The official returns show that in 1871 the total population of Ireland was 5,412,377; in 1881 it had fallen to 5,174,836; in 1891 to 4,704,750, and 1901 to 4,456,546. The decline in the population, therefore, since 1871 has been 955,831, which is equivalent to over 17.6 per cent. In addition to the loss of the export trade, and the contraction in the numbers of the consumers at home, the Irish millers had to contend against the competition of imported flour in their own narrow market. The Americans were not content with sending their surplus produce to England, but they sent it to this country also, and this competition has continued down to the present day. The competition referred to has been greatly developed by the extremely low freights at which flour has been brought from America by the Trans-Atlantic passenger steamers within recent years. The flour has often been brought at a merely nominal freight, practically as ballast, and this has, of course, been an enormous advantage to the American miller in enabling him to compete on more advantageous terms with the home manufacturer. He gains another advantage also in the low through freight given by some of the Cross-Channel Steamship and Irish Railway Companies, so that he is often able to send his flour from the docks at some English port into a country town in Ireland at a lower freight than the miller in that town has to pay on his foreign wheat from the Irish port of discharge.

The decline in wheat growing in Ireland has been an undoubted injury to the smaller of our millers in country districts. The opening up of foreign wheat markets in the United States, Australia, New Zealand, the Argentine Republic, and in other parts of the world, has caused a considerable fall in the price of that article within the past twenty or thirty years, and this fall rendered the extensive growing of wheat at home unprofitable. Irish wheat is of a soft nature, and before it could be used for milling it had to be dried, and the cost of this drying and the loss of weight in the process handicapped it considerably in competition with foreign wheat, which is for the most part put on the market fit for milling without having to go through any process of kiln-drying. The farmers practically gave up the growing of wheat, and the country miller lost a source of supply in his own district where he was saved the heavy cost of carriage, which he had to pay on imported wheat. It is difficult to get the complete figures showing the number of mills at work thirty years ago, and those working at the present time, but there is no doubt that the number shut down during that period was very considerable. Taking one particular district in the south, there were twenty-seven flour mills in that district in the year 1874, while to-day there are only three. Probably the output of the three mills at work to-day

does not fall far short of the quantity of flour produced by the twenty-seven mills at the earlier period; but we must remember that once a mill is shut down it is very rarely ever turned to account again for milling or for any other industry, so that there has been a very serious loss of the national capital in the shape of the buildings of those derelict mills, and the valuable machinery with which they were equipped. As against the decline in flour milling, however, it is only right to set the increase in the quantity of maize ground. Indian meal as a cheap and good food for cattle has rapidly grown in favour within the last twenty years, and the increase in our cattle trade has naturally increased the demand for meal. This does not, however, compensate the miller for the decline in the demand for his flour, the machinery used for grinding meal being less elaborate and considerably less costly than that required for the manufacture of flour, has made competition in this branch of the business very keen, and his profits in this case leave him nothing to compensate him for the interest on the capital which he has sunk in his flour plant.

Complete returns showing the total quantities of wheat and flour imported into Ireland are difficult to obtain; but perhaps it may be permissible to take the figures of the importations into one port as a typical example. The quantity of wheat grown at home being so small may, for practical purposes, be disregarded, and the figures showing the imports of flour and wheat into the port of Cork for twenty years since 1881 are eloquent in showing how the industry has declined in the South of Ireland. Taking Cork and Kerry as the two counties which are principally served from the port of Cork, let us first examine the variation in the populations of these counties. The figures as given in "Thom's Directory" for 1902, are:—

	1881.	1891.	1901.	Decrease since 1881.
Cork (City and County) -	495,607	438,432	404,813	90,794
Kerry - -	201,039	179,136	165,331	35,708
	696,646	617,568	570,144	126,502

The decrease in the population of these two counties for the twenty years since 1881 amounts to 126,502, or over 18 per cent.

Now taking the figures of the importations of wheat and flour into Cork, taking them on an average of ten years, we find that between the years 1881 and 1891 the average annual imports of wheat were 80,971 tons, and flour 14,063 tons, while from 1891 to 1901 the averages were—wheat, 63,708 tons, flour 22,502 tons. These figures show that while the populations of the two counties have been decreasing the importations of flour have been increasing. The average annual importation of wheat shows a falling off of 17,263 tons, while flour importations have increased 8,439 tons per annum. No mere words could give a better picture of the decline in the milling trade than these figures. In the first ten years under consideration wheat was 85.2 per cent., flour 14.8 per cent. of the total quantity of the two articles imported, and in the second ten years wheat had fallen to 73.9 per cent., while flour had increased to 26.1 per cent. The following Tables show the importations of corn into Dublin and Belfast respectively in the years 1896-1900.

TABLE A.—Showing the Quantities and Value of CORN Imported **direct** from Foreign Countries and the Colonies into DUBLIN in the years 1896 to 1900, inclusive.

CORN.	Quantities.				
	1896.	1897.	1898.	1899.	1900.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
Wheat, ...	1,551,700	1,285,700	1,310,000	1,629,500	1,314,400
Barley, ...	329,060	249,040	145,650	80,060	272,580
Oats, ...	29,900	25,000	39,800	——	35,200
Maize, or Indian Corn,	1,903,100	1,815,100	1,217,900	1,768,300	1,182,800
Wheatmeal and Flour,	616,740	594,440	865,870	840,700	897,600
Oatmeal and Groats,	9,940	20,540	36,500	19,900	43,900

CORN.	Value.				
	1896.	1897.	1898.	1899.	1900.
	£	£	£	£	£
Wheat, ...	516,260	483,097	548,575	557,990	450,023
Barley, ...	103,604	83,413	49,065	31,138	91,266
Oats, ...	7,368	5,436	12,946	——	10,000
Maize, or Indian Corn,	379,458	314,980	250,050	367,826	278,925
Wheatmeal and Flour,	275,947	320,159	523,971	428.792	456,362
Oatmeal and Groats,	4,702	7,748	17,396	9,754	22,173

TABLE B.—Showing the Quantities and Value of CORN Imported **direct** from Foreign Countries and the Colonies into BELFAST in the years 1896 to 1900, inclusive.

CORN.	Quantities.				
	1896.	1897.	1898.	1899.	1900.
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
Wheat, ...	230,700	198,600	114,900	113,100	201,600
Barley, ...	216,960	374,230	388,005	297,790	415,740
Oats, ...	38,700	26,100	48,000	4,900	51,600
Rye, ...	264,500	301,900	276,800	328.500	234,500
Peas, ...	8,600	16,920	4,630	13.420	20.220
Maize, or Indian Corn,	2,498,800	3,190.600	3,389,000	3,986,200	3,539,700
Wheatmeal and Flour,	946,300	1,017,740	791,850	1,229.760	1,268,300
Oatmeal and Groats,	10,800	6,160	18,250	4,360	13,100
Meal, unenumerated,	47,400	102,800	1,500	50,220	11,000

CORN.	Value.				
	1896.	1897.	1898.	1899.	1900.
	£	£	£	£	£
Wheat, ...	71,595	75,800	42,339	38,358	73,255
Barley, ...	50,306	81,481	98,347	82,970	123,731
Oats, ...	8,677	7,492	15,737	1,512	15,382
Rye, ...	63,422	73,065	75,660	96,423	67,718
Peas, ...	3,110	5,823	2,053	5,189	7,817
Maize, or Indian Corn,	501,501	549,360	673,272	809,714	783,506
Wheatmeal and Flour,	418,037	579,565	471,075	685,711	689,376
Oatmeal and Groats,	4,324	2,503	9,833	2,415	6,741
Meal, unenumerated,	11,106	23,081	375	11,069	2,225

The present position of the miller is that, on the one side, he sees the numbers of his customers gradually dwindling away, while, on the other, he is menaced by increasing competition from foreign made flour. In addition to this, technical knowledge in milling is becoming more necessary every day, while the rapid improvements in machinery make it necessary that the miller should have a large capital in order to enable him to keep abreast with these improvements, and to meet foreign competition.

The following Table gives some idea of the extent and character of the Milling Industry in Ireland since 1891. It must be remembered that the majority of these Mills are very small concerns:—

TABLE C.—Showing the Number of CORN MILLS for the years 1891 to 1901, inclusive, classified according to the POWER used, the kind of the CORN chiefly ground, and the AVERAGE QUANTITY (in cwts.) ground per week when the Mills are at work.

YEARS.	Total No. of Mills.	Description of Power used.				Kind of Corn chiefly Ground.				Average quantity Ground per week when at work.					
		Water.	Steam.	Wind.	Water and Steam.	Wheat.	Oats.	Indian Corn.	All others.	Under 25 cwts.	25 and under 50 cwts.	50 and under 100 cwts.	100 and under 200 cwts.	200 and under 500 cwts.	500 cwts. and upwards.
		Number of Mills.				Number of Mills.				Number of Mills.					
1891	1,482	1,319	68	20	75	228	1,003	249	2	91	151	297	434	305	204
1892	1,497	1,322	87	21	67	255	1,043	194	5	89	168	328	426	270	216
1893	1,533	1,342	92	22	77	292	999	236	6	94	160	348	421	290	220
1894	1,478	1,302	82	19	75	385	884	151	58	91	147	349	442	236	213
1895	1,504	1,327	86	16	75	217	1,039	201	47	104	196	325	435	245	199
1896	1,474	1,284	88	19	83	196	958	274	46	97	170	353	398	256	200
1897	1,434	1,251	90	23	70	209	950	246	29	107	168	358	371	227	203
1898	1,412	1,234	93	18	67	195	965	237	15	121	159	375	339	217	201
1899	1,397	1,216	99	17	65	215	932	236	14	114	161	351	343	224	204
1900	1,389	1,214	98	18	59	217	874	281	17	119	182	314	374	212	188
1901	1,351	1,167	99	14	71	189	908	250	4	119	185	323	325	218	181

In conclusion, there is one feature in connection with the use of foreign flour in Ireland which is generally lost sight of, and more especially by the Irish farmer. Ireland has developed considerable importance as a country for the raising of cattle and pigs, and these must be finished off for the market on bran, tailings, etc. These commodities are the bye-products of the manufacture of flour, a given quantity of wheat yielding about 70 per cent. of flour, and 30 per cent. of bran, pollard, and tailings. If, therefore, the home production of flour is curtailed, it follows that the farmer must pay higher prices for these bye-products, while the American, whose flour our farmer is consuming, has these food-stuffs for his cattle at a lower rate in consequence of the manufacture of a quantity of flour in America for the foreign market. This enables the American farmer to put his beef and pork into competition with Irish beef and pork on more favourable terms. This is a matter which is of the utmost importance to the Irish farmer, and it frequently happens that bran, etc., is sold at far lower rates in neighbouring countries than in this, owing to the increasing importations of foreign flour, and the consequent decline in Irish milling.

THE IRISH LEATHER AND BOOT-MAKING INDUSTRY.

Until about thirty years ago the tanning industry in Ireland was in a flourishing condition, and despite the startling decrease in population which followed the famine, the making of leather was carried on all over the country under sound financial conditions and with a large measure of prosperity. Up to about 1870 most of the leather required for use in Ireland, including that used for the "uppers" and soles of boots and that required for harness making was produced in this country. The heavy "sole leather" made in Ireland, chiefly, from South American hides, was of excellent quality and particularly suited to the requirements of an agricultural population. A lighter class of sole leather was manufactured out of Irish hides and was used principally for female wear. For upper leather the demand was chiefly for a strong water-resisting article called "brogue" leather. Calf skins were also tanned, and these, with sole and harness leather, were manufactured in almost every part of Ireland; while Dublin, Cork, and Limerick could boast of quite a number of tanneries, each working to the full extent of its capacity. Indeed many small towns had tanneries of their own. Such imports as there were at this time were confined for the most part to the lighter classes of upper leather, very little of other kinds of leather coming from abroad.

The chief centres of production were Dublin, Cork, and Limerick, which turned out large supplies of the kinds above mentioned. Cork was particularly noted for the production of one class, of which the southern city made a specialty. This was "satin-calf" which is still produced there, though in limited quantities as compared with its former output. Bandon was known as the chief centre for the manufacture of "brogue leather," and in that town five and twenty years ago, there were four tanneries, working full time and all doing remarkably well. Their leathers were known well and found a ready market. Dunmanway, in the same county, had a thriving tannery. Clonmel in the heart of Tipperary had three. Further east, Wexford and New Ross turned out excellent leather. So did Kilkenny on even a larger scale. Ballytore, in the County Kildare, which is still working, was noted for its tanned goods, and these may be taken as fair samples of the widespread distribution of this once important industry. Drogheda also had at least one tannery, and the same might be said of numerous other towns in which this industry gave employment to large numbers. In Limerick there were three tanneries which did a brisk trade in sole, harness, and upper leathers. Two of these are still in existence and in full working order.

The tanneries in Ulster, situated at Belfast, Lisburn, Downpatrick, Carrickfergus, Coleraine, Newry, and Richhill, County Armagh, were working in the eighties. A few of them, as will be seen, survive at the present

day, but the output is not very large. So far as the North is concerned, the tanneries showed signs of decay soon after the Crimean war. In their hey-day they produced leather from Irish and South American hides, chiefly for home consumption.

A notable feature in the manufacture of leather was that the production, on the one hand of sole leather, and on the other hand of upper and harness leathers was as a rule a distinct undertaking. The two last-named classes were usually manufactured side by side, as the general manipulation of both is, in a great measure, similar, and a factory turning out one description could with advantage produce the other. The same conditions prevail to-day, and outside of Ireland it is an unusual thing to find sole, upper and harness leather manufactured by the same firm. Another fact worthy of notice is the isolation of currying—or the finishing processes. Outside of Ireland the currying is, in many cases, carried on by firms other than tanners. The reason for this is that the operations necessary after the tanning is complete are numerous and complex. In dealing with some classes of upper and many other leathers, such for instance as bag leathers and enamelled or patent goods, the finishing operations are so exceedingly technical that special expert knowledge and the use of numerous machines are necessary for their successful completion, and this is generally regarded as quite outside the tanner's calling. On the other hand, those who devote themselves to the finishing or "currying" processes may know nothing whatever about the tanning, which can, to a large extent, be carried on with the aid of unskilled labour.

Thirty years ago a very large amount of capital was sunk in the tanning industry in Ireland, which was the means of giving a great deal of employment throughout the country. None but men of capital were able to embark in this trade, as the long period covered by the various stages of manufacture, particularly in the case of sole leather, made large capital an essential condition. The same remarks are still applicable to the industry.

As already mentioned, Irish leather was noted for its excellence, which was to be attributed to the superior methods of manufacture. The tanning materials used were those which even now, in the light of the most searching scientific examination, are considered the best procurable. The tanning was done with oak bark, cork tree bark, and valonia, mostly the two first named. Cargoes of cork tree bark were imported from Algeria, and sufficient oak bark was easily procurable in various parts of Ireland. The tannin extracted from oak and cork tree barks was employed in the production of upper and harness leathers, and these two combined with valonia, which is the cup of the acorn brought from the vast oak forests of Asia Minor, and which has, for many years, been imported largely into these countries, were the materials with which most of the sole leathers were tanned. Sumach from Palermo in Sicily was used with calf skins. Of late years much scientific research has been devoted to the leather industries, and several new tanning materials of considerable value have been placed at the tanner's disposal, which with improved manipulation of the hides in course of manufacture and the aid of more machinery, has considerably lessened the time employed and lowered the cost of production. Still the tanning materials above mentioned are at the present day in universal use, though in many cases in combination with cheaper substitutes.

About 1870 the manufacture of boots and shoes in Ireland was an important industry, and gave an immense amount of labour, not only in the

centres of large population, but in many towns, villages, and hamlets throughout the country. So far as the making of footgear was concerned, Ireland may be considered as self-providing up to the end of the sixties. It is true that the wearing of boots was not as general then as it is to-day. The small farmers, cottiers, and agricultural labourers could not in many instances afford to buy them, and accordingly the number of people, more especially children, to be seen in their bare feet was very much greater then than now. Those who did wear boots or shoes, chiefly the latter, patronized a strong coarse class suitable for wear in a humid climate such as that of Ireland. "Factory" goods were then unknown, and practically all the boots worn in the country were made at home. The temptation to buy cheap footgear was not present, and the people were content to use the same styles which had been in vogue for generations. This support of home manufacture was not confined to any class. The gentry and people of means generally patronized local industry, their boots being made from the finer classes of upper leather made in Cork and other smaller towns. From all this it may be gathered that the leather industry and the allied trades were in a thoroughly healthy condition at this period. There was a good return on capital invested, a large amount of employment given, and the money thus circulated throughout the country had a beneficial effect on the general prosperity of Ireland. Then came the lean years. Great Britain, and more especially England, is known to have reached high-water mark in commercial development in the early seventies, and this was exactly the period that witnessed the undermining and eventually the downfall of the leather industry in Ireland. Commercial energy across the Channel, and more markedly in the midlands of England, was not confined to the textile trades, although these were the first to take advantage of the great wave of prosperity which swept with astonishing results over the country. Immense boot factories were erected in various centres between Leeds and Northampton, and to a lesser extent in other parts of England. The introduction of modern machinery cheapened production enormously, and the Irish market was flooded with machine-made boots and shoes at prices which made successful competition by the Irish boot makers, who did not adopt similar methods of production, impossible. In Ireland boot-making which had been largely a cottage industry —many men and their families working in their homes—was ruined by the march of modern mechanical invention, and the factory system which inevitably followed. This state of affairs was not long in re-acting on the Irish leather industry itself. About the same time too were occurring those changes in the manufacture of leather abroad, which resulted in very considerable reductions in the prices of all leather goods. Thus every year witnessed a decline in the profits of the Irish tanner, and at the same time his output was gradually but effectually being reduced. Many of the Irish tanners at this critical epoch were, it is to be feared, not equal to the occasion. They were essentially conservative in their ideas and adhered to the old fashioned methods. The result was lamentable, but it was inevitable. The ordinary sources for consumption of their goods were no longer available. No new markets were opened, and the natural consequence was that trade shrank rapidly. Many of those whose capital was sunk in tanneries withdrew it from the languishing industry, and thus, in many towns, what had been previously a thriving trade, was reduced to the last stages of decay. Some few, here and there, took up a more intelligent

attitude. They went with the times, adopted modern methods, and they have survived.

The manufacture of leather in Ireland at present is confined to a few localities. Limerick, which is the most important centre of the industry, has two tanneries which produce over 30,000 heavy hides per annum. The major portion of this is sole leather of good quality made from Irish and South American hides. Harness leather of different classes is manufactured exclusively from Irish hides, and upper leather suitable for the strongest classes of boots is also produced, but not in great quantities. Cork has three tanneries still manufacturing considerable quantities of calf-skins, and one of these turns out a good deal of best heavy sole leather mostly from South American hides. A progressive tannery is still working actively in New Ross, manufacturing Irish hides and "kips" into sole and upper leathers mainly for local consumption. There are leather factories also in the following towns tanning Irish hides:—Dunmanway and Bantry, in County Cork; Clonmel, in County Tipperary; Mountmellick, in Queen's County; Ballytore, in County Kildare; Dublin, Drogheda, Newry, Belfast, Derry, Coleraine and Richhill, County Armagh. In Dublin one tannery produces leather for bookbinding from sheep and calf-skins, also "basils" for the saddlery and harness trade. The products of the only tannery in Belfast consists mainly of upper leathers. Derry confines itself to sole leather. New Ross, as mentioned, and Ballytore manufacture sole and upper leather. Excepting Limerick and Cork, almost the entire output is in the other towns confined to upper and harness leathers. This exhausts the list of tanning centres in Ireland at the present moment.

The sole leather manufactured is of a superior quality for wearing, but the upper leathers are mostly heavy and of a coarse finish, and harness leathers, too, are not as well finished as English and Scotch goods. In justice to the Irish tanner it must be remarked that much of this is not his fault, because his raw materials, Irish hides—which are devoted to this branch—are generally so cut and injured by the butchers that it is almost impossible for him to produce first class goods. Outside of Limerick and Dublin it is difficult indeed to procure more than five per cent. of Irish hides even passibly well taken off. The same remarks apply to sole leather made from Irish hides, which yields not within two pence per pound of its foreign made rivals of similar quality. In upper leather made from Irish hides most of these knife cuts can be got rid of when the goods are being shaved down to the required substance, which is always less than the natural thickness of full or partly grown hides.

The outlook of the Irish leather industry is not without its encouraging aspects, for a small export trade to England and South Africa is done in sole and harness leather, and Irish manufactured leather in competition with the products of other countries, England and elsewhere, finds a ready sale. Moreover, it is reasonable to note, that with the better flayed hides which it is to be hoped the Irish Department of Agriculture and Technical Instruction will cause to be obtained, the output of Irish tanneries will be greatly increased. More enterprise, too, in seeking new markets could not fail to bear fruit in finding an outlet for any surplus produced. It may here be mentioned that it is estimated that butchers lose at present from 1*s.* 6*d.* to 2*s.* 6*d.* per hide, which, at a modest calculation, represents a total annual loss of about £20,000 per annum to Ireland. This is only the direct loss; for as the tanner cannot, with the material at his command, get more

than a small percentage of his goods classed as best, most of his production must of necessity be secondary no matter what excellent tanning may be given or how highly finished his leather may be.

Turning again to the manufacture of boots and shoes, it must be noted that there are at this moment a number of successful boot factories in Dublin, Belfast, Cork, Derry, Waterford, Ballymena, Lisburn, Mullingar and Killarney, equipped with modern machinery. They produce boots and shoes suited to the requirements of this country, and their products find a ready sale. It is well known in the boot trade that Irish-made goods are more reliable, and so they command a better price than those made abroad. It is also satisfactory that although any increase in the output of machine-made boots in Ireland is slow, it is nevertheless going on steadily, perhaps in proportion to the spread of knowledge in their manufacture. This success is a guarantee that with energy, intelligence, and enterprise, the boot-making industry could be largely developed. The multiplication of boot factories would, of course, re-act on the leather industry, and thus, in addition to keeping in the country the money now spent on imported boots and shoes, the spread of this industry would have a most beneficial effect on the Irish tanning trade.

THE BELFAST LINEN INDUSTRY.

Whether the art of linen-making was carried directly from Egypt to Europe, or whether it was introduced by weavers from Carthage is doubtful; but it is certain that linen manufacture was first practised in Ancient Egypt. That it was one of the earliest Egyptian arts is proved by the examination of mummy cloths; and the fineness of many of these wrappings shows that a high degree of skill was attained in linen manufacture. The Egyptian cloth, however, differs in structure from modern linen; for while the weft of the Egyptian linen often counts only one-third of the warp, the weft of the modern material generally counts as many threads to the inch as the warp.

It is said that the Romans introduced linen-making into England soon after their conquest of that country; and though this is doubtful, it is certain that flax culture was practised both in Great Britain and in Ireland from an early date. Indeed by the Brehon Laws the Irish "Brughairs" or farmers were obliged to learn and practise flax culture. Flax was, however, never extensively grown, and for the past half century the flax crop area has shown a great and continued decline. In 1860 there were 128,595 acres under this crop, and in 1864 the area so cultivated had increased to over 300,000 acres, in consequence of the impetus given to the linen trade by the scarcity of cotton; but this increase was followed by an immediate reaction, which has since continued, despite the fact that the moist, mild climate of Ireland is well suited for flax growing. The area under this crop reached its lowest level in 1898, when flax was grown on only 34,469 acres. In the following year, however, there was an increase of 520 acres, and in 1900 the area had increased to 47,451 acres. In 1901 there was a further increase of over 8,000 acres, the area under flax in that year being 55,471 acres. The diminution in the supply of the raw material has been attributed amongst other causes, to the large supply of cheap fibre from Russia, the better quality of the Belgian fibre, and the consequent unremunerative return to the farmer for the cultivation of the crop in Ireland.

As is well known, a temperate climate appears to be the most congenial to the production of a strong and fine fibre of flax. We are sorry to say, that though our climate does its duty to the flax plant, our farmers do not quite equal to those of France, Belgium, or Holland, in the after processes of pulling the plant, watering and scutching it. These operations have been generally conducted in Ireland in a more or less careless manner, involving a great loss to the farmer himself, and seriously injuring the linen trade of the country. The process of scutching being generally conducted in mills driven by water-power, often at a considerable distance from the farmer's house, the unscutched flax has to be carted there, and remains often for months unscutched and exposed to damage. In this connection it may be mentioned that the Department of Agriculture and Technical Instruction is conducting experiments in the kind of soil and the manures best suited for the flax plant. These two essentials in the successful growth of flax have

not always received the attention required. The system of retting, or rotting, in dug-out ponds, is primitive, and is the same as the inferior "blue" system in Belgium. Double-retting, in a slowly running river, as carried to perfection in Belgium, at Courtrai, in the river Lys, is nowhere practised (legally) in Ireland. With the discovery of the retting bacterium, and the conditions of its life, by Winogradsky, it is hoped that some artificial system of retting may be commercially possible ultimately. The valuable manures contained in the retting water, and the flax seeds, so useful as sources of oil, oil cake, and manure, are at present generally lost in Ireland. An inquiry instituted in 1900, by the Department of Agriculture and Technical Instruction for Ireland, showed that, as a rule, the flax seed imported (very little home-grown is used), is fairly pure and of good germinating power, but that it is inferior in weight, indicating that the seed imported is not allowed to ripen fully in the field, but is the seed taken from the flax plants when the fibre is at its best for textile purposes, and before the plants and their seeds are quite ripe. The linen industry of Belfast and the surrounding district thrives well, but its supply of raw flax fibre is now largely continental.

Up to the end of the seventeenth century neither the cultivation of flax nor the manufacture of linen appears to have obtained much footing in England, as it was then a question whether it would be for the benefit of the country or not. People were afraid that it would interfere with what was called "our noble and ancient woollen manufacture." Though twenty acres of land were required to obtain wool for setting to work the same number of hands which an acre of flax would employ, yet it was stated that "the woollen manufacture would be found to employ by far the greater number of hands in the end, and yield the most profit to the public, as well as to the manufacturers." On the revocation of the Edict of Nantes in 1685, it was recorded that about seventy thousand Protestant artificers from France settled in England, where they introduced new manufactures and improved old ones. Linen, for which they had long been famous, was among these new industries.

In the history of Ireland linen-making is very similar. The industry was carried on from an early time—it was certainly practised in the thirteenth century—and in the fifteenth century linen cloth was exported to England. In this connection the following verse from an old work written about 1430, and dealing with the trade of Chester is interesting:—

> "Heides and fish—salmon, hake, herring—
> Irish wool and linen cloth, faldinge
> And marterns, good be her marchandie;
> Herts hides, and others of venerie.
> Skins of otter, squirrel, and Irish hare,
> Of sheepe, lambe, and foxe, is her chaffare, &c., &c.
> Fells of hides and conies great plentie."

We know too that O'Neill and the other Irish chieftains who appeared at the court of Elizabeth were "clothed in vestures of yellow linen," but it was not, however, until the destruction of the woollen trade that linen-making assumed any importance in this country. In 1636 Strafford brought over Dutch farmers to instruct the Irish in the best methods of flax culture, and though his efforts were doubtless caused by his desire to more effectually kill the woollen trade—by supplanting it—still he proved his sincerity in wishing the linen trade well by investing a large private sum in the project.

In 1697 an Act was passed containing various enactments intended to aid the linen industry. King William III. invited Louis Crommelin and twenty-five Huguenot families to come from Holland, where the linen trade flourished, and carry on the industry in this country. In 1699 a patent was granted to Crommelin declaring that:—

"A grant of £800 per annum be settled for ten years as interest at 8 per cent. for £10,000 advanced by the said Louis Crommelin for making a bleach-yard and holding a pressing-house, and for weaving and cultivating and pressing flax and hemp, and making provision for both to be sold and ready prepared to the spinners at reasonable rates and upon credit, and providing all tools and utensils, looms and spinning-wheels, to be furnished at the several costs of persons employed, by advances to be repaid by them in small payments as they are able; advancing sums of money necessary for the subsistence of such workmen and their families as shall come from abroad, and of such persons in our kingdom as shall apply themselves in families to work in the manufactories. Such sums of money to be repaid without interest, and to be repaid by degrees. That £200 per annum be allowed to said Louis Crommelin during pleasure for his pains and care in carrying on said work, and that £120 per annum be allowed to three assistants, together with a premium of £60 per annum for the subsistence of a French clergyman."

Crommelin started the linen industry at Lisburn and at Hilden where Messrs. Barbour's famous mills now are. Under his wise direction the industry flourished; and when he died in 1727, it was continued and increased by his nephews. In 1711 the Linen Board was appointed to encourage and, to a certain extent, control the flax and hempen manufactures of Ireland. The Board met every week in the White Linen Hall in Dublin, now the Linen Hall Barracks, and was entrusted, until its dissolution in 1828, with the distribution of Parliamentary grants, which varied from £10,000 to £33,000 a year. About the same time, the Duke of Ormonde, Lord Lieutenant of Ireland, with the intention of aiding the industry, directed that hat-bands and scarfs of *linen* should be used at funerals; and this custom, though it gradually fell into disuse is not yet extinct. The exports of linen from Ireland in 1690 were estimated at 300,000 yards, and had increased in 1720 to 2,400,000 yards, valued at £100,000. The returns kept by the Linen Board from 1728 to 1821 show how enormously the export trade developed. In 1728 there were 4,692,764 yards of plain linen exported; in less than twenty years the figures were doubled; in 1821 there were 43,507,928 yards exported. In 1739 the export of linen from Ireland amounted in value to over £600,000. In the same year the Brown Linen Hall was established and the industry became recognised as a staple one. In this connection it should be mentioned that the industry received many benefits and much encouragement from the then Earl of Donegall.

The linen manufacture increased in importance until the latter end of the eighteenth century, when it was seriously threatened by the cotton industry, and about the year 1800 many linen makers dropped that industry and devoted themselves to cotton-weaving. However, after nearly thirty years of great prosperity—at one time there were over 100,000 spindles at work—the cotton industry began to decline, and when the spinning of flax by machinery was introduced it rapidly fell into decay; until at present cotton manufacture has practically ceased to exist.

Flax Spinning.

Flax spinning by machinery was not introduced into Ireland until shortly after the beginning of the nineteenth century, and in the first five years ending December 31, 1810, bounties amounting to £9,618 had been paid by the Government for the erection of 6,369 flax spindles, and preparing machinery for different manufacturers. These spindles were all for what is termed "dry spinning," which is the system still in use in some places where coarse yarns are produced for certain classes of goods. On the introduction, between the years 1825 and 1830, into Ulster of the "wet spinning" process, which was invented by Kay and Marshall of Leeds, a great advance was made in spinning the finer descriptions of linen yarns.

Since that time the trade has become in reality a national one, and the linen manufactures of Ireland are now known in every civilized country. From the peculiarity of the climate, its linen can, when adequately treated, be brought to a snowy whiteness, which no other country can equal. From Russia, Prussia, Belgium, Holland, and France, we import flax, and yet to all these countries we are sending our yarns and linen. Italy and Spain also take a share of our exports; and had the people of Great Britain as great a taste for fine linen and cambric as the Spaniards, our home trade would be trebled. Linen fabrics are really cheaper than cotton or "union" goods when the greater endurance and the greater beauty of the texture are taken into account.

The following figures* indicate the extent of the linen manufacture in Ireland for the past twenty years.

Spinning Mills.				Power-loom Factories.	
Years.	Spindles employed.	Spindles unemployed.	Total Spindles.	Years.	Looms employed.
1882, ...	853,106	20,136	873,242	1882, ...	21,779
1883, . ..	816,334	58,454	874,788	1883, ...	23,676
1884, ...	816,334	50,454	866,788	1884, ...	—
1885, ...	810,456	63,454	873,910	1885, ...	24,300
1886, ...	803,026	70,754	873,780	1886, ...	24,300
1887, ...	803,026	40,564	843,590	1887, ...	25,300
1888, ...	803,026	27,561	830,590	1888, ...	25,000
1889, ...	827,451	7,456	830,907	1889, ...	26,360
1890, ...	815,685	11,766	827,451	1890, ...	26,592
1891, ...	827,451	—	827,451	1891, ...	26,592
1892, ...	837,642	9,000	846,642	1892, ...	28,233
1893, ...	837,642	9,000	846,642	1893, ...	28,233
1894, ...	846,642	—	846.642	1894, ...	28,733
1895, ...	846,642	—	846,642	1895, ...	28,764
1896, ...	846,642	—	846,642	1896, ...	29,000
1897, ...	869,056	—	869,056	1897, ...	31,484
1898, ...	846,100	—	846,100	1898, ...	31,484
1899, ...	835,100	—	835,100	1899, ...	31.484
1900, ...	835,100	—	835,100	1900, ...	31,484
1901, ...	835,100	—	835,100	1901, ...	31,484

* These figures are taken from the "Belfast and Province of Ulster Directory" for 1902.

THE LONDONDERRY SHIRT-MAKING INDUSTRY.

The shirt-making industry of Londonderry succeeded in point of time two other industries, which deserve more than a passing reference, namely the Linen industry, which flourished during the eighteenth and part of the nineteenth century, and the Sprigging industry, which though short-lived, yet filled a gap between the decay of the linen industry, and the commencement of what is now a unique and progressive industry.

Sir Robert Slade, Secretary to the Irish Society, in a narrative of a journey which he made to the North of Ireland in the year, 1802, says:—

"The Linen Market of Londonderry forms an object of great curiosity; it is held twice in every week, and lasts for two hours only, within which short period of time I was assured, linens were purchased in single webs of the manufacturers to the amount of £5,000 and upwards in ready money. These workers do not reside in the City, but are dispersed in cabins round its neighbourhood, where they have, each of them, a few acres of land, for the sake of keeping a cow, and raising some potatoes and flax, and for which, by means of their looms, they are enabled to pay a heavy rent; it is this circumstance of the Linen manufacture that makes the Society's lands so valuable. Each man brings his web or piece of cloth, and is eager to lay it before the factor, the bargain is made or rejected in a few seconds, almost in a whisper, and the linens thus purchased are conveyed to the bleaching grounds, which add great additional value to the land."*

From the above narrative one can imagine what a sad calamity would be the decay of an industry, which was paying £10,000 per week in ready money, for labour alone, in the City of Derry and the surrounding country. Such a calamity did actually occur, and it synchronised unfortunately with the decay of the potato crop.

In 1840 the Brothers Lindsay started the Sprigging industry, which, for a time, gave employment to a considerable number of females, who had been thrown out of employment owing to the decay of the linen industry. About the same time a Mr. William Scott started a shirt-making factory in a street where the Abercorn and Carlisle Roads have now their junction, at the approach to the Carlisle Bridge. Mr. Scott's first order for shirts, it is interesting to note, was from a Mr. McCarter, to send to a son in Australia, who was in business there. For a time the two infant industries competed for existence, but finally shirt-making held the field. Soon Mr. Scott's trade outgrew his accommodation and he removed to Bennet-street, where he carried on an ever increasing business, and was paying in wages for hand-made shirts, £500 per week. Mr. Scott's trade continued to increase by leaps and bounds; his business prospered, and he was soon able to retire. It was not until 1850, however, that shirt-making assumed any great importance. About that year, however, the industry took a new phase; for,

* "Concise View of the Irish Society," p. ccvi

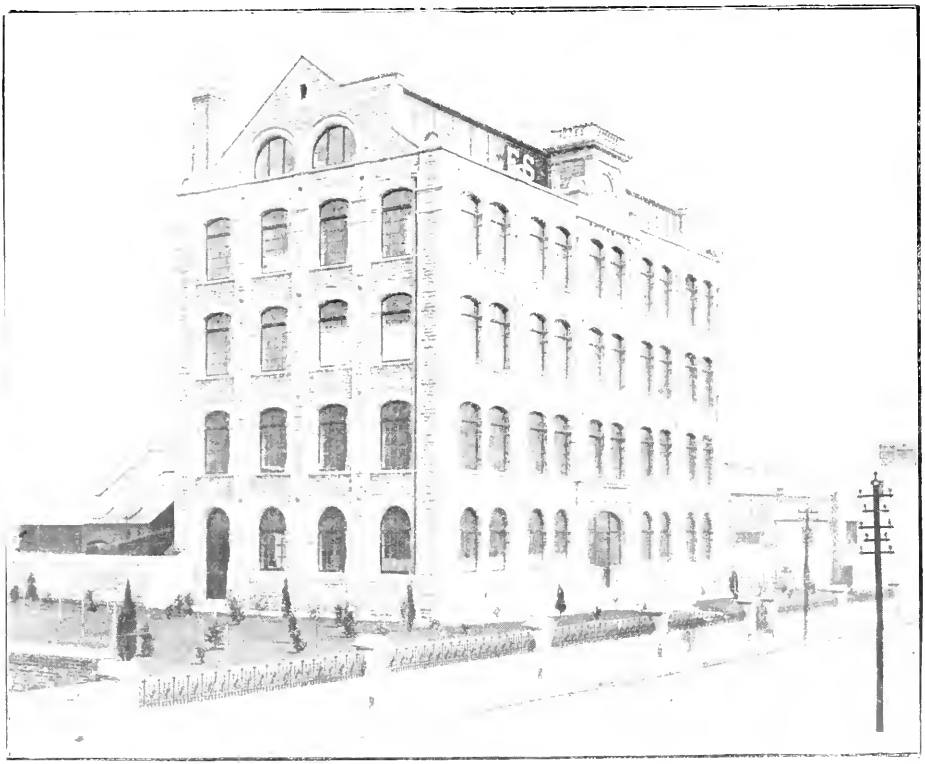
whilst up to that time shirt-making had been carried on chiefly, if not exclusively, in the homes of the peasantry, after 1850 it was to a great and gradually increasing extent practised in factories and workshops in the towns.

As a result of this change of policy the trade attained great importance, until at present in the Counties of Londonderry, Donegal and Tyrone—where the industry chiefly flourishes—there are not less than 80,000 persons engaged in shirt-making. This number, of course, includes the great number of women who work in their homes. Indeed Derry City, which may be called the capital of the industry, is the great centre from which the trade of the United Kingdom, the Continent, and the Colonies is supplied. Great too, as the industry has become, it is still growing; for whilst in 1870 there were about 10,000 persons employed in the various factories, in 1897 the number had reached 13,000, and to-day more than 18,000 persons are engaged in shirt-making in the Derry factories. Moreover, many of the manufacturers complain that they cannot get a sufficient number of workers. This difficulty is to some extent inherent in the trade itself, for this reason—that considerably over 80 per cent. of the persons engaged are females, and it is always difficult to get a large supply of female labour unless there is work in the neighbourhood for their male relatives. In this respect Derry compares very unfavourably with Belfast. Belfast is, indeed, singularly fortunate, for whilst the women and girls are employed in the linen trade, the males of the various families find occupation in the shipbuilding and allied trades. Derry, on the other hand, though there are ship yards and railway works, cannot provide work for many men.

Some details as to the position of the workers may be interesting. Girls when they first enter the factories are called learners, and are placed under the supervision of a trained worker; whilst learning their trade they receive about four shillings a week. Afterwards when they become proficient they rank as full paid "hands" and their earnings depend upon their skill and energy. After about six months a girl is generally able to earn about 12*s.* a week; but the average wage does not much exceed nine shillings a week. Usually good workers, however, frequently earn about a pound a week; but these are mostly engaged on "finishing." It may be mentioned that to earn nine shillings a week a girl has to sew—with a machine of course—about two dozen to two and a half dozen shirts.

The first cost of a shirt of average quality is about three shillings and sixpence, of which about two shillings and sixpence is for material and a shilling for labour. The latter sum paying not only for the sewing, but for the cutting out, finishing, and packing for transit as well.

The industry is divided into three branches—first, the cutting out of the material, which is done exclusively in the factories; secondly, the sewing, which is done partly in the factories, but largely in the homes of the workers; and lastly, the laundry and finishing for market; this last operation is carried out wholly in factories, and is the best paid part of the work. The rural workers within a radius of five miles, carry the unmade work to their homes, and when made up return it to the factory, where they are paid for the work. To the rural stations distant from eight miles to thirty-five, the unmade work is conveyed by rail or horse van (mostly by horse van), and in like manner conveyed back again to the head centre (Londonderry). At the rural stations a competent examiner receives, and pays for the work when returned duly made up. The work supplied to the rural stations is



TWO TYPICAL LONDONDERRY SHIRT-MAKING FACTORIES.

all cut out in dozens, and require only to be put together; therefore the same skill is not required in the rural districts as is required in the city.

The following short account of some of the chief firms engaged in the industry may be not uninteresting. Soon after 1850 two Scotch lads arrived in Londonderry, and established themselves there, each starting a factory for shirt-making, one of them being the present William Tillie, Esq., D.L., the other the late Adam Hogg. How Mr. Tillie's business has increased from small things may be seen by a look at his block of buildings at the city end of the Carlisle Bridge, whilst the business of the late Adam Hogg has also become very extensive; one of his "branches," which extends from Sackville-street to Great James's-street, is 126 feet long by 120 feet wide, and is five stories high. The other branch is one of the largest factories in the city, having a frontage of 309 feet, with a breadth of about 78 feet, there being four flats. Ebrington Factory is situated on the eastern side of the river. The newest establishment in Derry is the "Star Factory." In the erecting of the "Star Factory," everything that money and brains could do for the proper equipment of the building and the comfort of the workers was done. Other prominent firms are those of A. B. Grant and Sons, and Welch, Margetson and Co.

So ably guided has been the shirt industry of Derry, that it is little wonder that it has increased, as it has done, from five unpretentious factories in the fifties till there are now (including laundries engaged in the shirt trade), thirty-eight splendid ones, with 113 rural branches, paying considerably over £300,000 per annum in wages alone.

An important allied trade is the making of collars, fronts and cuffs. This industry is carried on in Belfast as well as in Derry, and in the two towns over 60,000 dozen of collars, fronts, and cuffs are made each week, representing an annual value of over £600,000.

THE MODERN IRISH LACE INDUSTRY.

Lace, from the antiquarian point of view, has furnished a subject for some learned treatises; but I rather desire to speak of the various laces which are at present made in Ireland, and shall only refer to antique examples where it is necessary to illustrate varieties of lace, or show differences which exist between the Irish lace and that from which it may be said to have been derived.

True lace may be divided into two classes, one made by means of the needle, and called "needle-point lace."

Needle-point Lace.

Fig. 1 is from a piece of Italian (Venetian) needle-point lace of the seventeenth century. The pattern is floral, and very simple in its character. The lace has that peculiar flatness which is observable in the Venetian needle-point laces. Note the fine ground which has been made altogether by means of the needle. The open work contrasts with this ground, and, in addition to forming the edge, is carried at intervals across the lace. There is a very effective hexagonal filling occurring chiefly at the edge; it is used sparingly, however, and affords a good example of the restraint exercised by the old lace-makers.

Pillow Lace.

The other class of lace is made by the twisting or plaiting of threads; it is known as "pillow lace," or sometimes "bobbin lace," from the fact that the threads are twined round small bobbins of bone, wood, or ivory. In both these laces the whole of the fabric is made by hand. This is not the case in the so-called Limerick and Carrickmacross laces.

Fig. 2 is from a piece of Italian-Genoese pillow lace of the seventeenth century. The pattern consists of a flowing scroll with conventional flowers and leaves. It is very even in its workmanship, and has peculiar raised portions in some of the flowers. It is not cut up by the insertion of many fillings, and the pattern is relieved clearly and effectively against the ground.

The needle-point lace is at present commonly subdivided into two classes, flat and raised needle-point; and although there is a considerable difference in the appearance of the two, yet both are made in the same way, that is, by means of the needle, the raised appearance in the latter being obtained by working over cords of varying thickness.

The growth of lace-making can be distinctly traced from its origin in embroidered linen. At first portions of the linen were cut away, leaving the embroidery. Threads were also drawn from the linen, and in the spaces so formed needlework was inserted. In order to avoid the trouble of withdrawing the threads, an open reticulated ground was made called "lacis," and upon this ground little devices were worked. All these varieties were found in use at the opening of the sixteenth century. The linen, as a basis, was gradually dispensed with, and the tooth-shaped borders (dentelles) came on the scene as the first appearance of true lace.

FIG. I.—VENETIAN NEEDLE-POINT, SEVENTEENTH CENTURY.
Museum of Science and Art, Dublin.

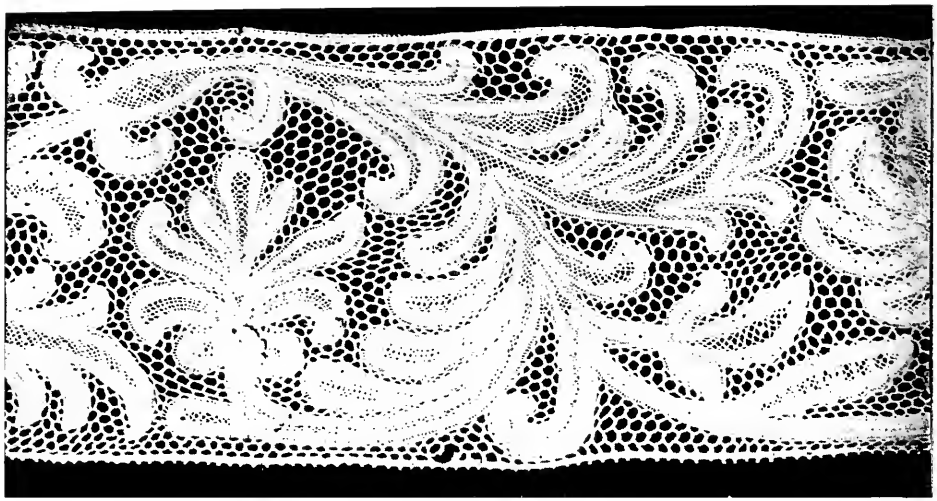


FIG. II.—GENOESE PILLOW LACE, SEVENTEENTH CENTURY.
Museum of Science and Art, Dublin.

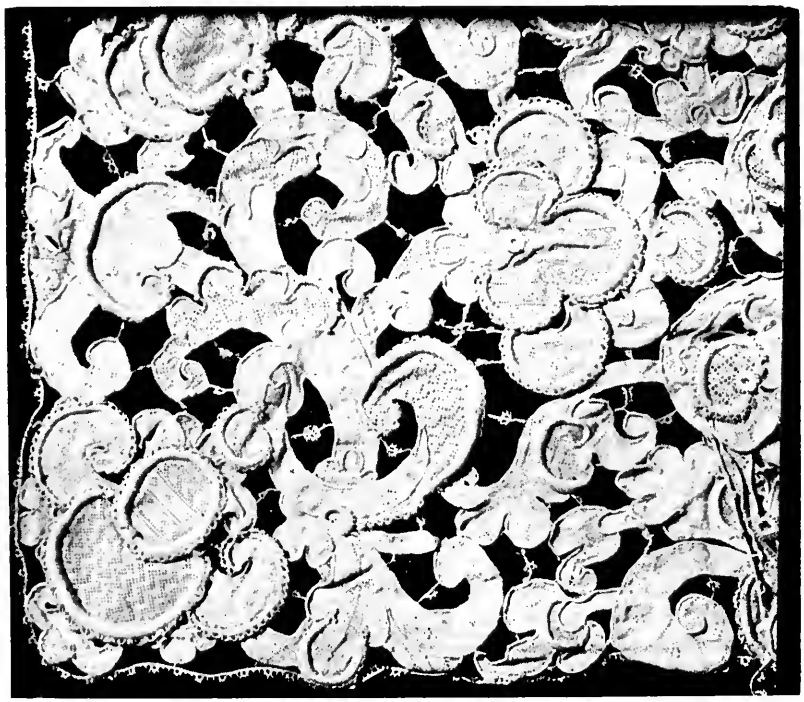


FIG. III.—GROS POINT DE VENISE, SEVENTEENTH CENTURY.
Museum of Science and Art, Dublin.

Thus from these small beginnings were gradually evolved in response to the demands of fashion the wonderful productions of the seventeenth and eighteenth centuries.

I trust my lady readers will pardon me for saying that it has been noted as a curious fact that lace showed little artistic character until men adopted the fashion of wearing it. It was for the great noble and the prelate that the magnificent specimens of "Point de Venise" were made in the seventeenth century. We read that a collar made for Louis XIV. at Venice cost £60, a large sum of money at that time. The fashions in those days changed as surely though rather more slowly than in our time; and the heavy laces were gradually supplanted by the laces having meshed grounds. As men wore less, women wore more of them, and so laces of lighter texture were sought after. The heavy Venetian points gave place to the lighter "rose point." In France such laces as the "Points d'Alencon" and "d'Argentan" and many other subordinate varieties rose into a position of importance.

Fig. 3 is from a fine specimen of Gros Point de Venise of the seventeenth century. It is only a small portion of the collar; the design is composed of fine, bold forms peculiar to this description of lace. The raised portions give an effect of richness; the closeness and solidity of the work are remarkable. The fine diapers and patterns formed by small holes on the flowers and leaves are worthy of notice, as well as the delicate cresting which surrounds some of the forms. There are very few "brides" or "ties"; the ornament is so designed that its forms mainly support each other.

Fig. 4 is also a piece of needle-point lace, Venetian, seventeenth century. It is probably a little later in period than the preceding specimen. The forms have become smaller, and more delicate, and consequently many more brides or ties are required to hold them in position. The workmanship is of the choicest; and it is possible that the greatest triumphs of the needle, so far as craft is concerned, have been attained in this description of lace. From the numbers of little crestings which surround the forms, suggesting the shape of frost or snow crystals, this lace has frequently been called Point de Neige. At the right side of the figure it may be noticed that the pattern is constructed on a vertical line and is symmetrical, from thence branching off into scrolls which play over the surface. These symmetrical portions occur at regular intervals.

Flanders had almost always restricted herself to the manufacture of pillow lace. It seems to have been introduced from Italy about 1536, and so engaged the attention of the Flemings that they were soon recognised as the chief producers of this lace. At the present time the lace makers of Bruges, in common with those at many other places in Belgium, may be seen busily engaged in the production of pillow lace.

Fig. 5 represents a piece of Brussels pillow lace of the eighteenth century. The pattern is floral, composed of sprays which intertwine with the meander which separates the two grounds. There are also small detached sprays. This contrast of a fine with a coarser ground is very effective, and may be seen in the earlier French needle-point laces. It is well to note how sparingly the fillings are used in all these antique laces.

Fig. 6 represents a border of Mechlin lace, of possibly an early date. The forms are large, and rather clumsily drawn. The pattern would seem to have been made for an insertion rather than a trimming border, as the ornament does not form the edge.

It may be of some interest to describe briefly the method of making lace.

Lace-making.

In needle-point lace the pattern is carefully drawn upon a piece of glazed calico, parchment, or paper; the former is commonly used in the present day. This is laid upon a piece of calico and the pattern is carefully outlined or "traced," as it is termed by the worker with a thread; this thread is the framework or skeleton on which the lace is made. When the work is completed, the lace is released from the calico by cutting with a sharp knife between the two pieces. In large pieces of work considerable skill is required in so cutting up the patterns into different pieces, to be made by different workers, that they can be easily joined together in such a manner as not to exhibit the line of junction. In some of the meshed hexagonal grounds of modern French lace this is done in a truly surprising manner, not the least appearance of a joining being visible.

In pillow lace the pattern is drawn (preferably) on a piece of parchment. It is then pricked over by an expert, and placed upon the cushion; in each of the holes a fine pin is inserted, and upon the pins the threads are plaited and twisted by means of the hands; the various methods of twisting and the arrangement of the holes resulting in the varieties of grounds and fillings. Children commence to learn pillow lace-making in Belgium at the age of five years.

Improvement in Design.

In the year 1883 the Cork Exhibition was held, and I had the honour of a seat on the Executive Committee of that undertaking. As part of my duty, I went to South Kensington to ask for a loan collection from the Museum. In conversation with General, now Sir John Donnelly, K.C.B., he mentioned the fact that Mr. Alan S. Cole intended paying a visit to Limerick in the summer of that year, and delivering two lectures on lace-making, and suggested that it might be an advantage if Cork had the opportunity of hearing these lectures also. I promised to bring the matter before the Committee on my return. On doing so, they heartily agreed with the suggestion, and Mr. Cole was invited to deliver two lectures on lace-making in the Exhibition building. Lace, embroidery, plain and fancy needlework formed an important section of the Exhibition, and almost all the convents in the South of Ireland were exhibitors. I proposed to Mr Cole that we should have a walk through the Lace Section of the Exhibition. We noticed the excellence of the work, so far as the use of the needle was concerned, and found it combined with poverty of design and very bad drawing. The result of our conversation was that an effort should be made to improve the character of the design and the quality of the drawing; and as a commencement it was decided that a letter should be sent to the convents which had exhibited, asking them whether they would be willing to grant an interview to Mr. Cole and myself in order that we might have a talk about the necessity which existed for such an improvement, and if they thought well of it, that some arrangement might be made by which the convents should form classes for instruction in drawing and design.

In the early spring of 1884 visits were made to several convents which had replied favourably, and in conjunction with Mr. Cole I submitted a scheme to the Department by which I might commence a course of instruction to these convent classes. It was to be a system of peripatetic teaching, if I may so call it. I was well aware that in many, if not all the convents, there were ladies who had received a certain amount of art education, which

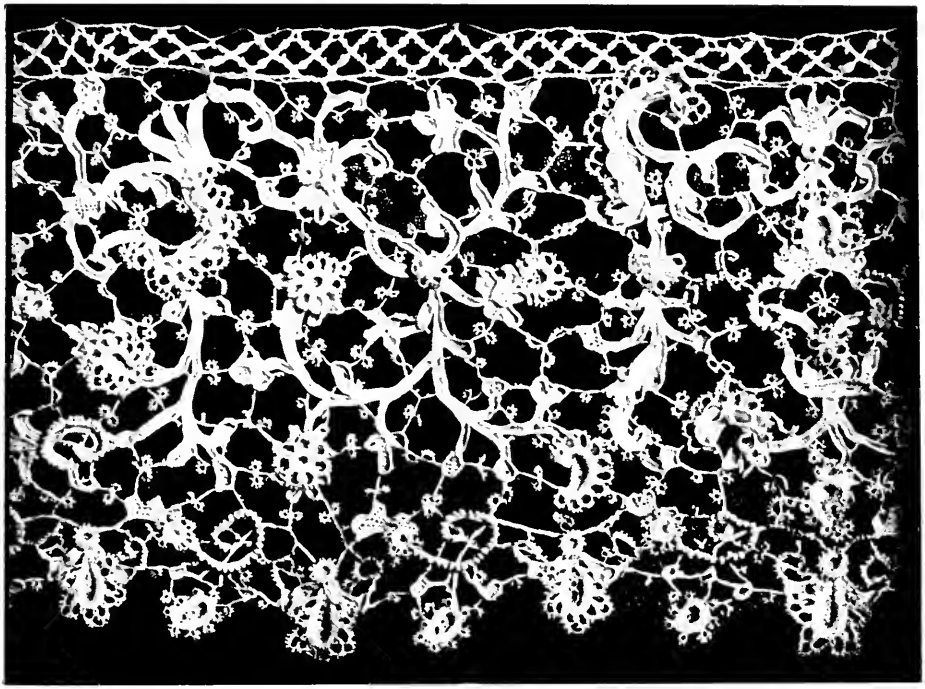


FIG. IV. "SNOW POINT," VENETIAN, SEVENTEENTH CENTURY.
Museum of Science and Art, Dublin.

FIG. V. BRUSSELS PILLOW LACE, EIGHTEENTH CENTURY.
Museum of Science and Art, Dublin.

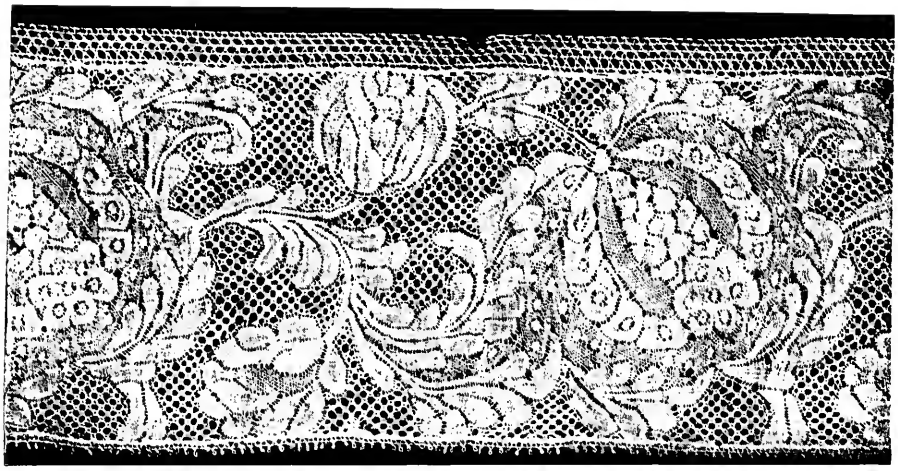


FIG. VI. MECHLIN PILLOW LACE.
Museum of Science and Art, Dublin.

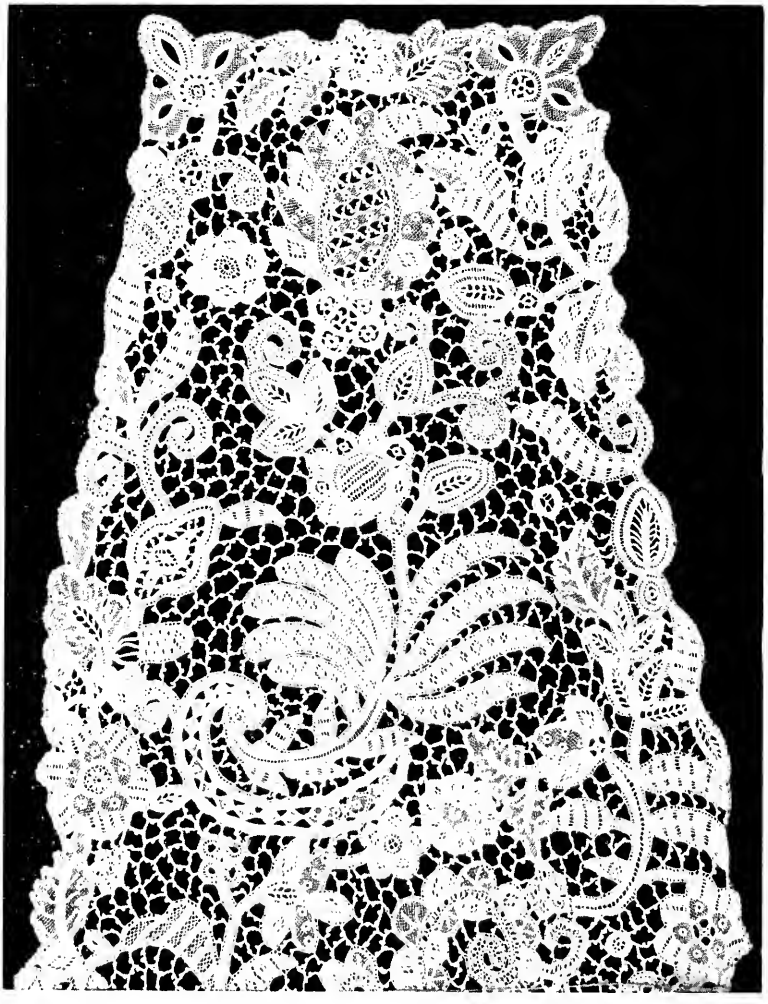


FIG. VII. OLD FLAT POINT.
Presentation Convent, Youghal.

only wanted direction in order to produce good results; and knowing this I proposed the formation of classes which should be taught by certain of the Sisters, who would themselves commence a course of study which would enable them to qualify for the Art Class Teacher's Certificate. I was to visit each class once a month, inspect the work done by pupils and nuns, lecture, give directions as to the work for the ensuing month, and generally guide their efforts.

The course of study which I adopted was as follows:—During the first year they should practice freehand drawing from the flat, and geometrical drawing; second year, model drawing, ornament from the cast, and the practice of making working drawings from photographs of antique lace, correcting the form when necessary; third year, drawing plant form from nature, and designing patterns. The Science and Art Department approved of this scheme, and the first class was commenced at the Convent of Mercy, Kinsale, followed immediately by a class at the Convent of Poor Clares, Kenmare. Before two years had elapsed there were classes in operation at Killarney, Tralee, Youghal, Thurles, Skibbereen, and St. Vincent's and Blackrock Convents, Cork. My idea was that a class of designers should be formed in each centre, with the work-room in close proximity, so that it would be possible to make trial pieces from the designs. This is absolutely necessary in order to judge of the effect of a piece of lace. I have been informed by M. Lefèbure, the great lace manufacturer in Paris, that he has sometimes had as many as five trial pieces made from a design before the result could be considered satisfactory. This ideal of mine was realised in some instances, notably at Kenmare and Kinsale.

The Committee of the Cork Exhibition gave a sum of £200, and the Science and Art Department an equal amount, for the purchase of good specimens of antique lace; and thus a small but valuable collection was formed. In order to make this available to the classes, I arranged a system of circulation by which each convent had a frame containing one or more pieces of lace on loan for a month, and thus they had an opportunity of studying from the entire collection.

Difficulties in Lace Designing.

Before the commencement of the Convent Classes we had endeavoured to form a small class of designers at the School of Art, Cork, with the object of supplying designs for lace and crochet to those centres which were not sufficiently advanced to make their own designs. I selected a few of the advanced students, and set them to copy from the lace in the loan collection which hung in the Exhibition; at the same time they made themselves acquainted with the technicality of lace-making, and the limitations of the material, by, in several cases, actually learning how to make the lace for which they were designing. It is scarcely necessary for me to remark that it is, in my opinion, absolutely impossible for any student, no matter how clever he may be, to make successful designs without fully comprehending the limitations of the material in which the design is to be carried out. I have several times had to combat an idea which is entertained by some; that is, if a large class of artisans is taught drawing, it is possible to make them all proficient at design. Like the poet, a good designer cannot be made. A notable instance occurs to me. I remember two ladies, sisters, who had studied together; both drew equally well from the cast and from nature, and had passed through all the elementary work creditably. They informed me that they wished to learn designing for lace.

I set them, for about a month, to make working drawings from photos. of old lace, restoring the good drawing, and studying the construction of the pattern. At the expiration of that time, I gave them a space of two inches wide between two horizontal lines, and told them to make a design for a border for needle-point lace, using any arrangement they pleased. One sister had a very good design made in a few hours; the other sat, day after day, over the paper for nearly a month without producing anything. At the end of that time, she told me she thought it would be well for her to give up the idea of designing—a conclusion in which I thoroughly concurred. But if you cannot make designers to order, there is no doubt the practice of drawing will improve anyone who has to use head and hand. As an illustration of the truth of this, in the Convent at Kinsale there is a large industrial school for girls; when they commenced to make the description of lace, which is known as Limerick lace, but which, as I have said, is really an embroidery on net, a teacher was engaged who had made lace in the Convent some thirty years before, but who had, on the decline of the industry, married and settled in Kinsale. The little girls who were selected to learn lace-making had been taught to draw, and it was pointed out to the lace teacher that this, no doubt, would help them, but she rather ridiculed the idea. She said that when she was taught lace-making, there was no drawing taught, and she could not see the necessity for it; she said the workers were compelled to "stab," as she expressed it, for about three months, a needle through a piece of calico on which a pattern had been traced, and she proposed to commence this course with the children. It was explained to her that this had been necessary for the reason that the workers had not been taught to draw, and that she would discover that the girls who were to commence lace-making with her would have no difficulty in following a pattern. Reluctantly and unbelievingly she consented; and, to her astonishment, found that it was perfectly true. She discovered that the children could follow a pattern rather better than she could, and that she need only teach them how to form the different fillings. She sent her daughter at once to the class to learn drawing, and had the pleasure of seeing her become one of the best designers in the class, where she still remains. Visitors to the Horse Show, Dublin, have had the opportunity of seeing work designed by this girl, and produced in the Convent, which has more than once carried off the highest prize awarded there.

I now propose to point to some of the varieties of lace which have been made in Ireland since the establishment of these Art Classes, contrasting them, in one or two instances, with specimens of an earlier date. Needle-point lace of the flat description is made at the Convent of Poor Clares, Kenmare; the Presentation Convent, Youghal; and at the Convent of Mercy, New Ross.

Youghal Lace.

Fig. 7.—Here is a specimen of old, flat needle-point from Youghal. I consider this a most instructive example, because it shows clearly how much depends upon good construction and good drawing in a lace design. You can see plainly that there is no idea of construction in this design, each portion is independent, there is no growth in the pattern; observe, on the left hand, how a stem appears to come out of the side of a four-sided form, which may have been intended to represent a flower. On the right-hand side, where there was a difficulty in forming the edge, leaves have been inserted which do not grow from any stem, and

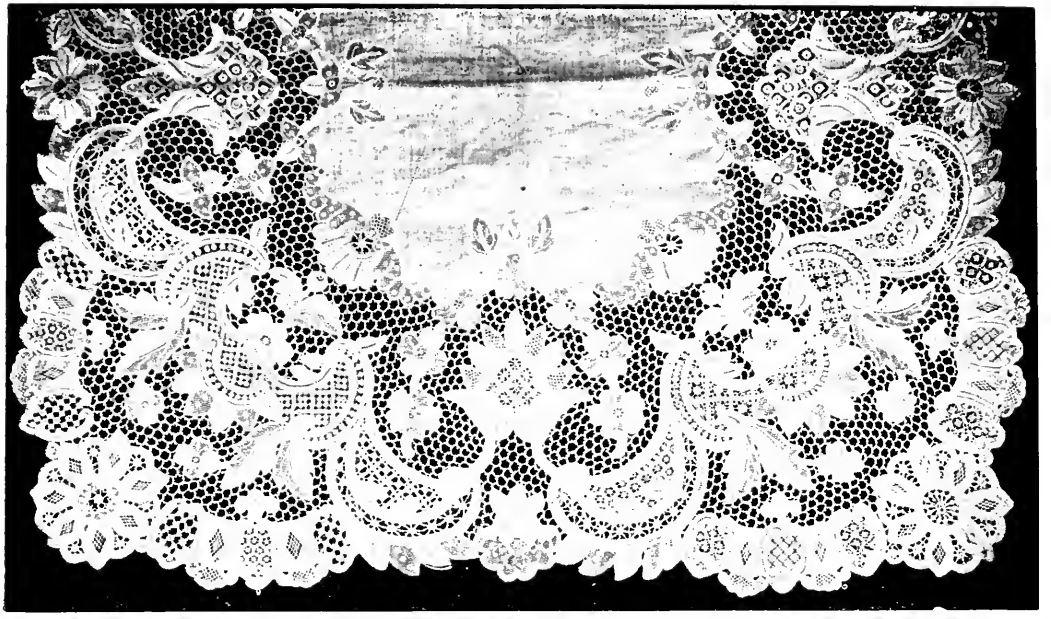


FIG. VIII. MODERN FLAT POINT, PRESENTATION CONVENT, YOUGHAL.

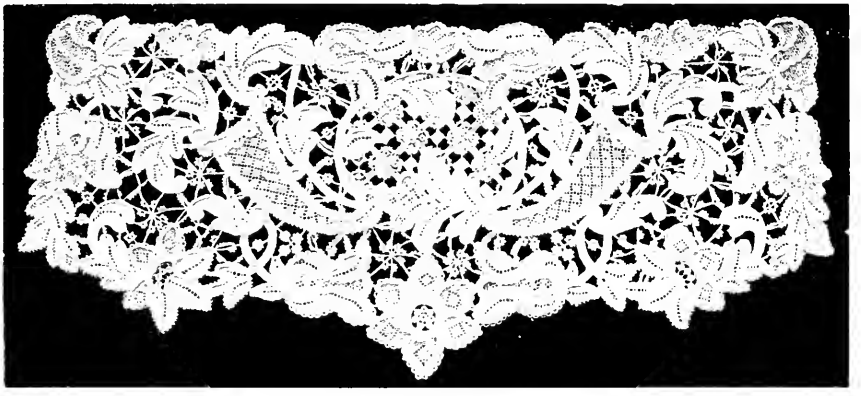


FIG. IX. MODERN RAISED NEEDLEPOINT, YOUGHAL.

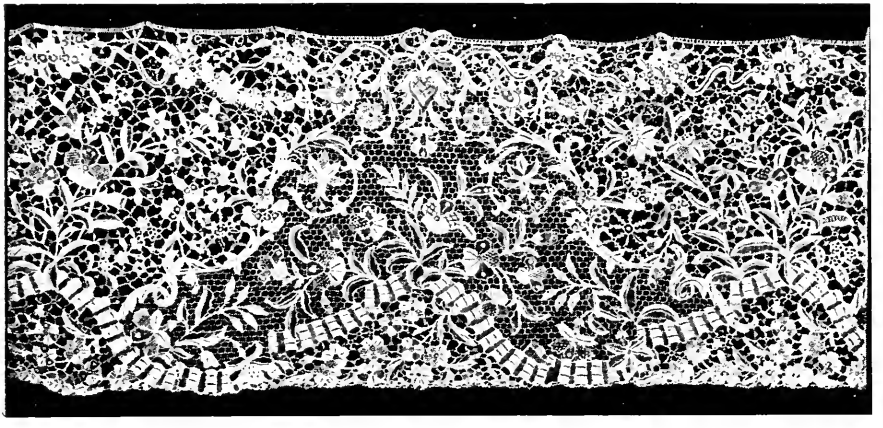


FIG. X. MODERN FLAT NEEDLEPOINT, CONVENT OF POOR CLARES, KENMARE.

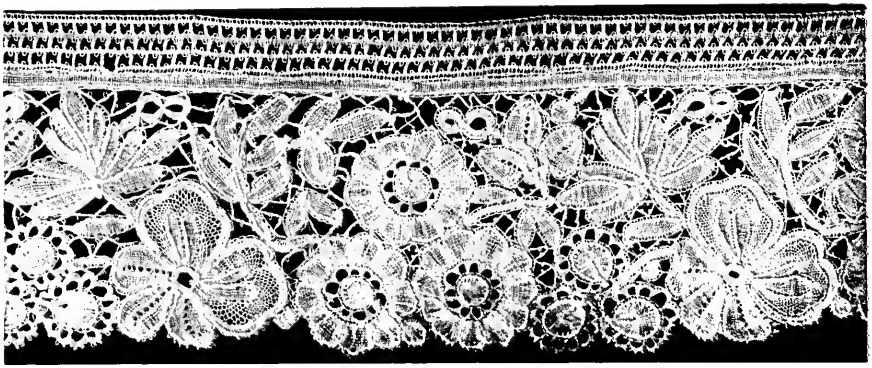


FIG. XI. BIRR PILLOW CASE.

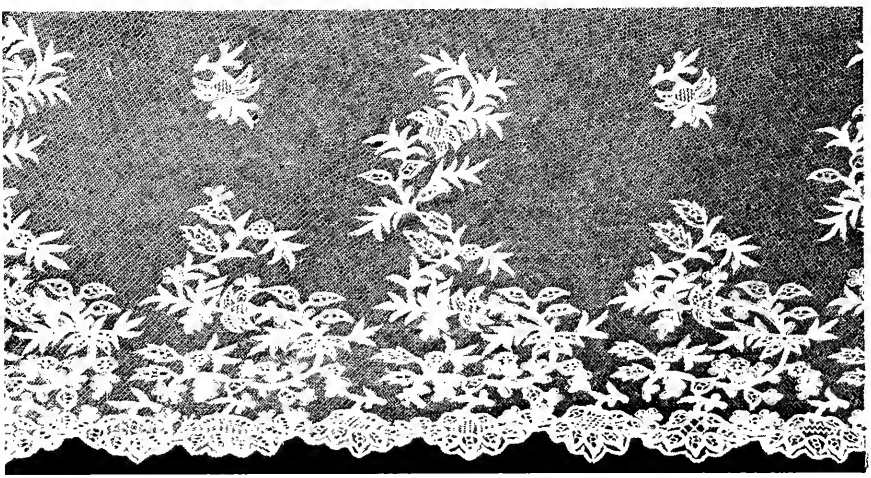


FIG. XII. OLD LIMERICK TAMBOUR LACE.

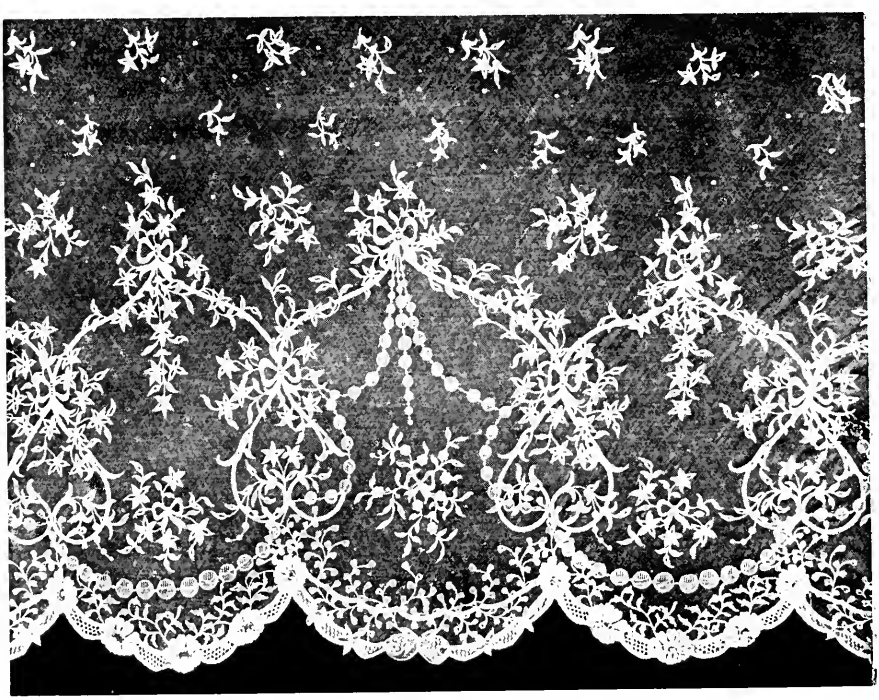


FIG. XIII. MODERN LIMERICK TAMBOUR LACE.

in two places the edge is actually formed by the ground. It looks as if the separate portions had been taken from different designs, and put together on the paper in a perfectly haphazard fashion, and, indeed, this is the way in which many such designs were made. Novelty was obtained by sometimes borrowing a spray or two from an old wall paper and inserting them into the body of the design. Again, look at the drawing of the forms, leaves of various kinds grow from the one stem, worm-like forms are introduced, and fillings are inserted without any proper idea of their value. The gound is without regularity. In fact, the whole design shows the debasement of form in a most complete manner, and illustrates what really took place in days gone by, when designs were traced again and again on tissue paper, by those who had never learned to draw, until the original form was lost, and a medley of meaningless shapes, such as you see before you, was the result.

Fig. 8.—Now turn to this specimen of modern flat needle-point from the same place. The lace is used to trim a handkerchief, which is a square. The border is wide in relation to the handkerchief, but that is in consequence of the dictates of fashion; sometimes the borders are very narrow, sometimes wide. You can at once see that there is construction in this design, the corners are symmetrical, and are formed on the diagonals of the square, as centre lines, while the diameters of the square again bisect the forms, which appear in the centre of each side. I say nothing as to the talent of the designer, but here is evidence that thought has been at work. There is a mixture of conventional with natural forms, which has been well managed, one contrasting with the other, and the eye is carried pleasantly round the border, with sufficient accent on the places where centre lines would occur. The effect gained by running the leaves with the cambric is good, as it helps to unite the border with the centre of the handkerchief. The little arch-like arrangement of flowers in the centre of each side is well conceived, as it leads the eye from the edge, at the corners of the handkerchief, up into the centre, and then down to the opposite corner, thus giving a pleasing line. The forms are well drawn, the curves are true, the fillings are perhaps a little too freely used, but the ground is very much more regular than in the last example. After a study of these two patterns, I am sure you will agree with me that there is some value in good drawing and design, and that it is not without reason so much has been said as to the necessity for both.

Fig. 9 is also an example of the improvement which has taken place in the designs for Youghal lace. This is a cuff of slightly raised needle-point; the forms are accentuated by the raised outline which adds brightness to the lace. The design is good; and one can see at a glance that there is no haphazard throwing together of the forms in this instance, but that the whole arrangement has been carefully thought out. Observe that although the general arrangement is symmetrical the severity of such an arrangement has been mitigated by the leaf which crosses the centre line, and hides the curve at the end of one of the cornucopiæ. The forms are well drawn, the small enrichments on the surfaces of the leaves and flowers are managed with judgment, and the bars or ties are well arranged, and sufficiently enriched with picots. On the whole, I consider this specimen fit to rank with many of the antique laces, both as regards workmanship and design.

Fig. 10 represents a flounce of needle-point lace from Kenmare. The design is very elaborate and rich in details. A ribbon flows in a scroll-like

manner along the lower portion of the flounce in part forming the edge; and at the top we have a narrower ribbon which, in places, appears to loop over the engrelure; small garlands and bouquets of flowers are attached to this ribbon.

The conventional ornament which separates the fine hexagonal meshed ground from the tied or barred portion is carefully drawn and well arranged; it contrasts successfully with the sprays and flowers which are tossed about in lines of playful growth. The workmanship is excellent.

Raised needle-point, better known as Inishmacsaint lace, is made at Miss Maclean's Class, Benmore, Enniskillen. It is also made at Miss Keane's Class, at Cappoquin, County Waterford, and at New Ross Carmelite Convent, at Youghal, and at Kenmare.

Pillow lace is made at the Convent of Mercy, Birr, and was made until lately at Miss Elwood's Class, Cong, County Mayo, and to a small extent at Golden Bridge Convent.

Fig. 11 is a specimen of a pillow lace trimming made at Birr. I do not think it fairly illustrates the excellent work done at that lace centre. The design is not quite satisfactory. The forms seem to be rather large for the depth of the border. There is not sufficient evidence of construction in the pattern; it should always be remembered that one great advantage which hand-made has over machine-made lace is that the repeat need not be short, as it must of necessity be in the latter. In this border the repeat is much too short, and so the lace becomes monotonous. The ties are not well arranged, and the forms are not remarkable for beauty of drawing.

Limerick Lace.

Limerick lace, which is an embroidery or net, is of two varieties, "run" and "tambour." It is made at Mrs. Vere O'Brien's Class, and elsewhere in Limerick. This lace is also made at the Dominican Convent, Cabra, at Kinsale, and at Golden Bridge Convent. To Mrs. Vere O'Brien the Limerick lace workers owe a great deal. Were it not for her sustained efforts to benefit the workers during some years past, the industry in that locality would have fallen into a state of complete decay.

Mrs. Vere O'Brien was one of the first to perceive the value of change of pattern, and the Cork School of Art was indebted to her for many encouraging orders for designs.

Fig. 12 is an example of old Limerick tambour lace. The pattern consists of a rather violently twisted spray, and an edge of detached blossoms which follow one another in a monotonous fashion. The design is not unsuitable to Limerick tambour work, and no doubt was highly prized before the days of machine-made lace. One cannot but feel, however, that there is not sufficient variety; any such which may exist is gained by the alternation of a tall and short spray of the same description of foliage. The remarks which I have before made on the variety which may be gained in hand-made as opposed to machine-made work are, I think, equally well exemplified in this illustration.

Fig. 13.—Modern Limerick tambour lace. The pattern is well suited to this description of lace. The trailing arrangement of the sprays, tied in places with bows of ribbon, and the strings of pearls combine to impart grace and lightness to the design. Large forms cannot, as a rule, be well rendered in this lace, and small forms, in order to be effective, require to be separated from one another.

Fig. 14 is an example of modern Limerick run lace. The design is based

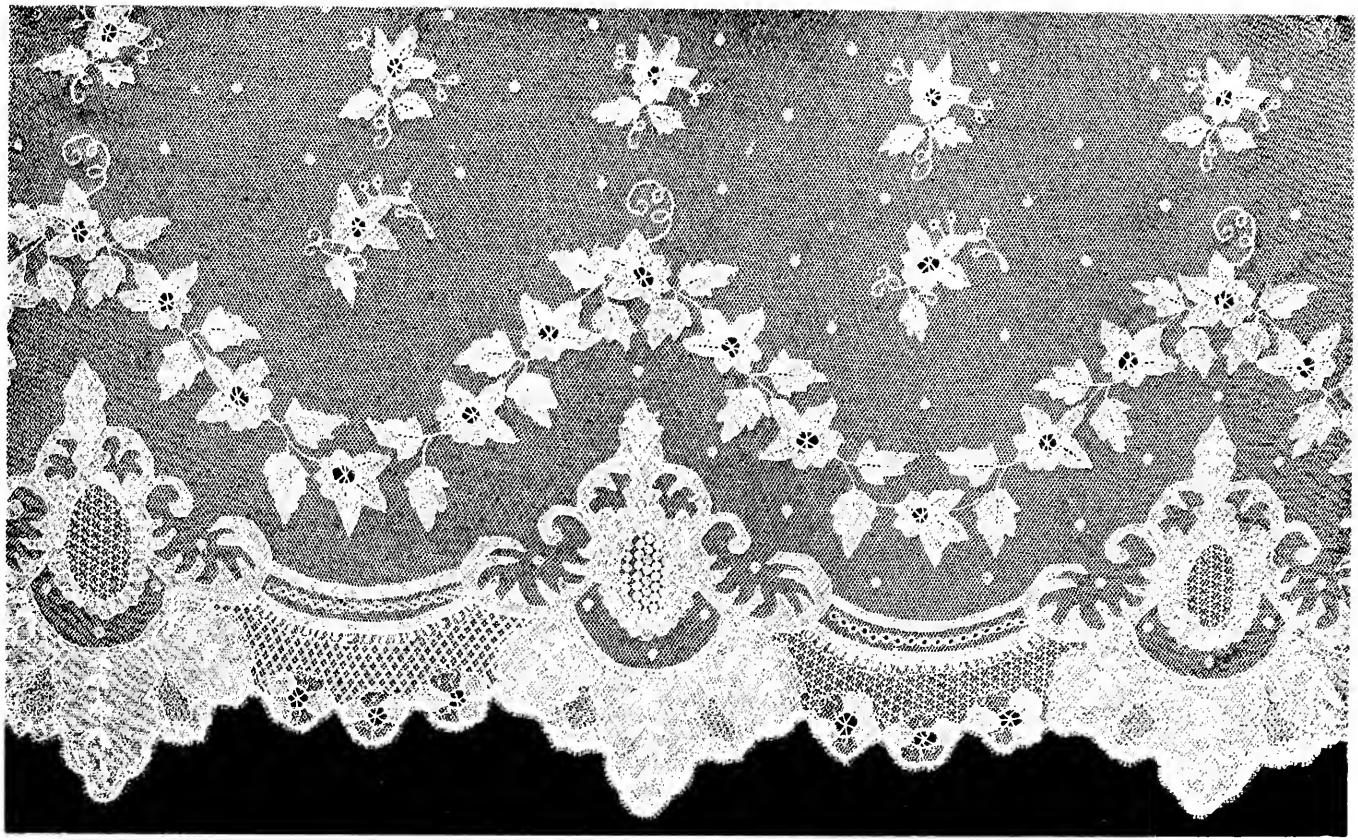


FIG. XIV. MODERN LIMERICK RUN LACE.

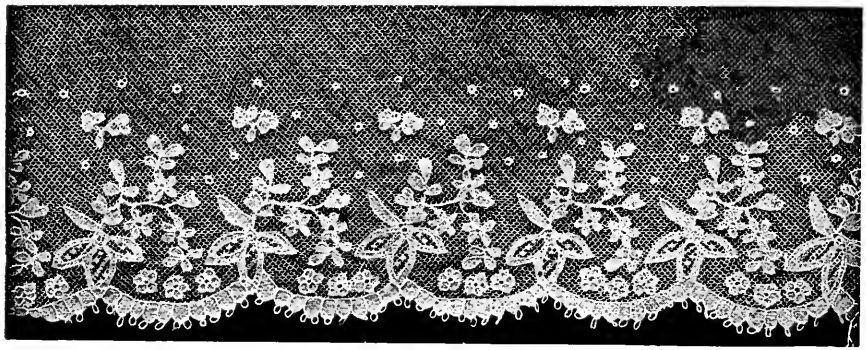


FIG. XV. OLD APPLIQUE, CARRICKMACROSS.

FIG. XVIII. SKETCH OF FAN DESIGN.
By Miss Alice Jacob

upon the idea which one so often sees in Brussels laces, and which has perhaps become a little tiresome from its too frequent repetition; that is, a separate conventional border in which fillings are introduced, surmounted by sprays or garlands of leaves and flowers. I think a certain stiffness of treatment exists where the curves above the three flowers in the border are attached to the curves of the conventional ornament. In Limerick run-work, there is always a squareness of form which should be taken into account in designing for it; and forms which depend for effect upon the beauty of their curves are likely to suffer in their translation into run lace. The garlands of leaves and flowers are well arranged, and work satisfactorily.

Carrickmacross Lace.

Carrickmacross lace is made at the Bath and Shirley School, Carrickmacross, at Crossmaglen, and the surrounding districts. It is of two kinds, "appliqué" and "guipure." It is not a true lace, as the work, which in needle-point would be called the "tight-work," and which is made with the needle, consists, in Carrickmacross lace, of cambric. The ground, also, where it is "appliqué" is a net ground. Very pleasing effects, however, are obtained by the use of needle-point fillings, brides, or ties, etc. Combinations of guipure and appliqué varieties have been tried with considerable success.

Fig. 15 is an example of old Carrickmacross appliqué on net. The first thing that strikes one is the shortness of the repeat, which is, as I before stated, a characteristic of machine-made lace, and results in monotony. The edge is simple, made up of a series of small petals, placed side by side. Observe the absence of construction in the pattern, which consists of one large three-lobed leaf, joined to a spray containing leaves of a quite different character. There are also three detached flowers which apparently have nothing to do with the spray nor with one another. The practice of cutting away the centre of the leaf and inserting a filling was very much in vogue with the Carrickmacross lace-makers in former days. I think it was most objectionable; no doubt it arose from a desire to give relief to the leaf by making a cut showing the place of the midrib; this was quite permissible, but workers who knew nothing about the midrib of the leaf, its position or shape, cut away the surface of the leaf until a mere fringe of cambric was left, and the leaves presented the appearance of having been eaten away in the centres.

A considerable improvement has, however, taken place, as will be seen by reference to Fig. 16, two lappet ends of modern appliqué. The design and workmanship of these are admirable; you can notice the graceful climbing arrangement of the ornament constructed for a surface which is to hang vertically. The midrib of the leaf is better expressed than in the preceding example, less of the surface has been cut away. The design is based upon the arrangement which is seen in many of the old lappets of the eighteenth century. Richness is obtained by using the fillings in panels formed by the ornament, and monotony is prevented by the alternation of the fillings. Observe the good drawing of the flowers and leaves, and the well rendered curves of the stems. This is particularly noticeable in the right-hand lappet, at the bottom of which a well drawn spray reflects great credit upon both designer and worker.

Fig. 17 represents a portion of a border of modern Carrickmacross guipure. In this lace, portions of the cambric and net are completely cut

away, and bars or ties are inserted. The design consists of a combination of conventional with floral forms: the edge is formed by an arrangement of flowers placed side by side so as to form a sort of festoon. There is a certain quaintness about the treatment of the pansies which is not unpleasing. Perhaps the only objectionable portion of the arrangement is the manner in which the stem starts from the second flower at the left-hand side (fig. 17*a*). The difficulty of concealing the starting-point of stems is one that has constantly to be dealt with in designing. In this case I cannot but think that it would have been better to have frankly accepted the starting-point; a small space might have intervened not only without detriment to the design, but with a positive advantage to the construction and flow of the curve.

Fig. 18.—Perhaps it may interest you to see the preparation of a design. Here is a photograph taken from the first rough sketch of the design for Fig. 19. After the shape of the fan has been laid down, the leading lines of the pattern are sketched in with charcoal; these are observable on the right side of the figure. As soon as the leading lines are arranged, the designer sketches in with charcoal the masses and chief features in the design. Then, with a brush and some sepia, the design is advanced a step further, as shown at the left-hand side of the illustration, all the forms in which have been drawn at once by means of the brush. Lastly, an accurate outline is made from this sketch, and forms the working drawing which is handed to the worker.

Fig. 19 is a photograph from the finished fan. It is a combination of appliqué and guipure, and has worked out most successfully. The design, which is very good, was made by Miss Jacob of the Metropolitan School of Art.

Greek lace (so called) is made at Miss Keane's Class, Mrs. Montgomery Stewart's Class, Strabane, and at Killarney Presentation Convent. It resembles the earlier forms of lace and is a true needle-point. It is often used for insertions, and sometimes for trimmings.

Cut linen work is made at the Convent of Mercy, Kinsale.

Crochet lace has, for many years, been an important cottage industry.

Crochet Lace.

Some years ago the demand for this lace in the South of Ireland was very great, and several persons made large fortunes by dealing in it. I have been assured by a traveller for one of the large houses in Cork that, at the flourishing period of the trade, he could have sold ten thousand pounds' worth of crochet in one day if he had had the material with him. The result of this demand was that the crochet-workers became mere producing machines. No attention whatever was paid to pattern, and, after a few years, people refused to buy such a carelessly made fabric. Crochet lace is always received with favour in Paris, where it is known as "Point d'Irlande." I have been told by M. Lefèbure that Irish crochet has a peculiarly distinctive character, which it is impossible to imitate on the Continent; and that if the lace became really fashionable, and proper attention was paid to the effects which might be produced in it by careful supervision, it was still possible to make it one of the leading and most attractive of laces.

It is interesting to endeavour to trace the origin of the peculiar forms which may be seen in the antimacassars of bygone days. The original patterns were derived from specimens of Venetian rose-point, but they have

FIG. XVI. MODERN APPLIQUE, CARRICKMACROSS.

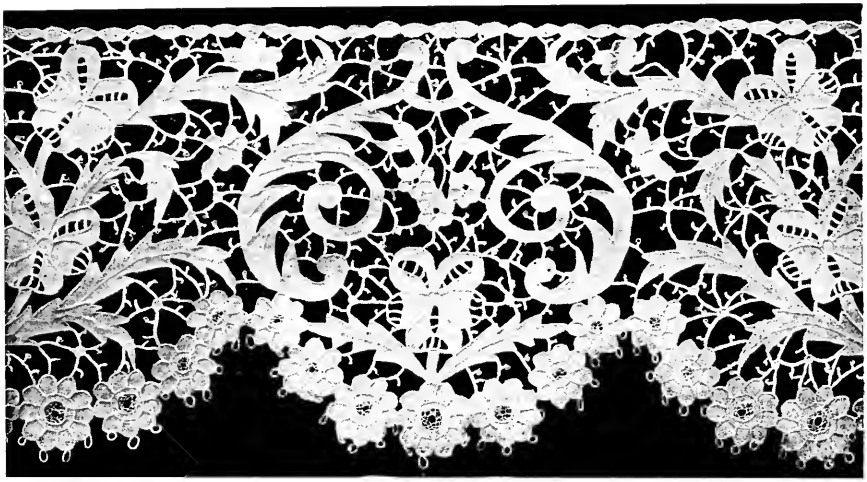


FIG. XVII. MODERN CARRICKMACROSS GUIPURE.

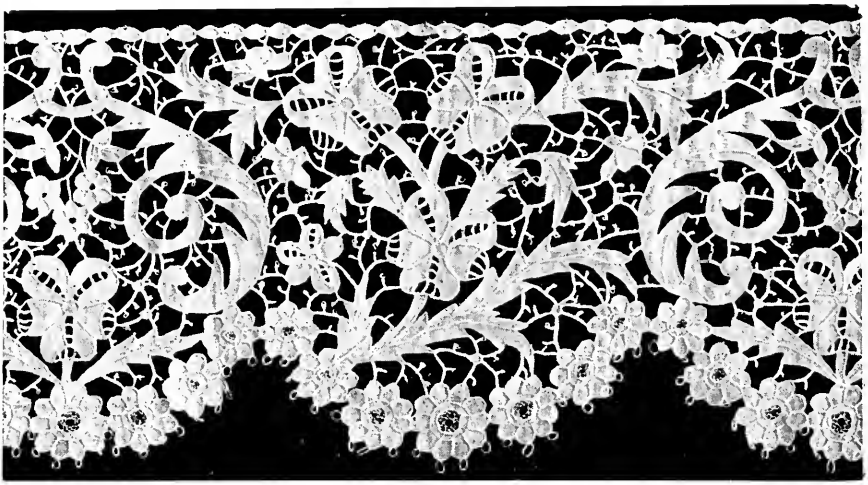


FIG. XVIIa. MODERN CARRICKMACROSS GUIPURE.

become so degraded as to be with difficulty recognizable. Until lately, one of the great obstacles to the improvement of the crochet industry has been to find workers capable of translating crochet pattern into work. Give a worker a piece of made crochet, and she will have no difficulty in copying it, while she will probably find it impossible to work from a drawing. When I visited Clones a few years ago, I could only hear of one worker who could make crochet from a paper pattern. I am happy to say that some improvement has taken place in this respect. The work produced in different districts varies in character. That made in the South of Ireland is more open, and contains larger forms than the northern crochet. The Clones crochet is very beautiful, has a distinctive character, and is in my judgment capable of great development. The chief centres for crochet making are Cork, Youghal, Kinsale, Crosshaven, Clones, Ardara, and several other places, where it is made in small quantities.

Fig. 20 is a border of old crochet. This example does not exhibit the degradation of form, of which I have just spoken, to the same extent as one may see it exhibited in the large antimacassars or pieces of ecclesiastical crochet of former days. Many of the old crochet forms were evidently derived from Venetian or Spanish rose-point; and owing to the facts that the designer could not draw, nor the worker render them properly, they gradually, but surely, deteriorated into the unmeaning shapes observable in crochet. In this lace, the forms are made separately by the worker, and the practice has been, as I have myself witnessed, for the worker to take a large sheet of brown paper cut to the size of the flounce or trimming, and on this to scatter crochet forms, keeping them pretty evenly distributed: they were then secured to the paper, and joined by a ground made in imitation of the ties or bars seen in the rose-point lace. There was no serious attempt at arrangement, and such principles of ornament as repetition, alternation, etc., were not considered.

The piece illustrated is a border made up of a curious trefoil-shape suspended from a horizontal bar, having a pattern at one end. This is apparently meant for a stalk carrying a leaf and a flower; then there are three shapes, which I think are intended for flower forms, on the ends of stems which project with great energy from a common centre. The only attempt at arrangement appears to be that of alternation, when the trefoil is below, the three-armed form is above, and *vice versa*. I am sure you will recognise this style of crochet pattern as one that was in vogue for many years. Now turn from it to Fig. 21, which also exhibits a border, made at Ardara from an improved design. There is no difference in the method of working; the forms are made separately as in the former instance, secured in their places on the pattern, and the ground worked between them. The edge of the border is carefully considered; the small scolloped forms are well rendered. We have the principles of alternation and radiation exhibited in this pattern Observe the six little trefoils, they are well made and arranged. One feels instinctively, on looking at this pattern, that thought, order, method have all been at work in the preparation of the design. The ground is more carefully rendered than in the preceding example; the weight of the pattern is at the edge of the border; and from the fact that the ties are lighter, cloudiness of effect in the ground is prevented, and greater contrast between the ground and pattern is secured.

Fig. 22 is an example of New Ross crochet, which is made up of simple forms, and yet exhibits the richness to be secured when these forms are well arranged with due regard to contrast. The edge is made up of small

trefoils similar to those used in Fig. 21. The heart-shaped forms contain ornaments which alternate, thus preventing monotony; and above these, six-leaved flowers or *parteræ* alternate with floral forms arranged on the diagonals of a square. These heart-shaped forms are difficult to render properly in crochet. Forms which depend upon beauty of curve alone, such as scrolls, etc., cannot be well rendered in crochet, and should be avoided, or only introduced when excellently made; even then, the bars or ties frequently pull them out of shape when the piece of work is released from the pattern. In this specimen the ground is prettily enriched by the use of little star-like forms which occur at the junction of the bars, a device which may be seen in some of the Venetian laces of the seventeenth century.

Fig. 23.—This collar of Cork crochet affords another example of the effect which may be secured by good arrangement. There is evenness of distribution, the forms are well shaped, and have evidently been carefully made from good drawings. Observe the pretty effect gained by the introduction of the seven star-shaped forms which occur on each side of the conventional ornament in the narrowest part of the collar, also the well arranged sprays which compose so well into the angles at top and bottom of the illustration. The edging also is worthy of notice; the small five-leaved stars suspended, as it were, by chains from the edge have a rich effect. The barring is well arranged, and the forms have been put together with great care, testimony to which is borne by the photograph, inasmuch as it has been taken directly from the lace.

Efforts to develop the Industry.

It would be very remiss of me not to mention the efforts which have been made for the development of the lace industry by Mr. Alan S. Cole. He has given considerable time and attention to this question. To him was due the formation of a Committee in London, in 1885, the raising of subscriptions for the purpose of offering prizes for good designs, and the giving of orders to the lace centres for pieces to be made from these patterns. In this way the sum of £500 was expended. From 1884, Mr. Cole paid visits once or twice a year to the most important centres, in order to report on their progress, and spur them on to fresh exertions. I rejoice to say that these visits, after having been discontinued for the past three or four years, have now been resumed, for I well know what a stimulating effect they had upon both workers and designers.

To the Countess of Aberdeen great credit is due for her practical efforts to help this along with other industries. After Mr. Ben Lindsey's death, she purchased 76, Grafton-street, for the purpose of enabling the lace centres to have an opportunity of disposing of their work; and those who know of its working can testify to the fact that, if the shop had closed, serious injury to the lace trade would have resulted.

There is ample reward for willing workers. The Royal Dublin Society, by its annual exhibition of Art Industries at Ball's Bridge (in which lace takes such a prominent part), and the liberal prizes it offers, is doing its utmost to stimulate efforts and draw public attention to good work. It is spending over £200 per annum for this purpose.

The Committee of the Branchardière Fund devotes the whole of the income arising from the interest of that fund to the following purposes:—It gives aid towards the cost of trial pieces of lace made from new patterns; it gives rewards to the workers of those pieces of lace and crochet which

FIG. XIX.—CARRICKMACROSS FAN—COMBINED APPLIQUE AND GUIPURE.
Worked for the Irish Lace Depot, Dublin.

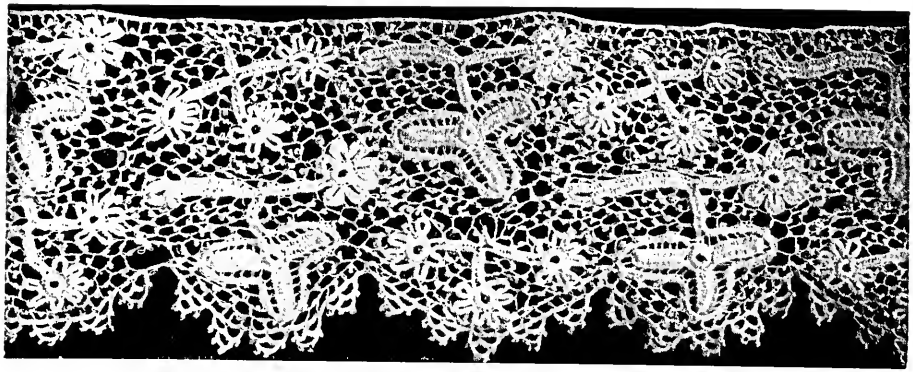


FIG. XX. OLD CROCHET LACE.

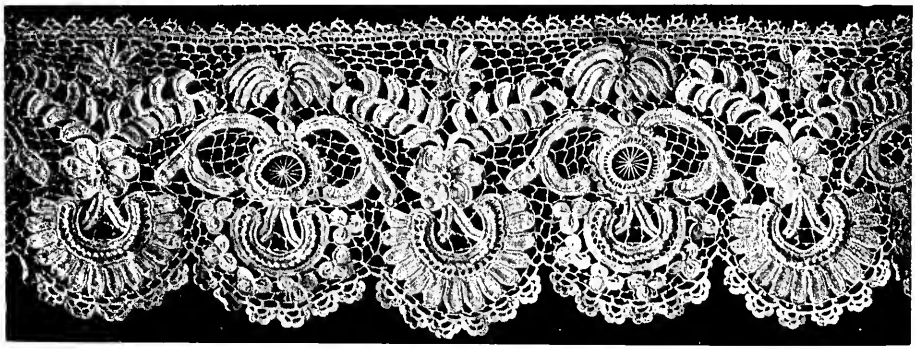


FIG. XXI. MODERN CROCHET LACE.
Ardara, Co. Donegal.

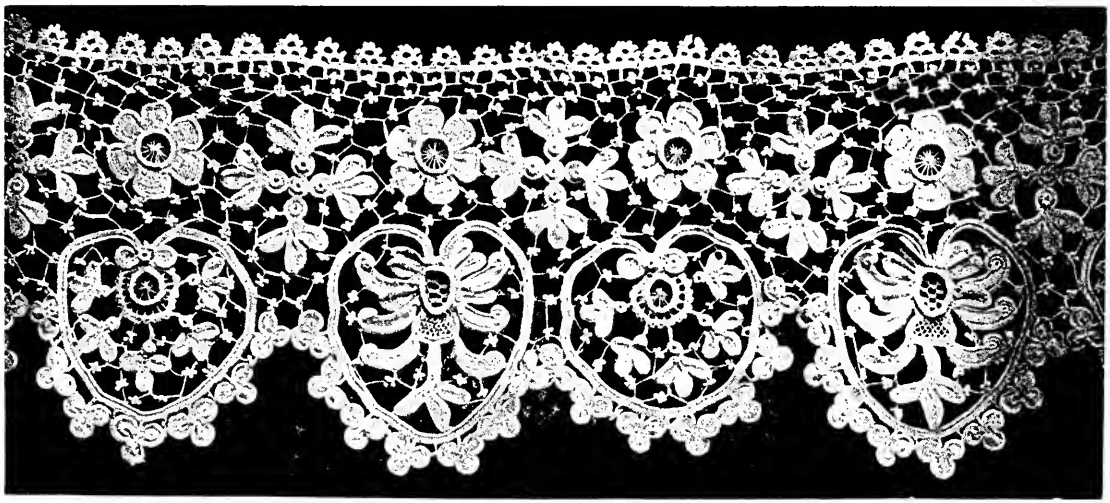


FIG. XXII. MODERN CROCHET LACE, NEW ROSS.

obtained prizes at the Royal Dublin Society's exhibition; it gives grants to enable lace mistresses and workers to obtain technical knowledge in lace-making, drawing, and design; and it makes purchases from the designs exhibited at Ball's Bridge, for the purpose of giving those designs to the lace makers. Thanks to this fund, there is thus a regular system established by which it seems to me that lace centres have facilities for improvement which they never before possessed. Any lace centre may write to the Secretary of the Branchardière Fund (Irish Industries Association, Dublin), for a design for some particular lace. Aid will be given towards the expense of making a trial piece from that design. The Royal Dublin Society affords the means of placing that lace before the public, and gives a reward to the lace centre if the lace should prove its superiority. And, lastly, the workers who make the piece of lace receive rewards. There is thus a continuity of action, which, if properly availed of, must, I think, contribute largely to success.

Having said so much, there are, it seems to me, two questions which we may fairly ask: firstly, is the revival of Irish lace-making of such a nature as to lead to permanent results? secondly, is it worth while endeavouring to compete with machine-made lace? In answer to the first, I am of opinion that much good has resulted from the revival; the character of the lace has been distinctly and admittedly improved. One need only look carefully at the hand-made lace exposed in the shop windows and at the Horse Show at Ball's Bridge in August of each year in order to see this, but, as to the permanency of the movement, I confess to some apprehension. Owing to the peculiar circumstances of the Convent classes in which lace is chiefly made, and their isolation from the centres of industry, there is always a danger of their falling behind in the struggle for perfection. I do not think their efforts, of late, have been marked by the same persistency as in former years. They are easily discouraged, and require constant incitement to fresh enterprise. The supervision of the needle-working in the Convent classes is no doubt carried out by the nuns who have charge of the work-rooms, and, to a certain extent, by the lace mistresses in the districts where laces are made in the worker's homes; but I am not referring to this, which is the purely technical part of lace-making. I refer rather to the supervision which makes itself acquainted with the demands of the market, which takes care that none but the best patterns shall be used, and that these shall be constantly changed, that the lace made shall be even in quality, and of the best materials, that all bad work shall be rejected, and that the requirements of fashion shall be attended to. This is the kind of intelligent supervision to which I refer; and one which, if it succeeded in gaining the confidence of the various lace centres throughout Ireland, would, I believe, be productive of great results.

In answer to the second question, I am of opinion that machine-made lace will satisfy the wants of the many; but there will always be a certain number of people who will appreciate and demand the hand-made article. I think that the existing lace centres are quite adequate to supply the present demand for hand-made lace. Of course no one can say what the dictates of fashion may require in the future. But the hand-made article may never expect to keep its place in the market, unless it can prove its superiority to the machine-made work. The machine has no soul; here is where the advantage of the worker comes in; the worker can put thought and intelligence into every form if she feels a perfect interest in what she is

doing. If she is merely a lace-producing machine, with no desire to express beauty of form in the material, then the machine is bound to conquer, for it will certainly out-rival her in accuracy and neatness. There is at the moment a revival in the demand for hand-made work in many industries, and all hand-workers, no matter in what material, must remember that thought and feeling can be expressed as well by the stiff, unyielding metal, as by the pliant and supple thread when they pass under the worker's hand; and that without this thought and feeling their work is a dead thing, and it were better that it had never been attempted.

Irish Spinning Wheel.

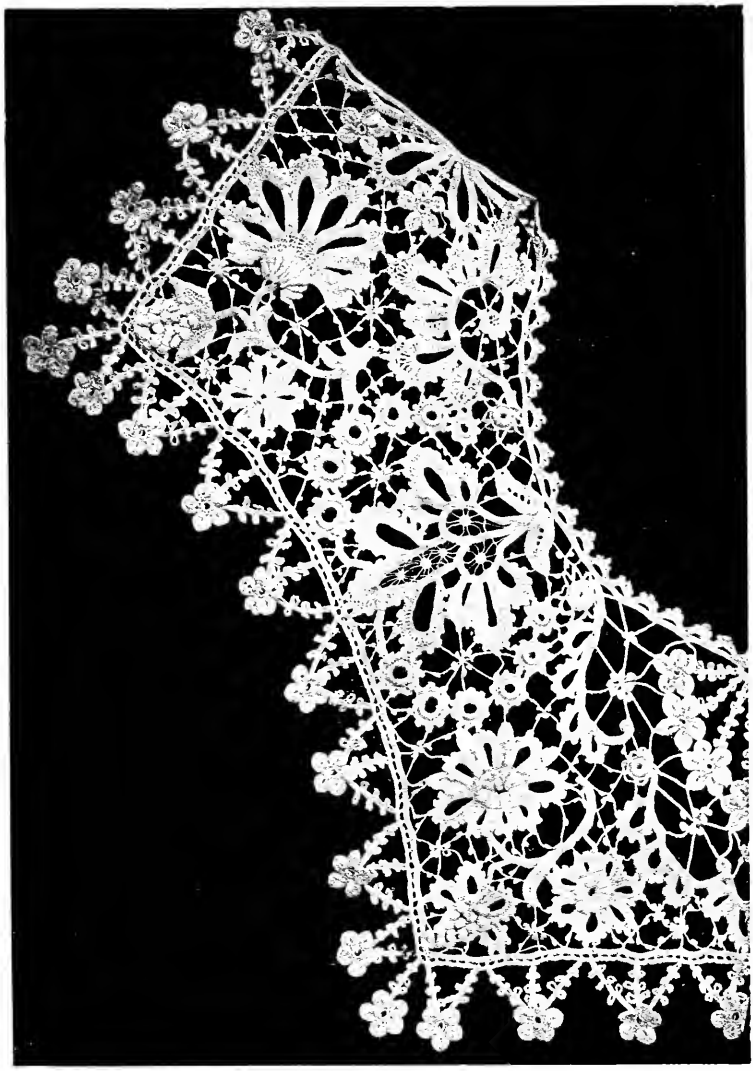
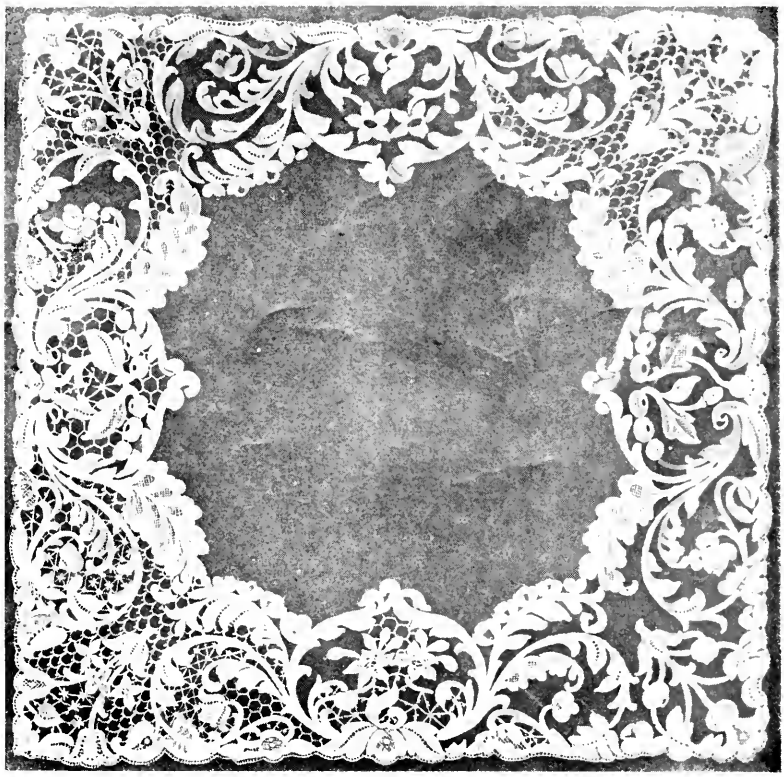
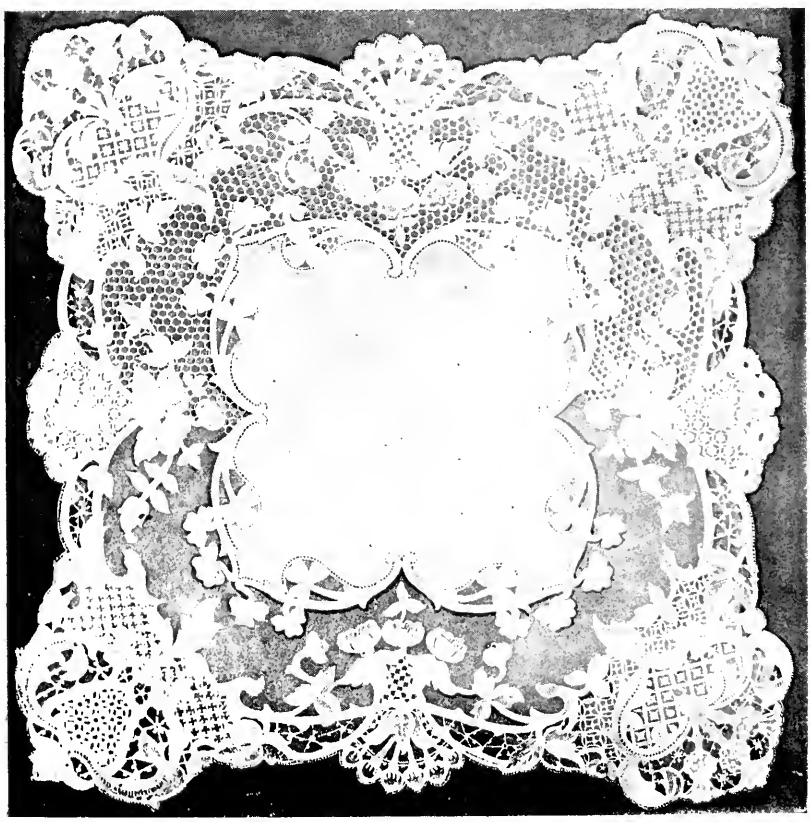


FIG. XXIII. CORK CROCHET.





DESIGNS FOR HANDKERCHIEFS—NEEDLEPOINT LACE.

Georgina Sutton. Cork Municipal School of Art.

THE MARKETING OF IRISH LACE.

The workers in Irish lace have had till recently many difficulties in reaching a market worthy of their work. Some of the finest fabrics are produced by country girls, who ply their needle in very modest cottage homes, and who often give to lace-making only the hours which they can spare from their labour on their father's farm. The guipure and appliqué of Louth and Monaghan, the beautiful crochet of Monaghan, Armagh, and Fermanagh, are, in large part, manufactured under these conditions. And many of the workers who have been introduced to the industry under the especially able guidance of Mr. Walker, of the Congested Districts Board, are obliged to submit to the same difficulties. It is often a matter of wonder to those who have looked into the conditions of the industry, to find spotless pieces of exquisite work delivered from homes which seem oddly out of keeping with these dainty products. The point lace of Youghal, Kinsale, and other centres is produced in much more favourable circumstances. The industry is here promoted by communities of nuns, and the workers have the advantage of a clean, well-lighted workroom; though in these centres, also, much of the work is done in the homes of the workers.

Where the officers of the Congested Districts Board are the guides of the workers, the marketing of the lace is duly provided for. The workers are not only instructed in the methods of industry and supplied with suitable designs, their work is also sent to the best markets, and they receive the full market value of their products. The same may be said of the work done in the larger convents which have established the industry on a successful basis. But in remote country districts the supply of designs was, till recently, both antiquated and inadequate, and the lace was sold to some shopkeeper in the nearest country town who had trade connections with the shops or wholesale dealers of Dublin, Belfast, or London. The remuneration of the workers was not determined by the competition of a wide market, and they suffered accordingly. There were other disadvantages incidental to dealing with a shopkeeper who was first a trader in grocer's or other wares, disadvantages which may be hinted at, but need not be further explained.

The Irish Lace Depot, established in Dublin by the late Mr. Ben Lindsey, did much for the marketing of Irish lace, and helped largely to the improvement and development of the industry. In Mr. Lindsey's time, the institutions and the individual workers connected with him had a ready and remunerative market for their work. I am acquainted with one institution which sent all its supplies of point lace to his Depot, and which was able to pay £1,500 a year in wages to its workers. But after Mr. Lindsey's death this outlet for Irish lace became sadly ineffective. A few years after his death, the institution to which I have referred had much difficulty in paying £600 or £700 a year to the same body of lace-makers.

Lady Aberdeen in her efforts to revive the decaying industries of Ireland, had opportunity of discovering what the gradual decline of the Lace Depot meant for the lace industry. She was about to leave Ireland for Canada, but before leaving she took a step which has had a remarkable influence on the fortunes of the Irish lace industry. She purchased the Lace Depot and its remaining stock, and entrusted the business which it carried on to a few gentlemen who were associated with her in her philanthropic undertakings. From her home in Ottawa she kept up communication with her representatives in Ireland, and by her advice and co-operation largely helped to the success which they achieved.

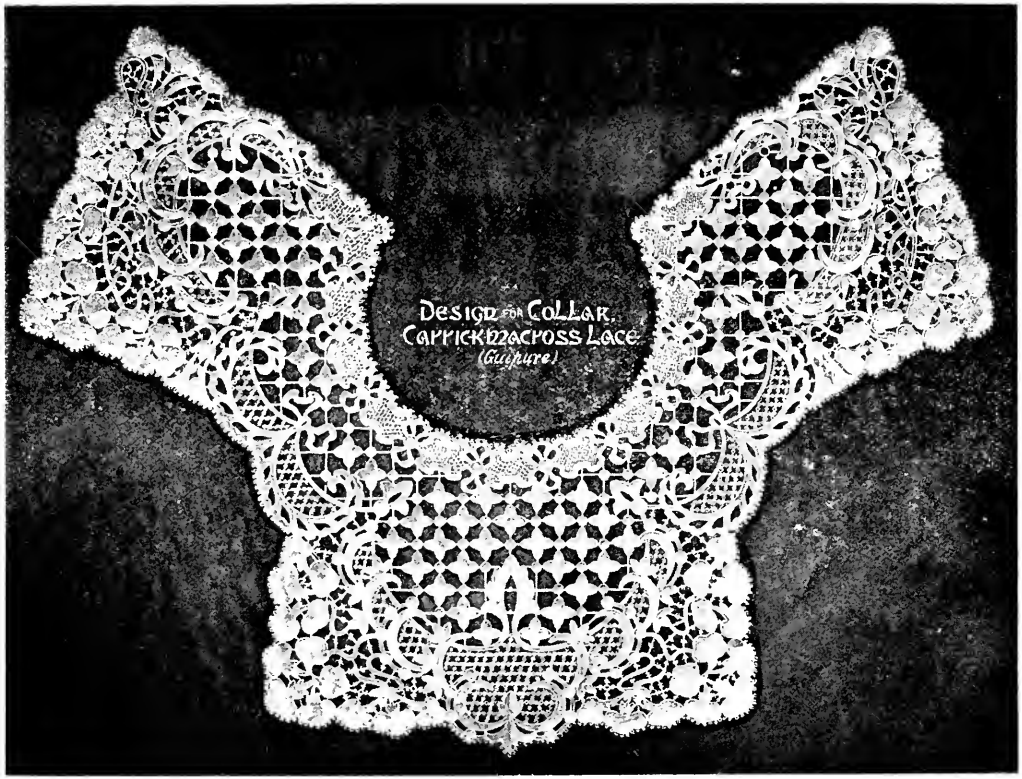
After a few years Lady Aberdeen and her helpers formed themselves into a limited liability company, in order to put their lace trade on a strictly business footing. The company was somewhat peculiar in its constitution and methods. All the shareholders, seven in number, were directors, each of them held a single £1 share; and the articles of association provided that no dividend should be paid on the shares, and that all profits should be employed by the directors to develop the lace industry in Ireland and improve the condition of the workers.

At the same time that Lady Aberdeen was carrying out this scheme, Mr. Horace Plunkett and his associates were spreading the knowledge of co-operative methods and organising co-operative societies in the rural districts of Ireland. Co-operative associations of laceworkers were formed early in the movement, and these increased in number and efficiency as the movement spread and took firmer and firmer hold of the country. In these co-operative societies the directors of the Lace Depot found steady sources of supply. Instruction could be readily given to bodies thus organised, the execution of large orders could be counted on, and the development of a trade constantly increasing in volume and value become possible. The organisation introduced by the Congested Districts Board coincided with the growth of co-operation, and helped to the same end.

To co-operative societies of lace-workers and to other organisations of lace-workers, the Depot supplied designs. From these and from the Schools of the Congested Districts it took the lace, when manufactured, at market prices, and sold it in the best markets accessible, and after defraying expenses and providing for the interest on borrowed capital, gave the societies of workers a bonus proportionate to the value of the lace they had supplied. It furthermore paid the salary of a teacher for those organisations which were unable, without this assistance, to procure competent instruction in lace-making. How its operations under these several heads have grown since the date of its establishment in 1893-4 is shown by the following figures:—

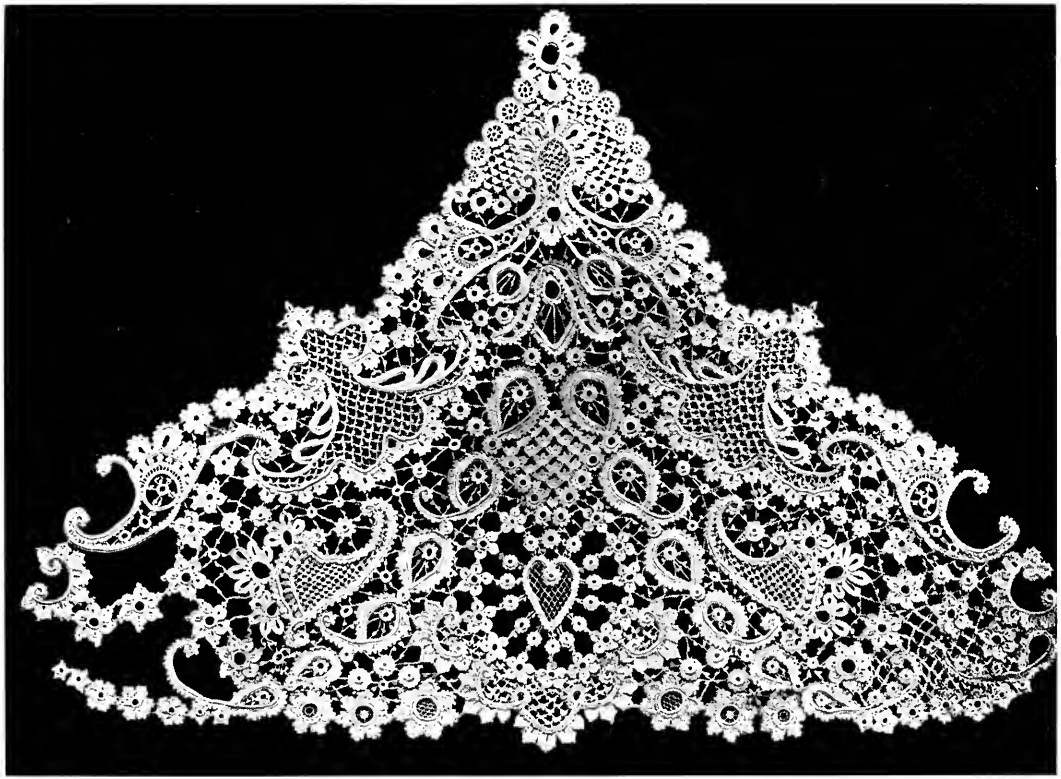
	Sales.	Grants to Workers.
1895,	£4,230	—
1896,	£5,227	—
1897,	£6,904	£50
1898,	£7,937	£85
1899,	£11,130	£250
1900,	£23,149	£400

The development of the Irish lace industry which the operations of the Lace Depot have effected have called into existence other agencies of distri-



DESIGN FOR A COLLAR IN CARRICKMACROSS LACE.

Miss Edith Emerson. Dublin School of Art.



WORKED CROCHET PANEL FOR DRESS.

Miss Amy Whitlegge. Cork School of Art.

bution, which, by enlarging the market have rendered competition more active. The sales carried out in London by the Irish Industries Association, of which Lady Cadogan is now President, have largely contributed to introduce Irish lace to favourable markets. With twenty-three co-operative societies of lace-workers, sixteen successful schools under the Congested Districts Board, and large numbers of unorganised workers furnishing an abundant supply, and the Lace Depot and other agencies opening the way to the market, the prospects of the lace industry in Ireland are distinctly hopeful.

A NOTE ON THE POPLIN OR TABINET INDUSTRY.

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 its name with the town of Poperingen, where they say it 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 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 soon became 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 first settled—because of the greater prosperity of the silk-weaving 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. It may be mentioned here that one of the earliest of the Irish poplin manufacturers was one of the well-known family of La Touche.

In 1800, the invention of the Jacquard loom revolutionised 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.

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 associated with the general idea of Irish poplin. The various processes of making require great skill and watchfulness, which is, perhaps, one of the reasons for the peculiar trade customs which exist. For, whilst 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 manner 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 is so characteristic of the best poplin. The beauty of the colour of Irish poplins has been attributed by some to a peculiarity of the Dublin water, but it is much more likely that it is due to the skill and knowledge of the Irish makers. Though poplin was at first almost exclusively made in the homes of the workers, there are now several factories engaged in poplin-making. The principal ones are those of Messrs Pim, Atkinson, Fry, and Elliot. Messrs. Pim and Co. are the largest manufacturers, and they export large quantities of poplin to England and the Continent, as well as to Asia, America, and Australia. Messrs. Atkinson and Co. cultivate more of a private trade, and are celebrated for their choice designs in gold and silver tissues and brocades. Though almost everyone admires poplin, the trade cannot be said at present to be very thriving, a fact which is, perhaps, partly the fault of the makers, but which is principally due to the misconception of the public. Many people consider poplin 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 much 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, etc., be obtained in poplin. None the less, it is a very beautiful material, everlasting in wear and really cheap. It is to be hoped, then, for these reasons and because poplin-making is a manufacture in which Ireland leads the world, that the future of the industry will be prosperous.

ART AND COTTAGE INDUSTRIES.

After Home-spun, the principal cottage industry of Ireland is that of lace-making. This being fully dealt with in a special article, it remains to mention a few other art and cottage industries which are more or less widely practised in Ireland. The work of amateurs, excellent as it may be, is not taken into account here. Reference is only made to industries which are carried on upon commercial principles. The chief of these are Hand-knitting, Hand-embroidery, Iron Work, Stained Glass, Woodcarving, Stone and Marble Carving, Carpet Making, Metal Repoussé Work, Cabinet Making, Porcelain, Silver and Goldsmith's Work.

Hand-knitting.

Hand-knitting, in spite of the growing severity of the competition of the knitting machine, is still widely spread over the country, and is the means of bringing in earnings great in bulk if small from the point of view of the individual worker. The wild district of Kincasslough, in County Donegal, and Glenties, in the same county, are important centres of this industry. The Arran industry in County Mayo turns out elaborate and beautiful specimens of hand-knitting, and at Baronscourt (County Tyrone), Courtown (County Wicklow), and Howth (County Dublin), it is practised with a success which is, in no small degree, due to the market provided by the depots and sales of the Irish Industries Association.

Hand-embroidery.

Hand-embroidery, in its more artistic developments, is still, fortunately, incapable of satisfactory imitation by machinery, and must rank in Ireland as a very considerable and by no means decaying industry. The so-called Swiss embroidery" has, no doubt, killed some of the cheaper and poorer forms of white embroidery or "sprigging," but the better forms have shared in the benefit of the reviving taste for genuine hand-work in industrial art; and up to a certain point, the work in coloured embroidery produced in obedience to a large and steady demand, by the Royal School of Art Needlework in Dublin, or the Garryhill, Turbotstown, Dalkey or Kenmare industries, is as good as any that we know of in the history of the industry in Europe. The white embroidery and drawn-work produced for the large Belfast firms, as well as at various independent centres throughout the country, such as Sligo, Ardara, Strabane, Ballintra, is also of admirable quality in design and execution. In this whole department of Irish art-work it may safely be said that nothing approaching it for excellence is to be found anywhere else in the United Kingdom, and not very much even in France or Belgium. The splendid embroideries of the East, with their inimitable peculiarities of style and material, and such examples of mediæval European work as were not only designed but executed by workers of high artistic training—these indeed remain unrivalled; but any other comparison Irish art needlework of to-day may safely endure.

As types of two different methods of industrial organisation, the following account of the Royal Irish School of Art Needlework and of the Dalkey Embroidery Society may be quoted from the pens, respectively, of the Countess of Mayo and the Lady Betty Balfour.

The Countess of Mayo writes:—

Royal Irish School of Art Needlework.

"I have been asked to tell you the history of the School of Art Needlework, over which I preside, and I do so all the more gladly because to me needlework has ever held a special attraction.

"I love those beautiful designs—those delicate traceries which adorn the wonderfully-wrought vestments, the quilts and the screens, to execute which (with marvellous and complicated stitches introduced) formed the principal occupation of the lady of the olden time. Her frame was her close and intimate companion, and these elaborate art pieces filled the long hours of solitude imposed upon her by her household tyrant. Who can say whether she was a whit less happy than we in our advanced freedom?

"Another well-loved friend is the dear old sampler, made beautiful by the introduction of every possible combination of stitch, over which our grandmothers spent many weary hours and indulged in many a childish tear. The sampler went out of fashion some time in the thirties, and with its departure we must perforce associate the gradual decline in art needlework. Frames were hidden away in lumber-rooms; the covering of chairs and sofas with vile pieces of tapestry grounded in cross-stitch, took the place of the beautiful embroideries; and the making of crochet lace absorbed all attention!

"This condition lasted over a long period, but light began once more to appear, and refined art needlework again came to the front. South Kensington Museum led the way in improving the standard of taste. Schools were established, and now there is every prospect that if the public will support the workers, art needlework will once more take its place in the front rank of Art. The School of Needlework in which I take so deep an interest owes its existence to the Countess Cowper, who, when in Dublin, as the wife of the Lord Lieutenant, was so much struck with the skill displayed in the production of embroidery by certain Irish ladies that she collected these ladies under one roof, and in 1882, with a committee to superintend the financial and business arrangements, inaugurated the 'Royal Irish School of Art Needlework.' The school worked well for some twelve years, and then the interest in it began to fail. There were many reasons why it was not so successful as it had been. In the first place, the times were out of joint, especially in Ireland. Money was scarce, and, above all, taste was still struggling in the quagmire of ignorance; while the fact that the Art School had been started to relieve ladies who had suddenly become penniless gave to the undertaking an eleemosynary element fatal to success. The system under which the School was managed, moreover, was not found to work satisfactorily At the same time it was felt that to close it entirely would be a great hardship to those ladies who for twelve years had been dependent upon it for their livelihood. It was, therefore, determined to re-organise the whole system, and to re-open a school upon a sounder financial basis. A small sum of money was collected as a starting point and for the purchase of stock, etc.; the affairs were carefully looked into, and, with a smaller executive committee, the new school was opened in 1894, with a paid manager and fourteen workers. Now, I am glad to say, we have twenty-three workers, and the embroidery that is sent out from our house will prove to future generations that the women of the nineteenth century are not behind those of previous times in the artistic and skilful use of their needle.

"Any work that can be done by the needle we undertake to do, and in the best manner. Books embroidered on parchment or satin are a specialty, also church embroidery of all descriptions. I would particularly call attention to an Altar frontal which we have lately finished, and which can now be seen in Kildare Cathedral. It is elaborately embroidered on alternate panels of cloth of gold and crimson damask, and I think I may say, without fear of contradiction, that it is about as good a specimen of artistic needlework as the present day can produce. An equally rich and elaborate frontal, with a figure of St. Patrick in the centre panel, has been more recently made for St. Patrick's Cathedral, Dublin. Under the superintendence of our manager every description of needlework is executed. Patterns can be sent on approval, and we are always glad to receive orders for embroidered dresses for drawing-rooms, weddings, &c. I may add that we have access to many beautiful embroideries in the National Museums and in private collections. We are also in correspondence with some of the best designers of the day, so that we can copy or originate according to the wish of our patrons. In conclusion, I would put forward one more motive for giving support to such efforts as we are engaged upon. It is well known that nothing lowers the tone of the mind more than a low tone in the surroundings; and it will be remembered that it was the rule in Greek domestic life that no object in daily use, however lowly it might be, should be fashioned after a low or sordid type. In the poorest households the child's eye grew accustomed to forms of beauty and art, fashioned out of the rudest material. So let it be with us!"

Of the Dalkey Society, which is a co-operative institution, Lady Betty Balfour writes:—

Dalkey Co-operative Embroidery Society.

"I happened not long ago to be with a party visiting one of the most successful new creameries in the West of Ireland. A fellow-visitor then made a criticism which struck me. It was to the effect that though, no doubt, these factories were beneficial to the trade of butter-making, they had to a large extent robbed the farmers' daughters of their home employment. The cow still had to be milked, and the milk conveyed by one member of the family to the creamery, but the actual butter-making which was formerly carried on in each individual farmhouse, being now transferred to the creamery, the girls at home must sit with idle hands.

"The reply seemed obvious. If the fathers had found the methods of co-operation unfailingly successful in the industries of butter-making, bacon-curing, the cultivation of flax, &c., why should not the daughters pronounce for themselves this 'open sesame' and co-operate on similar principles for such industries as dressmaking, embroidery, needlework, millinery, artificial flower making, basket work, lace work, &c.

"Surely no one will venture to say that where men have successfully combined for business-like purposes, women are incapable of doing so.

"Under this system the skilful and capable girl need not wait for an employer, the willing but ignorant one for a teacher. Let them combine to procure the implements, materials, and technical training necessary for the production of a marketable article, and they will have secured for themselves a livelihood.

"The suggestion that women as well as men should combine to work an industry under the new system has, in one case, already been most successfully tested.

"The Co-operative Needlework Society which has been started at Dalkey has set an excellent example to girls elsewhere in Ireland.

"A number of girls who, in school and afterwards, had shown themselves capable of doing very highly-finished needlework, whose skill should have been to them a source of income, yet found themselves without the means of exercising their talents to profitable purpose. Manufacturers and other employers could not help them; it remained for them to help themselves. The friends of the co-operative movement, which was spreading so rapidly among the farmers of the country, came to their rescue. A meeting was held at the Convent of Dalkey, and a society was formed 'to develope and improve the general needlework and art embroidery in Ireland, to improve the moral and social status of the workers engaged in such occupations by imparting to them technical education in all branches of their business and obtaining a market for their work, and saving for them the profits derived from the sale.'

"The Loretto Nuns at Dalkey blessed the enterprise, and gave the workers the use of a building in the convent grounds, which was fitted up as a workroom. One of the nuns undertook the management, competent teachers were secured, and the society was started in October, 1895.

"The convent is beautifully situated at the edge of the sea, and the workers when they lift their eyes to the window can rejoice in the wide expanse of sea and sky looking out over the blue bay of Dublin.

"Twenty-five workers are now employed there, but the number varies according to the amount of work on hand.

"A small capital was subscribed to start the society, and it is now self-supporting.

"Workers are not required, on entering the society, to pay anything, but they are all obliged to become shareholders. This they can do by allowing their share of profits to be devoted to the purchase of their shares till they are fully paid up. This does not, however, diminish in any way their ordinary wages.

"The workers are paid according to the amount and quality of their work. The profits of the society, as ascertained when the accounts are made up at the end of each half-year, are divided among the workers in proportion to the wages that each has earned during the time.

"A committee is elected by the members of the society, and the rules for hours of labour and the general conduct of business are made by the committee. A member cannot be dismissed for any cause whatsoever except by a vote of the whole society.

"Before a worker is admitted a member of the society she must first enter the workroom as an apprentice, or as a paid hand. If she does not prove herself capable and industrious she will not be admitted into the society.

"The work I myself saw at Dalkey comprised plain needlework, simple dressmaking, and embroidery. This last was certainly the most important work of the place, and the orders executed were, I noticed, almost entirely for ecclesiastical purposes. The embroidery of some of the vestments showed the most exquisite workmanship. A magnificent cope, ordered by the Countess of Aberdeen, and executed at Dalkey, attracted general attention at the Horse Show in 1896. Side by side with this beautiful church work it would be satisfactory to see more orders from lay members of the community. As soon as the society becomes more generally known ladies will doubtless send orders there for their dresses, and lovers of beautiful embroidery would render a service by sending good designs to be worked out for curtains, piano covers, screens, table cloths. I should also like to recommend the Dalkey workers to those who know not where they can get their handkerchiefs cheaply and prettily marked. The specimens of this kind of work which I saw there were admirably done.

"The Dalkey society has prospered continuously since it was started, and the work is good enough to need no extraneous advertisement or help. It is not therefore so much for the good of this Society that its work and history need be put before the public, but rather for the purpose of holding it up as an example which I trust will be speedily followed by others, and in the hope that similar societies may soon be started in all parts of Ireland where the need for self-help is great, and where poverty is the result of a dearth of employment and not of an absence of skill. This result, above all others, would be gratifying to those who have so effectually watched over the infancy of the Society of Needleworkers at Dalkey."

Since the foregoing account was written the work at Dalkey has attained notable developments. The department of ecclesiastical embroidery has increased its workers, their training has been perfected, and their work can more than hold its own against the imports from Lyons and Rome.* An altar frontal ordered by Her Excellency Countess Cadogan was exhibited by the Society at the Textile Exhibition in Dublin, 1897.

Besides the above, the work of the Kenmare, Garryhill, and Turbotstown industries, under the care, respectively, of the Convent of Poor Clares, the Viscountess Duncannon, and Mrs. Dease, has formed a notable feature at the exhibitions of the Royal Dublin Society and the Irish Arts and Crafts Society, and has set up a standard of taste in design and excellence of workmanship which is of much value to the industries dealing with simpler forms of art-needlework. The industries at Marlfield (Clonmel), conducted by Mrs. Bagwell, and at Ennis (the Little Sisters of the Poor), and at Gort (Sisters of Mercy), turn out children's frocks, aprons, etc., in excellent style, with simple, yet dainty and artistic ornamentation, and rich vestments are also made at Gort.

The HAND-TUFTED CARPET INDUSTRY in Ireland is one of large and growing importance. Introduced a few years ago into Killybegs, County Donegal, by Messrs. Morton of Ayrshire, it has taken firm root there and has doubled the number of its workers since the Glasgow edition of this Handbook was produced last year. There are now about 300 workers employed at two centres in South Donegal (Killybegs and Kilcar), and further extensions are, we believe, contemplated. These beautiful carpets are made entirely by hand, by the traditional method which we find illustrated in a Greek vase painting of 2,400 years ago.† The factory is a large, airy building with the vertical warps stretching from floor to ceiling. At each of these a group of girls is employed, knotting in the tufts of woollen yarns to the threads of the warp in accordance with diagrams before them, and beating the weft close with small heavy combs, which take the place of the "sley" in the ordinary weaver's loom. Practically any design which can be drawn on paper is capable of reproduction by this process. The mechanical repetitions of patterns in machine-woven fabrics are not obligatory here, and the carpets of the Donegal factories are artistic in effect, and are as durable as the Turkey carpets whose processes of manufacture they reproduce.

* The fruit of the excellent art training given is now being reaped in the very beautiful designs which the workers are able to draw for themselves, and afterwards to carry out in embroidery. This union of art and craftsmanship, so much to be desired and aimed at in the technical education of our people, has already been attained here with the happiest results.

† See tail-piece page 401.

Other Art Industries.

Besides the art and cottage industries already mentioned, there are others which are carried on in Ireland with more or less success, but, so far as concerns the production of genuine works of art, on a comparatively small scale. Among these are stained glass, wood-carving, book-binding, wrought-iron, repoussé brass and copper work, cabinet-making, basket-work, pottery. The STAINED GLASS from Belfast exhibited at the Arts and Crafts Exhibition (Dublin) of 1899 was considered by Mr. Harold Rathbone, who wrote the official report of the Exhibition for the Committee, to show remarkable merit in drawing and colour. The Department of Agriculture and Technical Instruction for Ireland has lately promoted the development of the industry in Dublin by providing the best artistic instruction obtainable, and a window made in the school thus started may be seen in the Department's section of the Cork Exhibition. The great ship-building works in Belfast provide much local employment for WOOD CARVERS, LEATHER WORKERS, PYROGRAPHERS, etc., and a high standard of technique is thereby generally attained, though in capacity for dealing with figure subjects Dublin is ahead. Carving in stone and marble for ecclesiastical work is carried on by several firms, but hardly reaches the level of an art at present, though some carvings recently done on the new cathedral at Letterkenny show decided promise in this direction. Artistic BOOK-BINDING of a high class is done on a small scale in Belfast; but on the whole, this industry, which might so suitably employ the taste and skill of Irish workers, must be admitted to be in a backward condition in this country. WROUGHT-IRON is made in Belfast and in Dublin, and, as fine specimens of the achievements of these cities in this direction the visitor to Ireland may be referred to the barrier of the station of the Belfast and Northern Counties Railway in Belfast, and to the entrance gate of the Science and Art Buildings, Kildare-street, Dublin. The industry of REPOUSSÉ BRASS AND COPPER WORK has attained so remarkable an artistic development at Fivemiletown, County Tyrone, that we may give some details of its origin.

The Fivemiletown Industries.

Cottage industries have flourished in Fivemiletown for several years under the direction of Mrs. Montgomery, of Blessingbourne, who has organised embroidery and sewing classes for girls. Mrs. Montgomery determined to extend the scope of her work, and to find occupation to which the young men as well as the young women of Fivemiletown could devote their spare hours. She went to London in 1891, and placed herself under the tuition of a lady teacher in repoussé metal work, who had been recommended to her by the Home Arts and Industries Association, and by the Spring of 1892 she was able to start an art metal work class at Fivemiletown itself. She was at first the only teacher, but was soon most ably seconded by Mr. Wilson, the manager of the Fivemiletown branch of the Northern Bank, whose children also showed an extraordinary aptitude for the work.

The Home Arts and Industries Association supplied some of the designs, others were furnished by Mr. H. de F. Montgomery himself, others again were worked up by Mr. John Williams, their main characteristics being flowery forms of a bold, conventional treatment, which were mainly derived from Persian and Gothic sources. Some again were adapted from old fifteenth century patterns, others were original. The result was that the

Fivemiletown Class made a very creditable show at the Home Arts and Industries Exhibition at the Albert Hall in June, 1893, and succeeded in winning a gold star for designs by Mr. Montgomery, and another for workmanship earned by Mr. Patrick Roche. This, was, however, but a beginning, and the reputation thus earned by the Fivemiletown Class stirred up strangers to take an interest in its further development. Mr. John Williams, then Art Teacher to the Surrey County Council, now head of the Art Department at the Northampton Institute, in Finsbury, spent part of his autumn holidays that year at Fivemiletown, where he was able to enjoy the beauties of the Clogher Valley in the morning, and to devote his evenings to developing the artistic faculties of the workers. His visits, repeated in 1894 and 1896, have done much to raise the standard of the work to a high pitch of artistic excellence. Some examples of the art metal work of Fivemiletown are illustrated in the accompanying plates.

The products of the Fivemiletown Industries have elicited the warmest praise at many exhibitions in 1895 and 1896, more especially at the Home Arts and Industries Exhibition at the Albert Hall, and the Exhibition of Arts and Industries, held by the Royal Dublin Society at the same time as the Dublin Horse Show at Ballsbridge. One of the judges at the latter exhibition gave expression to the opinion that he had seldom seen modern work approach so high a standard of excellence.

As regards CABINET-MAKING for which Dublin was once so famous, it may be said that as an art industry (save in the sense of skilful reproduction of Chippendale and Sheraton work), it hardly exists in Ireland, except in one locality—Killarney. Here, however, a School of Arts and Crafts, founded by the Viscountess Castlerosse, and skilfully utilising the artistic traditions of the place, has lately been producing work of much promise, in the shape of decorated bedsteads, chairs, tables, and other articles of woodwork, great and small, simple and elaborate. These are all marked, if not by great originality of design, at least by the apt and tasteful utilization of models from the best eighteenth century work, and they put it in the power of the visitor to Killarney to obtain a fitting memento of his visit to that enchanted region.

BASKET-WORK of an ornamental as well as useful character is carried on at Letterfrack, County Galway, Beaufort, County Kerry, and Castlecomer, County Kilkenny. Much ingenuity and taste are displayed in adapting wicker-work to various purposes, but these industries have suffered hitherto from the lack of native-grown osiers of the right quality—a need which steps are being taken to supply.

The BELLEEK POTTERY ware, which has been made so popular by its characteristic lustre and tint, is the one pottery industry of any considerable extent in Ireland. It suffers at present from some lack of novelty in designing, but should be capable of considerable extension if this point were attended to. Ordinary household ware, as well as ornamental pottery, is made with much success at the Belleek works.

SILVER AND GOLDSMITH'S WORK, which, like furniture-making, flourished so remarkably in Ireland during the eighteenth century, is still carried on with a high degree of technical skill; and much good ecclesiastical brass work is done by at least one Dublin firm. Here, however, as in most other departments of modern Irish art work, we are struck by the absence of a native and original school of design. There is much artistic knowledge and taste in the country, and much excellent craftsmanship, but

NEWSPAPER HOLDER IN REPOUSSÉ BRASS WORK, MADE AT FIVEMILETOWN, CO. TYRONE.

DISH IN REPOUSSÉ COPPER, MADE AT FIVEMILETOWN, CO. TYRONE.

the link between the art and the craft has yet to be completed. The history of the establishment of this union in the case of the lace industry may be studied with advantage from this point of view. It saved that industry and brought it to its present flourishing condition; and the application of the same methods to other art industries is a matter which manufacturers and the public should lay to heart, if Ireland is ever to develop her latent capacities in this direction.

Finally, we may mention the ILLUMINATING and ENGRAVING work, of which Ireland can furnish some admirable specimens. A book plate by Mr. John Vinycomb, M.R.I.A., is here reproduced as evidence of the manner in which the traditions of this art are maintained in Belfast.

Book-plate by Mr. John Vinycomb, M.R.I.A., Belfast.

THE SHIPBUILDING INDUSTRY IN IRELAND.

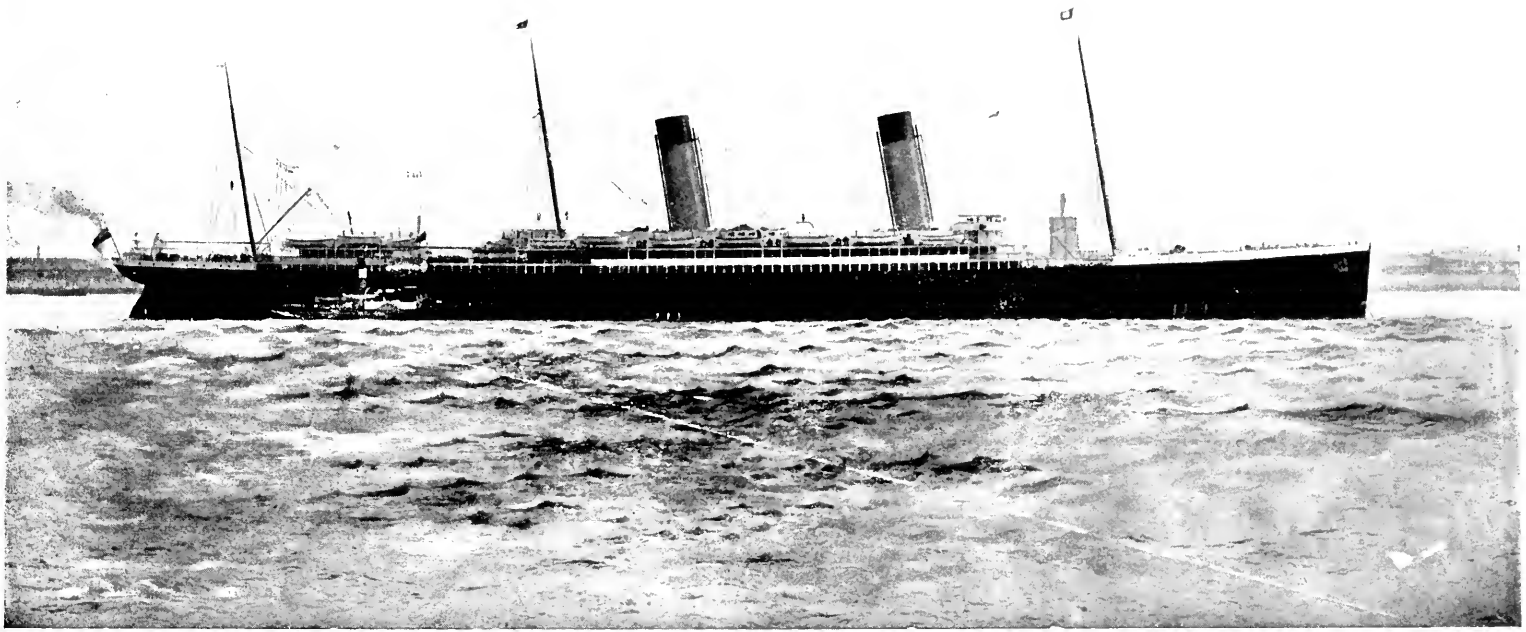
I. BELFAST.

The success of the shipbuilding industry in Belfast is a striking proof of what industry and perseverance can accomplish. With few natural advantages—for in this part of the United Kingdom neither coal nor iron is found—and with a comparatively small foreign trade, the spirit and enterprise of the people of Belfast has enabled them to excel in two branches of industry, linen and shipbuilding. These industries, though apparently but remotely connected, have this common factor—that they both demand skill and care in design and execution. It may be noted here that, though the connection between these industries is not, as we have said, very apparent, much of their success is due to the fact that they have become subsidiary to each other—the non-competents for one industry finding occupation in the other. Thus while the male part of the community is engaged in shipbuilding and kindred industries, the female and child labour is absorbed in the local textile trade.

Shipbuilding began in Belfast, as elsewhere, with the building of wooden ships. As far as is known the first vessel was launched in 1636. The ship was of some 150 tons, and was, it is said, intended for a privateer, her owner, strange to relate, being a Presbyterian clergyman.

In the year 1682 the largest Belfast ship was the "Antelope," a Virginian trader of 200 tons register. In 1700 the "Loyal Charles" of 250 tons burden was launched; but up to 1791 there was no regular place for laying down a vessel. In the early part of the nineteenth century some fifty or sixty vessels were built, the largest being the "Hindoo" of about 450 tons burden. The first iron ship built in Belfast was the "Seagull," in 1844, by Messrs. Coates and Young, but iron shipbuilding as an industry did not begin until 1850, when the Belfast Ironworks was opened by Messrs. Barnes and Co. In 1853 Messrs. R. Hickson and Co., of Queen's Island, "laid down" a large vessel—the "Mary Stenhouse"—the first built on the Island. Messrs. Hickson continued their business with great and growing success until in 1858 their firm—and that of the Belfast Shipbuilding Co.—was acquired by Mr. Edward Harland, the founder of the famous firm of Messrs. Harland and Wolff. Such has been the energy and enterprise of this company that from 100 hands in 1858, the number of persons employed has increased to over 9,000, and the amount of tonnage turned out by the firm during the past seven or eight years exceeds the production of any other yard in the world. In this connection the following figures are interesting. Messrs. Harland and Wolff turned out tonnage to the amount of 81,316 tons in 1896, 84,240 in 1897, 67,905 in 1898, 82,634 in 1899, 73,897 in 1900, and last year they launched seven ships having a gross tonnage of 92,316, or including deck erections, 98,756; the average size of each vessel being thus over 14,000 tons.

The greatest successes of this firm are associated with the White Star



THE WHITE STAR R.M.S. "OCEANIC."

Line. Indeed the whole fleet (forty-four ships) of the White Star Company was built by Messrs. Harland and Wolff. It was for the White Star Company that the long type of ocean steamship, with saloon and first-class passenger accommodation amidships was introduced in 1870. This, though a great advance in ship construction, is only one of the improvements due to the Belfast firm. Every demand, indeed, made by modern commercial necessities and modern luxurious ideas has been met by Messrs. Harland and Wolff. The world wanted big ships; Queen's Island built the "Oceanic" and "Celtic." Steady "railway timers" were required, and the "Majestic" and "Teutonic" were produced. In fine, Messrs. Harland and Wolff have always shown themselves pioneer builders of vessels of great size and extraordinary speed.

The two great achievements of these shipbuilders, however, were the successful launching and completion of the new White Star passenger and mail steamers "Oceanic" and "Celtic." The "Oceanic's" dimensions even exceed the "Great Eastern's." The "Oceanic" is 704 feet long, and at the time of her launching was universally acknowledged to be the finest vessel ever produced, and the crowning success of the century in naval architecture and marine engineering, reflecting the highest credit alike on the enterprise of her owners and the capacity of her builders. The only matter for regret is that Mr. Thomas H. Ismay, the founder, and until his death the head of the White Star Line, should have passed away within a few months of the completion of this splendid addition to his already celebrated fleet.

This splendid ship, huge though its size, has been surpassed by the "Celtic," launched on the 4th April, 1901. The length of the "Celtic" is given as 700 feet over all; she is, therefore, a few feet shorter than the "Oceanic," though still ahead of the "Great Eastern." In breadth she is 75 feet—7 feet more than the "Oceanic," but about the same amount less than the "Great Eastern." It is this breadth of beam that makes her so much bigger than the "Oceanic," while she surpasses the "Great Eastern" because a section of her amidships would be approximately a square, whereas in Brunel's boat it was approximately a triangle.

The "Celtic" has not been designed with any view of attaining high speeds; her claim to distinction lies rather in the fact that she is the biggest boat that ever has been built or is now in process of construction. The only vessel in the past that approached her was the "Great Eastern," which had a gross tonnage of 18,915 compared with her 20,880.

Besides the vessels built for the White Star Company for their Atlantic trade, the "Afric," "Medic," "Persic," "Runic," and "Suevic," have been built for the Australian traffic of Messrs Ismay, Imrie and Co. So that Messrs. Harland and Wolff have put a girdle round the earth for the White Star Company. The Queen's Island firm are the builders also of the excellent vessels that are used for the African traffic of the Union Line, and of some of the vessels used by the Atlantic Transport Company.

It is well known that not a little of the success of Messrs. Harland and Wolff is due to their astute and far-seeing manager, the Right Hon. W. J. Pirrie; an Irishman, of whom another great Irishman—Lord Dufferin—said when the degree of LL.D. was being conferred on the Chairman of the firm of Messrs. Harland and Wolff, "that he was a man who by his talents and indefatigable exertions had so stimulated the activity of his town that he lifted it from its former comparatively inferior position to that of being the third greatest commercial city in the whole Empire."

Messrs. Harland and Wolff are the head of the world's shipbuilding industry; and their position is all the more creditable from the fact that, while some of the Clyde shipping yards have to thank the arts of war for their success, the Queen's Island firm supplies exclusively peaceful Argosies.

Second in importance to Messrs. Harland and Wolff is the firm of Messrs. Workman, Clark and Co., but though they only take second place in Belfast, they are one of the largest shipbuilding firms in the world.

This firm commenced business in 1879 on the north side of the river, and have ever since been improving their status in the shipbuilding world, their name now standing amongst the first shipbuilders of the United Kingdom. In a short time after this successful venture they extended their works to the south side of the river. The increase of output, however, has compelled them to add considerably since then to the capabilities of both yards, and to take over the property of Messrs. M'Ilmaine and MacColl, Ltd., so that the firm possesses at the present time no less than five separate establishments. The equipments are all up-to-date, and calculated to ensure expedition in attending to the various orders received. As an instance of this, it may be stated that the yards are complete with ten slips for taking ten ships at one time. Large engine and boiler shops have been constructed for the building of machinery, and these are replete with every facility for efficiently dealing with the work required. Since the founding of the firm they have built sailing ships, cargo and passenger steamers of from 200 to 11,000 tons, although during late years they have confined themselves to steamers approaching the latter size. Among the steamship companies for whom Messrs. Workman, Clark, and Company have, at various times, constructed steamers are the Cunard Steamship Company, the Allan Line, the West India and Pacific, the Ocean Steamship Company, the Norddeutscher Lloyd, the Hamburg-American Line, the City Line, M. and J. Harrison, Houlder Bros., and Company, Ltd., the China Mutual Steam Navigation Company, and others, including local shipowners. The following figures will give an idea of the volume of the trade done by this firm. In 1896 their output was 38,440 tons, in 1897 it was 24,743, in 1898 over 50,000, in 1899 more than 45,000, in 1900 the tonnage was 62,329, whilst last year they launched ten vessels having a tonnage of 52,711, or including deck erections, of over 58,000 tons. These facts demonstrate the great success and growing importance of this firm, and promise well for its future development.

II. Londonderry.

The shipbuilding industry of Londonderry dates back to the early part of the last century. At first the industry was confined to the repairing of vessels, the greater number of which were at that time, built of oak. The methods in use were rather primitive, and "dry docking" was carried out by excavating a site along the slob, into which, at high tide, the vessel was drawn, and there left high and dry. When the tide receded, a temporary obstruction was placed at the entrance of the "dry dock," to prevent the water at high tide from interfering with the workmen when executing repairs. These methods were soon found unsuitable owing to the growth in the shipping trade of Derry, and a memorial was presented to the Deputation of the Irish Society by the Chamber of Commerce, stating that the memorialists had been, for sixteen months, engaged in a fruitless corres-

pondence with the Corporation of Londonderry respecting Port Charges. The memorialists concluded by saying that "although we have taken from us nearly £2,000 per annum in Port Charges, we are yet without a 'wet' or 'dry' dock, or even a slip, upon which vessels could undergo repairs."* The agitation was continued by the Chamber of Commerce, Londonderry (the greater part of the members of which were shipowners, and shippers) and resulted in a contract being entered into with Messrs. Pitt, Skipton and Co. to construct a "patent slip dock," where vessels of 300 tons register could be repaired. This patent slip dock was commenced in the year 1830, at an expense of £4,000. In 1834 there were 31 vessels of all sizes repaired at the slip. In 1835 there were 13 repaired, and about 20 open boats. Of the vessels 3 were put on the slip, and 10 into the dock. In 1836 there were 9 vessels repaired (including 2 steampackets), and about 20 open boats. Of the vessels 6 were put on the slip, and 3 into the dock; the slip was found to answer all the purposes of a dry dock.

"Mr. Skipton's partner was a Mr. Henderson, an experienced lieutenant in the Navy. A foreman and a gang of shipwrights were employed in the general yard attached to the establishment, from which a vessel of 180 register tons was launched, a handsome vessel, built of Irish oak, and calculated to carry 259 tons. The Naval stores were imported from Liverpool and Glasgow, the oak used was chiefly Irish, being procured from Walworth, Killymon, and Learmount."†

Another Derryman, Captain Coppin, started shipbuilding about 1847 or 1848, and succeeded in building a number of smaller vessels for traders. In the early fifties, Captain Coppin contracted with the Admiralty to build a large vessel for the Navy, to be called "The Great Northern," which, when completed, was condemned by the Inspector for not being up to the standard required. This vessel was left in the hands of Captain Coppin, and it not being adapted for the shipping trade, a serious blow was struck at the Derry shipbuilding industry. Public opinion at the time, and the tradition in Derry attribute the condemnation of "The Great Northern" to private and political reasons.

A new local authority was created by Act of Parliament in 1855, entitled the "Port and Harbour Commissioners," whose business was to look after the port and harbour. This new body set to work to improve the harbour, so as to meet the requirement of the increasing trade of the port. It was found that the "Patent Slip Dock" was insufficient for the repair of large vessels coming to the port, and that dry docks were needed. To meet such a want, the Harbour Commissioners erected the present graving dock in 1862, at a cost of £25,000, where vessels of a very large size can be "dry-docked" for repairs. The Harbour Commissioners have done all that it is possible to do to revive the shipbuilding industry in Londonderry, having spent £16,000 in preparing the yard, and in establishing permanent fixtures, so as to encourage either an individual or a company to revive the shipbuilding industry in Londonderry.

In the latter part of 1886 an agreement was entered into with Mr. C. F. Bigger, and the Derry shipbuilding yard was opened, under a lease of twenty-one years, at a rent of £50. For six years there was much promise

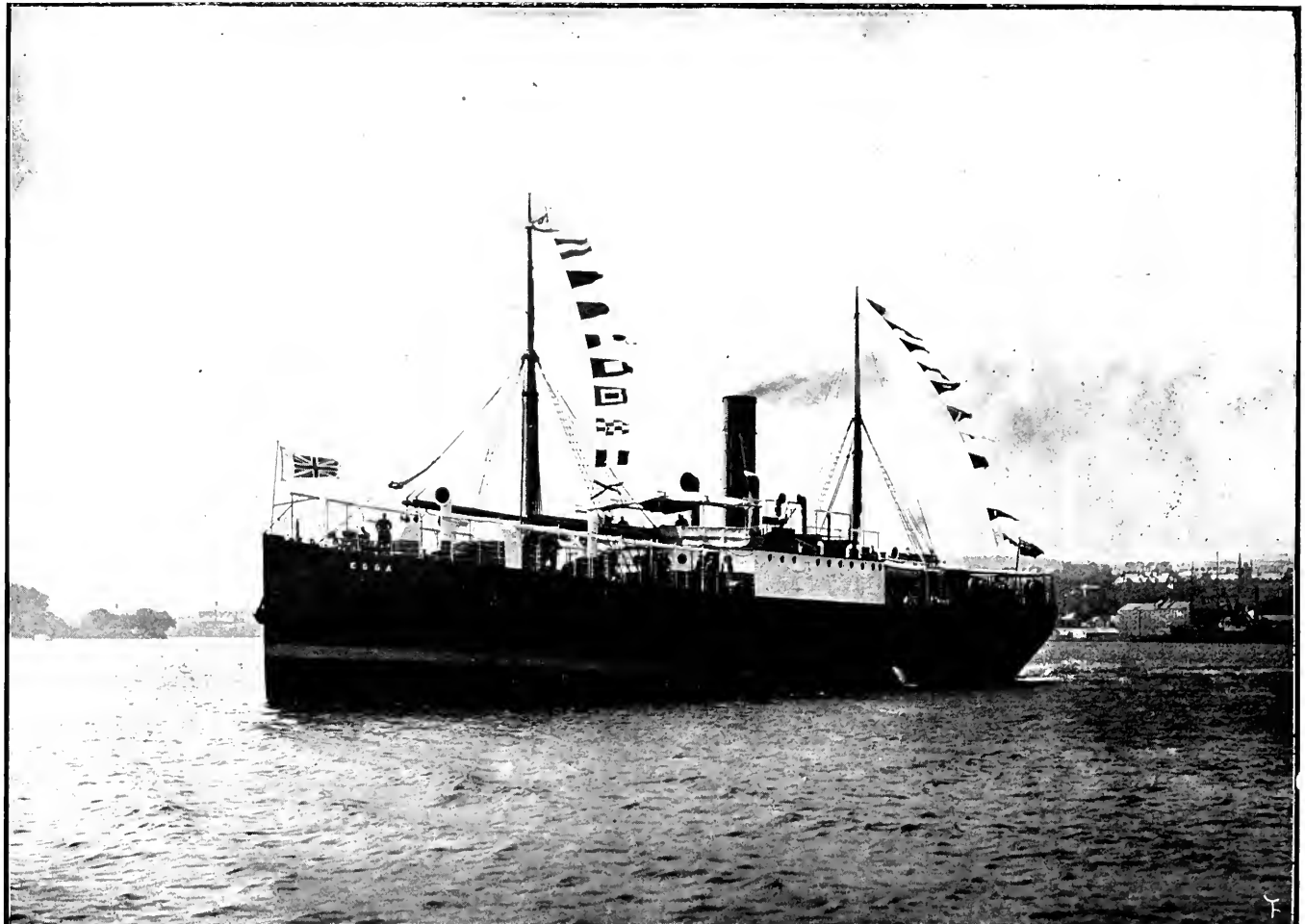
* "Memoir of the North Western Liberties of Londonderry," p. 129.
† *Ibid.* pp. 251, 252.

of success, but unfortunately, the shipbuilding yard was closed in 1892. In 1898 an effort was again made to re-start the shipbuilding industry, and a Company called the Londonderry Shipbuilding and Engineering Company, Limited, was formed. The yard was re-opened in the early part of 1899, and was so completely re-organised, that larger vessels could be built than before. Since the re-commencement, several vessels have been built, two of which were over 380 feet in length, one being the "Egga" (see illustration).

Among the steamship companies for which the Derry Company has built are:—MacVicar Marshall, Liverpool; Houlder Bros., London; Elder Dempster, Liverpool; African Steamship Company, London; and two Austrian firms. The Company has also undertaken a large quantity of repairs and overhauls, and at the present time has several contracts which will provide employment for many months. One of the serious drawbacks of shipbuilding in Londonderry, is that only the hulls are constructed, and either the hulls have to be towed over, mostly to the Glasgow or Tyne works for their engines, or the engines have to be brought to Londonderry. This causes considerable loss of time and money. Over 400 men and boys are employed, and as the industry is prosperous and progressive, the number of workers required is increasing.

Though Belfast and Londonderry are the chief seats of the industry, shipbuilding is carried on also at Haulbowline, and the industry is being revived at Dublin. As regards Haulbowline, though the place has many advantages for shipbuilding, and though a certain amount of activity is displayed there, the industry has not attained any great importance; it promises well, however, and the Irish Industrial Revival will doubtless benefit the Southern "yard."

In Dublin an effort is being made to revive the old and once prosperous shipbuilding industry on the Liffey, and an influentially supported Company, the Dublin Dockyard Company, has been formed to carry on the work. The dockyard is being rapidly put into working order, and much modern machinery is being installed. As regards the capacity of the dockyard, there will at first be three berths available for the construction of vessels up to 300 feet in length, and in a little time this accommodation will be increased. It is to be hoped that the attempt to revive an industry of such an important nature will be successful, and that it will obtain the earnest support of the Dublin shipowners, port authorities, and citizens at large.



THE S.S. "EGGA," BUILT IN THE LONDONDERRY SHIPYARD.

THE BREWING INDUSTRY IN IRELAND.

The early history of brewing is somewhat obscure, owing in part to its very antiquity, and the history of the rise of the brewing industry in the United Kingdom, and especially in Ireland, has been much neglected. Indeed, until 1889, when Mr. Alfred Barnard commenced his work on "The Noted Breweries of Great Britain and Ireland," but little of importance had been written upon the subject, and even the work referred to does not deal with the rise or progress of brewing in general, but only with the development of particular breweries. It is, however, clear that the art of preparing an alcoholic beverage from grain or other saccharine substances by means of a process of fermentation was one of man's first inventions, and in countries where the vine did not flourish, and often, even where it did, drink made from corn, generally barley, seems to have been common from the earliest times. The process of making such a beverage was well known among the Egyptians and from them the Greeks derived, like so much of their other knowledge, skill in the art of brewing. In the time of Tacitus beer seems to have been the usual drink of the Germans, and from the historian's description there can be no doubt that they understood the method of converting barley into malt.

Antiquity of Brewing.

The art of malting and the use of beer are supposed to have been introduced into Great Britain by the Romans, and a writer in the third century noted that Britain produced "such an abundance of corn that it was sufficient to supply not only bread, but also a liquor comparable to wine." After the Saxon Conquest brewing was widely practised in England and ale soon became the national beverage. It is frequently mentioned in mediæval records and a statute passed in 1272 enacted that a brewer should be allowed to sell two gallons of ale for a penny in the cities, and three or four gallons for the same price in the country. From a lease which is still extant, made, in 1295, in favour of the Abbot of Burton-on-Trent, it is evident that Burton was already at that date a brewing centre, and that the monks made their own malt. Mary Stuart, even in the midst of her troubles, was not insensible to the attractions of English beer, for when she was imprisoned in Tutbury Castle, her secretary enquired where beer might be procured for her Majesty's use, to which Sir Ralph Sadlier the Governor made answer, "Beer may be had at Burton, three miles off." A Brewers' Company was formed in London in the fifteenth century, and we read that they tried to curry favour with the then Lord Mayor by making him a present of an ox which cost 21*s.* 2*d.*, and a boar priced at 30*s.* 1*d.*, "so that he did no harm to the brewers and advised them to make good ale in order that he might not have any complaint against them."

The rise of Brewing in England.

The use of hops in the manufacture of ale seems to have been a German invention of the fourteenth century, which was not introduced into England for two hundred years. The use of hops at first was viewed with disfavour, and in 1530 Henry VIII. prohibited it by statute, but hop plantations soon became common in England. Hops made such a change

The use of Hops.

in transforming the old sweet barley wine or ale into clear tonic-hopped beer, that it was commonly said—

"Turkey, carpe, hoppes, picarel and beer,
Came into England all in one year."

It is interesting to note that the words ale and beer were both used in the earliest times, but the latter word almost entirely dropped out of use during the early Middle Ages. Neither Chaucer nor Langland use it, but in the fifteenth century the word beer again crept into use with special reference to a malt liquor containing an infusion of hops. Neither the word, nor, as already noted, the article, was at first approved of. Old Andrew Boorde, in his "Dietary," published in 1542, declares that "Ale for an Englishman was a natural drink . . . Beer is made of malt and hops and water. It is a natural drink for a Dutchman, and now of late days is much used in England to the detriment of many Englishmen." But the word and the article itself alike grew in favour, and the term ale is now little used except in provincial dialects or as a trade name.

The progress of Brewing in England.

Stow says that in 1585 there were twenty-six breweries in the city of London and Westminster, and that they brewed as much as 648,960 barrels of beer in the year. The extent of the brewing industry in England even at the beginning of the eighteenth century, is shown by the fact that the average amount of malt upon which duty was paid each year exceeded twenty million bushels, which probably represented an output of about ten million barrels of beer.

In 1760, according to the *Annual Register*, there were fifty-two breweries in London alone, producing 975,217 barrels a year. The largest of these were Calvert's, Whitbread's, Truman's, and Thrale's—all of which are in existence at the present day. On the death of Henry Thrale, the brewery last mentioned (supposed to be then the largest in the world), was sold by Dr. Johnson and his brother executor to Messrs. Barclay, Perkins & Co., for £135,000.* While on his tour to the Hebrides in 1783, Johnson mentioned that "Thrale paid £20,000 a year to the revenue, and nad four vats, each of which held 1,600 barrels."

The Taxation of Beer.

In order to follow the vicissitudes of the brewing industry during the last two centuries, reference must be made to the taxes imposed, and indeed the development of brewing cannot be traced without constant reference to the beer and malt duties. Beer was first made an excisable article by the Long Parliament in 1643, and on the Restoration in 1660, an excise duty of 2*s.* 6*d.* per barrel on strong beer, and 6*d.* per barrel on small beer was imposed to recoup the Revenue for the loss caused by the abolition of the old feudal duties payable by landowners, and in the following year the tax was extended to Ireland. The duty was increased and varied greatly from time to time; in Ireland the duty during the greater part of the eighteenth century averaged about 4*s.* per barrel of strong beer, and 9*d.* per barrel of small beer. In England the tax was much higher,

*It is in connection with this brewery that one of Johnson's characteristic sayings was delivered. Boswell tells us that at the sale, Johnson, who took the office of executor very seriously, appeared bustling about with an ink-horn and pen in his buttonhole, like an exciseman, and on being asked what he really considered to be the value of the property which was to be disposed of, answered: "We are not here to sell a parcel of boilers and vats, but the potentiality of growing rich beyond the dreams of avarice."

being from 5*s.* to 8*s.* on a barrel of strong beer during the greater part of the eighteenth century, and 10*s.* per barrel from 1802 to 1830, when the tax which had been repealed in Ireland in 1795, was repealed in England also.

For a long time in England, viz., from 1697-1830, and for a short time in Ireland, viz., from 1786-1795, beer was subject to a double duty, for in addition to the beer tax already mentioned, a tax on malt was levied uninterruptedly from 1697 in England, and from 1786 in Ireland, until 1880. The tax in England was at first 6*d.* per bushel, but after sixteen years it was raised to 9*d.*, and then gradually increased until it reached 4*s.* 5*d.* in 1804. At this time the tax on beer in England was 10*s.* per barrel; and as about two bushels of malt were usually used in making a barrel of beer, and as hops were also taxed, and as a license duty was imposed upon brewers by Pitt in 1784, the total amount of taxes levied on a barrel of beer in England at the beginning of the nineteenth century amounted to nearly £1 per barrel, as compared with a duty of from three to four shillings a century earlier.

Result of Taxation.

The result of this heavy taxation was that the brewing industry in England made little progress during the eighteenth century. The greatest production of malt during the century or more of double taxation, when the beer duty was co-existent with the malt tax, was in 1722, when 32,999,688 bushels were charged with duty; and the lowest was in 1800, when the amount was less than half that of 1722. The amount of malt produced in the twelve years ending 1816 was slightly less than the amount produced in the twelve years ending 1720, and the average annual production of beer—something like 10,000,000 barrels—remained fairly constant throughout the century, despite the great increase in population. This decrease in the consumption of beer per head of population was, of course, partly due to the increased use of tea and coffee, owing to the preference that was developed for these beverages, quite apart from the increased price of beer. In 1722, when beer was the common beverage at every meal, the consumption of tea averaged but one ounce per head; in 1830 it had increased to thirty-six ounces, and during the same time the use of ardent spirits had increased from half a gallon per head to double that quantity. The fact that the brewing industry made little or no progress during this period is, however, mainly attributable to the heavy taxation, and it was not until the beer tax was repealed in 1830 and the licensing laws reformed, that the brewing industry in England began again to expand.

The Progress of Brewing in Ireland.

Little is known of the early history of brewing in Ireland where beer was not a national drink in the same way as in England. In the reign of James I., however, Dublin was noted for its brown ale, and early in the eighteenth century it was estimated that the amount of beer annually produced in Ireland was nearly half a million barrels, Dublin and Cork being the chief brewing centres, while there was a considerable quantity of beer imported Several of the existing Irish breweries can lay claim to very considerable antiquity. Thus the firm of Messrs. Jameson, Pim, and Co., hold leases dating from 1715, and in 1766 the Ardee-street Brewery, then owned by Sir James Taylor, headed the list of the forty Dublin Breweries which paid

excise duty. Again, the Anchor Brewery was founded in 1740, and in 1759 Mr. Arthur Guinness purchased Mr. Rainsford's brewery, and thus laid the foundation of the present colossal establishment of Messrs. Guinness and Co., whilst the Cork Porter Brewery, at present owned by Messrs. Beamish and Crawford, was worked in 1715 by one Edward Allen, and several of the country breweries were established in the eighteenth century.

The Royal Dublin Society took a very active part in fostering the brewing industry, and as early as 1744 granted premiums to brewers who used the largest quantity of Irish hops. In 1763 out of the £8,000 which was granted by Parliament to be spent by the Society in encouraging certain trades, £200 was devoted to the brewing industry. In April, 1764, the Society granted premiums varying from £20 to £12 to the first five persons who sold by retail the greatest quantity of Irish Porter in the year ending 25th March, 1764, and the winner of the first premium was one Stephen Malone, who sold 24 hogsheads. In October, 1765, the Society granted to Mr. Thomas Andrews of New Row, on the Poddle, a premium of £62 6*s.* 6*d.*, being at the rate of 1*d.* per gallon for 14,958 gallons of porter brewed by him since 1st June, 1764.

How the Royal Dublin Society helped the Brewing Industry.

In 1771 a committee was appointed by the Society "to consider in what manner it might be expedient to give encouragement for the establishment of good public breweries in different parts of this Kingdom."

The committee reported in March, 1772, as follows:—

1. "That it is the opinion of this Committee that the Discouragement of the consumption of low-priced spirituous liquors in the country is an object of the utmost consequence to the health and morals of the people as well as to the Police and Manufactures of this Kingdom, and, of course, highly deserving of the attention of *the Dublin Society*."

2. "That it is the opinion of this Committee that the erection of new Breweries of a good kind of Malt Liquor in the several Provinces of this Kingdom would be the most likely means to promote this desirable end."

3. "That it is the opinion of this Committee that a premium of four shillings in the barrel should be given upon the first 1,000 barrels of Ale of the value of 30 shillings per barrel (first cost to the Retailer) which shall be made and sold out of any one Brewery which shall be erected after the 25th of March, 1772, the Quantity and Value of said Malt Liquor to be ascertained by the certificate of the Collector of the District where such Brewery shall be established."

"The said Premium shall be given for each of the four Provinces respectively."

These proposals were adopted with the proviso that no brewery in the city of Dublin or within twenty miles thereof should be eligible, and in 1777 Mr. James Higginson obtained a premium of £200 for having established a brewery in Lisburn and for having brewed the required 1,000 barrels.

In 1772 the Society entered into correspondence with Mr. Combrune* of the city of London, as to the best method of brewing good beer. In a very interesting letter dated 9th July, 1772, Mr. Combrune pointed out that the different varieties of beer were due to different combinations; that there

* In 1761 Mr. Combrune had published his "Theory and Practice of Brewing," which was the first work that attempted to treat of the industry on scientific principles. Although, as already mentioned, the historical side of the brewing industry has been neglected, there has been no lack of treatises upon the art of brewing; indeed, as early as 1573, a treatise of this nature was published in Erfurt, with the quaint title: "On the Divine Noble Gift, the Philosophical, the Mighty, Dear, and Wondrous Art to Brew Beer."

was no royal road to good brewing; that the only way to succeed was an observance of certain general principles, and that though bad beer might be brewed from good malt, the foundation of brewing good beer was good malt. He controverted the statement of Irish brewers that the defects in Irish porter were due to bad hops and bad barley, and attributed them rather to bad malting, and he pointed out that, with proper materials, suitable utensils, and a skilful "artist," there could be no doubt that it would be possible to brew in Dublin porter similar to that brewed in London.

During the early part of the eighteenth century brewing increased in Ireland, a number of breweries were started, and Dublin and Cork became great brewing centres, and in the middle of the century the annual amount of beer brewed in Ireland was about 600,000 barrels of strong beer. The excise tax in Ireland was considerably lower than in England, and as already mentioned, averaged during the eighteenth century, about 4*s.* per barrel on strong beer, and about 9*d.* on small beer, and no malt tax was levied in Ireland until 1786. Still, despite the comparatively low duty and the fostering care of the Royal Dublin Society, brewing began to fall off in Ireland, with the result that the amount imported from England increased from about 15,000 barrels in 1750 to about 65,000 in 1785, and to over 100,000 barrels in 1792. The imposition in 1786 of a tax of 7*d.* per bushel on malt accelerated the decline, as the tax on beer amounted to 4*s.*, and hops were also taxed, and the licence duty was high.

The Irish Parliament and Brewing.

In 1791 the condition of the brewing industry attracted considerable attention in the Irish Parliament. The decline in brewing had been accompanied by a great increase in the consumption of spirits. The amount of whiskey charged with duty for consumption in Ireland had risen from a little over 100,000 gallons at the beginning of the eighteenth century, when the duty was 4*d.* per gallon, to over 3,400,000 gallons in 1790, although the duty had increased to 1*s.* 1¼*d.*, and it was universally admitted that an enormous quantity of spirits was illicitly distilled, whilst over 1,000,000 gallons of spirits were imported. A strong opinion was expressed throughout the country that the best way to discourage the excessive consumption of spirits was by encouraging brewing The spirit duty at the time was 1*s.* 1¼*d.* per gallon, and the beer duty 4*s.* 6*d.* per barrel, and although all malt whether used for distilling or brewing was subject to the same malt tax (7*d.* per bushel in 1791), the distiller received a refund in the shape of a drawback. It was accordingly suggested that the beer duty should be abolished and that the tax on spirits should be increased. In February, 1791, the Speaker (Right Hon. John Foster, M.P. for Louth County) declared that the average number of barrels of beer annually brewed in Ireland in the past five years was only 400,000 as compared with an average of 600,000 for the period 1760-65, and that the decline was mainly due to excessive legislation and oppressive restrictions. Mr. Beresford urged in reply that the apparent decline in the amount of beer brewed was due to frauds on the revenue; he pointed out that of the eighteen hundred retailing brewers licensed in Ireland at the time, less than half paid duty on even one barrel in the year, and "there are besides these innumerable persons vulgarly called 'shebeeners,' who brew and sell without license or duty." Mr. Grattan declared that "whatever is adopted with regard to spirituous liquors would be imperfect, indeed, if nothing was done in advancement of the breweries.

The state of your brewery on a comparative with its state thirty years ago, is that of a rapid decline, the decrease is about one-third; increase of importation nearly two-thirds; whereas the increase of intoxication, that is the increase of the consumption of whiskey in the course of twenty years, has been enormous. Judge from this growth of poison and this decline of nutriment how necessary the interference of Parliament to sustain the latter (*i.e.*, brewing) as well as to check the former (*i.e.*, distilling)."

After a long discussion several resolutions were carried to the effect that it was desirable to curtail the present excessive use of low priced spirituous liquors; and that decisive advantages should be given to the breweries over the distilleries by means of alterations in the duties, so as to secure a decided preference for the breweries. Effect was given to these resolutions three years later when the tax on beer was withdrawn. It may be noted here that in 1830 the beer tax was repealed in England also, and that until 1880 no tax was directly levied on beer in either country, though it was indirectly taxed by means of a duty on malt (which, during the greater part of the nineteenth century, stood as 2*s.* 8½*d.* per bushel), and by taxes on hops and sugar used for brewing, and by the levying of licence duties.

The production of Malt.

The official returns as to the amount yielded by the malt tax until its repeal in 1880, furnish the best indication of the progress of brewing. In 1785, when the malt tax was first imposed in Ireland, the number of bushels upon which duty was paid was 4,446,343, and this was about the average for the remainder of the century. For some reason, which is not very apparent, as there is evidence to show that brewing did not decline, the quantity of malt upon which duty was paid in Ireland greatly declined, despite the rapid increase in population in the beginning of the nineteenth century; in 1816 the total quantity fell, for the first time on record, below the 2,000,000 bushels mark, and about this figure it fluctuated for some twenty years. For the ten years following the starting of Father Mathew's temperance crusade in 1838, the amount of malt annually charged with duty averaged only about 1,500,000 bushels, and it was not until 1859 that the 2,000,000 bushels mark was again exceeded. The consumption of beer in Ireland had just then received considerable encouragement from the heavy increases which had been made in the spirit duty, and accordingly the quantity of malt on which duty was paid steadily increased, and in 1871 exceeded 3,000,000, bushels, whilst the average for the decade immediately preceding the repeal of the malt tax (1871-80) was even higher. It may be of interest to note that the amount upon which duty was paid in England averaged about 25,000,000 bushels during the first thirty years of the century; after the repeal of the beer tax and the reform of the licensing duties in 1830, the amount steadily rose, except for a slight check during the early forties; in 1860 it exceeded 40,000,000 bushels, and thirteen years later the 50,000,000 bushels mark was passed, and during the last ten years that the malt tax was levied the average annual amount of malt upon which duty was paid in the whole of the United Kingdom exceeded 56,000,000 bushels.

The Revival of Brewing in Ireland.

The decline at the beginning of the nineteenth century in the amount of malt upon which duty was paid in Ireland of which mention has been made above, was, no doubt, partly due to the increase in the rate of the duty levied on malt. This duty, which averaged about 2*s.* per bushel in the ten years immediately following the

repeal of the beer tax in 1795, after several fluctuations became settled at *2s. 7d.*, and the decrease in the amount of malt upon which duty was paid without doubt was due in part to the decrease in lawful distillation, and the increase in illicit distillation which followed upon the sharp increases in taxation to which spirits became subject after 1795, but still it is hard to account for the remarkable decrease in the amount of malt upon which duty was paid. However, as already mentioned, it seems quite certain that the decrease was not due to any decline in the production of beer. Brewing revived in Ireland after the repeal of the beer duty, and porter brewing is said to have received a marked stimulus at the beginning of the nineteenth century from the introduction of the use of roasted malt as a colouring and flavouring material, though it was not until 1850-60 that porter became the really popular drink in Ireland and that the Irish trade became mainly a porter trade. Newenham, in his "View of Ireland," published in 1809, stated that according to official estimates the beer made in Ireland in 1808 exceeded 751,000 barrels or nearly double what the Right Hon. John Foster stated in the speech, already mentioned, to be the annual production about 1790. Newenham attributes the decline in the amount of malt charged with duty to the illicit malting carried on with the collusion of the revenue officers, and declares that the amount of beer brewed in Ireland in 1808 was really far greater than the 751,000 barrels stated. "It is obvious to everyone," he wrote, "that the number of breweries in Ireland has been augmented since the year 1792; that the additional ones are on a much more extensive scale than the former ones, and that the proprietors resort to every expedient (the writer hopes with increased success) to induce the people to prefer their liquor to whiskey." In the province of Munster he states that there was an almost universal preference given to malt liquors over spirits, "and the porter brewers of the city of Cork alone almost vie in extent with some of the principal ones in London."

The Rise of the Export Trade.

That the brewing industry was rapidly expanding in Ireland early in the nineteenth century, despite the enormous decrease in the amount of malt which is returned as having paid duty, is shown also by the figures relating to the export and import of beer. We have already seen that the importation of beer from England averaged over 100,000 barrels a year about 1790, but the importation of beer declined, and Ireland soon began to export beer to England. The first year when the exports of beer exceeded the imports was 1814, when the figures were:—imports from England, 215 barrels; imports from Scotland, 24 barrels; exports to England, 424 barrels; exports to Scotland, 46 barrels.

In 1823 the exports of Irish beer first exceeded the 1,000 barrels mark, and in 1828 Ireland exported 8,035 barrels to England, 48 to Scotland, and 3,180 to foreign countries, whilst the imports from England were but 505 barrels. Most of the beer exported from Ireland has always been shipped from the port of Dublin, and in 1861 the quantity thus exported to Great Britain was 170,384 hogsheads; the exports increased in 1871 to 281,301, in 1881 to 338,690, and in 1891 to 460,985 hogsheads. During the last decade there were considerable fluctuations, the total falling in 1898 to 368,628 hogsheads, but the last few years has witnessed a revival in the export trade, and in 1901 the quantity exported was 459,864 hogsheads.

The temperance movement headed by Father Mathew of course affected the production of beer, though to a less extent than it affected the produc-

tion of whiskey. The amount of malt upon which duty was paid in Ireland during the decade 1838-47 was 30 per cent. less than the corresponding amount for the previous decade, and the famine years and the subsequent emigration had their effects upon the brewing trade, and numerous breweries were obliged to close. Shortly after the middle of the century, however, the brewing industry began again to expand, and the heavy increases made in the spirit duty, especially in 1858, when the English and Irish rates were equalised, and the rate fixed at 8*s.* per gallon, treble what it was in Ireland five years previously, tended to increase the use of beer. The amount of beer brewed in Ireland in 1856 was estimated by the Commissioners of Inland Revenue at 926,000 barrels, and in ten years this amount had increased over 50 per cent.

The growth of the brewing industry and the regularity of the increase in Ireland in the last forty years is clearly shown by the following figures:—

Year.	Number of Barrels Brewed	
	In the United Kingdom.	In Ireland.
1861*	19,534,460	1,437,713
1871†	26,431,760	1,616,656
1882‡	27,687,572	2,044,331
1891‡	31,927,303	2,555,273
1901‡	36,394,565	3,149,142

* Estimated by the Commissioners of Inland Revenue from the amount of licence duty charged
† ,, ,, ,, ,, ,, ,, materials used.
‡ Calculated ,, ,, ,, ,, ,, ,, beer duty paid.

Brewers and the Law.

As has been already mentioned, the beer tax was abolished in Ireland in 1795, and in England in 1830, and was not re-imposed until 1880, when the malt tax, which had been levied in England from 1697, and in Ireland from 1785, was abolished. Until 1847 brewers were not permitted to use any materials except malt and hops in the brewing of beer for sale. Hops also were subject for a long time to a duty which was reduced in 1860 to 1½*d.* per lb., and finally abolished two years later. In 1847, under the provisions of 10 Vic., c. 5, brewers were permitted to make use of sugar in brewing. The amount thus used in the United Kingdom averaged only about 35,000 cwts. a year in the period 1847-66, but in 1867 250,000 cwts. were used, and in 1879 the amount exceeded 1,000,000 cwts., and last year nearly treble this amount was used. This increase was no doubt due to the public taste for a sweeter beer; but it has also been fostered by sugar refiners preparing a better sugar for the use of brewers, and also by the manufacture of grape sugar from sago, rice, and other farinaceous substances. At first there was no tax imposed upon the sugar used in brewing, owing to the high customs duty paid, but afterwards, owing to the reduction of the sugar duty, a special tax was imposed on all sugar used for brewing, and the tax was arranged on the assumption that 210 lbs. of sugar was equivalent for brewing purposes to a quarter of malt. The amount paid in Ireland for the malt tax in 1875 (an average year) was £430,000, and the amount paid for the tax levied on sugar used in brewing was over £31,000.

The present method of Taxation.

In 1880 a great change took place in the method of taxing beer, a direct tax on the beverage being substituted for the indirect taxes formerly levied upon the materials used. This change had long been advocated as the collection of the malt duty had necessarily imposed oppressive restrictions upon manufacturers, and the malt tax was objected to by many as economically unsound, being a tax on raw materials. The change in taxation, however, was delayed for a long time owing to the practical difficulties that beset the collection of a beer tax in consequence of the great number of breweries. This difficulty was largely obviated by the decline in the number of breweries (over 50 per cent.) which took place in the forty years preceding 1880. This decrease in the number of brewers from whom the tax would have to be collected, enabled Mr. Gladstone, as already mentioned, to abolish, in 1880, the duties on malt and sugar used in brewing, and to substitute a direct tax of 6*s.* 3*d.* per barrel of beer, the tax being calculated according to the specific gravity of the worts before fermentation, the standard barrel being one of 36 gallons of worts of a specific gravity of 1.057° with an allowance of six per cent. for waste. This change in taxation which established the principle of a "free mash-tun," at once increased the rate of duty paid by brewers by about 10 per cent. Thus, though the quantity of malt and sugar used in the four years 1881-4 was seven per cent. less than the quantity used in the preceding period, the total amount received from brewers in the shape of beer duty in 1881-4 was considerably greater than the amount received in 1877-80 from the taxes on malt and sugar. In 1889 Mr. Goschen altered the standard specific gravity, upon which the beer duty is charged, from 1.057° to 1.055°, a change which was equivalent to a further increase in the duty of about 2½*d.* per barrel. In 1894 the duty was increased by 6*d.*, and in 1900 an extra shilling was imposed, bringing the tax up to 7*s.* 9*d.* per barrel. The result is that the taxes at present levied on beer are equivalent to a tax of considerably over 30*s.* per quarter of malt, or over 40 per cent. more than was levied in the time of the malt tax, just twenty-two years ago. The net produce of the beer tax in 1900-1901 was £13,940,536, of which £449,916 was paid over to the Local Taxation Account and the remainder to the Exchequer. The net amount of beer duty paid in Ireland in the year ended 31st March, 1901, was £1,204,670.

Licence Duty.

The practice of requiring persons engaged in the preparation or sale of excisable commodities to take out licences, and of charging a duty on such licences, existed, at least, as early as the reign of Queen Anne. The principle was not, however, very generally applied until the budget for 1784, when at the close of the American War, Mr. Pitt imposed a duty upon brewers which was made to vary from £1 10*s.* to £50 a year according to the quantity of beer brewed. The earliest duties of this description in Ireland were stamp duties, and in common with most of the other licences duties were of a repressive nature. On the repeal of the beer duty in 1830 the scale of duties on licences was re-cast, and the number of brewers in England steadily rose to over 49,000 in 1838. From that date brewers declined in number, so that in 1879 they amounted to 22,000; at present they number over 18,000, two-thirds of whom are private brewers who do not brew for sale. At the beginning of the century the average number of brewers licensed in Ireland was about 220. After 1838 they gradually decreased, until in 1852, when they numbered only 96, and at present the number is 39,

of whom two hold two licences each. In 1826 the number of retailers licensed in Ireland was over 12,000, which increased to over 21,000 in 1838, and then declined in four years to 13,000. The different varieties of licences subsequently increased and the number of persons holding different licences to sell, under different conditions, beer, spirits, or wine in Ireland is now over 25,000 and the total for the whole of the United Kingdom is over 230,000.

The following Table shows the number of brewers in the United Kingdom, the quantities of materials used, and the amount of licence duty paid and beer duty charged for the year ended 30th September, 1900.

TABLE showing for the Year ended 30th SEPTEMBER, 1900:—
The NUMBER OF BREWERS in the United Kingdom in each of the undermentioned classes;
The QUANTITIES OF MATERIALS USED by each class;
The AMOUNT OF LICENCE DUTY PAID by, and BEER DUTY CHARGED on, each class.

CLASS.	Number of Brewers in each Class as represented by the Number of Licences issued.	Quantities of Materials used.				Amount of Licence Duty paid and of Beer Duty charged.
		Malt.	Raw Grain.	Rice, Rice Grits, Flaked Rice, Maize Grits, Flaked Maize, and other similar preparations.	Sugar, including its Equivalent of Syrups, Glucose, and Saccharum.	
BREWERS FOR SALE who Brewed (reckoning at the Standard gravity of 1.055°) — Barrels. Barrels.	No.	Bushels.	Bushels.	Cwts.	Cwts.	£
Under 1,000	4,763	2,323,353	418	8,195	43,719	451,040
1,000 & under 10,000	935	5,151,278	3,604	110,229	289,895	1,200,134
10,000 ,, 20,000	286	5,658,236	14,421	148,633	323,149	1,370,467
20,000 ,, 30,000	146	4,955,791	2,876	148,266	300,903	1,213,829
30,000 ,, 50,000	120	5,398,205	1,968	168,608	346,974	1,339,451
50,000 ,, 100,000	111	7,715,722	17,284	222,458	505,238	1,916,841
100,000 ,, 150,000	27	3,973,047	13,084	49,704	297,690	973,400
150,000 ,, 200,000	11	1,436,841	—	66,510	99,420	383,994
200,000 ,, 250,000	9	1,896,081	35,160	49,250	133,783	479,050
250,000 ,, 300,000	2	382,012	—	16,391	18,266	94,225
300,000 ,, 350,000	3	1,519,032	—	48,181	73,268	342,609
350,000 ,, 400,000	3	1,168,552	—	31,695	50,647	270,076
400,000 ,, 450,000	—	—	—	—	—	—
450,000 ,, 500,000	5	1,250,847	—	17,840	119,403	341,504
500,000 ,, 600,000	4	2,165,547	98,288	76,722	144,994	595,111
600,000 ,, 700,000	5	2,148,542	—	34,114	90,395	481,061
700,000 ,, 800,000	2	1,266,368	—	3,147	52,504	272,700
800,000 ,, 900,000	—	—	—	—	—	—
900,000 ,, 1,000,000	—	—	—	—	—	—
1,000,000 ,, 1,500,000	3	1,898,880	—	1,902	68,756	405,712
1,500,000 ,, 2,000,000	4	2,914,580	—	—	20,708	570,277
2,000,000 & over ..	1	3,890,198	—	—	—	777,916
TOTAL, ..	6,440*	57,113,112	187,103	1,201,845	2,979,712	13,479,397†
BREWERS NOT FOR SALE:						
Chargeable with Beer Duty.‡	2,756	54,689	—	—	327	10,169
Not chargeable with Beer Duty.	10,148	—	—	—	—	3,013
TOTAL, ..	12,904	54,689	—	—	327	13,182
GRAND TOTAL, ..	19,344	57,167,801	187,103	1,201,845	2,980,039	£13,492,579

* The actual number of Brewers to whom Licences were issued was 6,290. A Brewer may have more than one Licence.

† Including Licence Duty amounting to £6,440.

‡ Farmers occupying houses exceeding £10 annual value, who brew for their labourers, and other private brewers occupying houses exceeding £15 annual value, are liable to Beer Duty.

Process of Brewing.

While the essential principles of brewing are of the very simplest nature, yet the modern processes are rather too complicated to be explained in an article which is not of a technical nature. A short description of the essential processes of brewing, however, may prove not uninteresting.

The first step is to make the malt. Malting and brewing are totally separate operations, and are often carried on as distinct businesses. Maltsters commonly make malt for brewers and distillers at a fixed charge per quarter, but most brewers, and practically all Irish brewers, make at least a portion, and some the whole, of the malt they use. Malting is carried on very extensively in Ireland, and in addition to the thirty-nine brewers who all make malt, and a number of distillers, there are over thirty firms in Ireland doing a large business in malting, many of whom, in addition to supplying Irish brewers and distillers with malt, export large quantities to England. Nearly all kinds of grain—wheat, oats, maize, etc.—may be, and have been, used to make malt, but barley is *par excellence* the malting grain, and in Ireland barley is almost exclusively used. The bulk of the barley to be used for the entire malting season is usually bought towards the end of September and during the months of October and November. The barley should be of good colour (straw), plump in the body, well closed at both ends, and with not too thick a skin.

Drying the Barley.

Before malting it is now usual to put the barley upon a kiln at a moderate temperature of about 100° F. for from 12 to 24 hours, according to the condition of the barley. This drying process has become more necessary in recent years owing to the introduction of the steam threshing mill, and the hurry farmers are in to rush the barley from the stooks into the market. In former times, when the barley was threshed in the farmer's yard with a hand-flail, or with a one-horse machine, the barley was allowed to stand for a few days in the stooks in the field, and was then carefully put into hand stacks, where it remained for a considerable time and thus became mellowed and matured. It was then put into large stacks in the haggard, where it sometimes lay for months, continuing to improve and go through the natural sweat. The modern kiln-drying is an endeavour to imitate nature by taking the place of this natural sweat, and it is rendered necessary by the changed conditions of harvesting already referred to.

Malting.

The barley is allowed to stand for some time after being dried, and the first step is then taken in the operation of malting, viz., putting the barley into a large cistern or steep where it is thoroughly soaked, the water being changed once or twice while the barley is in the steep. This process in malting is a forced vegetation, the object of which is to produce that saccharine matter upon which the value of malt depends. The vegetation is forced as the maltster cannot wait for the slow operation of nature; hence, as a substitute for the moisture of the earth the grain is immersed in water where a few hours' infusion is equal to many days employed in the ordinary course of vegetation. After the expiration of from 54 to 60 hours the water is drawn off, and the barley which is now swollen and very soft is put into a heap on the floor, or as maltsters term it, "couched." Here it stands for some 24 hours, after which it is spread out on the floor in a thick layer about 12 inches deep. The process of germination or sprouting now commences and

goes on for a period of from eight to ten days, during which it is frequently turned, until the maltster considers the germination has gone far enough. The grain is then transferred to the kiln or drying chamber, where it remains for about three days. The strong heat to which the grain is subjected stops further germination and thoroughly clears the grain of all moisture. If the malt is required for pale ale the drying on the kiln is light and the malt is consequently pale in colour. Porter brewers and distillers require malt which has been much more highly dried and which has consequently a browner appearance.

When the process of drying is thoroughly completed, the "malt," into which the barley has now been transformed, is transferred to hermetically sealed bins or stores, where it remains for a few weeks to mature. Generally speaking a quarter of barley of 448 lbs. should yield a quarter of malt which weighs about 336 lbs. It would be quite outside the scope of these pages to discuss in detail the chemical changes effected in barley by malting. Roughly speaking, a substance called Hordein, a form of starch, which constitutes about fifty-five per cent. of the substance of barley is by the process of malting transformed into sugar gum and starch, under the influence of the nitrogenous principle which is contained in the seed, and which is known as *diastase*. The sugar in the grain nourishes the young plant, and it is just when the sugar is most abundant in the sprouting barley that the vital changes are arrested by heat, and malt formed. The physicial condition of the grain is also altered, the malt being of a mealy nature, and having a sweet taste.

The actual process of brewing involves about six distinct operations.

(1) The malt is passed into a mill where it is crushed between a pair of rollers in order to coarsely bruise it, so as to enable the warm water (with which it will be mixed) more easily and thoroughly to permeate it, and extract its sweet or saccharine matter.

(2) The grist is then mixed with warm water in a cylindrical vessel known as the masher, fitted inside with revolving arms, which keeps the grist and water in constant motion, and prevents the former from settling at once to the bottom before the water has extracted all the saccharine matter which it contains. The grist and water are then conducted to the mash-tun proper which is a cylindrical vessel having a false bottom percolated with holes or slots, and fitted with revolving arms which further mash the grist if necessary. The "goods," as the malt and water are called, are allowed to stand for about two hours, at the end of which the taps connected with the false bottom are turned and the liquor drained off into the "underback," the grains being deposited upon the top of the false bottom. The liquid which has been drawn off—known as worts—is in fact raw beer, and is very sweet to the taste. If the average strength of it is higher than the brewer requires for the particular class of beer he is making, the malt in the tun is sparged, *i.e.*, sprinkled with sufficient hot water to bring down the strength of the wort. The mashing and sparging processes may last from six to twelve hours, but under the Excise regulations must not exceed the latter limit.

It should be noted that the Inland Revenue Act of 1880 (Secs. 12 and 13) enacted that every brewer shall be deemed to have

brewed a minimum quantity of 36 gallons of worts at 1.057° for every 84 lbs. of malt or corn and for every 56 lbs. of sugar used. In the matter of duty, therefore, apart from other considerations, it is to the interest of the brewer to have at his command such appliances and skill as, within safe brewing limits, will ensure the extraction of the maximum quantity and strength of worts from the materials used, since if he fails to get the standard minimum and is charged on the materials, the duty becomes very heavy.

The grains which remain deposited on the false bottom are removed from the mash-tun as soon as possible. They form the most important bye-product in a brewery, and are used chiefly for feeding cattle. In some breweries the sum realised by their sale at one time sufficed to pay the whole of the wages bill of the establishment. In Dublin the grains are bought chiefly by dairymen, who feed their cows upon it, and in some country districts the grains are largely used for fattening ducks. Generally speaking the bulk of the grains turned out is greater than the bulk of malt mashed; sometimes in Ireland the amount of grain left after mashing reaches as high a figure as 1½ barrels of grains for each barrel of malt mashed, and the average price ranges from 6*d.* to 1*s.* per barrel, and in some districts a higher price is sometimes obtained.

(3) The worts are run as quickly as possible out of the underback into the "Copper," which in Ireland is an ordinary big copper pot or large domed copper vessel. The hops and any sugar or other saccharine matter that may be used are now introduced, and the whole is boiled for a couple of hours. The effect of boiling is twofold. It coagulates a substance called mucilage, which is always present in the worts, and which, if not eliminated, would spoil the beer; it also extracts from the hops and imparts to the liquor the flavour and essence of the former.

(4) The worts are now run into the hop-back, a vessel provided with a false bottom, which retains the spent hops and allows the clear liquor to pass into the cooler. These spent hops form an unimportant bye-product and are occasionally used by market gardeners as manure. After the lapse of a little time to allow of settling, the cooling process is rapidly carried out by means of refrigerators.

(5) After leaving the cooler or refrigerator the worts are collected in the fermenting vessel, where yeast or barm is added to excite the fermentation. It is at this point, before fermentation, that the quantity and gravity or strength of the liquor are gauged by the excise officer and the duty assessed at the present rate of 7*s.* 9*d* per 36 gallons of worts of the standard specific gravity of 1.055° Soon after the introduction of the yeast the appearance of the head of the beer undergoes considerable changes. There appears towards the top of the fermenting vessel a creamy head; then in about another nine hours this head has grown into a deep frothy mass, parts of which constantly cave in, giving to the upstanding portions an appearance of rocky peaks of snowy whiteness. When the fermentation reaches the most active stage, bubbles of gas may be seen breaking through, the carbonic acid, mixed with air and

alcoholic gas, appearing as a bluish vapour over the surface of the yeast. The carbonic acid gas may be pumped off from the fermenting vessels and collected for compression. It forms a valuable bye-product, but the process of securing it is elaborate and profitable only in very large breweries. In the year 1890 Messrs. Arthur Guinness, Son and Co. first began to utilise the acid given off. It may be used in the artificial production of cold (*e.g.*, for the refrigerators required in the brewery) and it may be reduced to a liquid state in which condition it is sold in steel cylinders for the purpose of soda water manufacture, cooling machines, etc. The freight upon the cylinders is, however, very heavy, and the demand for carbonic acid in the United Kingdom is not very extensive, and consequently it does not form a sufficiently remunerative bye-product to induce most brewers to work it up.

Simply stated, the effect of fermentation is to change a portion of the saccharine in the worts into alcohol, and the longer the fermentation is allowed to go on, the greater will be the change. In the case of pale ales which are comparatively highly alcoholic, and in the case of ales for export, which require keeping qualities, the fermentation, or attenuation as it is called, is allowed to proceed much further and longer than when mild ale or porter for immediate consumption is being brewed.

During fermentation the worts throw off a quantity of yeast, which rises to the top of the liquor and is constantly skimmed off and forms a bye-product. Sometimes it is sold in the liquid state in which it was removed, and is then known as barm; in other cases it is pressed and made into solid yeast cakes, and the liquor pressed out can be worked up afterwards. In large breweries the surplus yeast not required for producing fermentation in the brewery, is pumped by hydraulic pressure through machines fitted with swansdown bags, until it assumes the consistency of soft cheese, after which it is packed into bags and sold to distillers.

(6) When the fermentation has proceeded far enough, the remnants of the yeast are removed and the beer is cleansed, cleared, and sent on to the fining or storage vessels, the temperature, which during the fermenting process has ranged up to 70° F., being brought to the normal state of from 58° to 60° F. The beer is now ready to be stored or put into casks according as it is intended for export or for immediate consumption, and according to the nature and quality of the drink.

Porter.

As most of the liquor brewed in Irish breweries is of the class known as porter, a few words concerning this article may not be out of place. Porter differs from ale in several respects, and especially in the fact that it contains a greater amount of nutritive matter, and a considerably less proportion of alcohol. Its origin dates back to 1722, when porter was first brewed by Harwood, a London brewer, who gave it the name of "Entire." This expression "Entire" requires some explanation. At the date referred to the beer retailers had a custom of selling a beverage called "half and half," *i.e.*, half ale and half "twopenny" (another kind of beer), which had to be drawn from two casks. The public at a later period

took a fancy to "three threads," a combination composed of these two, and a black beer. The retailer had to draw this mixture from three different casks, and the process was so inconvenient that it gave rise to the practice of brewing a beer possessing the qualities of all three varieties. This beer being drawn from one cask, came to be known by the name of "Entire Butt," an appellation to which brewers for a long time adhered, and although the circumstances which led to this designation have long ceased, *stat nominis umbra*, and the term is still retained by several brewers in London, and may even to-day be seen on the signs and boards of many old-fashioned London taverns. At a later period when this drink began to become popular, it acquired the name of "porter," because at that time the porters and labourers were the principal consumers. Thus Malone says porter was a kind of strong beer so called because it was "much drunk by porters who carry burdens," and this appellation has been retained to the present time.

The term "Stout" is often applied to this class of beer. Johnson defined "stout" as a cant name for strong beer, and it is used in this sense by Swift, but the term "stout" is now employed either as a synonym for porter, or to designate "Extra" porter. When it was discovered that roasted malt gives a quite exceptional flavour, the old black beer was transformed into modern aromatic nutritious porter, and Ireland soon acquired a reputation for the quality of its porter, which has been maintained to the present day. The Royal Commissioners on Irish Railways remarked in their Second Report (1838) that "Irish porter is now largely exported to England, and the Dublin bottled porter successfully rivals the London porter even in London itself."

Ale is distinguished from porter, in the first place, by the fact that the water employed in the brewing of ale is generally hard, while softer water is used for black beer. A second difference between the two kinds lies in the use of the roasted malt for black beer, which gives it its dark colour and aromatic flavour. The process of roasting the malt is not unlike coffee roasting. The manufacture of porter has created a special industry, to some extent confined to Ireland,—the roasting of black or patent malt, which is carried on by several firms in Ireland, *e.g.*, Plunkett, Boydell, O'Reilly, etc., whilst a considerable quantity is imported from firms like Hugh Baird and Son of Glasgow. Black malt imparts a flavour to the spent grains which cattle do not like, and consequently the price obtained for porter grains is much less than for grains used in making ale. Besides these two principal differences there are several others of a secondary character, which consist not so much in the actual process of brewing, as in the method of fermentation and in the after treatment of the worts.

Good porter, well brewed, is said to contain not only all the qualifications necessary to sustain physical energy, but is also considered to have intrinsic value as a medicinal beverage, and consequently the medical faculty not infrequently recommend its use for those suffering from debility or exhaustion.

The Materials used in Brewing.

A few words may not be out of place here upon the three chief constituents that go to form good beer, viz., barley, hops, and water. Of course

the character of the beer is mainly determined by the skill with which the brewer conducts the varied and complicated processes of brewing, but it may be fairly stated that, in the words used by Mr. Combrune, 140 years ago, in his letter to the Royal Dublin Society, which has been already quoted, "the foundation of brewing good beer is good malt," and the quality of the malt depends primarily upon the nature of the barley used.

The Barley Crop of the United Kingdom.

The amount of barley grown in the United Kingdom in the year 1901 was 67,638,339 bushels, and the amount imported was 49,485,027 bushels. A very small quantity was exported, and consequently the quantity of barley used in the United Kingdom in 1901 was about 117,000,000 bushels. The official returns show that over 57,000,000 bushels of malt were used in making beer during the year ended 30th September, 1901, and, as a bushel of barley generally produces about a bushel of malt, nearly one half of the total amount of barley grown in or imported into the United Kingdom was used for making beer, the remainder mainly going into the ordinary consumption or being employed for seed or in making whiskey.

The Brewing Industry and Irish Barley.

The outstanding feature in the agricultural economy of Ireland during the past fifty years has been, of course, the conversion of tillage land into pasturage. Whilst barley has shared in the general shrinkage of crops, it has done so in a less degree than any other corn crop. In 1855 there were 226,629 acres under barley, and in 1900 the area under that crop had fallen to 161,534 acres, a decrease of 28 per cent., but during the same period the acreage under oats and wheat decreased by over 48 and 90 per cent. respectively. There can be no doubt that the steadiness exhibited by barley as compared with oats and wheat is chiefly due to the increase in brewing, for, as will be seen from the figures below, over half the barley grown in Ireland finds its way into Irish breweries. A remarkable proof of the close connection existing between barley growing and brewing is found in the fact that barley is, generally speaking, grown only in the brewing districts. Brewing has never been a really flourishing industry in the North of Ireland or Connaught, and it is accordingly significant to note that Ulster and Connaught have respectively but 3 and 2 per cent. of the total barley area of Ireland, although the former is the great tillage province. Practically all the great Irish breweries, past or present, would lie within the triangle formed by Waterford and Cork as the extremities of the base and Dundalk as the apex. Last year the only counties in Ireland in which over 10,000 acres were under barley were Wexford (31,360 acres), Kilkenny (19,102 acres), Queen's (18,373), Cork (17,109), Tipperary (17,020), Louth (14,345), King's (14,271), and Kildare (10,498). It is, of course, true that the location of many of the country breweries may have been determined, to some extent, by the reputation of their neighbourhoods as barley-growing centres, but still it is evident that the brewing industry exercises an important influence upon barley-growing and so tends to keep the land under cultivation and to keep the people at home.

The amount of barley grown in Ireland in 1901 was 6,530,716 bushels, whilst the quantity of malt used in making beer was 5,978,696 bushels, so that the amount of barley used by brewers was not much less than the entire yield of Irish barley-fields. All the barley grown in Ireland is not, however, used for the production of beer; some is not suitable for malting, and a con-

siderable part of the crop goes into ordinary consumption or is used for seed, whilst a quantity of barley as well of malt made from barley is used in distilleries, or is exported to English breweries, and consequently a large quantity of foreign barley has to be imported. In fact over 1,300,000 bushels of barley were imported into Ireland in 1901 direct from foreign countries, and probably at least as much again was imported *viâ* England.

Though it is difficult to say exactly what proportion of Irish barley finds its way into Irish breweries, there can be no doubt that very considerably over 50 per cent. of the crop each year is converted into malt which is used for brewing, and this fact alone suffices to emphasise the dependance of Irish barley-growers upon the brewing industry.

The Demand for Irish Barley.

There can be no doubt that good Irish barley possesses specific qualities that render it entirely suitable for the production of malt beverages, and owing to its superior quality, to say nothing of the desire to foster home industries, Irish brewers have always shown a marked preference for home-grown barley, though they are forced, owing to the insufficient supply, to import foreign barley. Whilst probably the supply of inferior Irish barley is quite equal to the demand, and cannot be profitably increased, there can be no doubt that the Irish breweries form a profitable market for well-grown and carefully harvested high class Irish barley, and that their demand would increase with any increase in the supply, for at present many brewers use foreign grain simply because a sufficient supply of good class home-grown barley is not available. The brewing quality of barley turns not only upon the suitability of the seed corn employed, but also on the character of soil, climatic conditions, and the care taken in manuring, harvesting, stacking, and artificially sweating the grain, and many brewers throughout the country have done much good work in assisting in bringing about an improvement in the methods of growing and harvesting barley. Thus Messrs. Arthur Guinness Son and Co. have for several years co-operated with the Irish Agricultural Organisation Society and with the Department of Agriculture and Technical Instruction for Ireland in carrying out barley-growing experiments, chiefly in County Cork and County Wexford, the objects of which are to test the suitability of different artificial manures, and the respective merits of different varieties of barley.

Farmers find by experience that some land is not fit for the growth of barley, and maltsters find that if barley is grown on certain soils it will not make good malt. Light calcareous soil is the best and usually produces an excellent crop, as also does well manured sandy soil, but cold clay land, even when well drained, will not produce the best malting barley. There is also room for improvement in the present methods of stacking, dressing, and grading the barley for market; the mixing of first class and second class grain is to be regretted; if each were sold on its own merits, the farmer would obtain a higher price all round, and would be more certain of obtaining regular customers.

Hops.

Hops are the second ingredient that calls for attention. On the average nearly 2 lbs. of hops, as well as about 2 bushels of barley are generally used in making a barrel of beer, and it is commonly estimated that over 500,000 cwts. of hops are used in the United Kingdom for brewing each year, and the amount used in Ireland is probably not less than 60,000 cwts. The quality of hops is

determined usually by (*a*) the colour, which should be a light yellow; (*b*) the fulness, which can be seen when a sample is cut out of a bale; (*c*) the quantity of seed they contain, and (*d*) the aroma or flavour. The hops used for making pale ales are finer in quality and dearer in price than those generally used for mild ales and for black beers. Hops are grown chiefly in America, Germany, and England, Kent being the chief centre of the hop gardens in the latter country. The area under hops in England has during the last thirty years ranged between 70,000 and 50,000 acres, and during the last few years it has been just above the latter figure. The labour bill forms the chief item in the price; it has been calculated that the average expenditure upon wages is £25 per acre of hops. During the first few days of the season dozens of special trains are run from London to various stations in Kent, which convey thousands of men, women, and children to assist in the harvesting of the hops. This annual exodus of the very poor from London to the hop gardens of Kent, for a short period of healthful and profitable work, is an interesting example of those temporary migrations of labour with which we are so painfully familiar in Ireland. The crop is a very uncertain one; in 1899 the yield in England was 661,373 cwts., and in 1900 only 347,894 cwts., though the acreage was practically the same in both years, and in 1901 the yield rose to some 550,000 cwts. Last year 116,042 cwts. of hops, valued at £459,051 were imported, of which two-thirds came from America, but this quantity was little more than half the average quantity imported during the past twenty years. Owing to the uncertainty of the crop, the price of hops is subject to great fluctuations, and consequently brewers carry a fair stock from year to year to guard against vicissitudes; and the application of the cold storage system to hops, has, by decreasing the depreciation in strength caused by keeping, exercised a further steadying influence upon their price.

Water.

Water is the last but not the least important ingredient which may be referred to. Generally speaking pale ales require a hard water and porter a soft water, such as that of Dublin and the south-east of Ireland generally. Brewery water is nearly always well filtered. Sometimes, without any known cause, the water suddenly goes wrong and as suddenly comes right again. These occasional troubles happen to most brewers in both town and country, though perhaps more often to the latter than to the former, and, while they last, they occasion great anxiety and loss. At the end of the year the item "returned beer" is an indication of their effect. For the purposes of brewing pale ale, where the water is soft, it is sometimes sought to harden it and render it suitable by the introduction of chemicals, and a porter brewer troubled with hard water may similarly attempt to soften it. It is, however, questionable if these attempts to rectify the water to suit the purpose required are entirely successful. A plentiful supply of naturally suitable water is indispensable to successful brewing. The quality of the water is frequently tested by analysis to detect impurities and to prevent mishaps. In addition to the water used in the process of brewing, an immense quantity is required for cleansing casks, for refrigerating, and other purposes. Many town brewers get their cooling water from wells and from the rain water which they store. In the country, where the water charges are not so heavy, the whole of the water required is usually drawn from the one source. It is difficult to obtain accurate statistics as to the quantity of water used in breweries, apart from the water consumed in the actual process of

brewing. It is probable that in an average sized concern, from twenty to twenty-five barrels of water are required for cooling, washing, etc., for every barrel of drink turned out; that is to say, a brewery turning out, say 100,000 barrels of beer in a year, will have a water consumption of, perhaps, over 70,000,000 gallons.

The Present Condition of Irish Breweries.

Some account has been already given of the progress of the brewing industry during the last two centuries, and the figures given on page 458 show the increase in production by decades during the last forty years, whilst the following Table, which has been kindly supplied by the Commissioners of Inland Revenue, gives a good idea of the present state of the brewing industry in Ireland:—

TABLE showing for the year ended 30th SEPTEMBER, 1901:—The NUMBER OF BREWERS in each of the undermentioned classes; the QUANTITIES OF MATERIALS USED by each class; the AMOUNT OF LICENCE DUTY PAID by, and BEER DUTY CHARGED on, each class.

CLASS.	Number of Brewers in each Class as represented by the Number of Licences issued.	Quantities of Materials used.				Amount of Licence Duty paid and of Beer Duty charged.
		Malt	Unmalted Corn.	Rice, Rice Grits, Flaked Rice, Maize Grits, Flaked Maize, and other similar preparations.	Sugar, including its Equivalent of Syrups, Glucose, and Saccharum.	
BREWERS FOR SALE who brewed (reckoning at the standard gravity of 1055°):—	No.	Bushels.	Bushels.	Cwts.	Cwts.	
Barrels. Barrels.						
Under 1,000	4	2,018	—	—	31	408
1,000 and under 10,000	16	144,719	40	663	1,899	29,743
10,000 ,, ,, 20,000	7	196,522	—	2,604	1,060	41,264
20,000 ,, ,, 30,000	2	74,828	—	1,765	4,189	19,126
30,000 ,, ,, 50,000	4	338,425	—	1,275	1,482	69,944
50,000 ,, ,, 100,000	5	464,941	—	—	983	92,722
100,000 ,, ,, 150,000	1	236,603	—	—	—	48,838
150,000 ,, ,, 200,000	1	287,288	—	—	—	58,548
2,000,000 and over ..	1	4,233,352	—	—	—	885,176
TOTAL	41*	5,978,696	40	6,307	9,624	†1,245,769
BREWERS NOT FOR SALE	Nil.	—	—	—	—	—

In order, however, to properly appreciate the present position of Irish brewers, it may be desirable to say something about each of the more important breweries. Ireland, so far as the collection of the beer duty is concerned, is divided into eight Collection Districts, and the following Table compiled from Parliamentary papers, shows the number of breweries, the

* The actual number of Brewers to whom Licences were issued was 39. A Brewer may hold more than one Licence.

† The Licence Duty paid being at the rate of £1 per licence, amounted to £41.

quantity of (1) malt, (2) unmalted corn, (3) rice, maize, and other similar preparations, and (4) sugar, etc., used in each Collection District during the year ended 30th September, 1901.

Collection District.	Common Brewers.	Quantities of Materials used by common Brewers.			
		Malt.	Raw Grain.	Rice, Rice Grits, Flaked Rice, Maize Grits, Flaked Maize, and other similar preparations.	Sugar, including its Equivalent of Syrups, Glucose, and Saccharum.
		Bushels.	Bushels.	Cwts.	Cwts.
IRELAND—					
Belfast	4	58,468	—	1,837	272
Cork	6	596,223	—	1,500	3,979
Dublin	7	4,754,448	—	1,275	14
Dundalk	4	243,763	—	197	2,518
Galway	1	5,632	—	—	—
Kilkenny	10	219,699	40	1,233	1,534
Limerick	3	89,022	—	265	1,226
Londonderry	3	10,881	—	—	81
TOTAL FOR Ireland, ..	*38	*5,978,136	40	6,307	9,624
TOTAL FOR United Kingdom,	1,847	54,314,687	165,073	1,323,287	2,822,253
PER-CENTAGE in Ireland,	2.0	11.0	0.024	0.47	0.34

* The difference between the number of brewers and the quantity of malt used, as set out in this table or the preceding table is accounted for by the fact that one victualler in the Kilkenny Collection District is licensed as a brewer for sale, and is included by the Commissioners of Inland Revenue in the preceding table but is excluded from this table.

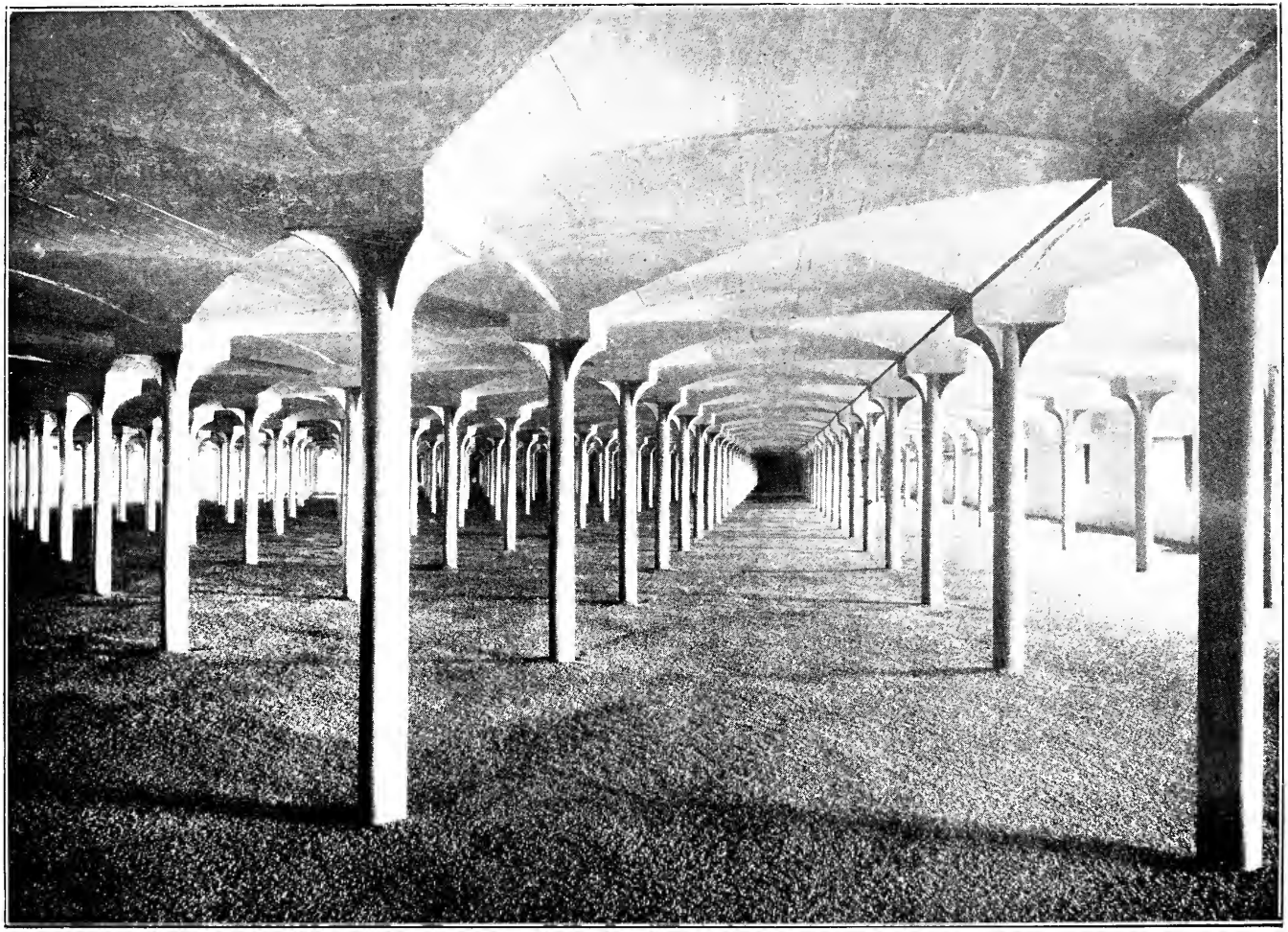
Thus it will be seen that whilst Irish brewers form only 2 per cent. of the total number of brewers in the United Kingdom, they produce over 8 per cent. of the beer and use about 11 per cent. of the total amount of malt, an almost infinitesimal portion of the unmalted corn, and less than ½ per cent. of the sugar, rice, maize, and other substitutes and preparations employed by the brewers of the United Kingdom.

THE DUBLIN COLLECTION DISTRICT.

Guinness's Brewery.

In dealing seriatim with the principal breweries in the chief Collection District, viz., Dublin, the first to be noted is, of course, the great firm of Messrs. Arthur Guinness Son and Co., Ltd., who occupy an absolutely unique position. In the year 1900-1901 there were about 37,000,000 barrels of beer made by the 6,440 brewers of the United Kingdom who brew for sale, and of this total over one-twentieth was brewed by the single firm of Guinness, who have by far the largest output of any firm in the United Kingdom or, indeed, in the world. The unique position occupied by Guinness's Brewery is shown by the fact that they manufacture more than two-thirds of all the beer brewed in Ireland. The first Guinness connected with the great brewery was Mr. Arthur Guinness, who purchased the concern as it then stood from a Mr. Rainsford in 1759, and it is understood that even at that date the brewery was already long established. The brewery then possessed a frontage of ninety feet, stretched back to a depth of three hundred and eighty feet, and abutted on three streets. The colossal business now

FRONTAGE OF PART OF PREMISES.



ONE OF THE MALTING FLOORS.

This Illustration shows the Malt spread out on the Floor in the Process of Germination.

enjoyed by this firm is all the more remarkable from the fact that some of the other brewers carrying on business in Dublin are of greater antiquity, and very much exceeded the trade of the St. James's Gate Brewery in the eighteenth century.

The beer 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, which is generally exported in wood; and Foreign Stout, which is specially brewed in the coolest season, stored in vats for a long time, and prepared for the bottlers, chiefly in Dublin, Liverpool, and London, who supply foreign markets.

The trade of the St. James's Gate concern was at first a local one, but about the year 1825 English Agencies were established, and henceforward there was a rapid increase in the trade across the channel. In 1834 their exports are stated to have been about 34,000 barrels of stout and porter per annum. In 1856 the figure had increased to 62,000 barrels, while to-day the annual export of Guinness's porter and stout is said to amount to more than 600,000 barrels. It was not until about the year 1860 that the export trade of Guinness to foreign countries and the colonies assumed any considerable dimensions; but the trade now done in this direction is very large.

The firm was turned into a public company in October, 1886, with a capital of £6,000,000, divided into 250,000 Ordinary Shares of £10 each, £1,500,000 Five per cent. Debenture Stock, and £200,000 Six per cent. Cumulative Preference Shares of £10 each. The £1,500,000 Five per cent. Debenture Stocks may be redeemed, at the Company's option, after January 1st, 1907, at 110 per cent. The prospectus shows that the profit made in the five years before flotation averaged £452,294 a year, while the profit made the year immediately preceding the formation of the new Company was £554,327. To show how this Company has expanded we give a tabulated statement showing full particulars taken from the balance sheets from 1887 to the financial year ending 30th June, 1901.

Year ending 30th June.	Excise Duty Paid.	Net Profits.	Dividend on Ordinary Shares.	Amounts placed to Reserve Fund.	Amounts placed to Depreciation Fund.	Balance Forward.
				£	£	£
1887	£339,443 for 9 months or at rate of £452,590 per annum	£544,985 for 9 months or at rate of £726,646 per annum	12 per cent. and 2 per cent. Bonus.	200,000	20,000	20,214
1888	457,080	790,930	15 per cent.	150,000	30,000	49,811
1889	481,066	712,035	15 ,,	125,000	30,000	25,641
1890	499,408	719,665	15 ,,	100,000	30,000	32,284
1891	524,170	749,518	15 ,,	100,060	30,000	68,427
1892	522,248	685,609	15 ,,	100,000	30,000	40,975
1893	544,709	703,331	15 ,,	100,000	30,000	31,681
1894	535,301	657,186	15 ,,	50,000	30,000	24,027
1895	600,627	717,259	16 ,,	75,000	30,000	25,193
1896	624,964	741,997	16 ,,	*a*100,000	30,000	26,554
1897	606,417	790,180	18 ,,	*a* 85,000	25,000	44,300
1898	646,237	839,182	19 ,,	*a*125,000	25,000	46,997
1899	680,448	812,699	19 ,,	*a* 80,000	25,000	66,123
1900	743,300	781,656	19 ,,	*a* 80,000	25,000	53,359
1901	864,123	850,613	20 ,,	*a*100,000	30,000	48,562

a These amounts were placed to Reserve for Capital Expenditure and Contingencies.

The value of the concern has enormously increased from the six millions at which it was valued in 1886. To-day it is valued by the public according to the current market prices at nearly twenty millions of money, and had the profits grown with the trade it is hard to estimate what this figure would have been. In the year ended 30th June, 1888, the Excise Duty paid was £457,080, and the net profits were £790,930, *i.e.*, the net profits were almost 75 per cent. more than the duty paid. In the year ended 30th June, 1901, the Excise Duty paid was £864,123, and the net profits were £850,613, *i.e.*, actually less than the Excise Duty, notwithstanding the fact that in this profit is included the interest derivable from over a million of money held in reserve. Thus, whilst the amount paid in duty increased 89 per cent. in thirteen years, the increase in net profits during the same time has been under 10 per cent. If, as seems most probable, the increased taxation which the Chancellor of the Exchequer has put upon the brewing trade is the cause of this diminution in profits, it is evident how hard the smaller breweries must be hit by the increase in the beer duty.

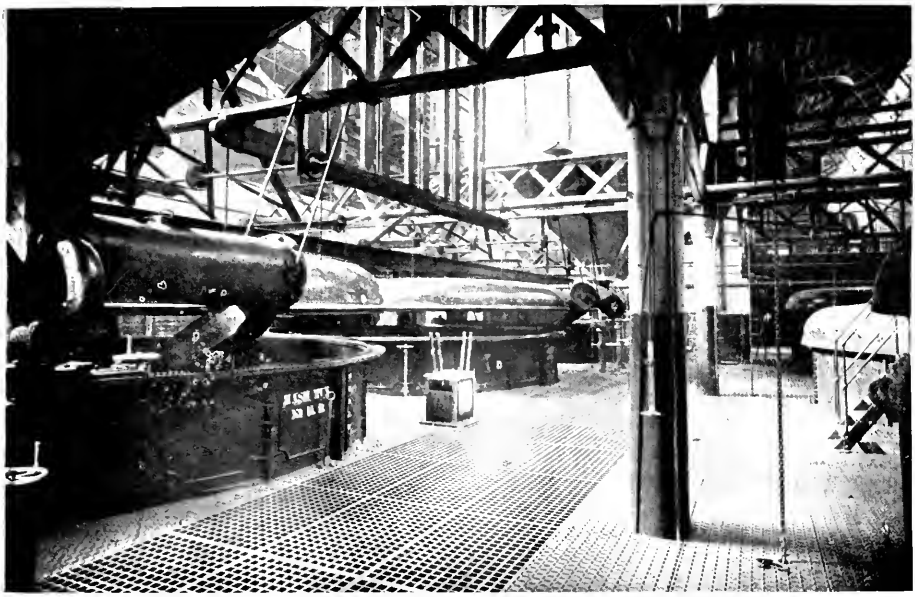
As has been already mentioned, the firm use Irish barley as far as possible, and about 60 per cent. of the malt used is made from home-grown grain, but a sufficient supply of Irish barley cannot be obtained, and consequently a considerable quantity has to be bought in Great Britain, and a small amount is imported from foreign countries. Like most brewers the Company make a large part of the malt they use, and the remainder of the malt required is made by various firms throughout the country on commission, or is bought in the Irish, Scotch and English markets. The hops used are obtained from Kent and America.

The Grand Canal supplies most of the water used for brewing. This water is of a moderate degree of hardness and is taken from filter beds at the fifth lock. 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. The enormous amount of water used is shown by the fact that, irrespective of the produce of two wells situate within the premises, the Company pay over £4,000 per annum though the rates are as low as 2½*d.* and 4*d.* per 1,000 gallons.

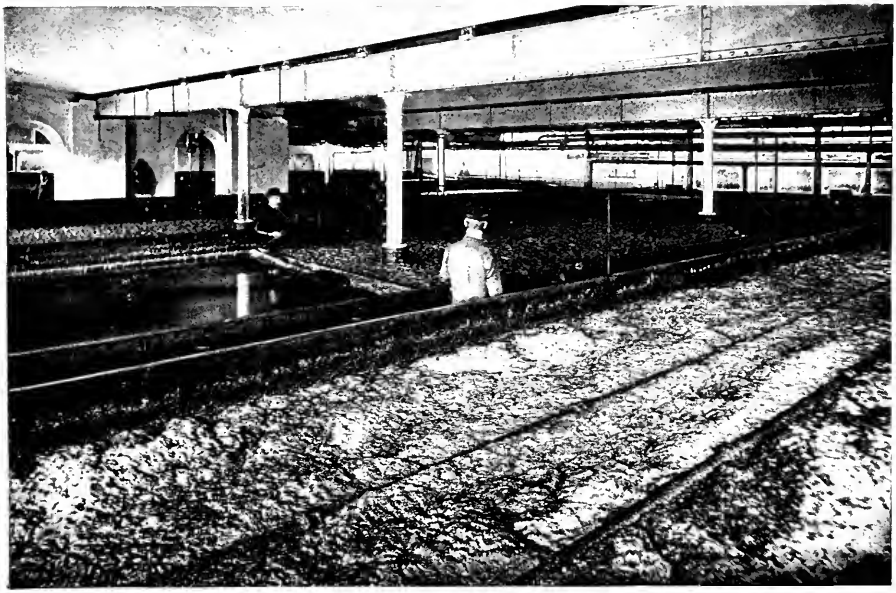
In 1860 the premises occupied by the brewery covered about four acres, but in proportion as its trade increased, the firm gradually acquired the ground adjacent to it, in order to carry out the extensions required. The buildings are composed of two principal parts, the old brewery and the new brewery, which was built in 1879 and subsequently extended to meet the growing demand for accommodation, and the premises to-day occupy more than forty acres, and are constantly being still further extended.

The premises are situated on three different levels. The first or upper level is about sixty 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, the grain stores, a vat house, and other buildings; while the third or lower level on the Victoria Quay consists of the carpentry, the cooperage shops, the cask washing sheds, the racking and filling stores, as well as the platforms on which the goods are loaded, according to their destination, on dray, boat, or railway.

The firm owns 160 drays and floats, 153 horses, 9 steamers, and 5 motor trucks, and more than 120 drays of stout leave the establishment daily, whilst the principal railways in Ireland have connecting lines to the brewery.



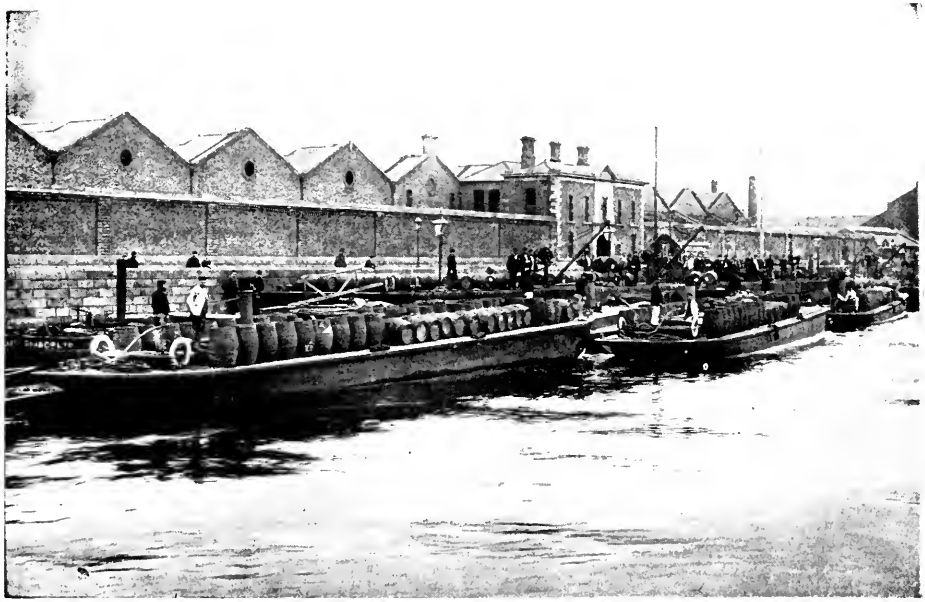
VIEW OF MASH TUNS.



THE CLEANSING HOUSE.

This Illustration depicts the Process of Skimming the Yeast from the Stout.

VIEW OF THE COOPERAGE YARD.



LOADING WHARF ON THE RIVER LIFFEY.

A special quay extends along the Liffey opposite the entrance to the lower level of the brewery. Steam barges belonging to the firm take the casks from this quay and bring them down to the Channel steamers anchored at the North Wall, as well as to the numerous vessels waiting at the mouth of the Liffey.

The different levels of the brewery are all united by a miniature railway line with a 22 inch gauge, and 15 small engines and a number of trucks bring down the casks. A spiral tunnel, similar on a small scale to that used on the St. Gothard Railway, gives the means of running from the middle up to the upper level. A great number of industries are carried on in the brewery premises. One comes across engineers, machinists, farriers, carpenters, joiners, brasiers, plumbers, painters, and other artisans, for, the repairs necessary to the machinery and general plant are done by the workmen employed by the brewery, and over 50,000 casks were made last year. One vast building is reserved for a printing plant, and extremely costly machinery has been set up to print the labels required for the firms engaged in the bottling of Guinness's Extra Stout. Over a million of these labels are printed each day. A post office adjoins the business offices, and over 300,000 letters arrive there annually, whilst the cost of postage stamps alone amounts in the year to nearly £4,000.

The laboratory, that most indispensable and important adjunct to every modern brewery, is on a vast scale. It is separated from the other departments and contains a large amount of special appliances adopted to the study of important processes relating to the brewing of porter.

The new electric installation, which serves for lighting as well as for the transmission of power at present contains plant of which the total power is 800 units, and greater power is being added. The dynamos are driven directly by vertical steam engines of a high velocity which work on the three wire system (with the middle earthed) at a continuous current of 420 volts across the outers.

The telephone and telegraph offices (situated in the main business offices) comprise a central telephone office connected with over forty branch stations throughout the brewery, and a pneumatic despatch system for the transmission of letters from one department to another is also in use.

An interesting exhibit in the Cork Exhibition is the model of the brewery which was first shown at the Paris Exhibition of 1900, and which gives a very striking idea of the huge establishment at St. James's Gate.

The Phœnix Brewery.

The Phœnix Brewery Co., Ltd., which claims to have the second largest capacity of the Irish breweries, stands on the opposite side of the street to Guinness's, and has an imposing frontage, whilst the buildings stretch back 540 feet towards the Liffey. This brewery was founded in 1778 by an English brewer named Mather, and was afterwards worked under the name of Daniel O'Connell, Jun. and Co. In 1828 the concern was taken over by Mr. John Brennan, father of Mr. Chas. Brennan, who at his father's death became proprietor of the brewery. He considerably enlarged and improved the concern, did a very extensive trade, both home and export, and also enjoyed a large share of military trade. In order to make the extensions required by the growth of the business, Mr. Brennan purchased and annexed the adjoining "Manders" Brewery, which covered six acres of ground. In January, 1897, the brewery was converted into a

public Company with a share capital of £190,000 and £100,000 4¼ per cent. Debenture Stock. The Company also acquired extensive maltings at Monasterevan, Sallins, Ballyroe, and Skerries, and are large consumers of home grown barley.

The Anchor Brewery.

The Anchor Brewery, Usher Street, is one of the oldest breweries existing in Dublin, having been founded so far back as 1740. The present proprietors, Messrs. John D'Arcy and Son, Ltd., have in their possession the title deeds of Messrs. Kavanagh and Brett who were the owners in 1782. Up to that time it would appear the liquor brewed in Dublin was ale and light beer, and the following advertisement cut from *Saunder's News-Letter*, published in Dublin in 1798, is interesting as fixing the date when the popular drink, for which Dublin has since become famous, was first brewed there :—" They (*i.e.*, Messrs. Kavanagh and Brett) are brewing under the direction of Mr. Chas. Page of London, Porter of a very superior quality, which will be found on trial to equal any imported from England."

From Messrs. Kavanagh and Brett the Brewery passed nto the hands of Mr. John Dominick Byrne, a practical brewer and excellent man of business who considerably increased the output, and, on his retirement in 1818, the premises were purchased by Mr. John D'Arcy for a sum of £35,000, which proves that, in those days of many breweries, the business must have been one of the largest in the city. Mr. D'Arcy was succeeded by his son, the late Mr. Matthew P. D'Arcy, in 1864, who added considerably to the property in land, buildings and plant. The premises now extend over 5 acres, and it is, in fact, one of the largest concerns of the kind in the United Kingdom. On the death, in 1889, of Mr. Matthew D'Arcy, M.P., who was a very well known public man, his sons Messrs. William M. D'Arcy and James F. D'Arcy, continued the business which they converted into a private Limited Liability Company in 1896.

The principal trade of this brewery has always been in Ireland, but the export business has not been neglected, and the quantity shipped last year amounted to close on 16,000 Hhds. The firm finds employment for over 300 people, and is capable of turning out 250,000 barrels annually. It may be mentioned that this firm have always been noted for the very high class of horses (all Irish bred) which they use. These horses, one of which is shown in an illustration, have won no less than ten first prizes at the annual Spring Show held at Ball's Bridge, Dublin, as well as the Guinness Championship Cup, for the best horse and vehicle, on three different occasions.

The Ardee Street Brewery.

One of the oldest, if not the oldest firm in Dublin, is the Ardee Street Brewery, the property of Messrs. Watkins and Co., the proprietors being Mr. Wellington Darley and Mr. Alfred Darley. Watkins' Brewery can lay claim to great antiquity, for, from papers held by the firm, it is believed that the site of the present brewery is the same as the site of the Brew House of the Monastery of St. Thomas at the time when the Monastery owned the " Liberties " of Dublin. On the suppression of the Monastery in 1536 their property was granted to the Earl of Meath, under whom Messrs. Watkins hold leases dating so far back as 1691, and it is believed that brewing has been carried on continuously in the same place since 1536.

In the year 1766, when there were forty brewers in Dublin paying Excise

duty, Watkins' Brewery was owned by Sir James Taylor, who headed the list of duty payments, at a time when the present firm of Guinness paid but a small amount. In 1790 the number of brewers had increased to fifty, paying between them £40,788 19*s.* 4¾*d.* Excise duty, and Watkins still headed the list of duty payers, paying £3,325 10*s.* 5¾*d.*, while Guinness paid only £744 17*s.* 0½*d.* The concern came into the ownership of Messrs. Richard and Joseph Watkins in the early part of the last century. The Darley family are connected by marriage with the Watkins, and so afford another example of the hereditary association certain families have had with the brewing industry in Ireland, for, as in the case of the Guinness, D'Arcy, Cairnes, Murphy, Thornhill, Smithwick, Macardle, Brennan, Beamish, Crawford, Cherry, Keily, Cassidy, Perry, Sullivan, and other families, many of the principal breweries in Ireland have been kept in the same families for generations. Messrs. Watkins and Co. do not brew ale, but confine themselves exclusively to stout and porter for bottle and draught. They brew from malt and hops only, and make all their own malt from Irish barley, grown mostly in the Counties of Tipperary and Wexford.

The Mountjoy Brewery.

The Mountjoy Brewery was founded in 1852 by Mr. Alexander Findlater, a Scotch gentleman who settled in Dublin. Mr. Findlater's name is perpetuated in Findlater's Church, a handsome building at the corner of Rutland Square, which he presented to the Presbyterian community. The brewery was formed into a Limited Company in 1890, and was very fortunate in being bought at a moderate price, and having only a small capital on which to pay dividends. The brewing is in the hands of Mr. J. R. Blood, grand-nephew of the original proprietor. The brewery, which is situated in the north-eastern extremity of Dublin, covers four acres of ground, and has a frontage to the main street of 240 feet. The maltings, vat houses, cooperage, etc., are situated at the back, and the whole is enclosed by a lofty stone wall and numerous buildings. This firm buy the best malt and hops procurable, and notwithstanding all the difficulties with which Irish brewers have to contend, are steadily making headway. Nothing but stout and porter has ever been brewed at the Mountjoy Brewery, and the liquor is sold principally in Ireland and England. The firm, however, ship a considerable quantity to Gibraltar, Malta, and Cyprus, where they have a connection of many years standing. Their "Crown" nourishing stout is a specialty, and their export trade during 1901, according to the shipping returns of the Port of Dublin, published in the daily papers at the beginning of the year was next to Messrs. Arthur Guinness and Co.

The North Anne Street Brewery.

The North Anne Street Brewery, Dublin, the proprietors of which are Messrs. Jameson, Pim and Co., can lay claim to very great antiquity; they hold old leases dating from 1715, and that portion of their works which embraces Hasard's Brewery, Beresford Street, is said to be of even earlier date. The business now includes those of James Pim and Co., Thunder and Co., Ally and Co., and Robert Manders and Co., which at different times have been absorbed by it. The present proprietors of this brewery also own the famous distillery of Messrs. John Jameson and Son, Ltd., of Bow-street. The premises and plant are in excellent order, and are being continually improved, and a new main boiler, engines, and chimney shaft have just been put in. All the malt used is made by the firm at the brewery maltings, almost entirely from Irish barley, the greater part of

which is purchased at their stores in Queen's County and Wexford, and the balance on the Dublin Corn Exchange. They malt about 30,000 barrels a year. About 200 persons are employed in the brewery, which is capable of turning out 100,000 Hhds. annually. In addition to the home trade, the firm exported 21,419 Hhds. last year according to the statistics published. They have stores in Manchester and Bristol, and many agents throughout the country both in England and Ireland.

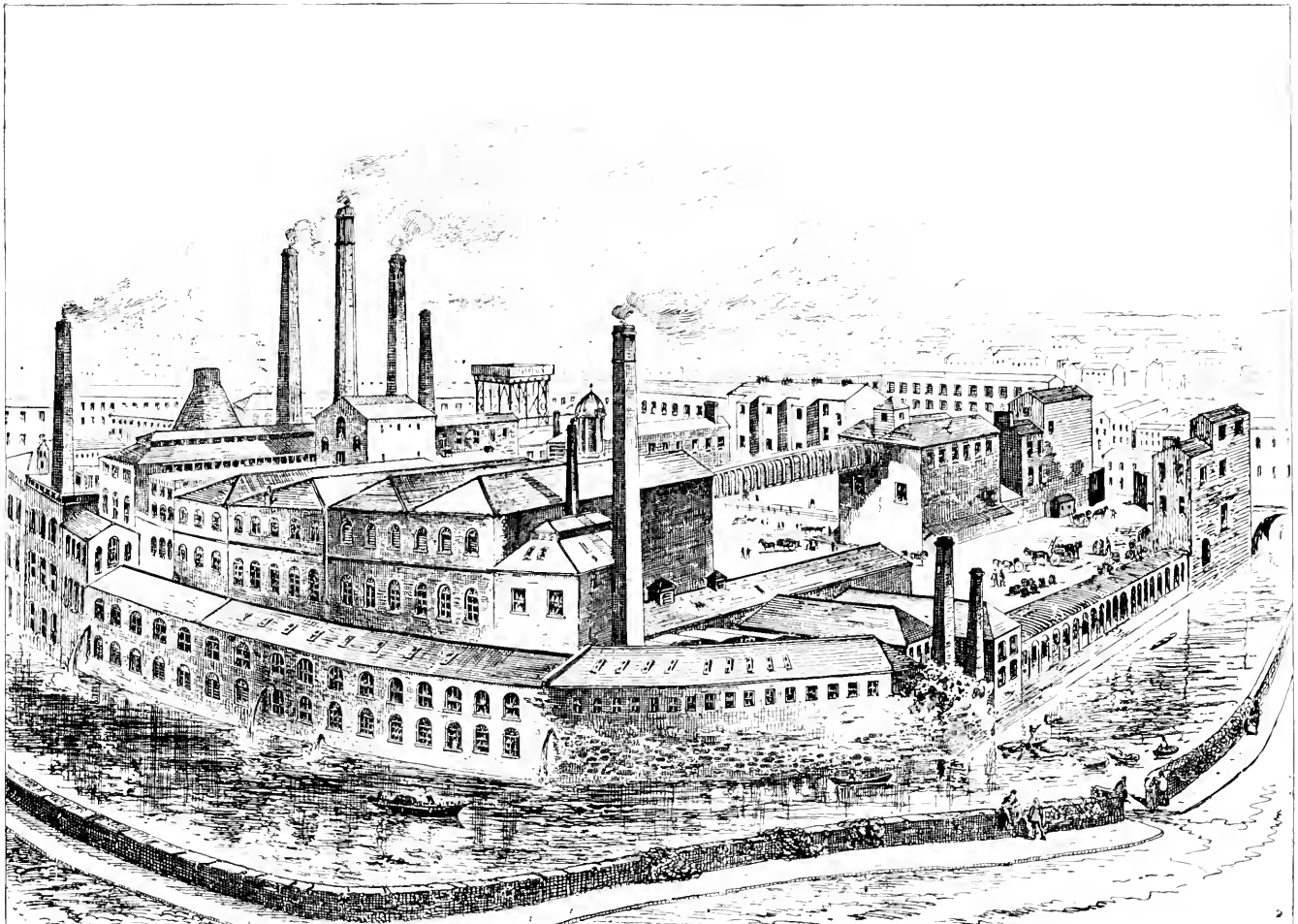
The Cork Collection District.

The second largest Collection District is that of Cork, which contains four independent breweries, where 596,223 bushels of malt were brewed in the year ended 30th September, 1901. The City of Cork has always been a great home of the brewing industry, and now contains two large breweries. A stranger landing in Cork, and driving through the city, is met on all sides by the names Murphy, and Beamish and Crawford, and it would seem that both these breweries have been fortunate enough to secure property in a large number of licensed houses, in the City of Cork, and indeed all over the South of Ireland.

Lady's Well Brewery.

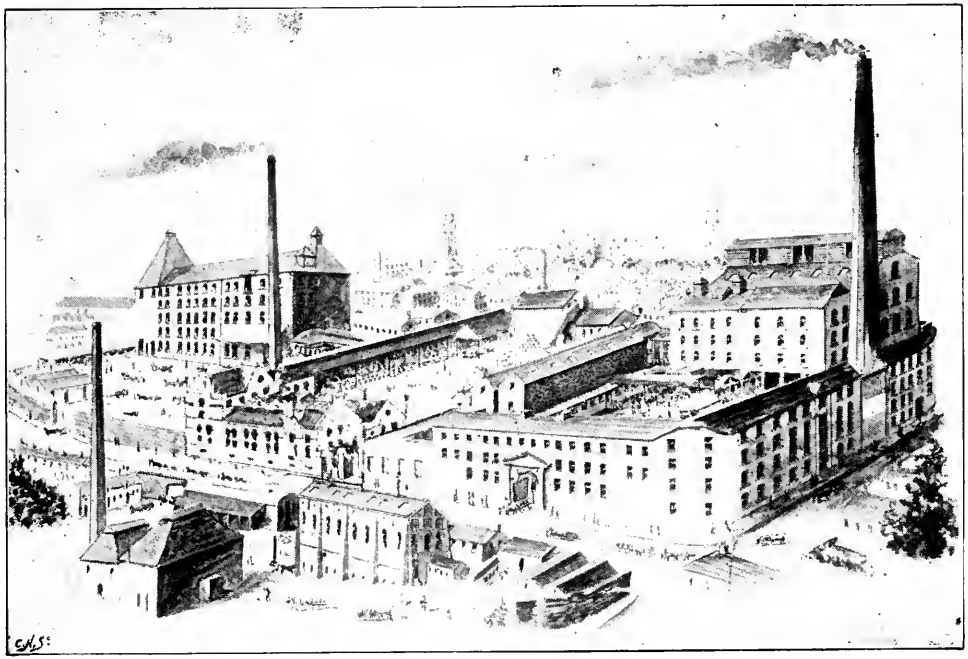
The Lady's Well Brewery, as Messrs. James J. Murphy and Co., Ltd., designate their premises, is situated in Leitrim-street, at the north side of the city, and is overlooked by the old Steeple of Shandon, famous for its bells. The buildings are irregular and picturesque, and cover over four acres. Close by is the ancient well from which the Brewery takes its name. The business was established in 1856 by Messrs. James J., William J., Jerome J., and Francis J. Murphy, and was turned into a private Limited Company in 1883. It has a capital of £500,000, divided thus, £300,000 in Ordinary Shares, £100,000 five per cent. Debentures, and £100,000 four per cent. Debentures, which, considering the size of the brewery, the extensive trade attached to it, and the large interest in licensed property which they control, must be much under the value of the concern, but as the family hold all the shares in their own hands this is immaterial. Some twelve years ago the brewery was remodelled and the plant renewed, and last year Messrs. Jas. J. Murphy and Co., Ltd., acquired the St. Finbarr's Brewery, Cork (Sir John Arnott's) and the Riverstown Ale Brewery and Maltings They have closed and dismantled both these breweries, but are working the malt houses. The licensed property of Messrs. J. A. Arnott and Co., Ltd., in the City of Cork was very large and turned out a valuable adjunct to the trade of Lady's Well Brewery, which now stands high up in the sale returns of the breweries of the United Kingdom. For many years Messrs. Murphy and Co. have been competing successfully for the English trade, notably in the Midlands and in the South. They were awarded Gold Medals for "highest excellence" at the Brewers' Exhibitions in Dublin in 1892, and in Manchester three years later. Only hops and malt are used; and the Company who now annually malt over 40,000 barrels of Irish barley, have done much to promote barley growing in their neighbourhood. They have a fine electric installation, electricity being largely used in the brewing for motive power. About 200 persons are employed in the brewery and cooperage, irrespective of clerks and travellers.

The local support given to Murphy's Brewery was well repaid by Mr. James J. Murphy at the time of the failure of the Munster Bank. When the Share-



BEAMISH AND CRAWFORD, CORK.

LADY'S WELL BREWERY.



JAMES J. MURPHY AND CO., CORK.

holders Committee were unsuccessful in forming a Directorate to restart it, he took up the undertaking which appeared at the time to be hopeless, formed a Board of Directors, and re-opened the Bank under the title of the "Munster and Leinster Bank," with a very limited amount of capital at its disposal and in the teeth of the most adverse criticism. From 1885 to 1888 he gave the liquidation of the old bank and the budding business of the new bank his undivided attention, and, before he died he had the satisfaction of seeing the old bank satisfactorily wound up and the new one in a sound financial position. Few realised the far-reaching view he took of the situation at the time of the failure. His opinion was that, unless the liquidation of the old bank was voluntary, and the new one started to take over and nurse the accounts locked up by the closing, the South of Ireland would receive a monetary shock from which it would take years to recover. Ably assisted by the late Mr. R. C. Hall of Cork, and Mr. F. W. Pim of Dublin, he carried through the liquidation, and undoubtedly saved the province of Munster and a portion of Leinster, from a calamity the results of which would have been far-reaching.

The Cork Porter Brewery.

Messrs. Beamish and Crawford, Limited, who own the other brewing establishment in Cork—the Cork Porter Brewery—is one of the oldest firms in Ireland. Records in the hands of the proprietors show that this brewery was in existence in the beginning of the eighteenth century, and that in 1715 it was in the possession of one Edward Allen. Later documents prove that in 1791 it became the property of William Beamish and William Crawford, whose descendants have ever since carried on the business, and are to-day represented by Mr. Richard Henrik Beamish and Arthur Frederick Sharman-Crawford. Writing in 1809, Wakefield states that Guinness was then only the second brewer in Ireland, Beamish and Crawford, brewing annually 100,000 barrels, standing first. Considering the great decline in the population of Ireland, which, of course, brewers are about the first to feel, Beamish and Crawford have held their own, introducing every possible requisite to keep their establishment in the front rank among the more important breweries of the United Kingdom. Like the Murphys, they have gradually added licensed property after licensed property to their register, and last year they purchased Lane's Brewery, and all the licensed houses in Cork and the South of Ireland which were attached to this concern, so that their output must now rank among the three largest in Ireland. In addition to the large local trade, the firm has, during the last few years, extended its field of enterprise by opening up an export trade in England.

In 1865 the brewery, maltings, machinery, and plant, were almost entirely rebuilt at a cost of over £100,000. The Brewery is situated in South Main-street, and is bounded on two sides by the south channel of the river Lee, which washes the walls. The brewery buildings, which, with the yards, cover many acres of ground, are quite enclosed by houses and high walls, and are erected round two big quadrangles. Both porter and ale are manufactured, entirely from malt and hops, and the former is sold at home and abroad. The ale brewed is entirely consumed in Ireland, and is sold both in cask and bottle. Their maltings which are situated in Nile-street, a short distance from the banks of the Lee, cover some acres, and are entirely enclosed. They are of very large dimensions, and consist of a picturesque block of buildings formed round three sides of a square court.

The whole of the machinery throughout the establishment of Messrs. Beamish and Crawford, is worked by electric motors. All casks used for the brewery are made on the premises at the cooperage, and so pleased are the Cork Coopers' Society with the work done, that they asked Messrs. Beamish and Crawford to exhibit their oak casks at the Cork Exhibition, which they agreed to do. The generosity of the firm is shown by the contributions which they have made to the re-building of St. Fin Barre's Cathedral, and to the enlargement of the Queen's College, Cork; whilst the Crawford Municipal School of Art perpetuates the munificence of the late Mr. W. H. Crawford.

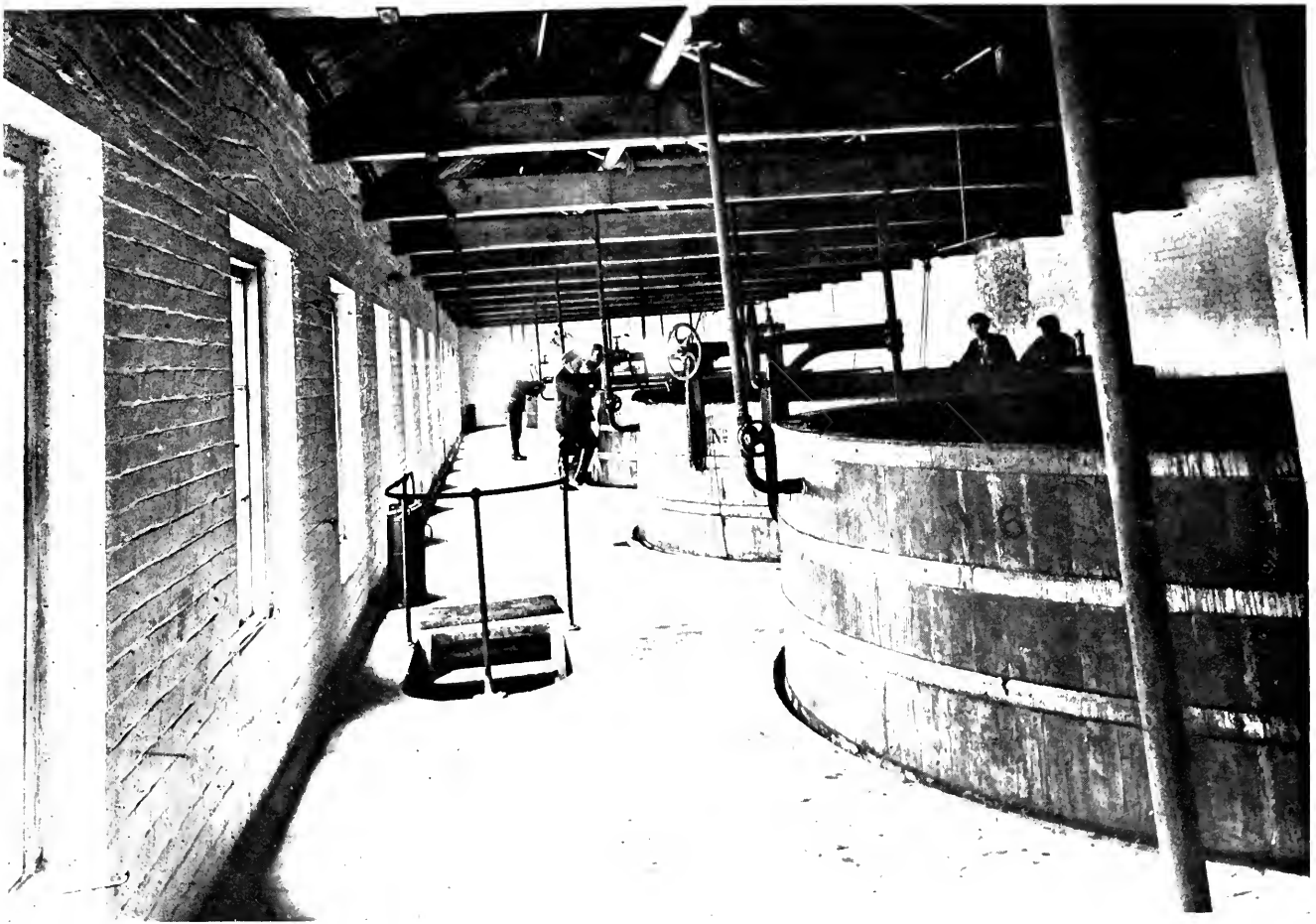
The Clonakilty Brewery.

This brewery was established over 100 years ago by Mr. Rickard Deasy, the father of the late Mr. Justice Deasy, in conjunction with the father of the Rev. Henry Stewart, at one time Rector of Rathbarry, and the business was disposed of, about twenty years ago, by order of the Court of Chancery and was purchased by Messrs. Travers, Canty, and Wright. It is a Limited Liability Company, with a nominal capital of £20,000. In their neighbourhood, within the last quarter of a century, two breweries have ceased working, one in Skibbereen and the other in Bandon in the West Riding of Cork, and as is always the case in the survival of the fittest, Messrs. Deasy and Co.'s trade has improved. This firm purchase locally between 5,000 and 6,000 barrels of barley per annum, and they are particularly well situated for a good supply of barley, as the land lying along the sea board is especially suitable for its growth, and the sea weed makes an excellent manure. They are anxious to improve the quality of the barley grown, and think that information as to the best seed and where to get it, and instruction as to the sowing, treatment, and dressing of the crop would be of material advantage to the farmers. This firm brew exclusively from malt and hops, and use neither substitutes nor sugar, and have a large business in bottled stout especially in their neighbourhood. They do a large bottling trade, and make a specialty of ginger beer. They obtained first class highest diploma medal at the World's Fair in Chicago, 1893.

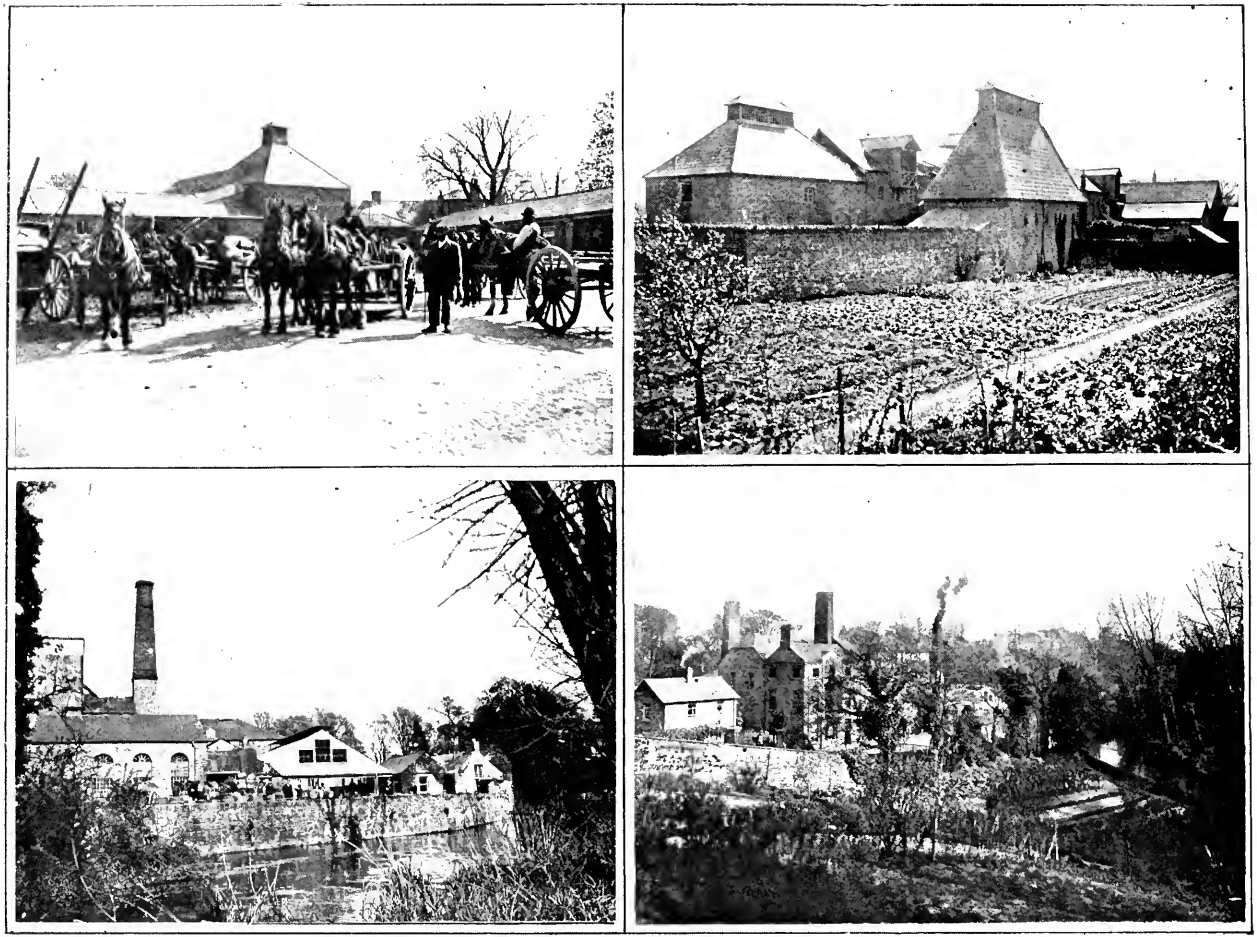
The Bandon Brewery.

The Bandon Brewery has been established for close on a century, but its ownership changed about the year 1865, when it was acquired by its present proprietors, Messrs. Allman, Dowden and Co. It is not a limited company but a private concern, and its business has been principally a local one, but of late it has been extending considerably to the more distant towns and districts of County Cork, as well as to other counties in the South of Ireland. Its trade, like other County Cork breweries, is largely a tied business. Lately its plant has been completely remodelled, and improved with the most up-to-date machinery, etc., necessitated by the increased demand for its produce. It is what is known as a twenty-five quarter plant, capable of an output of 400 barrels per week. Being situated in the centre of a fine barley-growing district, the brewery is in a position to obtain its supplies of grain for malting purposes from the local farmers. Nothing is used in the manufacture but hops and malt produced from the finest qualities of home-grown barley, and the output now is increasing largely month by month.

There were two other breweries working in Cork until recently, but they have been amalgamated with the existing establishments.



ONE CORNER OF THE FERMENTING ROOM.
Each vessel contains 500 barrels.



VIEWS OF THE CASTLEBELLINGHAM BREWERY.

The County Louth Breweries.

The next largest Collection District is that of Dundalk, which contains five breweries, all in the County Louth.

The Castlebellingham and Drogheda Breweries.

The Castlebellingham and Drogheda Breweries Company, Limited, own two breweries, one in Drogheda and one in Castlebellingham, which were amalgamated in 1890. The Drogheda Brewery is still called Cairnes' Brewery by many, owing to the old association of the Cairnes family with the brewery. The late Mr. William Cairnes, the grandfather of the present chairman of the Drogheda and Castlebellingham Breweries Company, founded the Drogheda Brewery so far back as 1825. The founder of the brewery was succeeded by his son, Mr. Thomas Plunket Cairnes, who devoted much of his time to public affairs. The confidence felt by the public in the large and profitable nature of the trade was shown when the concern was floated in 1890 as a Limited Company, in conjunction with the Castlebellingham Brewery, as the capital of £265,000 was eagerly applied for by the public. Mr. Thomas Plunket Cairnes died in 1894 and was succeeded in the Chairmanship of the breweries by his son, Mr. William Plunket Cairnes. Mr. A. T. Cairnes is General Manager of the Company and is assisted by Mr. J. Cecil Thornhill at Drogheda, and by Mr. Charles Thornhill at Castlebellingham. In the early days of the brewery, ale was its principal manufacture, and Drogheda Ale was celebrated all over Ireland. From 1850 to 1860, porter became the more popular drink, and Cairnes' porter thenceforth became recognised as a sound, full bodied, well-flavoured article. The firm a few years ago were successful in introducing a light, bright, highly hopped ale, at a moderate price to meet the popular demand. The Cairnes are also large maltsters, having two houses at the brewery, as well as Balfour's maltings, a malt house at the New Quay (formerly Gernon's Brewery), and the Linen Hall Maltings in Drogheda, which, of course, contribute in a great extent to the prosperity of the local farmers. The brewery premises are conveniently situated; the north side abuts on the river, and coals and other imports can thus be delivered direct into the yards, while it is but a comparatively short distance from the railway station. The supply of water from the Tubberboice Well is considered specially good for brewing, and the Company have added recently to their supply by boring through 400 feet of solid rock, where eventually they tapped an excellent spring. The business of the brewery extends to all parts of the country, the Company having many agents and travellers under the general superintendence of Mr. Robert McIntosh.

The Castlebellingham Brewery.

The Castlebellingham Brewery is situated close to the river Glyde, and the beauty and picturesqueness of its surroundings leave nothing to be desired. The buildings, including the brewery, the malthouses, stables, and dwelling-houses, extend northward and cover an area of several acres. The business was established early in the eighteenth century by a member of the Bellingham family, who was succeeded in the ownership by the Woolsey family. In 1888 the brewery was converted into a private Limited Liability Company, and in 1890 it was amalgamated with the

brewery owned by Messrs. Cairnes and Sons, Drogheda, and the combined business was turned into a public company, with a capital of £265,000. Thackeray was amongst the visitors to Castlebellingham, and very pleasant allusions are made in his "Irish Sketch Book" to the merits of the Bellingham ale. Charles Lever also in his last work, "Lord Kilgobbin," speaks favourably of the Castlebellingham brew—

"It's downright good. Let us have some more of it." And he shouted "Master" at the top of his voice. "More of this," said Lockwood, touching the measure. "Beer or ale, which is it?" "Castlebellingham, sir," replied the landlord; "Beats all the Bass and Allsopp that ever was brewed."

"You think so, eh?"

"I'm sure of it, sir. The club that sits here had a debate on it one night, and put it to the vote, and there wasn't one man for the English liquor."

Since Lever's time the business has increased very considerably, which has necessitated extensive additions to the plant, premises, malthouses and stores. A notable feature of the business, in addition to the ordinary wholesale and export trade, is the business done with the army, and a book of testimonials of goodly size bears witness to the excellence of the beer supplied, not only to home stations, but also abroad in the Mediterranean, Hong-Kong, Egypt, etc. The brewery and malthouses employ a large staff of labourers and mechanics, such as coopers, carpenters, plumbers, masons, harness makers, etc.; the principle observed being to carry on the industry with home labour for the benefit of the families in the vicinity. In buying materials also the Company follow the principle of encouraging home industries, and are very extensive purchasers of the barley, hay, and oats grown by the farmers in the district, Louth barley being held in high estimation by maltsters and brewers.

The Dundalk Brewery.

Tradition says that the site of the Dundalk Brewery, known as Cambricville, was originally a cambric factory established by the Huguenots. Be this as it may, it is well known that brewing was carried on here in the end of the eighteenth century, with varying fortunes, until the time of Father Mathew's crusade, when the Cambricville Brewery was closed like many similar establishments. But another brewery in Dublin-street, Dundalk, weathered the storm, and in the fifties was run by Messrs. John and Arthur Duffy and Mr. Edward Henry Macardle, J.P., under the style of Messrs. Duffy and Macardle. About 1859 Mr. Arthur Duffy sold his interest to the remaining partners, and soon after Mr. John Duffy's death his widow disposed of her share to Mr. Macardle, who in 1863 formed a partnership with the late Mr. Andrew Thomas Moore, J.P., of Ashton, Phœnix Park, Dublin New capital and more energy being now introduced, the business increased, and in view of the rapidly increasing trade, additional premises had to be acquired, and Messrs. Macardle, Moore and Co. purchased the premises at Cambricville from the late Mr. James D. McAlister. The concern was converted into a private Limited Liability Company in 1894, under the name of Macardle, Moore, and Co., all the shares being retained by members of the two families, and Mrs. M. Macardle, who is the "Chairman," is said to be the only lady in the United Kingdom that occupies such a position. The other Directors are Messrs. T. Callan Macardle, J.P., J. St. P. Macardle, M. J. Macardle, and T. Levins Moore, B.L., and the head brewer is Mr. J. P. Kieran.

The brewery buildings proper cover some five acres of ground, and while overcrowding has been carefully avoided, the establishment is remarkable for great compactness and ease of intercommunication between the different departments. Numerous extensions have been carried out in recent years under the supervision of Mr. J. St. P. Macardle, one of the firm, who is an engineer by profession, and who has invented a number of labour-saving appliances. His cask washing patents have now been adopted by practically all the leading brewers in the country, including Messrs. Arthur Guinness, Son and Co. The fermenting room is some 500 feet long, and contains six fermenting vessels, of a capacity of 500 barrels each, ten fermenting vessels of a capacity of 200 barrels each, and eight skimming squares, while alongside the fermenting room is the vat house, similar in extent, which contains twenty large storing pieces where the products of the mash tun are matured before being sent on to the racking store. Close to the hop store, erected to hold some 500 pockets, and constructed so as to keep this valuable and expensive article as cool as possible, is the racking store, and alongside the cask washing shed is the cooperage and fitting shop where a large number of coopers are constantly employed, as the firm import the wood and make their own casks. The progressive character of the firm is shown by the installation of an Acetylene Gas plant, which lights the whole premises and is undoubtedly the largest of the kind in Ireland, while another advance in the direction of scientific methods is the utilisation of a machine (constructed on Mr. J. St. P. Macardle's plans) for the supply of pure sterilised air to the refrigerator and fermenting departments. Being situated in the heart of one of the best barley-growing districts in Ireland, the firm buy their barley direct from the farmers, and store it in the malt houses in Cambricville, and in the branch corn warehouses and maltings at Anne-street and Dublin-street, but as they are not able to make sufficient malt to meet the requirements of the brewery, plans are now being made for extensive alterations and enlargements to the Dublin-street maltings.

Owing to the increase in the volume of trade, horses and carts became such a very serious item of expenditure, that the firm arranged with the Great Northern Railway to run a special siding into the brewery, and narrow gauge lines now thread their way through every portion of the premises. The firm have a similar arrangement at their stores in Queensbridge, Belfast.

While spending large sums on the improvement of the brewery, and new machinery, etc., Messrs. Macardle, Moore & Co. were very fortunate in securing, in the town of Dundalk, many of the best licensed properties, and now that competition is so keen, these properties are of course an asset the value of which it would be hard to estimate, and an interest in many licensed houses in the adjoining counties, as well as in Belfast, has been secured. They have from a very early period done an extensive military trade, there being scarcely a garrison town in Ireland, which at one time or other they have not supplied, while they have sent their brew to the troops so far as Gibraltar. The firm held the entire Curragh contract for two years, and at present hold the Dublin contract for the sole supply of porter and stout. No better idea can be given of the resources of the firm than the ease with which they carried out the contract given to them for the sole supply of the 10,000 troops called together for the Irish military manœuvres in 1890, in the Abbeyleix district of Queen's County. This entailed sending their casks over the lines of three railway companies, and necessitated the employment of over sixty horses and drays. The *Army and Navy Gazette*,

of August 26th, 1899, spoke highly of the quality of the beer and the efficiency of the arrangements. The firm has won several medals, including the first prize medal for porter at the Exhibition of Irish Arts and Manufactures of 1882, the first prize medal for superior quality of beer at the Irish Artisans' Exhibition in Dublin in 1885, and the gold medal for ale and stout at the Distillers, Brewers, and Allied Trades Exhibition held at Dublin in 1892.

Casey's Drogheda Brewery.

Drogheda has a second brewery which was founded in 1840 by Mr. Patrick Casey. He was succeeded in the business by his nephew, Mr. Patrick Casey Connolly, J.P., who extended the trade in many directions and turned the brewery into a Limited Liability Company in 1889. On the death of Mr. Casey Connolly, in 1894, re-organisation became necessary, and the present Company was registered in July, of that year. The directors, Messrs. Christopher Tighe, Samuel Hunter, William Bannon, and John Dolan are well known local men, with a good knowledge of the trade in the district, and every effort is being made by them to promote the prosperity of the concern. The brewery buildings are situated in West-street and Stockwell-street, and they also have those fine premises known as the Mell Brewery, where they carry on their malting operations, buying considerable quantities of Louth barley.

The Great Northern Brewery Company.

The success attending the County Louth breweries, the splendid water supply of Dundalk, the fact that its markets are well supplied with high class barley, and its favourable geographical position in the centre of the service afforded by the Great Northern Railway Company, as well as the fact of Dundalk being in direct communication with England and Scotland by means of the Dundalk and Newry Steam Packet Company, induced some gentlemen in Dundalk and its neighbourhood to lease, in 1897, a very suitable site adjacent to the Dundalk railway station, and to form a Company with a capital of £30,000, for the establishment of a new brewery in Dundalk, under the name of "The Great Northern Brewery, Limited." Whether from the view of advertisement or convenience no better site could have been chosen; and although business in the North of Ireland took a turn for the worse shortly after the concern started, in the brewing as well as other trades, owing to the war and other causes, the new Company have, owing to the energy of the Managing Director, Mr. John M. Cox, and the Secretary, Mr. F. H. Cox, opened up a business over a wide area in the North and North-West of Ireland. In view of the fact that competition is keener, and old associations more firmly knit between the trade and already established breweries in the County Louth than in any other part of Ireland, they have made considerable headway, and have paid dividends of five per cent. to the shareholders. The firm have a railway siding into their brewery and into their stores at Queensbridge in Belfast. The barley purchased by the Company has been successful in obtaining prizes at the Spring Show in Dublin.

The Kilkenny Collection District.

The fourth largest Collection District is that of Kilkenny, which contains no less than ten breweries, all of which are situated in the heart of the

barley-growing district. Two of these breweries are in the town of Kilkenny itself. The St. Francis Abbey Brewery, owned by Messrs. E. Smithwick and Sons, Ltd., was founded in 1710. It is now a Limited Liability Company with a capital of £75,000, and is situated in the centre of one of the best barley-growing districts in Ireland, where the Smithwicks can get an unlimited supply of the best raw material, of which they malt about 20,000 barrels per annum, and where there is a first rate supply of good brewing water. There is nothing except the emigration from their neighbourhood to prevent them making steady progress. Their trade is now to a great extent confined to Kilkenny and the neighbouring counties, the great extension of the tied house system in England having materially curtailed their trade in that market. The Smithwicks bottle extensively and have an enormous number of drays continuously delivering beer in wood and bottle in the surrounding districts.

The Kilkenny Breweries.

The other Kilkenny brewery, known as the St. James-street Brewery was established by the Archdekins in 1702, and was ultimately acquired in 1810 by the Sullivan family who are the present proprietors. The brewery does a large local business in ales and stouts and also has a considerable trade in Belfast. The manufacture of mineral waters and hop bitters is also carried on and affords employment to a large number of hands. These mineral waters have a high reputation and command a ready sale in the south-eastern counties.

Waterford, like Kilkenny, has two breweries, and the name the town won for brewing good beer dates back to the beginning of the century. Previous to that time the town depended upon London and Bristol for its supply of beer and porter, but at the end of the last century this was no longer the case; for an old writer of the period, referring to the brewery under notice, states:—"A public brewery has been established in Waterford, and brought to such perfection as to supersede the necessity of any importation from England, for the brewery is conducted upon a scale affording the means of a considerable export of beer to Newfoundland, and latterly to England, which is progressively increasing." Another writer, referring to the various industries of Waterford, says:—"There is also a great brewery in this town, where a capital nut-brown ale is manufactured, but the fires of the distilleries have not survived Father Mathew's Crusade."

The Waterford Breweries.

The brewery owned by Messrs. Davis, Strangman and Co. is a Limited Liability Company, having a nominal capital of £150,000, of which £100,000 has been subscribed in £10 shares. The Directors are Messrs. W. G. D. Goff (Chairman), John Strangman, Samuel Strangman, H. W. D. Goff, and E. A. Gibbon. Anthony Marmion, in his "History of the Maritime Ports of Ireland," declares that Strangman's ale and porter are held in high estimation, both at home and abroad. This brewery was acquired by William Strangman and Company in 1792, and in 1888 it was formed into a Limited Company. The buildings are imposing, and every modern requisite to produce a first-class article has been provided by the firm; while their malt houses, cooperage, cask washing sheds, industrial shops and stables altogether make this an important provincial concern. Their malt house is a fine block of buildings,

measuring 151 feet by 140, and is six storeys high. It contains four malt floors, and two barley granaries, two large mills, both of which are connected with the malt depôt, and which hold many thousand bushels. The steeps are capable of containing 200 barrels at one time. The firm do a large local business, and export large quantities to the South of England and Wales.

The second brewery in Waterford is St. Stephen's Brewery, which is owned by Messrs. Patrick Keily and Sons, and which is one of the oldest concerns in the trade in the South of Ireland. The business was originally founded over a century ago by Messrs. Condon Brothers, and remained in the possession of that firm until 1858, when the property was acquired by Mr. Patrick Keily, and it has since come into the possession of his grandsons, who trade under the name of Patrick Keily and Sons. The site of the premises is full of historic interest, having been at one time occupied by the ancient church of Saint Stephen, which suggested the title of the brewery, and visitors are still shown portions of the old graveyard, whilst a building now used as stores and stables was formerly an hospital for lepers in the reign of King John. The ground area occupied by the brewery and maltings is about three acres in extent, and the arrangements throughout are of the most modern type, the plant being one of twenty quarters capacity. A splendid supply of the purest water is obtained from three fine old wells in the grounds, from which it is forced by powerful pumps to all parts of the brewery. Besides its trade in the South of Ireland and in Belfast the firm do an extensive export business to the South of England.

Dungarvan.

The St. Bridgid's Well Brewery, Dungarvan, once one of the most flourishing breweries in the South of Ireland, in later years fell off from its high estate through various causes, and ran the risk of collapsing, when the ground landlord, the Marquis of Waterford, was approached by Sir Owen Slacke, C.B., and the late F. Weldon Walshe, Esq., J.P., who pointed out that the closing of the brewery would throw many people out of employment, and remove the only industry surviving in the town. His Lordship generously responded, and spent thousands of pounds in overhauling and remodelling the buildings, getting new plant, steam engines, boilers, etc., and practically transforming the old establishment into a new brewery. The malt house, which had not been used for many years, was brought into good condition, and the necessary details attended to, so that now thousands of barrels of fine locally-grown barley pass annually over its floors and are made into malt for porter and ale. A very extensive bottling trade is also carried on, and bottled stouts and ales are turned out in large quantities. A new mineral water plant has lately been added, fitted with two of Barrett and Foster's engines, so that now this brewery is extremely well equipped. Everything is done to encourage local trade and give employment; there is a fine cooperage from which the casks are turned out, and all the corks used in the bottling business are cut on the premises. Thus it will be seen that this brewery deserves all the support it so generously receives, for, not only does it benefit the local trader and the labourer, but is also of immense benefit to the surrounding farmers whose barley it purchases readily, thereby providing an easy, convenient, and certain market.

The Monasterevan Brewery was established by the late Mr. Cassidy in

1860, who also owned the Monasterevan Distillery and anticipated that the high duty put on whiskey and the consequent increase in price, would cause less demand for whiskey, and that the people would drink ale and porter instead. The present proprietors are Messrs. Robert and Edward Cassidy, who buy barley largely from the farmers in the neighbourhood, and make it into malt, which is used by the firm for the manufacture of whiskey and ale and porter. While Cassidy's pot-still whiskey is a well known and popular trade article in Dublin and the country, the trade of the brewery is more local.

Monasterevan.

The firm of Messrs. P. and H. Egan, Ltd., Brewers and Maltsters, Tullamore, was founded in 1852, and in 1896 was converted into a Limited Liability Company, with a capital of £80,000. The output of the brewery chiefly consists of mild and bitter ales. A considerable trade is done both locally and in the West and South of Ireland. Strange to say, they also send some ale to Scotland. They have the advantage of being in a barley growing district which is second to none, and they purchase from the farmers about 20,000 barrels annually. Besides the brewing business the Company is also engaged in malting, and in a wholesale wine and spirit business, and mineral water manufacture. No less than seven breweries, which formerly existed within a 20 mile radius of Tullamore, viz., at Tullamore, Mullingar, Athlone, Birr, Mountmellick, Kilbeggan, and Rosenalis, have been closed within the last twenty years.

Tullamore.

The Creywell Brewery, owned by Messrs. Cherry Bros., is the only brewery at present working in New Ross, three having been shut up during the last half century. Originally built for a distillery, the Creywell Brewery was acquired over seventy years ago by the ancestors of the present proprietors, who furnish another instance of the hereditary nature of the brewing trade in Ireland. The buildings occupy about five acres of ground, and are equipped with all modern appliances. The firm also work a mineral water factory, and for both businesses they have the great advantage of a supply of water which is said to be of unsurpassable quality.

New Ross.

The only brewery at present working in the town of Wexford is that owned by Messrs. Wickham and Co., although fifty years ago there were no less than six breweries in full work in this neighbourhood. Wickham's brewery is one of the most ancient in the district, having been established over a century ago. The premises are centrally situated in Main-street, and extend in the rere to the Quay. The brewing plant is modern and is of ten quarter capacity, the machinery being driven by a steam engine, and all the necessary facilities are provided for cask washing, etc. Adjoining the brewery are extensive maltings, and there are also bottling houses and stores.

Wexford.

The Mill Park Brewery in Enniscorthy is owned by Mr. George Lett, and was established seventy years ago by the Pounder family, whose interest was purchased in 1864 by the ancestors of the present proprietor. The building is equipped with a modern plant, and the beer is brewed from the best malt and hops only. In recent years a mineral water factory has been established by the proprietor of the brewery.

Enniscorthy.

The Limerick Collection District.

The next largest Collection District—Limerick—contains three breweries, one in Clonmel, one in Carrick-on-Suir, and one in Rathdowney.

Clonmel.

The Clonmel Brewery, which is owned by Messrs. Thomas Murphy and Co., Ltd., was first built in 1798 upon a most substantial basis, and was enlarged from time to time to keep pace with the increased demand resulting from a growth of popularity. In 1829 it was destroyed by fire, and was rebuilt in the castellated style in which it is now seen. From that period to the present day improvements have been introduced into the several departments to keep pace with the progress of inventive skill, and as a result the brewery is splendidly organised and equipped. There are three large malting houses. A portion of the supply of barley is procured in the local market, but the greater part is brought from the Cashel, Horse and Jockey, and Thurles districts. Messrs. Thomas Murphy and Co., Ltd., are ale, stout, and porter brewers, and employ about 200 hands. Besides their own immediate locality their business extends over the entire County of Tipperary, Waterford, Kilkenny, Cork, Limerick, Clare, Galway, Mayo, Sligo, and the City of Belfast, and they also do an export business with England and Wales.

The casks are made on the premises, and the department from which they are turned out contains a fine saw mill, and is not the least interesting of the features of the brewery. At the Dublin Artisans' Exhibition in 1885, a first class certificate was awarded for the excellence of the cooper work sent from this establishment. There is also a department for building floats, carts, and cars of the regulation pattern. The water for brewing is obtained from two artesian wells, one seventy feet, and the other thirty feet deep, and high pressure water supplied by the Corporation from a source about three miles distant from Clonmel. Within the recollection of one of the present directors, two breweries in Clonmel, one in Clogheen, three in Limerick, and one in Tralee were closed.

Carrick-on-Suir.

There is a very old established brewery in Carrick-on-Suir, of which Messrs. Richard Feehan and Sons are the proprietors. They brew ales, porter, and stout, and do a considerable trade in ales. Nothing but malt and hops are used, and the firm make all their own malt, and purchase all their barley locally, principally from the farmers upon the County Kilkenny side, except a little foreign barley which they mix with the home barley for the production of their light ales. They have a wholesale whiskey business in connection with the brewery. Their business is personally superintended by Mr. R. B. Feehan, a thoroughly practical brewer who obtained his experience in England.

Rathdowney.

The Brewery in Rathdowney which is owned by Messrs. Robert Perry and Son, Ltd., Brewers and Maltsters, dates back to the early part of the last century, when it was founded by a member of the Perry family, who have since carried it on. The firm was registered in 1877 as a Limited Company under its present title. The business has been steadily progressive, and gives

extensive employment. A unique feature is the brewing of non-deposit ale under sole rights for Ireland, and the Company has the distinction of holding the Royal Warrant as brewers to the late Queen Victoria. In connection with the brewery are extensive maltings, with branches at Donaghmore, and at Brosna, Roscrea, Irish barley only being used. The firm has always been noted for the excellence of malt they make.

Brewing in the North.

The history of the brewing trade in Ulster has been one sequence of vicissitudes which it is not easy to explain. As fortune after fortune has been made in the whiskey trade, and as the increase in the population of Belfast has been phenomenal, the failures which have attended efforts to make brewing a success, especially in recent years, is surprising. Going back to the fifties, when the population of Belfast was about one-third of what it is to-day, there were in full work in Belfast, Lewers' Brewery, situated in Anne-street, which had previously been worked by Mr. Lewers' brother-in-law, Mr. Ledlie Clarke; Messrs. Mackenzie, Shaw and Co.'s Brewery, Hercules-street; Messrs. Clottworthy and Dobbin's Brewery, Smithfield; Messrs. Henry Scott and Co.'s Brewery, Cromac-street; Messrs. Fordyce and Co.'s Brewery, Cromac-street; Mr. Johnson's Brewery, King-street; Mr. Henry Murney's Brewery, Bank Lane; and finally Mr. John Kane's Brewery, North Street. The Belfast Brewery Co. was built later at very considerable expense, and at one time no less than thirteen breweries were working in Belfast.

There was also a brewery in Comber, where what is now known as the Old Distillery stands, while all over the North of Ireland there was a net work of breweries. The father of the present Mr. Jas. Johnston, Lurgan, had four working, two at Lurgan, one in Antrim, and one in Newtownards. There was also one at Lisburn worked by Mr. William Graham. Downpatrick had two breweries, Saul's and Moore's, and there were at least two working in Derry, viz., Carson's and Meehan's. Coleraine also had a brewery owned by Mr. Jas. Moore, and there was one at Desertmartin in the County Derry, which was owned by Mr. Edward Kelly, who also had a brewery at Limavady; whilst Mr. James Colgan worked one at Ballymoney. Lyle's of Donaghmore was an important concern, and tradition says that about seventy drays used to start from the brewery on a Monday morning laden with beer for all parts of the country. Then, again, there was William Henry and Co., who did a good trade in those days in Newry, and Mr. Arthur Russell, father of the late Chief Justice of England also at one time had a brewery in the same town.

Belfast.

Whatever may be the cause of the comparative lack of success which has attended brewing operations in the North, whether it be the non-suitability of the land in the North of Ireland to grow barley of the kind required for brewing, or whether the quality of the Belfast water, so admirably adapted for making whiskey and mineral waters, may not have been quite so suitable for brewing, it is quite certain that up to a recent date the only surviving brewery was Caffrey's in Smithfield, which is owned by Mr. Thos. R. Caffrey, J.P. Within the last few years Mr. Caffrey ceased brewing in Smithfield, and

built the Mountain Brewery, the red brick buildings and chimney shaft of which, at the bottom of the mountain, strike the eye as one approaches Belfast on the Great Northern Railway. The new brewery which is constructed on the most modern principles, and which is fitted up with the most modern machinery, is said to be a thriving concern. No doubt, the water supply from the mountain was one of the advantages which induced Mr. Caffrey to go out of the city. The show cards for Caffrey's beer and 2*d.* ale may be seen in the windows of a great number of public houses in Belfast and the neighbourhood, whilst porter is of course largely brewed.

Notwithstanding the want of success of previous breweries in Belfast, a new firm has been started within the last few years, viz., McConnell's Brewery, Ltd., which has a capital of £25,000. The Directors are Messrs. Charles H. Brett, Thomas Andrews, and Robert Montgomery. The brewery and maltings are modern and well equipped in every way for doing a successful business, and there is a plentiful supply of Cromac water from a well 500 feet deep. The firm of J. and J. McConnell, Ltd., so well known in the whiskey trade, is very much identified with this new brewery, which has been built on the banks of the Lagan adjoining their distillery; and this firm's trade connections are so strong that the product of the brewery has already got a footing in the many publichouses in Belfast. Notwithstanding the fact that there is hardly any important brewery in Ireland, or, indeed, in the United Kingdom that has not agents in Belfast, this new Company has already established a satisfactory reputation for their products, and returned good dividends to the shareholders.

The third brewery in the Belfast Collection District is owned by Mr. Jas. Johnson, whose name has been already mentioned. His brewery is situated in Lurgan, and is said to do a good business in Lurgan and in many other towns in Ulster such as Dungannon, Armagh, Portadown, Lisburn, Ballymena, Antrim, and Banbridge.

The Londonderry District.

The Collection District of Londonderry contained three breweries, but only two are at present working, one in Enniskillen and one in Sligo. The Enniskillen brewery belongs to Messrs. W. J. Downes and Co., and is situated on the banks of Lough Erne. It has been in the hands of the present proprietors for a good many years. They are not so fortunate as some of the other brewers in the matter of barley, as neither in quality nor quantity does the local crop meet the demand for malt which, of course, is a great loss to the firm. In the entire County of Fermanagh in the year 1901, there were only 116 acres under barley, so that they have to get most of their barley from a distance. Notwithstanding this disadvantage the brewery has been doing a more or less satisfactory business. They brew ale and porter, both of which are reputed to be of excellent quality.

Alderman Edward Foley, ex-Mayor of Sligo, who does a good local business, owns the other brewery in the Londonderry Collection District. This being one of the two breweries working in Connaught (the other is the Westport Brewery, situate in the Galway Collection District), Mr. Foley has a fine field for extending his operations. Many Irishmen from the West of Ireland who find their way to England in the harvest time, learn to follow the example of the Englishman to drink beer rather than whiskey. The consequence is that considering the poverty of the West of Ireland, there is a considerable trade done in Irish beers and porters, and Scotch and English beers are also largely patronised.

PORTER BREWERY,

No. 81, STEPHEN's-GREEN.

IRISH PORTER,

At Two GUINEAS per Hogſhead,

FOR READY MONEY ONLY.

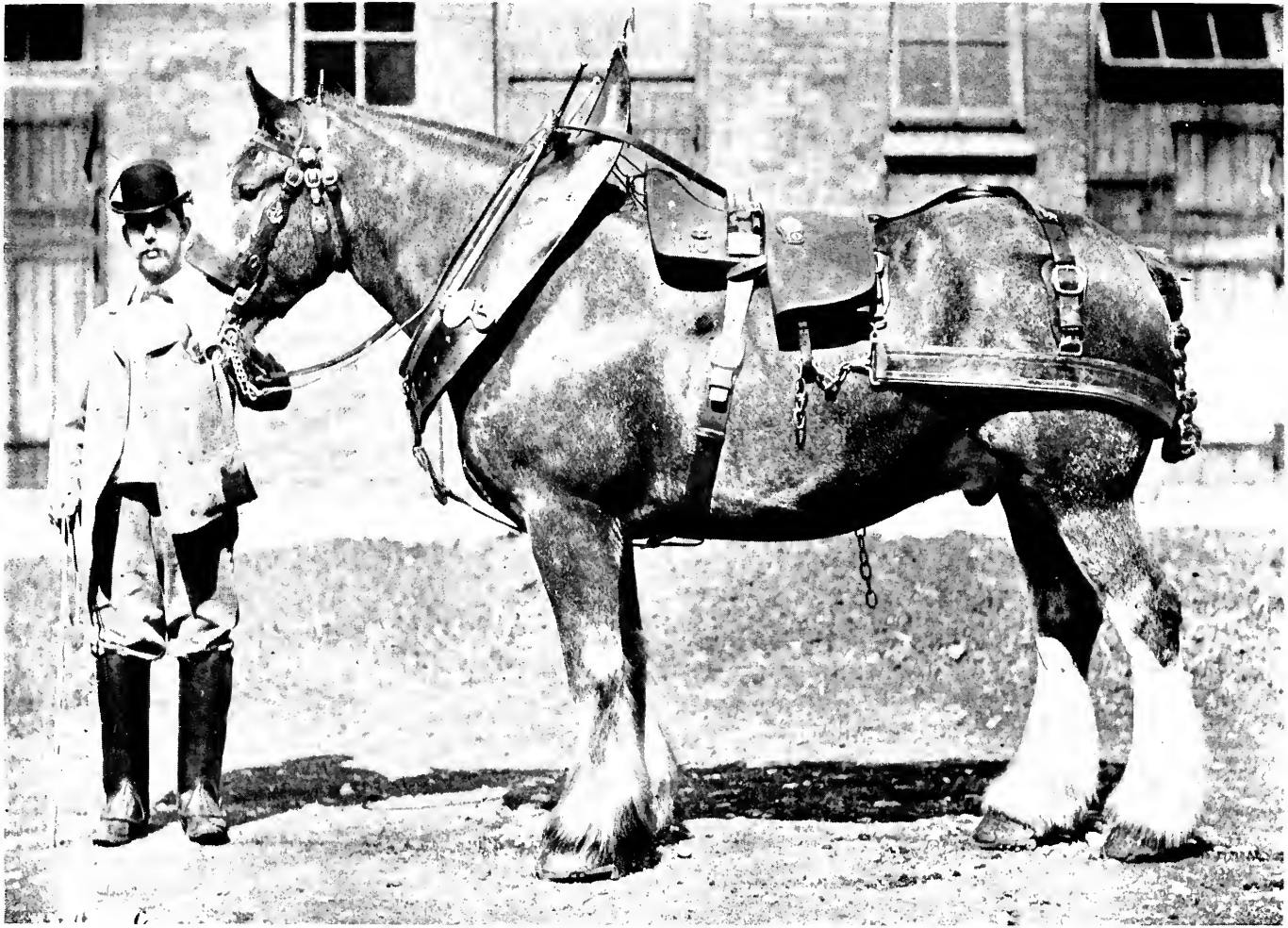
PAT. SWEETMAN continues as uſual to have an Ample Stock of CHOICE PORTER, READY FOR SALE at the above low Price, Equal if not Superior to any Engliſh. The Character of his Porter being now Eſtabliſhed in moſt parts of the Kingdom, he thinks it almoſt needleſs to ſay it will be the Advantage of all Country Dealers to apply to him.

Mr. SCOLLOUGH, many Years head Cooper to Mr. THRALE, of London, and Mr. EDWARD O'REILLY of Dublin, attends at his Stores from 8 to 4 o'Clock each Day.

☞ All Caſks intended for the Country to be paid for.

DUBLIN: Printed by Widow CARRICK and Son, in Bedford-row. 1780.

COPY OF AN ADVERTISEMENT IN POSSESSION OF W. P. CAIRNES, ESQ.



"BUTTER SCOTCH."

(Winner of Challenge Cup for Best Horse and Float, and Champion Cup for Best Horse and Vehicle at the Royal Dublin Society's Spring Show, 1898.)

The Industrialisation of Brewing.

In both England and Ireland, the present century has witnessed a great change in the brewing trade, which has been affected like other manufactures by the industrial revolution, and what was primarily, especially in England, almost a household industry, is now conducted on the factory system. Formerly brewing was carried on in nearly every large household in England, in the same way as baking; and the vast majority of the brewers brewed only for home consumption and not for sale, but owing to the changed character of modern brewing, this system of brewing for household consumption is dying out, though even at the present day there are, roughly speaking, over 12,000 brewers in England who do not brew for sale, as compared with about 6,000 who do. This system of private brewing never prevailed to any appreciable extent in Ireland, but none the less, as a result of the change in the nature of the industry, the increase in the size of most brewing establishments has been accompanied by a decrease in the number of brewers actually working. The decline in the number of brewers at work in Ulster and round about Tullamore and Limerick has been already noted, and in quite modern times, to take the case of Dublin only, the breweries owned by Messrs. P. and J. Sweetman* and Co., Manders and Co., J. R. Read and Co., Caffrey and Co., the Greenmount Brewing Co., and the City of Dublin Brewery Co., have been closed or absorbed by other firms, and the same fate has befallen numerous breweries throughout the country. This decline in the number of breweries, whilst no doubt in part due to the decrease in the population in rural districts and to the increase in taxation, and the exactness with which the duties are collected, is undoubtedly primarily due to the industrialisation of brewing, for the quantity now produced is four times as great as at the beginning of the nineteenth century though the number of brewers at work in Ireland is less than quarter of what the number was a century ago.

The Scientific Brewer.

Concurrently with the revolution caused in brewing, as in so many other trades, by the introduction of machinery, a great change has taken place in the nature of the industry owing to the practical application of science to the various manufacturing processes. The broad lines upon which the operations of malting and brewing are based had been fixed by practical experience long before anything was known of the scientific principles underlying the methods employed, and a number of rules gradually came to be formulated through the observance of which the brewer was enabled, although he might possess no scientific knowledge, to carry on his operations with a greater or less degree of success. But the brewer who worked under such conditions was little better than an animated machine; he simply followed a certain routine, and knew nothing of the why and wherefore of the various processes going on around him. When an irregularity occurred, he was no more able to detect the cause of his trouble with a view to its remedy, than an ordinary individual is to locate the fault in his watch when it has stopped from some hidden cause. All this has been

* The advertisement of Sweetman's Brewery, which is reproduced on accompanying plate, shows that in price, at any rate, there has been little change during the last hundred years.

changed; now the smallest brewer who hopes to succeed has to possess a knowledge of the principles involved in the daily routine of his work, and the greater that knowledge is, the better, as a rule, is the beer, for successful brewing depends very largely upon an intimate acquaintance with the constituents used, an appreciation of the result of any deviation from the normal, and an ability to seize the psychological moment in each operation—qualities which are to be found only in the scientific brewer. The truth is, brewing, like so many other important industries, has now passed from the empirical to the scientific stage. This change was not effected at a leap, but has been necessarily of slow growth. Much prejudice had to be overcome, and for a long time the intervention of science was regarded with considerable distrust. Now all this has changed; the benefits which science is able to confer are generally recognised and appreciated, and where science was formerly repulsed, she is now welcomed with open arms.

The Irish brewing trade is in many ways different from the English brewing trade, and a few distinctive features of the Irish trade may be noted here.

The Special Characteristics of Irish Brewing.

As already indicated it is mainly porter that is brewed in Ireland, though several firms are steadily obtaining a reputation for high-class ales; but, perhaps, the most striking characteristic of Irish brewing is the remarkable purity of all classes of Irish beer. Most English brewers use a considerable proportion of sugar in some form other than that contained in malt. Thus, in the year ending 30th September, 1901, the brewers of the United Kingdom in producing some 37,000,000 barrels of beer used over 56,000,000 bushels of malt, 165,127 bushels of unmalted corn, 1,323,754 cwts of rice grits, flaked maize, and similar preparations, and 2,858,911 cwts. of sugar, glucose, saccharum, etc. Whilst the Irish breweries made about 8.0 per cent. of the total amount of beer, they used nearly 11.0 per cent. of the total amount of malt, but only forty bushels of raw grain, less than 0.5 per cent. of the maize and such preparations, and about 0.3 per cent. of the sugar substitutes. The small proportion of sugar used in Irish breweries is shown by the fact that for every quarter of malt used in each country, 42.6 lbs. of sugar were used for brewing in England, 20.5 lbs. in Scotland, and but 1.4 lbs. in Ireland. There can be little doubt that Irish beer owes much of the high character which it bears to its purity, arising from the almost exclusive use of malt. Beers of saccharine and sugary nature, not produced from pure malt sugar, can hardly be described as nutritive, and it is to the absence of malt substitutes, such as are largely used in England, that Irish brewers owe their freedom from disturbances such as that recently caused by the arsenic scare in Manchester. Other interesting features of the Irish brewing trade are the absence of brewing for household consumption only, and the hereditary nature of the brewing trade in Ireland which has been already commented upon.

How the Irish Brewer is handicapped.

There are several reasons why, despite the excellence of their manufacture, Irish brewers have more difficulty than English brewers in making their business pay. Not only is the population small, but, owing to the fact that whiskey is more commonly drunk in Ireland than in England, the consumption of beer per head is far less, and owing to the sparse population, brewers' agents have to travel long distances, and small supplies of beer have to be sent to distant parts of

the country. This necessitates the investment of a very large capital in casks, and the annual expenditure on the cleaning and the cooperage is necessarily much higher in most Irish breweries than in English establishments, as the casks in England have not to be sent so far, nor are they subjected to so much exposure to the weather. Another advantage which English brewers possess over their Irish competitors arises from the system of tied houses which characterises nearly every English brewery, and which may be said to be almost an exception in Ireland. There can be no doubt, moreover, that the excessive number of public houses in Ireland unfavourably affects the brewer; and if these surplus licences could be abolished on payment of a reasonable compensation, brewers, like other people, would benefit by the change. For each of the 1,688 common brewers in England there are 66 retailers licensed to sell beer; for each of the 121 Scotch brewers there are 91 houses; but in Ireland for 38 breweries there are 19,702 persons licensed to sell beer, which gives an average of 518 houses for each brewery. The enormous number of these houses in Ireland as compared with Great Britain does not cause a great consumption of beer in Ireland as compared with Great Britain—the average consumption as a matter of fact is little more than half—but it does show how the Irish brewer is handicapped by having to deal with a large number of houses, each of which requires only a small supply, for, whilst an English brewer in order to sell 10,000 gallons of beer has on the average to deal with only about 35 retailers, the Irish brewer has to deal with nearly twice that number. In connection with the subject of licences, it may be remarked that the Sale of Intoxicating Liquors (Licences), Ireland, Bill, which at the time of writing has passed through the House of Commons, will, it is hoped, in time remedy the evils resulting from surplus licences. It may be noted that, at present, when a brewer establishes a district agency or depôt for the distribution of beer he is obliged to take out a wholesale licence, and the law does not provide any facilities for enabling him to do so, but forces him to go through a troublesome, expensive, and irritating procedure, and he is treated like an ordinary retailer, for his premises have to be of a fixed valuation, and he is supposed to be in exclusive occupation of the premises for at least three months before he can obtan the licence. The success which has attended the efforts of the Licensed Grocers and Vintners Protection Association in promoting the Bill mentioned above will, possibly, encourage the Secretary of the Association—Mr. Robert Russell—to take up this matter in the interests of the Irish brewers so as to get a short Bill introduced which would place this licence on the same footing as the Brewer's ordinary licence or the Wholesale Spirit Dealer's licence, which can be obtained on application to the Inland Revenue authorities.

The Consumption of Beer in Ireland.

It is not easy to state very accurately the actual consumption of beer during the eighteenth century and earlier part of the nineteenth century in any particular part of the United Kingdom, owing to the fact that the figures showing the production of beer are, necessarily, in the absence of other data, mostly estimates based on the quantity of malt used or duty charged. These figures are practically incomplete in the case of Ireland, because a large quantity of this malt must have been used for distillation, and there seems to be no doubt that, about the beginning of the nineteenth century, the payment was evaded as regards a considerable proportion of the malt used. According to the estimate of the

Speaker of the House of Commons in 1791, the amount of beer brewed in Ireland was about 400,000 barrels, and the amount imported was about 100,000 barrels. As the population was probably about 4,200,000, the average consumption per head of population would appear to have been less than one-eighth of a barrel; but this estimate can be but little more than a very rough approximation. According to the returns quoted by Newenham in the book previously mentioned, the production of beer in Ireland in 1808 was 751,000 barrels, the net imports amounted to 1,755 barrels, and the population has been estimated at about 5,500,000. These figures show that the average consumption per head was slightly under one-seventh of a barrel, or just about five gallons; but it must be remembered that Newenham very emphatically declares that the production was under estimated, and that the actual amount of beer made was about half as much again as the amount given in the returns. The difficulty of estimating the consumption in later years, arising primarily, as already pointed out, from lack of accurate information as to the production of beer, is complicated by the fact that no official record is kept of the cross-channel trade between England and Ireland. So long as separate accounts were kept by England and Ireland, and their revenues administered by separate Treasuries, it was indispensable that customs and excise duties should be levied in the country where the dutiable article was consumed, and consequently it was necessary to keep an exact account of the cross-channel trade. When the revenues of Great Britain and Ireland became consolidated in 1817, new regulations were framed whereby all payment and repayment of duties in the cross-channel trade were to cease, except in the case of articles which were subject to different rates of duties. As a result of this change, accounts of the quantities of articles shipped from Great Britain to Ireland, and *vice versa*, ceased to be kept after 1825-6, and beyond the shipping lists of certain ports, there is no official data available since that date for measuring the interchange of articles between Great Britain and Ireland nor consequently for measuring the consumption in the two countries, except in the case of spirits, which can be moved only under the permit system, and in the case of live stock, statistics as to the exportation and importation of which have been collected for a considerable period by the Veterinary Office (now merged in the Department of Agriculture and Technical Instruction for Ireland). The result is that no accurate statement can be made as to the exports and imports of beer.

The following Table shows the amount of beer *brewed* in Ireland, in 1861, 1871, 1882, 1891, and 1901, the population in Ireland in each of these years, and the amount brewed in each year per head of population.

Year.	Number of Barrels Brewed.	Population.	Amount Brewed per Head.
1861	1,437,713	5,798,564	8.9 gallons.
1871	1,616,656	5,412,377	10.7 ,,
1882	2,044,331	5,150,000*	14.2 ,,
1891	2,555,273	4,704,750	19.5 ,,
1901	3,149,142	4,456,546	25.4 ,,

* Estimated.

The consumption of beer per head was, of course, less than the amount brewed, for the quantity of beer exported from Ireland has for a long time

exceeded the amount imported. At the time of the Financial Relations Commission a special inquiry was instituted by the Commissioners of Inland Revenue to ascertain the actual incidence of the different taxes in each part of the United Kingdom. The total amount of duty paid on beer in the United Kingdom in the year 1889-90 was £9,410,426, of which £761,713 was paid in Ireland. From information furnished by the Collectors of Inland Revenue throughout the United Kingdom after communication with the different traders in their districts, it was estimated the duty paid in Great Britain upon beer exported to Ireland amounted to £36,905, whilst the duty paid in Ireland upon beer which was subsequently exported, amounted to £177,262 and that consequently the duty paid upon beer *consumed* in Ireland in 1889-90 amounted to £621,356. This represents a consumption of 1,988,339 barrels, the rate of duty in 1889-90 being 6*s.* 3*d.* per barrel; and as the population may be fairly estimated at 4,750,000, the average consumption in 1889-90 would seem to have been about 15 gallons per head of population.

The consumption is now probably considerably higher. The production of beer in Ireland in 1901 shows an increase of over 20 per cent. (nearly 600,000 barrels) as compared with the production in 1891, and the exports certainly have not increased to that extent during the last decade, whilst the population has decreased. Most of the porter exported from Ireland is shipped from Dublin, and the amount despatched from that port in 1900-1901 was about the same as in 1889-90. Still the export trade of Dublin in beer, as distinguished from the coasting trade, has undoubtedly increased, for much of the beer that formerly was sent by boat from Dublin to Belfast and some other parts of Ireland, now goes by rail, and there is an increased export of beer from several other Irish ports, but it seems probable that a considerable portion of the additional 500,000 barrels brewed in 1901 as compared with 1891, was consumed in Ireland, so that the total average consumption of beer in Ireland is probably not less than about 17 or 18 gallons per head, whilst the consumption of beer in Great Britain averages at present about 33 gallons per head of population.

Before leaving the subject of the Brewing industry in Ireland, it may be noted that, though we live in an age of co-operation when "syndicates," "combines" and "trusts" are words grown familiar in our mouths, the brewers of Ireland have not, as yet, combined to form an association to guard and promote the common interests of their industry. Although the brewing trade is one which, in some respects, seems peculiarly to require such action, the County Louth Brewers' Association, consisting of firms in the Dundalk Collection District, is the only combination of brewers as yet formed in this country, but perhaps it may be destined to be the nucleus of a Brewers' Association for all Ireland.

THE DISTILLING INDUSTRY IN IRELAND.

The Early History of Distilling.

The Distilling Industry has now reached enormous dimensions in the United Kingdom, but it is only in comparatively recent times that distilling has attained to the important position which it now occupies. The art of separating alcoholic spirit from fermented liquors appears, however to have been known in the Far East from the most remote antiquity. It is thought to have been first known to, and practised by, the Chinese; 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. The art of distilling does not seem to have been known to either the Greeks or the Romans, as nowhere in their writings, which have survived, is any reference made to alcohol or any distilled spirit, nor have the discoveries of ancient cities and monuments during the last hundred years revealed anything to indicate the existence of a knowledge of distilled alcohol in Rome or Greece. Arnauld de Villeneuve, a physician of the thirteenth century, is the first author who speaks explicitly of an 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. His disciple, Raymond Lully of Majorca, declares the essence of wine to be an element newly revealed to man, but hid from antiquity because the human race was then too young to need this beverage, which, he declared, was destined to revive the energies of modern decrepitude.

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.

Distilling in Ireland.

It seems to be generally admitted that distilling was practised in Ireland at an earlier period than in Great Britain. When Henry II. in the twelfth century invaded Ireland, the inhabitants were observed to be in the habit of making and using an alcoholic liquor called Usquebaugh (Uisgé-beatha, water of life), a term which is consequently 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 somewhat modern corruption of Usquebaugh. Johnson, in his famous dictionary, states that this word is "an Irish or Erse word which signifies the waters 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 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 much corn, grain, and other things are consumed." A heavy penalty was imposed upon domestic distilling, the nobility being excepted. It was this statute that made distilling without licence illicit, and the penalty of death was afterwards enforced against illicit distillers. 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. The gradual development of the distilling industry in Ireland can be best followed by examining the official returns relating to the tax. The quantity of spirits upon which duty was paid in Ireland exceeded one million gallons, for the first time, in 1773, whilst the quantity made at the end of the century was over four million gallons.

The earliest Irish Distilleries.

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 recognised as a legitimate distillery, making about 16,000 gallons of whiskey per annum, most of which was exported to the West Indies and America. 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 Roe in 1757, and the North Mall distillery in Cork was erected by Mr. Wyse in 1779, 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, as has been mentioned in the preceding article, endeavoured to check the activity of the distillers by encouraging the brewing industry.

Morewood writing about the distilleries in the South of Ireland in 1838 mentions in his treatise on "Inebriating Liquors," the establishments of Wyse, Callaghan, Morrogh, Lyons, O'Keeffe, Shee and Daly as being of immense magnitude. The concern of Murphy, and that of Hackett at Middleton were, he declared, little inferior, whilst the distillery at Clonmel gave employment to 150 hands, and at Brown's establishment in Limerick, 3,000 tons of coal and 20,000 boxes of turf were annually used, whilst the machinery and implements cost upwards of £20,000.

Morewood gives an interesting account of the materials used at the best Irish distilleries about 1838, and mentions as a typical example the following proportions:—

One-fourth malt at 32s.	per barrel of	1¾ cwts.	= 8s.
One-half barley at 18s.	do.	do.	= 9s.
One-fourth oats at 12s.	do.	do.	= 3s.

The average cost per barrel of mixed materials was thus 20*s*. The barrel of mixed materials in the above proportions yielded 7½ gallons of spirits at 25 over proof, so that the materials for one gallon at that strength cost 2*s*. 8*d*. The duty at the period referred to was 2*s*. 8½*d*. per gallon, and the cost of manufacture was estimated by Morewood at 4*d*., so that the total cost to the distiller of a gallon of whiskey at 25 over proof was 5*s*. 8½*d*.

The nature and conditions of the Irish Distilling Industry have greatly changed since the time of Morewood. The changes in the duty and in the regulations enforced by the Inland Revenue authorities, as detailed below, have had a marked influence upon the fortunes of distilling, and the same forces that brought about the industrialisation of the brewing industry have had their effect upon distilleries also. Many of the smaller establishments have ceased working, and the larger distilleries have steadily increased their output, and ever increasing applications of scientific methods have tended in the same direction. The amount of spirits distilled is now three times as great as the amount 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. The greatest change in the industry has been brought about by the spread of patent stills and the use of Indian corn or maize, and the consequent growth of the blending and rectifying trade.

Modern Irish Distilleries.

According to the returns of the Commissioners of Inland Revenue there are now thirty distilleries in Ireland, but some of these concerns are mainly blending establishments. Consideration of space prevents mention being made of each distillery in Ireland in this article, but a few words as to the date of foundation and situation of those concerning which such particulars are readily available, may not be out of place. The best known distilleries in Dublin are, perhaps, those belonging to John Jameson and Son, Limited; John Power and Son, Limited; the Dublin Distillers Company, Limited; the Distillers' Company (Phœnix Park Distillery); and the Dublin City Distillery Company. The two first-mentioned distilleries, viz., the Bow Street Distillery, owned by Messrs. John Jameson and Son, and the John's Lane Distillery, owned by Messrs. John Power and Son, date back to 1780 and 1791 respectively, and are both exclusively Pot-Still establishments. The Dublin Distillers Company was formed by the amalgamation of three distinct distilleries, the Thomas Street Distillery, formerly owned by George Roe and Co., the Marrowbone Lane Distillery, formerly owned by William Jameson and Co., 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.

The distilleries in Ulster differ from those in most other parts of Ireland in two respects. They are mostly of comparatively modern establishment, though a few are of considerable antiquity, and the patent stills are used, either in conjunction with or, to the exclusion of the pot-still, to a much greater extent than in the rest of Ireland. There are four large distilleries in Belfast, viz., The Royal Irish Distillery, which was built in 1869, and is owned by Messrs. Dunville and Co.; The Irish Distillery, Limited; the Avoniel Distillery built in 1882, and McConnell's Distillery.

Among other distilleries in Ulster may be mentioned the two establish-

ments working at Comber, County Down, owned by the Comber Distilleries Company, and of the two buildings one was originally a brewery and the other a paper mill until 1825, when distilling was started in both establishments. The two distilleries in Londonderry, one of which dates back to the eighteenth century, are owned by Mr. Watt, and Messrs. Young, King and Co. have a distillery in Limavady. Then there is the Bushmills Distillery already mentioned as famous for being the most ancient in Ireland; it and the Coleraine Distillery, owned by the representatives of the late Sir Robert Taylor, are remarkable as being the only "All Malt" distilleries in Ireland.

Almost midway between Belfast and Dublin there is another well-known distillery at Dundalk, owned by Messrs. Malcolm, Brown and Co., which dates back to the eighteenth century. According to the statistical records of Dundalk this Distillery, as far back as the year 1837, employed 100 men and used 40,000 barrels of grain.

Cork is another important centre of the distilling trade, and the Cork Distillers Company includes three distinct distilleries. One of these is the North Mall Distillery, which was erected by Mr. Wyse in 1779. The second establishment is the Middleton distillery, which is situated some thirteen miles from the City of Cork; the buildings were originally used for a woollen manufactory, then as barracks, and, finally, they were converted into a distillery shortly after 1825. The third distillery, known as the Watercourse, has not been worked since 1876, but is held as a stand-by. There are two other distilleries in the County of Cork, one in Bandon owned by Messrs. Allman and Co., who fitted up the present distillery about the year 1826, and one situated at Kilnap, owned by the Glen Distillery Company, which was started about twenty-five years ago. Another distillery in the South of Ireland worthy of note is the Limerick Distillery, owned by Mr. Walker, and situated within a few hundred yards of the famous treaty stone. The Nun's Island Distillery in Galway, owned by Mr. H. S. Persse, was purchased by the father of the present proprietor in the year 1840, and is remarkable as being the only distillery in Connaught.

With the exception of the Bishop's Water Distillery in Wexford, which was erected in the year 1827 and which is owned by Messrs. Nicholas Devereux and Co., the other provincial distilleries are all situated in the Midlands. Thus in Monasterevan there is Mr. Cassidy's Distillery which was built as far back as 1784, and which belongs to the proprietor of the Monasterevan Brewery mentioned in the preceding article. Mr. Daly's Distillery in Tullamore, was founded in the year 1829, and the Brusna Distillery at Kilbeggan, owned by Messrs. John Locke and Co., was established in the year 1750, and so, as already mentioned, disputes with the Bushmills Distillery the distinction of being the oldest established distillery in Ireland; whilst the Birr Distillery, owned by Messrs. R. and J. Wallace, was founded in the year 1805.

Taxation and Production.

The history of distilling as applied to fermented liquors so far as the United Kingdom is concerned, is, like the history of brewing, inseparably connected with questions of taxation; indeed but for this fact it would be well-nigh impossible to trace the gradual development of the distilling industry. As already mentioned, even before the Restoration taxes were levied upon the distilling industry, and in 1660 a duty was imposed on British spirits, which amounted in Ireland to 4*d*. per gallon, and

in Great Britain to 2*d.*, 3*d.*, or 4*d.*, according to the material used. In 1724 (the first year for which records for the whole of the United Kingdom of the quantity of spirits upon which duty was charged are available), the duty had increased to 3*d.*—6*d.* in Great Britain, and to 8*d.* in Ireland. In that year the quantity charged with the duty and the duty paid was as follows:—

	Quantity.	Amount of Duty.
	Gallons.	£ s. d.
England, ...	3,563,625	89,735 11 7
Scotland, ...	145,602	3,504 12 10
Ireland, ...	134,080	4,469 6 10

The duty in England and Scotland was subsequently increased, and in 1751 the figures were:—

	Quantity.	Amount of Duty.
	Gallons.	£ s. d.
England, ...	7,049,822	357,122 13 5
Scotland, ...	848,768	16,610 19 5
Ireland, ...	596,090	19,869 13 5

In 1773 the quantity charged with duty in Ireland for the first time reached the one million gallons mark, and though the duty was raised, the production as measured by the quantity charged with duty, rapidly increased, amounting to over 2,000,000 gallons in 1781, and to over 3,000,000 gallons nine years later. These figures relate only to the quantity upon which duty was paid in Ireland, and no official figures relating to the amount actually distilled are available until 1802, when the number of gallons of spirits manufactured was as follows:—3,384,742 in England, 1,344,835 in Scotland, and 4,475,458 in Ireland.

In the early part of the nineteenth century the rate of duty was constantly changed, and ranged from over 5*s.* to over 11*s.* in England, but was much lower in Scotland and Ireland. In 1821 when the duty was 11*s.* per gallon in England, 6*s.* 2*d.* in Scotland, and 5*s.* 7¼*d.* in Ireland, the quantities produced in the three countries were:—2,662,852 gallons in England; 3,216,858 gallons in Scotland; and 3,627,552 gallons in Ireland. About 1825 when the duty was reduced, a great increase in production took place, the quantity distilled in that year being 2,039,771 gallons in England, 8,224,807 in Scotland, and 8,835,027 in Ireland. In 1836 the quantity made in Ireland amounted to 11,894,169 gallons, which, until 1879, was the highest on record for Ireland. Then came Father Mathew's Temperance Movement, and whilst the quantity of spirits made in Great Britain remained fairly stationary, the production in Ireland fell for several years to less than half of what it was in 1838. In a few years, however, the manufacture of spirits revived, and for the ten years after the Famine, it amounted each year to over 8,000,000 gallons.

The duty in Ireland was only 2*s.* 8*d.* per gallon until 1853, when it was raised to 3*s.* 4*d.*, in the following year the duty was increased to 4*s.*, and then to 6*s.* 2*d.*, whilst in 1858 the duty was raised to 8*s.*, and thus equalised with the duty in Great Britain. This rapid increase in taxation, the duty being

thus trebled in five years, led to a sudden fall in the quantity produced in Ireland, which was accentuated by the further increase of 2*s.* per gallon imposed in 1860, and for several years the quantity made was but one half of the average production during the decade 1849-58. Thus in 1863 the quantity made was only 4,137,544 gallons, the lowest figure recorded since 1823. Towards the end of the sixties Distilling revived in Ireland, and though the duty has since been raised to 11*s.* per gallon, there has been a steady increase in the output of Irish Distilleries, as is shown by the following figures:—

TABLE showing the Number of GALLONS OF SPIRITS DISTILLED in England, Scotland, and Ireland during certain years.

—	England	Scotland	Ireland	Total for United Kingdom
Year ended 31st March, 1861,	7,211,822	11,211,648	4,801,115	23,224,585
" " 1871,	7,576,495	14,501,983	8,873,545	30,952,023
" " 1881,	9,830,636	16,752,613	9,720,834	36,304,083
" " 1891,	10,533,637	21,101,023	12,988,924	44,623,584
" " 1901,	12,603,311	30,196,016	14,221,520	57,020,847

The amount in warehouses in the United Kingdom on 31st March, 1900, was 157,169,968 gallons, and, as shown above, 57,020,847 gallons were distilled during the year ended 31st March, 1901, making a total of 214,190,815 gallons to be accounted for. This was disposed of as follows:

Delivered for Home Consumption, ...	36,703,728	gallons.
Exported, ...	5,773,718	"
Used for fortifying Wines for Ships, Stores, &c. ..	309,166	"
Methylated, ...	5,070,713	"
Deficiencies allowed, ...	4,830,661	"
TOTAL Distributed, ...	52,687,986	"
BALANCE in Warehouse on 31st March, 1901,	161,502,829	"

Illicit Distillation.

Any account of the development of the distilling industry in Ireland would be incomplete without some mention of illicit distillation. It is difficult in these days, when illicit distillation is of comparatively small importance, to realise the extent to which that traffic grew during the eighteenth century. The produce of the smugglers' stills, being made from malt alone, found a ready market on account o its distinct flavour, and the trade was encouraged by the high rate of duty levied at licensed distilleries. Both in Great Britain and Ireland the smugglers may be looked upon as the pioneers of the whiskey trade. To them is largely due the superior quality of the fine old malt whiskey that is made nowadays, and the "sma stills" and "illicit potheens" may be said to be the foundations upon which the whiskey distilling industry has been built. The illicit whiskey acquired the name of "potheen" from the fact that it was usually made in a small pot, and it was sometimes called "Innishowen," from a district in Donegal notorious for illicit distillation and famous for the superior quality of its whiskey.

Many interesting and curious facts have been related of the extraordinary contrivances of the people to evade the law, and to prevent

detection, such as the artful construction of distilleries on the boundaries of townlands (in order to evade the law which imposed a fine on any townland where an illicit still was discovered), in the caverns of mountains, on islands, in lakes, on boats, and in rivers. Many stories have been told how Revenue Officers have been carried away and secreted for weeks together in order to prevent their giving evidence, and of various other schemes and their treatment while in confinement, and of the various other schemes and devices to defraud the Revenue.

In the year 1820 illicit distillation had become so prevalent in the United Kingdom, that more than half of the spirits actually consumed were supplied by the smuggler, and it was found necessary in 1821 to appoint a Parliamentary Commission to investigate the subject, and propose a remedy. The result of the new regulations which were adopted was a surprising increase in the quantity of legally made spirits. In 1820 the quantity made in the United Kingdom was 9,600,000 gallons, and in 1826 it was 18,200,000. Illicit distilling continued to be common for some time, but shortly after the middle of the century it was practically stamped out in Great Britain. In 1850 the number of detections amounted in England to 551, and in 1869 to 41. In Scotland there were 14,000 prosecutions in 1823 for illicit distilling and malting, but in 1856 the number had fallen to 48.

The efforts to suppress illicit distillation have not been so successful in Ireland. In 1854, the Royal Irish Constabulary were, for the first time, employed, in addition to the Revenue Police, in the suppression of illicit distillation. In 1870 the Commissioners of Inland Revenue stated (Thirteenth Annual Report, 1870, C. 82) "There can be no doubt that the moral effect of the employment of a force so much respected, and so closely connected with the magistracy and the Vice-Regal Government will have great influence on some classes in Ireland who have hitherto been too much disposed to look with indifference upon offences against the Revenue laws. Could we obtain the cordial co-operation of the owners and occupiers of land in that country, as we have in most parts of Scotland, we should have no apprehensions of the revival of smuggling to any great extent, even if the price of grain were much lower than at present."

Although the co-operation of most landowners has now been obtained illicit distillation still occurs to some extent in Ireland, though the nature and characteristics of it seem to have largely changed. The quality and quantity of the harvest, especially of oats, do not seem to have the same effect upon illicit distillation as formerly, when there used to be constant variations in the extent of smuggling in Ireland, without any other apparent cause than an abundant or deficient crop. Treacle and porter are now the materials generally employed, and the process is so simple and easy that it may be conducted successfully in any place where there is a supply of water, and as illicit spirits can be sold with a fair profit at about 5*s.* a gallon, being 11*s.* (the amount of the duty) less than legally made spirits can be sold at, it cannot be expected the practice will soon be entirely suppressed. In 1850 there were 3,545 detections, and last year the number of seizures by the Royal Irish Constabulary was 2,008, which is over the average for recent times, but most of these seizures were of a trifling character, and it must be remembered that the temptation to carry on illicit distilling is much greater now, when the tax is 11*s.* per gallon, than it was fifty years ago, when the tax was less than one-third of this amount.

The Manufacture of Whiskey.

It is impossible in the course of a short article to give a full account of the processes involved in the manufacture of spirits, but a short description of the main facts as to the "death, burial, and resurrection of John Barleycorn" may prove not uninteresting.

The Production of Alcohol.

All substances containing either sugar or starch will yield spirits on being fermented; but in the case of grain and other starch-containing substances, the starch has to be first converted into sugar. In France and many other countries a large quantity of spirit is prepared from beetroot, potatoes, and the fermented juice of the grape, and in Jamaica and some other places, directly from sugar cane. In this country, however, most alcoholic spirits are obtained by the distillation of the fermented extracts of grain. The process of making spirits from corn may be divided into two stages, viz.:—first, the formation of the alcohol, and secondly, its elimination from the unfermentable ingredients with which it is mixed; in other words, the whole process may be divided into the two stages of brewing and distilling. The first step in the former process is to saccharify the starch contained in the grain. The usual method to accomplish this is to mix malted barley with the raw grain, as malt contains a substance known as "diastase," which has the effect, when mashed with unmalted grain at certain temperatures, of converting the starch of the grain materials into a saccharine extract capable of fermentation. The process of malting and the change produced in the malted grain have been explained in the preceding article (see page 461). The next step in the process is the actual brewing. The raw grain is crushed in a mill and then passed with the malt into the mash-tun, where, as in making beer, the meal is submitted to the action of water at a certain temperature, and by means of revolving arms the "grist" is thoroughly incorporated with the water. The insoluble starch in the grain is thus converted into the soluble saccharine fluid known as "wort." As this saccharine fluid is required by distillers for its alcohol only, all Irish distillers, with two exceptions, use a considerable quantity of unmalted grain, and in some Patent Still establishments over 80 per cent. of the mixture mashed consists of raw grain.

The wort is run off from the mash-tun through the perforated false bottom into the underback, and the grains remaining in the mash-tun are re-mashed several times until they are practically exhausted of all their soluble constituents, after which the grains are utilised for feeding cattle. The wort, after being cooled, is then passed into the fermenting vessels, and yeast being added, the process of fermentation begins. The chemical actions which take place have been already described in the article on brewing; the main feature is the conversion of the fermentable sugar, by the influence of yeast, into alcohol and carbonic acid, and as the secondary products are of but small importance, the conversion may be represented by the following chemical equation:—

Fermentation.

$$\underset{\text{(Glucose)}}{C_6\ H_{12}\ O_6} = \underset{\text{(Alcohol)}}{2C_2\ H_6\ O} + \underset{\text{(Carbonic Acid)}}{2C\ O_2}$$

The degree to which fermentation is carried is very different in distilling from that which prevails in brewing. The brewer desires to retain as far as possible the aroma of the hops and malt and to convert only a portion of the sugar into alcohol, thus leaving a large proportion of the sugar and dextrine in the beer; the distiller on the other hand desires to convert as much as possible of the sugar into alcohol and at the same time to avoid the formation of secondary products, more especially the oxidation of the alcohol into acetic acid.

Distillation.

The second stage in the process now begins. The fermented wort, known as "wash," is a fluid containing varying proportions of alcohol, unfermentable grain extract and water, and the object of the distiller is to isolate the spirit as effectually as possible. This is done by distillation, *i.e.*, by converting the volatile constituents of the wash into vapour. Distillation is a generic name for a class of operations, all of which agree in one point, namely, that the liquid operated upon is heated in a closed vessel or still, and thereby wholly or partially converted into vapour which is then condensed by cold into the liquid state. The distillation of spirits is, thus, the process of separating alcoholic spirits from fermented liquors. Water boils at 212° F., and alcohol at 173°, and a mixture of equal parts of alcohol and water will boil at the intermediate temperature of about 192°; hence the boiling point of "wash" depends on the proportion of spirit which it contains. The more volatile spirituous vapour first passes over to be condensed at a low temperature which has to be increased as the spirit becomes weaker by admixture with water. The apparatus is always arranged in such a way that the vapour is cooled to condense into the liquid form again, which runs into separate vessels called "Receivers." In whiskey distilleries nearly the whole of the alcohol is separated from the water by repeated fractional distillations, the distillates being collected in several vessels as "Low Wines," "Feints," and "Whiskey."

All classes of distilling apparatus may be classified under three heads, viz.:—first, stills heated and worked by the direct application of a fire, secondly, stills worked by the action of steam blown direct into the alcoholic solution from a steam boiler; and thirdly, stills heated by steam passing in pipes through the alcoholic solutions to be acted upon. But the apparatus used for the distillation of spirits are commonly divided into two classes:—pot-stills and patent stills.

The Pot-Still.

To the first of these classes, viz., stills heated by the direct application of fire, belong to the earliest and simplest forms of distillatory apparatus including the famous "Pot-Still" so generally used in Ireland. This still is an almost flat-bottomed copper pot, with a high head to prevent the fluid within from boiling over. From the top of the head runs the "worm," *i.e.*, a tube connected with the head and carried in a spiral form round the inside of a vessel or tub filled with cold water, which acts as a condenser. The alcohol leaves the still in the form of vapour which is condensed into a liquid and cooled in its passage through the "worm" to the Receiver. The spirit thus collected has to be re-distilled until it becomes much stronger and cleaner. The first distillate from the still is termed "Low Wines," and passes into the "Low Wine Receiver," whence it is transferred to the first "Low Wine Still" to be again

distilled. The products of this second distillation are collected in the Feints Receivers, and the cleanest and most suitable of the "Feints" are transferred into the third still to be ultimately discharged as "Whiskey." In distilling with an apparatus of this simple construction it is obvious that at the beginning of the operation, when the wash or liquid to be distilled is rich in alcohol and its boiling point low, the distillate will pass over at a comparatively low temperature. As the operation progresses and the proportion of spirit becomes less, the boiling point of the mixture in the still rises, and more heat is required to evaporate it. As the alcoholic strength of the liquid which remains in the still continually weakens, a point is eventually arrived at when the value of the weak distillate produced will not balance the expenditure on fuel necessary to distill it.

Patent Stills.

The "patent stills" of the second and third class are too elaborate, and the method of working is too complicated to be even briefly described in a short article. The best known of these stills is "Coffey's," which is the only patent still used in the United Kingdom for the manufacture of "silent" or rectified spirit. It is said to be the speediest and most economical device for preparing a highly concentrated spirit in a single operation, as it extracts all the alcohol from any fermented liquid, and only one condensation of the distillate is necessary. The process of distillation, which is carried on by steam, is continuous, and the "low wines" spirit is not collected as in the case of pot-stills, but passes on in the form of vapour to the rectifying column where it is purified into strong spirits. By the patent still a spirit is obtained almost destitute of flavour or smell, and of a strength varying from 62 to 68 over proof.

Whiskey and Patent Spirit.

If only alcohol and water passed over in distillation all spirits from whatever material derived would be the same, but this is not the case. Each distillate has its own peculiar flavour, depending upon the nature of the materials from which it is extracted, and spirits of the high strength produced by most patent stills ultimately pass to the condensers at such a low temperature that scarcely any of the volatile oils on which the peculiar flavour of whiskey depends, are present with it; hence the patent still is not adapted for the distillation of Fine Whiskies which require a certain amount of these essential oils to give them the proper "whiskey" flavour, and patent spirit has usually to be blended with fine whiskey in order to be acceptable to the consumer. Pot-Still whiskey contains essential oils or flavouring matters in excess when it is new, and they require to be broken up and re-arranged by the spontaneous action which occurs between them and the spirit with which they are in contact. This modification of whiskey takes place during the period of bonding when the whiskey is maturing in oak casks. It is the presence of the essential oils, and their gradual modification in cask, which makes whiskey so different from rectified spirit, and the fact that time is required for this modification is the reason why whiskey improves with age.

The spirits obtained from patent stills contain very little of the essential oils or flavouring constituents which ultimately give taste and aroma to the matured whiskey obtained from pot-stills, where the valuable bye-products referred to are kept and incorporated in the spirit. The difference between the two spirits was well put by a witness before the Select Committee on British and Irish Spirits appointed in 1890. It was stated that silent spirits

seem to act physiologically like other spirits, but are, owing to the small amount of bye-products contained, insipid and flavourless, just as the extract of meat is, unless condiments are added to convert the extract into pleasant-flavoured soup, and that the bye-products act as the condiments to the insipid alcohol of silent or patent spirits. This want of flavour, arising from the absence of bye-products, is supplied by blending. Most of the patent spirit made in Ireland is blended, *i.e.*, mixed with pot-still whiskey, and many distilleries consequently use both pot-stills and patent stills. The relative merits of "Self" whiskies and of blended whiskies has given rise to no small amount of discussion, both before the Committee mentioned above and elsewhere. Many hold that the pot-still product matured and ripened by age is the only spirit that should be designated "whiskey;" but of course an examination of this question, still less an expression of opinion, is quite outside the scope of this article. Much of the patent spirit made in England, especially in London, is rectified, that is, converted into flavoured spirits, such as gin and factitious or British brandy, by the addition of juniper berries or other flavouring seeds. Most of the patent spirit produced in Scotland, as in Ireland, is blended with pot-still whiskey so as to lighten and cheapen it. It may be pointed out that the marked difference in flavour between Scotch and Irish whiskey is mainly due to the fact that the Scotch dry their malt with peat, which imparts a decidedly smoky character to the Highland product, whilst anthracite or smokeless coal is generally used in Ireland, with the result that Irish whiskey is free from the marked smoky taste of Scotch whiskey.

The Bye-products of Distilling.

The following bye-products from distilleries are worthy of note:—

1. Spent grains, which, as in the case of brewers' grains, are sold as a feeding stuff. When spent grains are sold direct from the mash-tub, a distiller generally receives about 6*d*. per bushel, and when they are dried, about 4*s*. 6*d*. per cwt.

2. The spent wash, for which 6*d*. to 10*d*. per 100 gallons may be obtained, in pot-still distilleries, is largely sold for cattle feeding or for use as a land manure. Its utility as a fertiliser seems to have been somewhat overlooked, and the remarks made by Frankland in 1871 upon this question, are worthy of consideration. He stated ("Experimental Researches," page 827) that his analyses show distillery drainage to possess a high manurial value, at least ten times more valuable than sewage, and he asserts that the waste of such rich manure in country places is simply disgraceful. The crops grown upon the distillery farm at Bushmills and on farms near many Scotch distilleries, afford a practical illustration of the high value of the spent wash as a fertiliser. At patent still distilleries very large quantities of spent wash have to be disposed of, and if they are situated in towns it may not be possible to profitably use the wash for manure. In such cases the wash is generally allowed to stand, and the clearer portion drawn off, and run to waste, whilst the thick matters in suspension are precipitated, pressed in bags, and sold as "slummage" for mixture with cattle food.

3. The yeast which is used to cause fermentation is generally bought from Brewers, and is at once thrown in with the newly collected worts in the

proportion of about 1½ lbs. of pressed yeast to each barrel of wort. The separation of yeast from the fermenting wash and its purification for use by bakers, is now a very important branch of the distilling industry, and, though by no means a new one, has been of comparatively recent introduction into Ireland. A distiller is allowed by the excise regulations to remove from a washback any quantity of yeast not exceeding 10 per cent. by bulk of the wort. By special indulgence this limit is frequently extended to 15 per cent., and the yeast may be removed by skimming, by decantation of the yeast from the wash, or by both processes. The removal of yeast has become a very important industry in some distilleries, in fact, in some patent still distilleries the natural order of things almost seems to be now reversed, and the manufacture of yeast seems to have almost become the primary object, and the spirits manufactured little more than a mere bye-product. It is not the custom in Irish pot-still establishments to collect the yeast.

Among other bye-products mention may be made of carbonic acid gas which may be collected and utilized in a similar manner to that which obtains amongst certain brewers, and which has been described in the preceding article.

Distilling and Barley-growing.

Though the quantity of barley required in Irish distilleries is much less than the quantity used in Irish breweries, still there can be no doubt that distilling, like brewing, has a marked influence upon barley-growing in Ireland, and that much of the comparative steadiness exhibited by the area under barley, during the last fifty years, as compared with the shrinkage of other cereals, is due to the steady market and good prices afforded by distilleries. The proportion of malted and unmalted grain now used for making whiskey varies in each distillery; but, as regards pot-still distilleries, it may not be inaccurate to say that the average proportion of malt used is from 25 per cent. to 50 per cent. of the mixture mashed; of barley from 40 per cent. to 60 per cent., and of oats somewhere about 15 per cent. Two of the Irish distilleries are all-malt distilleries, where no unmalted grain is used. Thus, on the average, 85 per cent. of the mixture used in pot-still establishments consists of barley, malted or unmalted, and the barley thus used is almost entirely home-grown.

In patent still distilleries the proportion of malt used varies from 15 per cent. to 25 per cent., and indeed, with modern plant and special manipulation, smaller quantities, it is said, may be safely used. Roughly speaking, from about 10 per cent. to 15 per cent. of the mixture mashed consists of oats, and the remainder, that is, from about 60 per cent. to 75 per cent., usually consists of maize. Rice, rye, unmalted barley, and wheat are sometimes used. The making of spirits in patent stills exercises comparatively little influence upon the agricultural economy of Ireland, as compared with the effect of the pot-still process, for, not only does from 60 per cent. to 75 per cent. of the mixture used in the patent grain distilleries consist of an imported cereal, viz., maize, but moreover the malt used for the mashing process in these distilleries is largely made from light foreign barley.

It is not at all easy to arrive at an even rough estimate of the amount of each variety of grain used each year by the Irish distilleries, for, in the first place, it is hard to say what proportion of the total output of spirits

made in Ireland is manufactured in pot-stills and what proportion in patent stills.* Then, as already mentioned, the proportion in which the different varieties of grain are mixed varies in different distilleries, and moreover, the quantity of spirit obtained from a bushel of the mixture is by no means constant, but varies with the quality of the materials used. However, as an approximate estimate it may be stated that about nine gallons or rather more of spirit can usually be produced from a barrel of 168 lbs. of the mixed meal. Assuming that at least one-half of the 14,000,000 gallons of spirits distilled in Ireland last year were made in pot-still distilleries, it would appear that about 2,000,000 bushels of barley (nearly one-third of the total Irish yield) were used in the distilling industry, so that distilling obviously exercises a marked influence upon the barley-growing industry in Ireland.

Distillers and the Law.

Reference has been already made to the restrictions imposed upon distillers in the middle of the sixteenth century, and with each increase in the taxation imposed, these restrictions became more irksome. Indeed the history of the Irish distillers during a large part of the eighteenth century is chiefly a narrative of ever-changing attempts at fraud, of consequent legislative restrictions and of complicated methods of assessing the duty. Not only were the regulations inadequate for the collection of the duty, but they were also so stringent and so ill-contrived as to prevent the licensed distiller from producing spirits equal in quality to those of the smuggler. The evil of illicit distillation reached such an alarming height in 1821 that a Parliamentary Commission was appointed to investigate the laws governing distillation, and to propose amendments. As a result of this inquiry new regulations were introduced which combined greater security for the Revenue together with a release for the distiller from many of the trammels under which he hitherto conducted his operations. Different methods of charging the duty were compared, and ultimately that prevailing in Scotland (which had been originally suggested by the distillers themselves was adopted, and further improvements followed.

In 1823 spirits were allowed to be warehoused duty free for home consumption in Scotland and Ireland. In 1848 the warehousing regulations of the United Kingdom allowed spirit to be bonded duty-free for exportation, home consumption, for removal to other warehouses, etc., and for use in methylating One per cent. was allowed, too, for waste in racking and blending operations. In 1855 all consumable goods used by distillers were allowed entry duty free. In 1860 the legislation concerning distillers was

* It was stated before the Select Committee on British and Irish Spirits appointed in 1890, that, in the year 1889, the quantity of spirits produced in Irish distilleries using pot-still only was 5 745,764 gallons, and in patent still distilleries 1,993,813 gallons, and that in distilleries using both kinds of stills 3,665,210 gallons were produced. It is well known that the amount of patent spirit produced in Ireland has enormously increased during the last ten years, and it seems to be the general opinion that at least one-half of the spirits now made in Ireland are manufactured in patent stills. It is interesting to note that it was estimated in this Report that of the mixed meal used in Irish Distilleries, malt formed 40 per cent. in pot-still manufacturies, 20 per cent. in patent still establishments, and just under 30 per cent. in distilleries which use both kinds of stills.

consolidated, and many restrictions abolished or partially relaxed. These applied, for instance, to the removal of yeast from fermenting vessels, to the sale of yeast, to the grinding of malt with stones, to the continuous running of pot-stills, to alternate periods of brewing and distilling, to the use of any material for making wort, to extended allowances for unavoidable waste, and to the loss of spirits through accidents.

The chief legal restrictions which at present govern the distillation of spirits are set out in the Spirits Act, 1880. In the first place the distiller has to pay an annual sum of £10 10*s.* for a licence and a duty of 11*s.* per gallon is charged when the spirit passes into consumption from the spirit store, or the bonded warehouse, or when they are transferred to duty-paid stock. An allowance, however, of 3*d.* per proof gallon is paid on the exportation of plain British spirits, and an allowance is also made when they are shipped for ship stores, and when they are used in Customs warehouses for fortifying wine, or are used in other operations at Customs warehouses, and are thus rendered inadmissable for home consumption. The allowance is designed to cover the extra cost of manufacture necessitated by compliance with the Excise regulations, and for the same reason an additional import duty is levied on foreign spirits (except Rum and Brandy) of 5*d.* per proof gallon.

As regards distillery premises, a distillery is not entitled to a licence unless the distillery is situated within a quarter of a mile of a market town, though a licence may be granted to a distillery situate beyond this limit on suitable provision being made for the accommodation of the Revenue Officers. No distillery may be worked within a quarter of a mile of a rectifier's premises, and a distiller must not carry on in his distillery premises the business of a brewer, nor that of vinegar, cider, or sweet wines maker, nor that of a sugar refiner; and a distiller is prevented from carrying on business on premises which communicate with houses where any of the above-mentioned trades are conducted.

As regards the processes, a distiller must not mash, brew, or use a still of any kind between Saturday, 11 p.m., and Monday, 1 a.m.; brewing and distilling operations must be in distinct and alternate periods, and a still may not be used until two hours have elapsed since the closing of the brewing period. The quantity of bub and other fermenting agents that may be added to wort in the washbacks must not exceed 5 per cent. by bulk of the wort or wash in such vessels. Its gravity must not exceed 1080, and it must be all placed in the specified washback within twenty-four hours of its first being made. The distillery is subject to very keen supervision by the Excise officers, to whom the distiller has to give a written notice of most operations, and the whole business of distilling is restricted by a number of very complicated and minute regulations, from most of which the Continental distiller is free. Individual distillers may obtain, upon proper application, special indulgences in the way of the relaxation of certain restrictions in order to meet their particular requirements. The chief indulgences above referred to are those which extend the quantity of yeast legally removable; those which curtail the interval between the brewing and distilling operations; those which extend the limits of warehousing strength; those which refer to the use of bub, and those which dispense with the erection of specified vessels and fittings and permit the erection of additional vessels.

In levying the duty the charge is not made by actual admeasurement of the spirits, but upon the quantity found according to a certain standard of

strength called proof* as denoted by Sike's Hydrometer. The principle followed, as already indicated, is to prescribe the course of manufacture and to establish such a system of checks and charges as shall render it impracticable for the distiller to abstract any spirits during the process of manufacture without the knowledge of the Inland Revenue officers. The distiller has to apprise the officers of the quantity and gravity of the worts collected in the fermenting vessel, and the wort is followed step by step until it is distilled into spirits. There are three methods by which the duty is charged: first upon the wash made in the distillery, one gallon of proof spirits being charged for every 100 gallons of worts for every five degrees of gravity attenuated; secondly, from the quantity of proof spirits calculated to be present in the low wines after deducting an allowance of 5 per cent. for waste occurring in re-distillation; and thirdly from the quantity of proof spirits contained in the spirits and feints produced from the distillation of the low wines. The distiller is charged with duty on the greatest quantity arising from any one of these three methods of charge. Only the first and third of these methods are applicable in most distilleries, as the second can be carried out only where preference is still given to the older methods of collecting all the low wines from a given quantity of wash before re-distilling any of them. The third method is generally considered to be the fairest, and it is almost invariably the one which determines the actual charge, as it is almost always the highest of the three. The first, or the attenuation method acts as a valuable check in comparing the brewing operation with the distilling operation, and of tracing discrepancies in either. The distiller is not compelled to pay the duty on his spirits immediately after they are manufactured; he can deposit them in bond, and defer paying the duty until he takes the spirits out of the warehouse for consumption, watching the market for a convenient time and opportunity to dispose of them to the best advantage.

The Consumption of Whiskey.

The amount of spirits consumed in Ireland is very different from the quantity distilled and from the quantity upon which duty was paid in any one year. Irish whiskey has of course a world-wide reputation, and large quantities are exported to Great Britain, the Colonies, and Foreign Countries. Thus last year, over half the whiskey upon which duty was paid in Ireland was exported and, indeed, more was sent to England alone than was consumed in Ireland. No very accurate calculation can be made as to the quantity of spirits consumed in Ireland, during the eighteenth century, per head of population. In 1791, when the population was about 4,200,000 it was stated in the Irish Parliament, as has been already mentioned in the preceding article, that duty was paid on over 3,400,000 gallons of spirits, whilst over 1,000,000 gallons were imported, so that the amount

* The term "proof" is used to express the strength of the spirit, and has come into general use in consequence of the Excise authorities adopting it as the standard. According to the Act of Parliament, proof spirit has a specific gravity of 0·923077 at 51° F., and at this temperature 13 parts of it weigh exactly the same as 12 parts of pure water. When spirit is said to be 30 per cent. above proof, it means that 100 parts of this spirit and 30 parts water will yield 130 parts of proof spirits; and when spirit is said to be 30 per cent. under proof, it means that 100 parts of this spirit contains 100 minus 30, or 70 parts of proof spirit.

of duty-paid spirits consumed per head of population was over one gallon. It was universally admitted, moreover, that an enormous quantity of spirits was illicitly distilled. Some estimates stated that the amount illicitly distilled was even greater than the amount upon which duty was paid. In 1811 the quantity of spirits charged with duty had risen to 6,378,479 gallons for a population of 5,956,460. In 1838 when the population was about 8,000,000, the quantity of spirits charged with duty in Ireland was over 12,000,000. About the time of the Father Mathew Crusade, the quantity diminished by nearly one-half, but in 1851 it had risen to 7,550,518 gallons for 6,552,385 persons. Ten years later, in consequence of the increased taxation, the amount of spirits charged with duty *for consumption in Ireland*, according to the returns of the Commissioners of Inland Revenue, had fallen to under 4,191,560 gallons for about 5,798,564 persons. The returns for 1871 and 1881 showed a slight increase in the quantity consumed, but the consumption was still under one gallon per head of population. In 1891, when the population was 4,704,750, the consumption was returned as 4,821,146 gallons, but about the time of the Financial Relations Commission it was discovered that a serious error had crept into these statistics, and that the consumption of whiskey in Ireland has been returned as greater than it really was. The following extract from a Parliamentary paper, issued by the Commissioners of Inland Revenue, shows how the mistake arose :—

"In April, 1858, the duty on spirits in Ireland was raised to the same rate as that prevailing in England and Scotland, and from that time to this the duty has continued at equal rates in the Three Kingdoms. With the equalisation of the rate it became a matter of indifference to the Exchequer in what part of the kingdom the duty on any particular gallon of spirits was paid. But, on the other hand, it became for the first time necessary, if it was desired to know the true contribution of each of the Three Kingdoms to the Excise, that the amount of spirits transferred, after payment of duty, from one to the other, should be recorded. Hence, in the year 1858-9, the Board of Inland Revenue established an account, intended to show the amount of spirits actually consumed in each of the Three Kingdoms, as distinct from the amount paying duty in each of them. This account has ever since been compiled quarterly, and a summary of it has been published every three months in the Board of Trade Returns, and once a year in our Annual Report.

"Unfortunately, the details of the account have, as it now appears, been often made up with very inadequate care by the officers responsible for them. The reason, no doubt, is that they were of no importance whatever to the Revenue. The Return in question was a return of the movement of spirits, which, whatever might become of them, had paid their full due to the State. Hence, the zeal of those engaged in collecting the statistics flagged, and they did not fully examine the documents from which they were compiling.

"This was more especially the case with regard to the spirits removed, after payment of duty, from dealers' stores. When duty-paid spirits are removed from a warehouse they are accompanied by a 'permit,' drawn up by the officer in charge of the warehouse, and it is easy for him to keep a correct account of such removals. But of the amount of the removals from dealers' stores our officers have no other information than that given by the dealers themselves, who are bound by law to send with every consignment of spirits a certificate stating the quantity and place of destination. The certificates are taken from the books supplied to the dealers by the

Revenue authorities, and containing counterfoils, on which the dealers fill in details corresponding to those given in the certificates. These counterfoils are subsequently collected by the officers of Inland Revenue, and it is in extracting the information contained in them, a task which is always laborious and often difficult, that frequent mistakes have occurred. It will easily be understood that, where the quantities under examination are so great, a number of omissions, each individually slight, may collectively produce a heavy per-centage of error."

The present Consumption of Whiskey in Ireland.

The result of these errors was that the official returns had for over thirty years set out the consumption of spirits in Ireland as being much greater than it really was. It was stated that the "normal error" during this period had been about 10 per cent., but owing to exceptional circumstances it amounted in the year ending 31st March, 1892, to over 600,000. In the last year for which returns are available, namely the year ended 31st March, 1901, when the population was 4,456,546, the quantity of spirits retained for consumption in Ireland as a beverage only was 4,238,334 gallons, *i.e.*, 474,844 gallons, (more than 10 per cent.) less than the quantity consumed in 1900. It will be noticed that the quantity retained was considerably less than one-third of the quantity distilled in Ireland during that year (14,221,520 gallons), and less than half of the quantity charged with duty in Ireland during the year (8,931,877 gallons). The figures quoted show that the average consumption of spirits in Ireland during the last fifty years has been considerably less than the average consumption during the first part of the nineteenth century, and that the quantity consumed per head of population (.95 of a gallon) is now nearly the same for Ireland as for the rest of the United Kingdom (.88 of a gallon). Though the consumption of beer, as has been already remarked in the preceding article, shows a great increase in the last forty or fifty years, it is still far less than—indeed little more than half of—the average consumption per head of population in the rest of the United Kingdom. The slight decline which has taken place in the consumption of spirits throughout the United Kingdom since 1825, when the consumption was slightly over one gallon per head, is not surprising, in view of the fact that during the last fifty years the taxation on spirits has increased 300 per cent. as compared with an increase of 50 per cent. on beer, and a decrease of over 75 per cent. in the tax on tea.

The Relative Taxation of Whiskey.

Though this article does not purport to inquire into the comparative merits or demerits of any beverages, alcoholic or otherwise, or the grievances, real or imaginary, of the makers, reference may be made to the question which has been so often asked, viz., what is the comparative rate of taxation to which spirits, beer, and tea are subjected? The question has not, as far as we are aware, been satisfactorily answered, though numerous comparisons have been instituted, *e.g.*, the alcohol present in beer and spirits respectively has been calculated, and the tax upon them has been reduced to that standard, and thus it is often stated that the duty on whiskey is four times the duty on beer *quoad* alcohol. Again, a comparison may be made according to the proporton that the duty bears to the price. According to this test the tax on whiskey is more than double the tax on beer, as the duty on whiskey forms over

one-half of the retail price of whiskey, and the duty on beer less than one-fourth of the price of beer.

Perhaps a more satisfactory method would be to compare such quantities of the articles as would usually be considered equivalent by the consumer. We may suppose, for instance, that a labouring man might hesitate between a pint of beer, a pint of tea, or a glass of whiskey. Now the duty on beer being *7s. 9d.* per barrel, it follows that the taxation of a pint of beer is considerably over a farthing, and supposing (which probably is a large estimate), that a quarter of an ounce of tea is used to produce a pint of the liquid, the tax which a pint of tea bears is something less than half a farthing. But the glass of whiskey is burthened with over 1½*d.*, and its contribution to the Exchequer is (if we suppose that it is retailed at about 20 per cent. under proof), a large percentage on the cost, and about five times as much as is imposed upon the beer, and more than twelve times as much as is imposed upon tea.

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