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R E P O R T

ON THE

SUPPLY OF FUEL IN IRELAND:

AN INQUIRY INTO THE CHARACTER AND EXTENT

OF THE

IRISH COAL FIELDS, PEAT MARSHES, ETC.

BY

H. O'HARA, C. E.,

AUTHOR OF "BRITISH INDUSTRY EXEMPLIFIED IN THE DEPARTMENTS OF COAL
MINING AND IRON SMELTING ;"
"THE COTTON PLANT, AND THE COUNTRIES ADAPTED TO ITS CULTURE ;"
"THE CULTIVATION AND MANUFACTURE OF FLAX IN IRELAND ;"
ETC. ETC.

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VICINITY.”**

BY H. O'HARA, C. E.,

Author of “The Cotton Plant and the Countries adapted to its Culture;” “The Cultivation and Manufacture of Flax in Ireland;” “The principles which should govern the classification and arrangement of public Museums;” “Characteristics of Mediæval decoration;” “British Industry exemplified in the departments of Coal mining and Iron smelting;” “The supply of Fuel in Ireland,” etc. etc.

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MAP

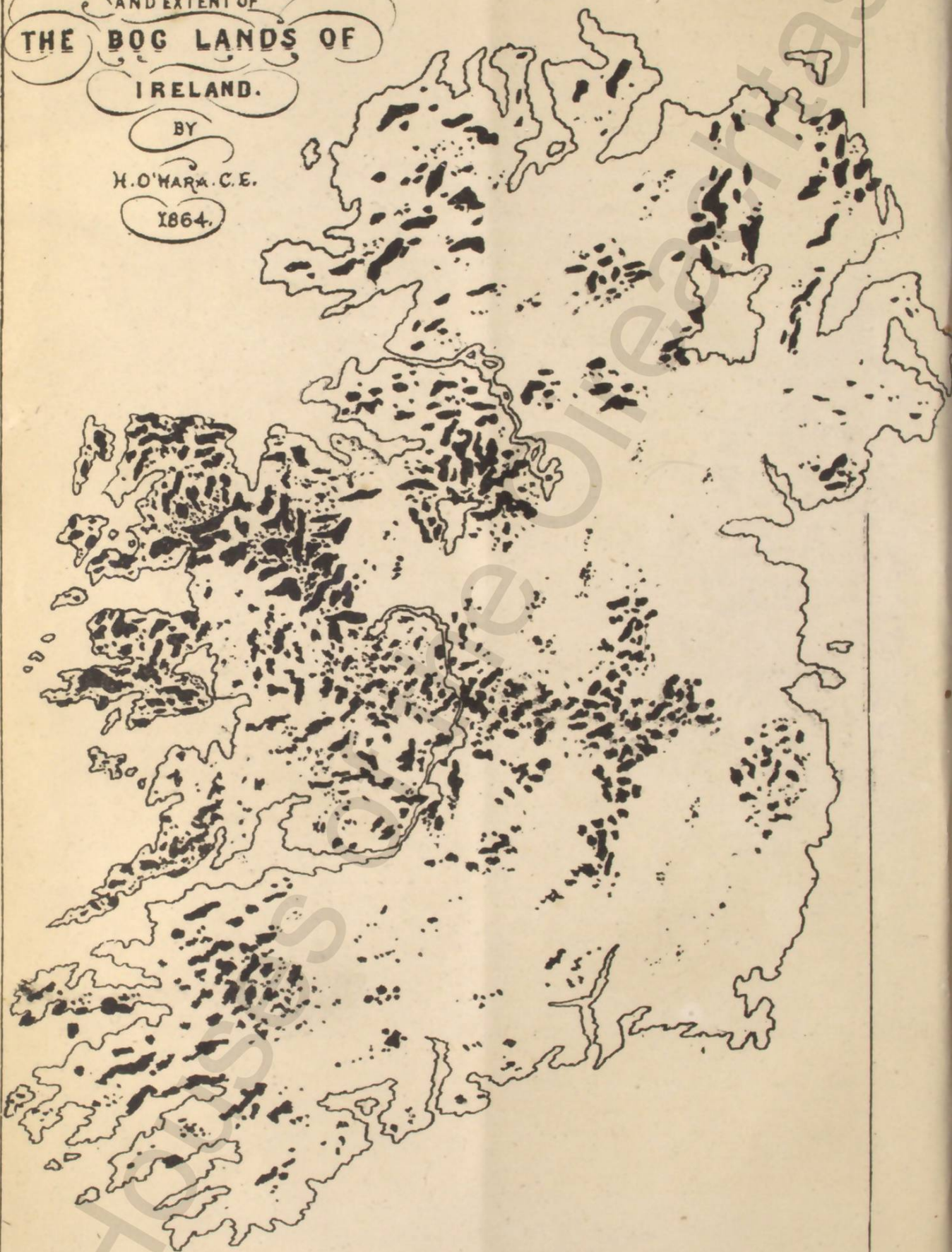
SHEWING THE POSITION
AND EXTENT OF

THE BOG LANDS OF IRELAND.

BY

H. O'HARA, C.E.

1864.



H. O'Hara, C.E. del.

J. T. Landey Lith

TO ILLUSTRATE MR O'HARA'S PAPER ON THE
SUPPLY OF FUEL IN IRELAND.

ON THE SUPPLY OF FUEL IN IRELAND.

THE inhabitants of most countries derive their supply of fuel from their forests and their woods. It is only within a very recent period that pit or "sea coal" has come into general use; and the people who first used it were the inhabitants of the west of Europe, and of the northern states of America. Ireland does not contain a single forest; and the few woods that are scattered through the country are so circumscribed in extent, that if they were cut down for fuel, and their produce exclusively consumed, they would not, at the present rate of consumption, afford the population a seven years' supply. This scarcity of timber in Ireland is a great disadvantage, which should be overcome by increasing the number of plantations in uncultivated districts. The aspect which the surface of the country presents at present, with regard to vegetation, is extremely different from its aspect a few centuries ago. We have abundant proofs that formerly Ireland was one vast forest. In times of warfare broad tracts were cleared to facilitate military operations, and extensive woods were consumed by fire. Immense quantities of timber were likewise consumed by the numerous forges and iron furnaces which at various periods were in a state of great activity. The remains of these ancient bloomeries, which are met with in the counties of Antrim, Leitrim, Roscommon, Sligo, Tyrone, Kilkenny, Carlow, Tipperary, Limerick, Kerry, and Cork, prove that the smelting of iron was very general in Ireland previous to the complete exhaustion of the supply of wood. The destruction of the forests must have caused a considerable change in the climate, and a still greater change in the soil. Indeed, the most remarkable effect has been the conversion of one-seventh of the country into a swamp. This has occurred through the greater exposure of the surface of the land to the moist winds of the Atlantic, which are highly favourable to the growth of a species of moss known as the *Sphagnum palustre*. This moss thrives only in exposed situations; and so favourable is the pre-

sent condition of Ireland to its propagation, that if the existing arable and pasture lands which have a south-western exposure were abandoned to nature, most of them would be covered by peat moss to a height of several inches in the course of a century.

The morasses which have been formed by the growth of this and other mosses, as well as by numerous species of reeds and rushes, are not confined to any particular district of the country, but are scattered over the entire island. They are chiefly valuable as sources of fuel; but they also contain the trunks and roots of numberless elm, fir, oak, yew, ash, and willow trees, many of which are in a sufficient state of preservation to be manufactured into articles of household furniture. Generally speaking, the peat moss, as cut by the peasant and burnt in his cabin, is not so good a fuel as wood. It contains a large quantity of water, which can only be effectually removed by the action of a dry current of air, as the fibrous structure of the peat causes it to retain moisture so obstinately that only the brisk heat of a kiln will completely drive it off. However, large quantities of turf are sold in the country towns and cities, which, having had the advantage of being stored during the summer months, are comparatively dry, and make a cheerful fire. Although nearly all the bogs are alike in their general character, yet there are differences between them, and much difference between the peat cut in different parts of the same bog. Near the surface, and frequently for a depth of 4 ft. or 5 ft., the organization of the several mosses is perfectly discernible; and from thence downwards to a variable depth, the structure of the plant may be traced through various stages of decay, until at the bottom of the morass all traces of it are lost in the complete decomposition which has ensued. The dense peat which forms the lower stratum of a bog makes the best fuel. Throughout the Kildare and King's County marshes the black or bottom peat has a somewhat earthy appearance; but nevertheless it burns well, and large quantities of it are conveyed by canal to Dublin for consumption. In Fermanagh, Donegal, and many of the northern and western counties, the dense peat of the numerous bogs is extremely rich in inflammable matters. It cuts like cheese, is easily dried, and burns almost like bituminous coal. In this peat considerable numbers of the trunks and roots of fir trees are found; and the resin and turpentine which they contain impart such combustible properties to the peat in contact with them, that it burns rapidly with a bright flame. The country people dry the roots of the fir, split the fibres longitudinally, and burn the splinters as candles. The oak trees found in the bogs, being in a tolerable state of preservation, are considered too valuable to be used as fire-wood; and as they are usually black at the outer rings of growth, owing to the tannic acid which the bark contains being acted upon by the iron held in solution by the bog waters, the wood is much prized for ornamental carvings. Most of the morasses are situated in the middle of the country; and if two lines were drawn,—one from Donegal to Bray, and another from Galway to Arklow,—they would include between them by far the greater proportion. Their situation is in no way peculiar, being found extend-

ing alike over the plains and mountain summits, and resting on marl, alluvium, gravel, and even upon the bare rock. The mosses thrive better, and consequently grow with greater rapidity, on low than high lands; and owing to this fact, the bogs which are situated upon mountain tops and slopes rarely exceed six feet in depth, whereas the bogs of the lowland districts vary from a mere superficial covering to a depth of forty or fifty feet.

The peat which is obtained from a mountain bog is usually much denser, blacker, and more impure than the peat moss of the plains. This impurity is often owing to the disintegrated portion of the rock being disseminated throughout the mass, which circumstance lessens its value as a fuel; and the greater density and blackness are owing to the slower and more stunted growth of the moss, and to atmospheric influences. The area of the bogs which are spread over Ireland amounts to 2,830,000 acres. Of this quantity 1,255,000 acres rest upon the mountainous and hilly districts near the coast; and the remaining 1,576,000 acres extend across the great limestone plain, and contain an almost inexhaustible supply of fuel. But as the turf is at present prepared for use by the peasantry, its heating power is not sufficiently intense to be employed with advantage under steam-boilers. It is bulky, and contains about 20 per cent. of moisture, sometimes more and sometimes less, according to the season in which it has been cut.

One of the greatest obstacles to the more general introduction and consumption of peat as a fuel, lies in the fact that the bogs are suffered to remain in so swampy a condition that the turf cannot be properly prepared for use without a considerable expenditure of time and labour, or the aid of machinery, to squeeze out the water. In a country where there is such competition for the possession of land, it is difficult to account for the present neglected state of nearly 3,000,000 acres. Much has been spoken, written, and proposed in connexion with the subject of the reclamation of these marshes, but nothing really practical or scientific has yet been attempted on a large scale. The mode of turf-cutting adopted by the peasantry is the rudest possible. No effort is made to drain the marsh, but the fuel is cut at the margin in shallow detached pits resembling quarries, and the interior portions of the bog remain unwrought, and in the condition of a quagmire. If a few deep trenches were cut transversely through the entire length of a bog, the whole of the superfluous water could readily be conveyed to a lower level, and got rid of. By this means the surface could be reclaimed at very little expense, and cultivated, and the peat in every part of the marsh would become accessible, and considerably improved in density and dryness. The climate of England is almost as favourable to the growth of aquatic mosses as that of Ireland, and the peat marshes are almost identical; yet vast tracts have been brought under tillage at an expense of millions of money, which has long since been amply repaid by direct returns, without taking into account the increased salubrity of the districts so improved. To render our peat more generally useful as fuel, a very important improvement might be

effected in the size of the turf sods, as their present shape and dimensions are those of a brick—a form which is most unsuitable to proper combustion in fire-grates and furnaces. If the turf were cut in three-inch cubes, it could be used with greater convenience and economy. It is not the custom to sell turf by weight in this country, but it is generally understood that in the immediate vicinity of the turbaries of the western counties, the measures which are employed in the sale of the commodity reduced to weight are equivalent to a rate of four shillings per ton. In the central and southern counties, the present rate is about 5s. 3d. per ton; and should the emigration continue, it is probable that it will rise to six or seven shillings per ton. The price of turf is almost exclusively made up of wages for labour and the cost of carriage, and the supply of labourers in any given district regulates the expense of the fuel. Thus, in 1825 the average cost of turf in the vicinity of most of the turbaries was only 2s. 8d. per ton, and in 1844 it was 3s. 9d.

Peat, when properly prepared, is, in Ireland, a cheap, plentiful, and excellent fuel. The vast mass of the poorer classes in the interior of the country are mainly dependent upon it, and in many parts all classes are obliged to rely upon it exclusively. There are many inland districts in which bogs are scarce, and a turbary is regarded as the most valuable property in the neighbourhood. In such localities the proprietors have frequently allowed the moss to again vegetate after most of the peat had been removed, in order that the supply might not be completely exhausted. But there are very few localities so situated. The bogs are so distributed over the country, the coal-fields so dispersed, the seaport towns so numerous around the coast, and the inland navigation and railway systems so arranged, that almost every spot in the island is within reach of an abundant supply of fuel.

Although the area under bog has been estimated at 2,830,000 acres, yet we may regard the extent as comprising about 2,000,000 of acres, as many of the marshes have been recently reclaimed, and others completely exhausted. If we allow an average depth of 3 yards, and estimate a cubic yard of dry peat to weigh 550 pounds, we shall find that the quantity of available fuel from this source amounts to 6,338,666,666 tons. On pursuing the calculation further, and taking the economic value of turf compared with that of coal, as 9 to 54, the total amount of peat fuel in Ireland is equivalent in power to above 470,000,000 tons of coal; and estimating coal at twelve shillings per ton, we find the money value of all the peat in Ireland to be £280,000,000 sterling. Large as this sum is, it might be greatly increased if the same means were adopted in Ireland to utilize peat that are successfully prosecuted in other countries. In Bavaria, France, and even in North America, where coal and wood are in enormous abundance, the bogs are converted into sources of wealth, and are not suffered to remain the unproductive and unsightly swamps which they are with us. The marshes are partly drained; and the effect of the removal of the water from the peat is to convert it into an excellent fuel,

The ash obtained from peat in these three positions varies also considerably, and the following may be regarded as representing the average percentage residue :—

Turf yields a considerable bulk of volatile and inflammable gases, which distribute the heat evolved during combustion through a greater space than most other fuels, and hence it may be found useful in many operations requiring a diffused heat. In this characteristic it differs remarkably from anthracite, which yields an intense and concentrated heat. The want of density, which is a characteristic of turf as a fuel, is probably the chief objection to its use in large manufacturing operations; but this may be so readily overcome by subjecting it to pressure, before use, that we may yet hope to see it extensively employed as compressed peat.

On the southern shores of Lough Neagh we have an extensive deposit of fossil wood, which is known by the name of *lignite*. This substance is intermediate in its composition between coal and wood, and, as it generally retains its woody structure, and is of a deep brown colour, it is often called wood coal. The deposit in which the lignite beds are enclosed covers an area of 60 square miles, and contains three large layers, which vary from 15 to 25 feet in thickness, besides several smaller ones. The thickness of the same beds varies in different parts of the basin, and borings that have been made in several places within the area prove that the lignite lies at variable depths. At Sandy Bay, in Antrim, several pits were sunk, and considerable quantities raised for local consumption.

When lignite is ignited, it burns well, gives off smoke, and leaves a dense charcoal as residue. This fuel is of a deep brown colour, presenting the structure of wood. It is far inferior to coal, as its heat is less intense and more diffused. Indeed, there is no fuel which is possessed of so many advantages as coal, and our main reliance must be upon it for generating the heat essential in most manufacturing operations.

There are so many varieties of coal, that it is extremely difficult to classify them. Almost every separate coal-field will contain a fuel differing in a marked manner from the character of the coal occupying another. Even in the same field there will often be found some difference between the coal raised from separate pits; and more remarkable still is the fact, that the several beds through which the shaft of a mine is sunk may yield coal of several qualities. Perhaps the best classification would be into bituminous, semi-bituminous, and non-bituminous. The bituminous varieties include cannel coal and caking coal. The semi-bituminous are called steam coals, and are largely employed under steam boilers, and for most smelting operations.

The non-bituminous coals are known as anthracites, and are extensively used in the manufacture of iron, lime-burning, and hop and malt drying. The anthracites are heavier than common coals, and contain from 80 to upwards of 95 per cent. of carbon.

Coal has been found in seventeen counties of Ireland, and in each of the four provinces. The names of the counties are:—Antrim, Fermanagh, Leitrim, Queen's County, Donegal, Monaghan, Roscommon, Kilkenny, Tyrone, Cavan, Westmeath, Carlow, Tipperary, Clare, Limerick, Kerry, and Cork.

Sir Richard Griffith, who was the first to publish a general description of the Irish coal-fields, grouped the areas occupied by the coal deposits into four great fields, which he named after the four provinces into which the country is divided. The coal found in Leinster and Munster burns without flame, and receives the names of anthracite, culm, and stone coal; that found in Ulster and Connaught burns, for the greater part, with flame, and is consequently known as blazing coal. The Leinster coal-field occupies portions of the Queen's County, and the counties of Carlow, Kilkenny, and Tipperary, but it is divided into three distinct and detached portions by the limestone rock upon which the coal beds rest. The Munster coal district is the most extensive in Ireland. It occupies large portions of the counties of Clare, Limerick, Kerry, and Cork. The Connaught coal-field occupies portions of the counties of Roscommon, Leitrim, and Sligo. The Ulster coal district is of small extent. It occupies portions of Antrim, Monaghan, and Tyrone. There is also a small patch of coal in the county of Cavan, which is remarkable from the fact that it occurs in rocks of the Silurian age, and not in the true coal measures, or Carboniferous group common to the rest of Ireland. The sum of the areas of all these coal-fields, or, in other words, the extent of country beneath which coal spreads, is 1,881,600 acres.

MAP

Showing the position
and extent of

THE COAL FIELDS

OF
IRELAND.

BY

H. O'HARA C.E.

1864.



Houses of the Oireachtas

The coal district of Antrim is situated on the north coast of the county, and extends for four miles along the shore between Murlough Bay and Ballycastle. Its average breadth, southwards, is about one mile and a half. The upper portions of the strata composing the Antrim coal formation are visible in the precipitous cliffs of the coast, and exhibit a thickness of basalt, sandstone, shales, and coal, which amounts in some places to upwards of 350 feet. Inclosed in the strata, at Murlough Bay, there are six beds of coal, four of which are highly bituminous; and the other two, which are nearly in contact with a trap dyke, are carbonaceous. The strata are very much deranged by the numerous dykes of basalt which traverse the district; and in such places as the coal has been cut through by one of these volcanic veins, the coal is charred, and otherwise altered for a short distance, which is usually in proportion to the size of the dyke.

The Ballycastle collieries are considered the most ancient workings in the British Islands. Their area is about 120 acres; and although the greater part of the coal has been extracted long since, considerable quantities of the ironstone are raised at present, and exported to Scotland. A considerable number of pits were sunk here in the early part of the last century, and the works were vigorously carried on, as they were stimulated and sustained by large grants of money from the Irish Parliament. About that period, as the workmen were driving some new galleries, they broke into several extensive works, in which were found antique implements, and other remains, which led to the conclusion that these mines must have been excavated a great many centuries ago by a people who were as expert at their calling as the coal miners of the present day. The Murlough Bay collieries have been worked to a very limited extent, and there are several seams throughout the Antrim district that have never been opened.

The coal district of Tyrone is situated a few miles to the west of Lough Neagh. The coal area of the district is very small, but the beds are of the most valuable kind. The coal is highly bituminous, and has been largely wrought. It resembles Whitehaven coal in appearance, burns rapidly, and gives out a strong heat. Several collieries have been for a long time established at Drumglass, Coal Island, and Annahone. Four of them have ceased working, and the only colliery at present in operation in the district is that situated at Drumglass. The "large" coal raised at this colliery is consumed to a considerable extent in the neighbourhood, and supplies the mills, distilleries, and dwelling-houses with an excellent fuel at 13s. per ton. The "small" coal is disposed of at 7s. per ton, and is employed for burning lime and bricks. The superior quality and thickness of the coal seams of this district, coupled with the fact that they occur in a neighbourhood which is thickly inhabited by an industrious population, give them much interest. The district is separated into two divisions, called respectively the Coal Island and the Annahone districts. The Coal Island district, which is the larger of the two, is of an oval form, about six miles long by two broad, and contains an area of about 7000 acres. The Annahone district is

not more than a mile long, and half a mile broad, having a superficial area of about 300 acres, but supposed to be much greater, and to extend for a considerable distance beneath the sandstone rocks which lie to the south-east. In a part of the district, called Annagher, there are five workable beds of coal, some of which have been partly wrought at various times. The thickness of each seam is as follows:—

	Ft.	In.
V. Coal, containing a seam of cannel coal,	6	0
IV. Coal,	3	0
III. Coal (Brackaveel coal),	5	0
II. Coal,	4	6
I. Coal, slaty and impure,	2	2

Making a total thickness of nearly 21 feet.

There is a small detached coal basin in the county of Monaghan, near Emyvale, which contains a few narrow seams of impure coal, which would hardly repay the cost of extraction. These, and the locality in which anthracite is found in the Silurian rocks of Cavan, are the whole of the coal-fields which exist in the Ulster district. In the county of Antrim there are two collieries, those of Ballycastle and Murlough Bay, neither of which is at present working. In the county of Tyrone there are three, namely, Annahone, Coal Island, and Drumglass, only one of which is at present in operation. The colliery of Kill, in the county of Cavan, is not at present working.

The province of Connaught contains the extensive district of Arigna, which is situated to the west of Lough Allen. This district contains three beds of bituminous coals. One of the two beds, which extend through Kilronan Mountain, is at present wrought on the northern slope, and the coal is sold in the neighbouring towns for 10s. a ton, and the culm sells at 8s. The bed is 18 inches thick; but the lower bed, which is separated from it by about 40 feet in depth of sandstone, is only 8 inches thick, and yields culm of very inferior quality. The coal extracted from the upper bed is of excellent quality, and, including the culm, is raised to the pit mouth at a cost of 5s. 6d. per ton. The various coal deposits which have received the appellation of the Connaught coal-field form a group around Lough Allen, which forms a basin in the centre of the district. The most productive deposits are two which are situated in the counties of Leitrim and Roscommon, within little more than a mile of each other. The coal of the entire district is bituminous, and of good quality. The total area of the Carboniferous rocks which surround Lough Allen on all sides, and on which the coal deposits rest, is about 320 square miles. Throughout this area there are numerous bands of ironstone of excellent quality, but the ore is now only valuable when in the immediate neighbourhood of a bed of coal. Before coal was applied to the smelting of iron, wood was the only fuel employed, and several extensive forests which flourished around the banks of Lough Allen were entirely consumed to supply the furnaces which were formerly in a state of great activity in the district. The Arigna coal-field is the largest in the Connaught

group, and has hitherto been the most productive. Its area is 5760 acres, and it contains one bed of coal and one bed of culm. The Altawowlan coal-field, which is situated about one mile to the north of the Arigna deposit, has an area of 2500 acres, and contains two seams of good coal, one of which is 1 foot 9 inches, and the other 2 feet thick. The thickness of these seams is not constant over the whole area. In some places the beds become gradually thinner, and in other places their thickness increases. Towards the county of Sligo it is well known that the "two-foot" seam increases considerably. The Meneask colliery is situated on the summit of Lugnaquilla Mountain, six miles north of Lough Allen, and on a field of 840 acres of slaty coal, which is 10 feet thick, including an 8-inch seam of good coal. One mile to the east of the lake there is a large oval tract of 4480 acres of coal, which covers the summit of Bencroi Mountain. There are also two or three small detached coal fields within the district, whose areas, added to the areas of the others in the same district, make a total of 17,550 acres, representing a weight of over 18,000,000 tons of bituminous coal. As in all other coal-fields, the strata of this district are dislocated by several faults; but, on the whole, the seams are tolerably regular, and their dip seldom inclines at a greater angle than 10° from the horizon.

The most important division of the Leinster coal district measures 21 miles north and south, and 14 miles east and west. The coal strata are conformable to the limestone rock upon which they rest, and which surrounds this and the other divisions of the district. The general stratification is, however, extremely irregular, and the surface of the ground, in the interior of the coal country, uneven. This division contains an area of over 230 square miles. Sir Richard Griffith, who made a careful survey of the district, considers that it contains eight beds of coal, all of which are workable. The following list gives the local name of each seam, and its thickness:—

	Ft.	In.	
VIII. The upper 3-foot coal,	3	0	
VII. The double seam,	2	6	
VI. The lower 3-foot coal,	3	3	
V. The Drummagh foot coal,	1	0	
IV. The 4-foot coal,	4	0	
III. The upper slate coal,	3	0	
II. The lower slate coal,	3	0	
I. The Rossmore foot coal,	0	10	

The limestone, which underlies the coal measures, rests immediately upon the granite, and the strata are consequently much contorted, a circumstance which renders the search for coal a matter of considerable difficulty. Many of the bands of ironstone, associated with the coal seams, are very rich, and in several places there are the remains of ancient excavations and forges, which attest the former industrial activity which existed in the locality. The manner in which the rocks are bent and dislocated in this district, renders the working of the coal seams troublesome and expensive. Notwithstanding this

disadvantage, the extraction of coal and culm has been carried on during a great number of years, with varying degrees of success.

Over the entire of the Leinster coal area an incredible number of shafts has been sunk, and an examination of the district proves that no means have been left untried to turn the coal beds lying beneath the surface to profitable account. The upper 3-foot coal occupies but a small area, as it only occurs between two slips in the strata of Coolbawn Hill. It is almost worked out. The double seam, as its name implies, consists of two beds of coal, separated by a bed of fireclay, 18 inches thick; each coal bed is about a foot in thickness, and the superficial extent of both is small. The lower 3-foot coal furnishes the valuable fuel known as the "Kilkenny anthracite." Its quality is far superior to the anthracites of Scotland and South Wales, and it is remarkable for its hardness, durability in the furnace, and intense heat when ignited. Its extent is not very great, as it only occurs in detached patches throughout the county of Kilkenny and the Queen's County. Several important collieries have at various times been established on this valuable seam, the most important of which was commenced 150 years ago by Sir Christopher Wandesforde, at Castlecomer, over an area of nearly 3000 acres. This colliery, and most of the others situated upon the seam, are almost exhausted; for such has been the activity with which mining operations have been conducted over the district, that Sir Richard Griffith, who wrote his Report in 1814, stated that "the appearance of the surface in every part where the coal was wrought bore a strong resemblance to a rabbit warren, there being a continued succession of hillocks and holes:" he said, "The number of pits that have been sunk may justly be compared to the perforations in a colander."

The Drummagh foot coal has been found in a great number of places, and numerous attempts have been made to work it along the line of its outcrop. The estimated area of the 4-foot coal is about 5000 acres. This coal has the disadvantage of containing a good deal of sulphur, as several bands of iron pyrites are interstratified and disseminated throughout the mass. The kelves which accompany this bed are extensively used for many agricultural purposes, as well as for the burning of lime. The kelves usually sell at the mouth of the pit for 3s. or 4s. per ton, according to quality. The solid coal of the seam, known as the "upper slate-coal," varies in thickness from 18 inches to 24 inches, and the soft coal from 10 inches to 20 inches. This coal has been extensively wrought at the Ardategle and Tollerton collieries; and it is now generally believed not to be an independent seam, but a continuation of that into which the Firoda shaft was sunk many years ago. The lower slate coal has long been wrought at the Wolf Hill, Clogrennan, Rushes, Moira, and numerous other collieries. The quality of this coal varies considerably at different places; and so numerous are the dislocations of the strata, that the expense of working it has been greatly increased. The thickness of 3 feet which this bed averages is made up of a seam of solid coal which lies at the top, and is 18 inches thick;

3 inches of culm; and a band of kelves, or slate coal, 15 inches thick. The solid coal is said to be an excellent fuel; it is generally free from sulphur, and yields an intense heat if burned when newly raised. Although the Rossmore coal is termed the "foot" coal, it is not of uniform thickness, but, being the lowest seam, it is of considerable extent. It was worked on Rossmore Hill a great number of years ago, but did not pay the expense. It is of a brown colour, and when exposed to the air it becomes reddish. Many attempts have been made to work it, with varying degrees of success.

Throughout the Leinster district there are thirty-one collieries. They are scattered through the counties of Carlow and Kilkenny, and the Queen's County. At present but eighteen of them are at work. They are the Curragh, Massford, Coolbawn, Rock, Monteen, Jarrow, Broompark, and Skehana collieries, near Castlecomer. In the Queen's County there are ten of them at work, namely, the Wolf Hill, Aughamafa, Mullaghmore, Holly Park, Meeragh, Geneva, Glen, Kilgorey, and Coorlaghan collieries. The anthracite which is raised from the pits of the district is a hard, glistening fuel, intermediate in colour between dark brown and black. It sometimes contains a little sulphur and iron, and when ignited it gives out an intense heat; but the disengagement of the sulphur during the progress of combustion often causes an unpleasant odour, and on this account many persons are prejudiced against its use for general domestic purposes. But, notwithstanding this, it is largely employed for cooking, malting, and the manufacture of iron, and is universally regarded as the best fuel for these purposes. At the pits the average price is 20s. per ton for the best quality, and the second quality readily sells at 8*d.* and 9*d.* per cwt. Immense quantities of the inferior coal, called culm, are consumed by the country people, as well as by lime-burners and brick-makers. It is a soft and scaly coal, which crumbles on exposure to the atmosphere, although it is raised from the mine in large flakes. When offered for sale, about one-third of its weight of broken anthracite is added to it, and disposed of at 3*d.* and 3½*d.* per cwt. When consumed for domestic purposes, it is usual to mix this culm with clay and water, and knead the whole mass together, and then to form it into a number of balls, which are laid upon the top of the fire. The kelves are a very inferior description of slate coal, only used by the poor when no other fuel can be had; they are of several qualities, but nearly all of them contain over 20 per cent. of sulphuret of iron. These are the three chief varieties of coal which occur in the Leinster district.

The Slieveardagh coal-field, which is a detached area in the county of Tipperary, is included in the coal district of Munster.

In the Slieveardagh coal field there are several collieries at present working, and throughout the neighbourhood there are numberless shallow pits, shafts, and abandoned workings. The Glengoolle colliery is situated on the outcrop of the second, or 20-inch seam, a considerable portion of which is already exhausted, but at a short distance towards the south-east there occurs a basin containing five workable

beds, through which the shafts of the Earl's Hill colliery have been sunk. The coal raised at this colliery is a very superior fuel, and readily sells at £1 3s. 4d. per ton, the price of the culm being 6s. 8d. per ton. There are several detached basins of small area throughout this district, a few of which have been wrought, and others remain unopened. On one of these small basins the Mardyke colliery was situated, and continued in active operation until the "2-foot seam," into which the shaft was sunk, became exhausted. The beds which lie below this seam are known to extend over a considerable area, and have hardly been worked, although they rise up to the surface in several parts of the district. At Knocknaglass, however, a shaft has been sunk through them, and screened coals, of the best quality, sell at 17s. 6d. per ton. There are three other qualities, which sell at 15s., at 12s. 6d., and at 10s. per ton, respectively. The pits at Boulea, Knockalonga, and Ballingarry Wood, are sunk into the second coal, which varies from 16 to 20 inches in thickness; but as the strata which enclose the seam are much contorted, the expense of extracting the coal is greatly increased. The Old Hill, and the Commons collieries are not at present working.

The district which has been named the Munster coal-field is of enormous superficial extent, and occupies considerable portions of the counties of Clare, Kerry, Limerick, Tipperary, and Cork. The area of the coal-measure formation which spreads over this great district is upwards of 640 square miles, and throughout the extent there are several large basins and outcrops of coal, many of which have been wrought at different periods, and others remain unexplored. The division of the district which extends into the county of Clare is very little known, as the country is in many places covered by large tracts of bog, and the rocks are concealed by drift and other superficial accumulations. In those parts of Clare which have been examined by the officers of the Geological Survey, particularly the parts near the sea coast, several small seams have been observed, two of which are workable, being 18 inches, and 2 feet 7 inches in thickness, respectively. The Munster coal district has been, for convenience, divided into the Clare, Limerick, and Kanturk districts. The Slieveardagh district has been already described. As it is situated in the county of Tipperary, it is regarded as an outlier. It has long been the scene of active mining operations; there are nineteen collieries in it, fourteen of which are at present working—ten of them being owned by the Mining Company of Ireland.

In the Kanturk district, situated in the county of Cork, there are three collieries at work, two of which belong to the same Company. In the Limerick district there are seven collieries, but only two of them are now in a state of activity. South of the Shannon three coal seams have been proved and partly wrought; they are the six-inch seam of good coal, locally known as the "hard seam;" the No. II. coal, or two-foot-six bed, which was worked at the Knocknaboola, Glen, and Rock collieries; and the one-foot-six seam, which is identical with the eighteen inch coal, which occurs in the county of Clare. It is chiefly

culm which is obtained from these seams; but when good coal occurs in the same pit with a seam of culm, both are mixed together by the owner of the colliery, and sold as culm.

The coals of the Limerick district are exclusively anthracite, culm, and kelve. The anthracite is a hard, glistening mineral, which burns well, but occasionally gives off an offensive odour during combustion, in consequence of the disengagement of the sulphur which it contains. The culm is a soft flaky coal, which burns well when mixed with the anthracite.

In the Kanturk district there are six good workable seams, the relative thickness and position of which are—

	Ft.	In.
VI. Coal (Harris's seam),	3	0
V. Coal (Bulk seam),	4	6
IV. Coal (Rock seam),	1	3
III. Coal (Sweet seam),	1	6
II. Coal (Fourpenny seam),	1	2
I. Coal (Castle seam),	0	10

The upper coal of this district, which is locally known as "Harris's seam," has not been as yet much worked. Like most of the coal seams in this district, the bed thins out in some places, and increases to considerable thickness in others. The next bed, or "bulk seam," is a most remarkable deposit, as it has been found, in the course of a few yards' distance, to "bulk," or attain a thickness of 10, 20, and even 30 feet. The "rock seam," or fourth coal, is an excellent bed of anthracite, almost free from sulphur; like the other beds, its thickness frequently varies in short distances, and it has been found to diminish to 9 inches, and to increase frequently to 2 feet.

The most valuable bed in the district is the "sweet seam," from which is obtained an anthracite entirely free from sulphur, and of great heating power. The other two beds are the "fourpenny" and "castle" seams; the former is an anthracite, containing iron pyrites, and has been worked to a small extent, but the latter has not been much touched, as it is an inferior culm.

From this rapid sketch of the character and extent of the Irish coal-fields, we learn that there are 73 collieries at present in Ireland, of which number 31 are in the Leinster district; 29 in Munster; 7 in Connaught; and 6 in the Ulster coal-fields. But of the 73 collieries thus distributed over Ireland, only 46 are at present working. The quantity of coal raised by the Irish collieries is about 120,000 tons annually. In 1863 the exact quantity was 127,570 tons. Although the quantity of coal raised in Ireland is small when compared with the productiveness of the English and Scotch collieries, yet the number of collieries in Ireland is steadily increasing; for in 1853 there were but 19 at work, and in 1856 there were 22 in operation. Small quantities of anthracite and pyritous kelves are shipped occasionally from the ports of Dublin, Cork, Dundalk, and Belfast, to foreign countries. In 1862 the quantity thus exported amounted to 2257 tons, the declared value being £1215.

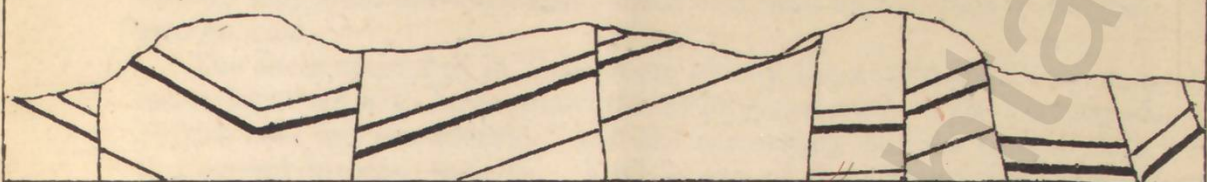
Of the total quantity of fuel raised by the Irish collieries in 1862, 73,000 tons were anthracite and small coal, and 54,570 tons were bituminous coal.

The fuels consumed in Ireland are chiefly the native peat, coal, and culm, together with large quantities of imported coals. The imports of British coal are considerable, and are increasing, but we cannot state the annual increase exactly. Fuel is one of the primary elements of industry and comfort, and its abundance or scarcity will regulate the extent to which manufactures can be conducted. It is therefore considered one of the great necessities of life, whether as an article of domestic economy or of national industry. The high price in Ireland of fuel suited to steam-boilers and to many industrial processes has hitherto been supposed to be one of the greatest obstacles to the extension of manufactures. At Glasgow, Leeds, and many other great seats of industry, coals are delivered at the factories for about 5s. or 6s. per ton, whereas at Dublin and its neighbourhood, the coals cannot be delivered, even at contract rates, under 13s. or 14s. per ton. This disparity in price affects the interests of a Dublin manufacturer in a manner that will be at once obvious, if we contrast the yearly cost of fuel to a Glasgow manufacturer who consumes 3000 tons of coal annually with the cost to a manufacturer at Dublin who uses the same quantity. The Dublin man pays £2100 annually for his coal, but the man at Glasgow obtains it for £900, and this difference of £1200 a year holds out to the manufacturer a premium for settling at Glasgow in preference to Dublin. The question is often asked, "Why are not the coal mines of Ireland more extensively worked, and their produce brought into competition with the imported coals?" The answer is, that the Irish collieries are worked to as great an extent as local circumstances will admit of, and in their neighbourhood coal may be obtained in as much abundance, and almost as cheaply, as in the most favoured districts of England, Wales, or Scotland. The subsequent increase in the price of the fuel is owing to the cost of the carriage; and whether the system of transit from the collieries to the places of consumption be by road, water, or railway, the additional cost will be influenced by the traffic arrangements of the respective districts. The most expensive mode of conveyance is by horse and dray on the ordinary roads. The charges for this mode of transit are regulated by a great number of local circumstances, such as the state of the roads, the season of the year, the supply of horses above those required for agricultural work, and mainly by having or not having a return load when coming back after the completion of the journey. These and many other circumstances so influence the rates charged for land carriage by horse and dray, that considerable differences exist throughout Ireland, and even in different parts of the same county, in the cost per ton per mile for the conveyance of fuel or other heavy goods. The highest rate that I am acquainted with is 1s. 8d., and the lowest, 3½d. It therefore becomes difficult to strike an average; but, after careful inquiry, I believe that 6d. per ton per mile may be regarded as the most usual rate for

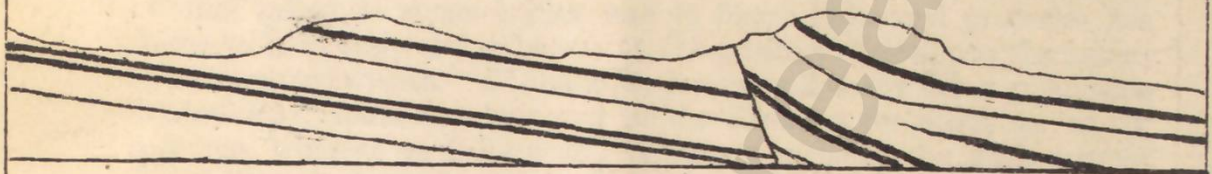
Houses of the Oireachtas

SECTIONS OF THE IRISH COLLIERIES.

1. Ballycastle Colliery. C^o ANTRIM.



2 Coal Island Collieries. C^o TYRONE.



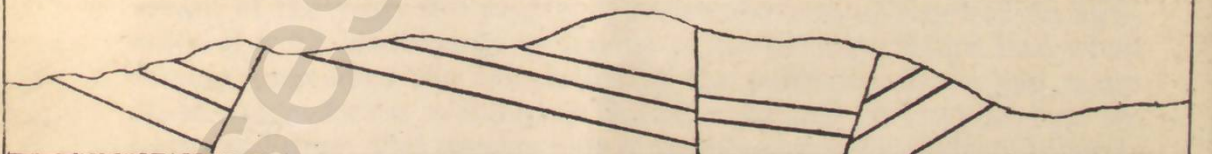
3. Bencroi Mountain. C^o LEITRIM.



4. Kilronan Mountain. C^o SLIGO.



5. Altagowlan Mountain. C^o LEITRIM.



6. Castlecomer Colliery. C^o KILKENNY.



carriage by this mode of transit. By the principal lines of railway, the cost of carriage is only 1*d.* per mile for each ton of coals conveyed upon them. The charge upon the Grand Canal is also but 1*d.* per mile for short distances, and for long distances it is as low as $\frac{3}{4}$ *d.* Extremely cheap as all of these rates are, they are sufficient to render it impossible that coal from the Connaught or Munster districts can be conveyed from distances of 80 and 120 miles and sold for less than 25*s.* per ton. If all of the Irish collieries were to send their coals to Dublin for sale, there would be great difference in their price. They would probably range from 24*s.* to 30*s.* per ton; for it must be borne in mind, that the best quality of coals is dearer at the mouth of an Irish pit than coals of a corresponding quality are at the pits in England or Scotland. The cause of the difference is chiefly owing to the fact that in the Irish collieries the seams of coal average about 3 feet in thickness, whereas in the English and Scotch collieries the seams are more numerous, and of much greater thickness. In working a narrow seam of coal there is more outlay and less return for the labour, because a considerable quantity of rock must be excavated from the passages through the mine, in order that the workmen may have sufficient headway. But the inferior coals, including culm and kelves, although their extraction is equally as expensive, are generally sold at about the same rate as ordinary coals at the English pits. There is always a brisk demand for the good coal raised from an Irish colliery, because within a radius of several miles around the pit it is much cheaper than the imported coal. The colliery owner may be a monopolist in his district if he choose, and may regulate the price of his coal to the state of the local market. The culm is an inferior fuel for household purposes; it is chiefly used for burning limestone; but when purchased for domestic consumption, a certain proportion of good coal is added to it. Many of the collieries of Leinster are situated within 50 miles of Dublin, and they send to the metropolis, by the Grand Canal, about 2000 tons annually. The coal of the Leinster district, being anthracite, is not suited for domestic consumption in the fire-grates at present in use, but it is a most valuable fuel for many processes connected with the fashioning of iron work, and that which comes up to Dublin is chiefly used by smiths and maltsters.

The Irish Parliament made strenuous exertions to stimulate and encourage the working of the coal mines of Ireland, and the local consumption of their produce. Large grants were given for the construction of roads and the erection of machinery, to render them accessible and efficient, and a bounty of 2*s.* per ton was awarded to all Irish coal brought coastwise to Dublin, at the same time that a duty of $10\frac{1}{2}$ *d.* per ton was imposed upon all British fuel imported. There is now no coasting trade in Irish coals, but there is a very extensive cross-channel trade in British coals, which employs a considerable amount of shipping. The vessels engaged in the trade are numerous brigs, and a few steamers. Owing to the prevalence of westerly winds during nearly nine months of the year, the coal brigs employed in this import trade are subject to all the delays and hazards incidental to the channel navigation; but beyond

occasional detention by adverse winds there is no interruption to the traffic, which is a most lucrative one, and in which is invested nearly £2,000,000 sterling.

In 1821 an Act of Parliament was passed which imposed a duty of 1s. 7½d. per ton on Irish coal brought coastwise to Dublin. The trade soon afterwards ceased, but the coal from the Ballycastle collieries continued for a few years to be exported to Scotland. In 1825 the duties on the cross-channel trade were abolished, and since that period we have no returns, nor the means of estimating the exports and imports to and from Great Britain; consequently, we cannot by the usual direct and reliable means of official returns tell precisely what quantity of British coal is consumed in Ireland. The coasting duty on coal was shortly afterwards abolished in 1830. When we consider the enormous extent of the coal area of the British Islands, an area of upwards of 12,000 square miles, 2,000 of which are in Ireland, we observe at once the great national advantages which these stores of fuel confer upon the country. The produce of the English collieries amounted last year (1863) to 72,431,144 tons; the produce of the collieries of Scotland, to 11,081,000 tons; those of Ireland yielded 127,570 tons; and the total quantity of coal raised in the United Kingdom was 83,635,214 tons. The most productive counties in England are Durham and Northumberland, which yield yearly upwards of 19,000,000 tons. Lancashire is the next, yielding considerably more than 12,000,000, and in Yorkshire about 10,000,000 tons were raised during the past year. In England and Wales there are 2555 collieries at present in activity, and 424 in Scotland, the total number in the United Kingdom being 3052. From some cause or other, probably the stoppage of many of the cotton mills, the total quantity of coals raised in 1862 fell in England and Wales about 2,000,000 tons, but in Ireland during the same year there was an increase of about 4,000 tons. The total exports of coal from Scotland is considerably over a million and a half of tons. The exports from English and Welsh ports is still more considerable, and the coasting trade enormous. This will be seen from a glance at some of the returns. From Whitehaven, in 1862, there were exported 194,432 tons; from Workington, 144,294; and from Maryport, 382,725 tons. The value of the coal raised and consumed in the United Kingdom amounts to £21,000,000 sterling annually, and the capital invested in the trade is about £10,000,000.

The importance of this trade is at once understood when we learn that the coal raised within the United Kingdom during the past few years represents more than ten times the money value of any of the metallic mines, or any mineral substance raised within the same area, and that the number of men employed as miners in the coal pits is considerably over 240,000.

It is less than a century ago since coal began to be regularly imported into Ireland. In 1783 the quantity was 230,140 tons, and in 1804 it amounted to 417,030 tons. These importations have increased amazingly, not only for consumption in the seaport towns, but to meet

the requirements of many of the inland districts. During the past year, 57,487 tons of imported coals were conveyed from Dublin to the interior by the Grand Canal Company's boats, being an increase over the previous year, in which the quantity was 54,523, and this again an increase over 1861, in which year the quantity was but 48,533 tons. I am indebted for these instructive figures to the kindness of the Directors of the Grand Canal Company, and, as they have never before been made public, they have a peculiar value.

With regard to fuel, London is similarly circumstanced to Dublin. The bulk of the coal consumed in London is sea-borne, and the remainder is conveyed by railways. Coal is much dearer in London than in Dublin, and, notwithstanding the fact, the number of trades and manufactures carried on with profit in that gigantic city is truly astonishing. The transit arrangements for the supply of the city with coal are of a very superior character, and the activity of competition has reduced the cost of carriage to the lowest remunerative amount; but in the London coal market there are several dues and charges imposed upon the article which are unknown in Dublin. In London the market or ship price includes—

	s.	d.
City dues,	1	1
Factorage,	0	4
Half weighing,	0	1½
Total,	1	6½

To the London market price is added—

	s.	d.
Lighterage from ship,	0	6
Porterage from barge,	0	10
Loss on small coal,	1	6
Cartage and shooting,	2	6
Wharf and office,	0	6
	5	10
Less discount to buyer,	0	6
Total,	6	10½

These charges bring the cost of many kinds of house coal up to 18s. 6d. per ton. The cheapest are the Newcastle and Sunderland coals, which range at about 16s. per ton, and the dearest are the Welsh, which sell retail at 23s. 6d. per ton.

A considerable impetus would be given to the consumption of Irish coal if the transit arrangements now existing were improved. This could be effected by connecting the collieries and railways by special tramway lines, and adopting generally the efficient transit systems so successful in England. According to the modern plan of sending the produce of a coal mine to market, the fuel, as soon as it is hoisted up from the pit, is screened and tumbled into a train of waggons at one operation, and then rolled off upon a tramway to the nearest railway.

The gauge of the tramway and the railway is the same, and, both being in connexion, there is not a moment's delay in the shunting of the waggons. The train then proceeds towards its destination; and if the railway does not exactly pass through the premises of the manufacturer to whom the coals are to be delivered, or proceed all the way to the side of the ship in which they are to be exported, the train leaves it by a short tramway, similar to that by which it entered, and quickly drops its load at the door of the workshop, or into the hold of the ship. By such arrangements, the cost of carriage is reduced to the lowest amount, and the tedious, costly, and wasteful system of loading and unloading half a dozen times in the course of a single journey dispensed with.

For many years past it has been the custom with the principal Irish railway companies to import British coal, and from it to make the coke used by their locomotives engines. This coke is prepared in two ways—by burning in heaps in the open air, and by conducting the operation in ovens built for the purpose. About 40,000 chaldrons of coke are available for consumption annually from the two gas companies in Dublin. The coke from the gas works, being light and porous, is not suitable for steam-engines, but it is an excellent and cheap fuel for stoves and cooking purposes. The railway companies are beginning to give up the manufacture of their own coke, as they find the Welsh, or steam, coal better adapted to their engines.

The return which I have obtained from the Grand Canal Company of the fuel traffic on their canals states the quantity of turf brought from the interior to Dublin to be 24,638 tons in 1863, and to average about 23,000 tons annually. The cost of carriage on turf is $1\frac{1}{4}d.$ per ton per mile, which is higher than the rate charged for coal. The turf which is brought to Dublin by the Grand and Royal Canals is consumed chiefly by the poorer classes. Around the city, and along the banks of the canals, there are numerous depôts for the sale of the turf. It is sold retail by bulk, and the rate at which it is sold is equivalent to 10s. 9d. per ton. The poor who consume it purchase it in very small quantities; but if large quantities were ordered, the vendors could sell it at 9s. 8d. per ton, and have a reasonable profit. The burden of the open boats, or barges, which bring the fuel to Dublin is usually 55 tons. As the turf is at present prepared and sent to the Dublin market, it is a very inferior fuel. Being, for the most part, spongy and porous, it retains the moisture which it imbibes from constant exposure to the atmosphere. It is bulky, and the shape of the "sods," although very convenient for transit, is unsuitable for general use. Our distinguished countryman, Mallet, has calculated that eighteen or nineteen sods of turf are equivalent as fuel to a cubic foot of wood. The quality of turf as a fuel could be greatly improved if it were kiln-dried, and afterwards kept under cover from the inclemency of the weather. In every improvement which has to be effected in any process, there is always some old prejudice to be overcome. Any improvement which may hereafter be made in the cutting and saving of turf must be commenced by the landowners, and carried out under their own superintendence, or that of

their stewards. Turf-making is like sea-fishing. Dependence for employment upon the state of the weather has a tendency to induce lazy habits. In Ireland we have wet seasons frequently, and during their continuance a considerable amount of labour is wasted by the poor peasant in the most wretched endeavours to procure a supply of fuel for the winter. A crop of turf gleaned under these circumstances is in the worst possible condition for use, and the cheerless hearth of a damp cabin is too gloomy a subject for a picture. Unfortunately, in nearly all of the attempts hitherto made at improving the quality of turf and reclaiming the bogs, expensive machinery formed a feature of the various plans, and materials had to be brought from considerable distances. Mr. Mallet, in a valuable paper on the preparation of turf, which he published in 1845, recommends the construction of a simple and cheap form of kiln, the walls and roof of which are built externally of turf sods. This form of kiln has been tried by several landed proprietors, and found to answer its purpose admirably. There is another process for the preparation of peat, which is at present practised in a few rural districts by the poor; it is similar in principle to the plan adopted in Holland for making hand turf. A hole or open drain is dug in a wet portion of the bog, and the muddy matter which settles at the bottom is lifted up, trodden upon with the feet until reduced to a pulp, dried in the sun, and shaped into cubical or spherical forms by the hands. The peat thus prepared dries much faster, and is more than twice the density of the peat cut from the turf bank in the ordinary way. The introduction of the Dutch method of turf-making into this country would be fraught with many advantages; a better fuel would be produced, irrespective of the state of the weather; women and children could be employed in its preparation; and the material being plastic in the hands of the operator, it could be moulded into suitable shapes for any special purpose. The Dutch cut through the centre of the marsh a canal of sufficient width to allow a large raft to float upon the surface. The denser particles of the peat sink to the bottom of the water, and the sediment so formed is lifted up with a kind of scoop by a man on the raft. The matter is deposited upon the banks in a row of small heaps, where it remains for a few days to drain. After the heaps have been trampled upon by a number of boys, who wear wooden shoes, it becomes plastic, and is then moulded into suitable forms for use. Prepared in this way, the peat dries rapidly in a current of air, and becomes extremely dense. The only objection to this mode of preparing peat for fuel is, that the boys expend a good deal of labour. I do not intend to advocate the exact imitation of the Dutch method in Ireland, but I suggest that the principle involved in the process may be taken advantage of, and applied to machinery. I have been favoured by Mr. John Kelly, C. E., Roscommon, with a number of samples which possess considerable interest, as they are of a useful character, and have been produced under circumstances which fulfil the conditions essential to the successful production of a cheap and abundant fuel. Mr. Kelly's samples are further

interesting from the fact, that amongst them are drainage pipes made of the peat itself. The idea of making these pipes of peat is, I believe, original. They are made independent of skilled labour, without machinery, and can be produced in endless quantity at a very cheap rate. Rude as they appear, they are well adapted to their purpose. I have been informed by an eminent engineer, who has conducted extensive drainage works in the west of Ireland, that peat is an excellent material for constructing drains. The ordinary stone drains frequently become choked by roots and other obstructions penetrating through their interstices, but peat appears to possess some property not yet investigated, of resisting the growth of roots through its substance. The cheap rate at which these pipes may be produced, and the simple mode of their manufacture, entitle them to much notice, as one of the chief objections to the reclamation of bogs arises from the apprehension of a considerable outlay. The other samples produced by Mr. Kelly are remarkable, as they show that a dense peat may be obtained without pressure, skilled labour, or expensive machinery. The idea of making drainage pipes of peat instead of terra cotta, is novel; and if after trial these pipes be found to answer their purpose, we may hope to see many thousand acres of profitless wastes reclaimed and added to the tillage lands of the country. There is, probably, no subject on which such diversity of opinion exists as on the reclamation of bog lands. Some persons advocate drainage, and others assert that drainage will not prove beneficial. In some districts the bogs are valued at $\frac{1}{4}d.$ an acre, in others they bring a rent varying from 5s. to £1 an acre. As turbaries, £6 per acre yearly is considered a reasonable rent, and instances are common of £80 per acre being obtained as purchase money for small tracts of bog. Such being the facts, we must bear in mind that local circumstances will not only influence the value of a peat marsh, but will modify the plan which should be adopted for its reclamation. As a general rule, it may be stated that all peat marshes will be benefited by being intersected by a wide and deep drain to remove the surface and bottom waters. In a great many instances minor drains may be introduced with advantage; but it often happens, owing to the spongy and retentive nature of peat moss, that much of the moisture which saturates the bog will not be discharged by the drains, because it will not leave the peat. This is a character common to nearly all of the morasses in Ireland; but there is a wide range of variation in the extent to which each exhibits it. The most successful system of reclamation has been found to be partial drainage, and a surface covering of earth and limestone gravel. But so diverse are the local conditions, that a system which may have been adopted with success in one district will often be found inapplicable in another. With partial drainage and a surface covering of clay the peat contracts, and, becoming more dense, the level of the surface falls about three inches for every foot of depth. The quality of the peat for fuel is thus very much enhanced; and as the surface is capable of cultivation, much good may be effected by any improvements undertaken with a view to turn these bogs to profitable account. From the varied con-

ditions of their extent, wetness, and local value, no system of reclamation can safely be recommended as generally applicable, and whatever course may be adopted in their treatment must be the result of local knowledge influenced by local considerations. The fact, however, is certain, that a most valuable fuel is not economized, and that 2,000,000 acres are lying neglected.

In closing this investigation, I have to state that I have arrived at the following conclusions :—

1. That there is a great scarcity of timber in Ireland, and that this scarcity should be overcome by increasing the number of plantations.
2. That the quantity of peat in Ireland is enormous, but that the manner of preparing it for fuel, as practised by the peasantry, is extremely rude and expensive.
3. That the coal mines of Ireland are far from being exhausted; that they are worked to a very large extent; and from their present condition, there is every prospect that increased supplies will be obtained from them.
4. That the proximity of the eastern coast of Ireland to the British ports from whence immense quantities of coal are shipped, and the lowness of freight between the British and Irish ports, offer facilities for supplying Ireland with British coals, and competing at present with the produce of the Irish collieries.
5. That the trade in coals between Great Britain and Ireland is now free from legislative restrictions, and that the competition between the produce of the two countries is of a purely commercial character.
6. That in the immediate neighbourhood of many of the Irish collieries coal and culm are extremely cheap and abundant; in the neighbourhood of the bogs turf is likewise abundant; and at the principal Irish seaports every description of British coal is regularly delivered by fleets of vessels engaged in the trade.
7. That a considerable impetus would be given to the consumption of Irish coal, if the improved machinery and systems of transit applied in England were adopted in Ireland.

I have also to make the following recommendation :—

That as the supply of fuel which may be obtained from the peat marshes is almost inexhaustible, and capable, when skilfully treated, of being rendered a most valuable addition to the national wealth, that attention should be directed—

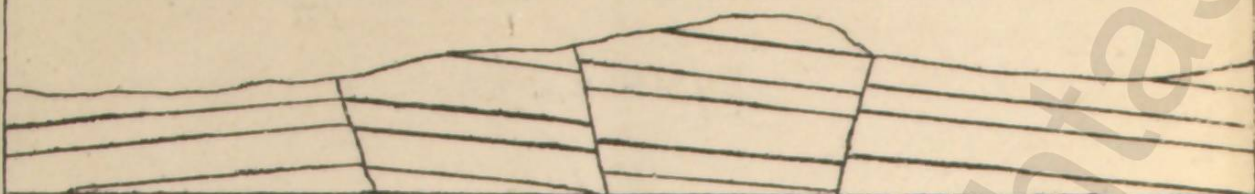
1. To the partial drainage of the bogs in localities where bog lands are numerous and of great extent.
2. To the necessity and advantage of landed proprietors erecting the cheap and useful kilns for drying turf which were designed by Mr. Mallet and the late Mr. Tredgold. Kilns erected in suitable localities may not only serve the use of several tenants, but also the use of the proprietor himself.
3. The encouragement and assistance of every person interested in the prosperity of the country, to carry into effect such feasible and in-

expensive plans for the compression of peat by machinery as are likely to prove successful.

4. The general introduction into populous localities of the Dutch method of making turf. By this process an immense amount of employment may be afforded to women and children at nearly all seasons of the year, and the labour of men, which under the existing system of turf-cutting is much wasted, economized. By this process, also, a better fuel may be obtained, at less cost than at present.

SECTIONS OF THE IRISH COLLIERIES.

7. Coolbawn Hill, CO KILKENNY.



8. Queen's County Collieries.



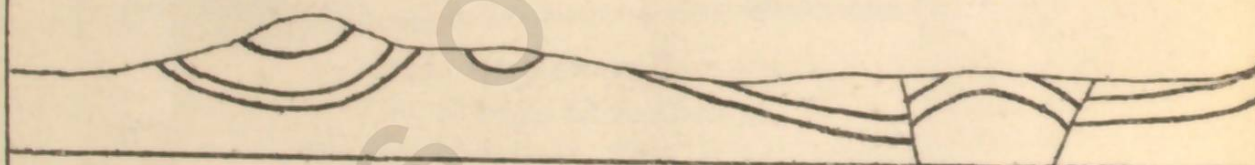
9. Limerick Collieries.



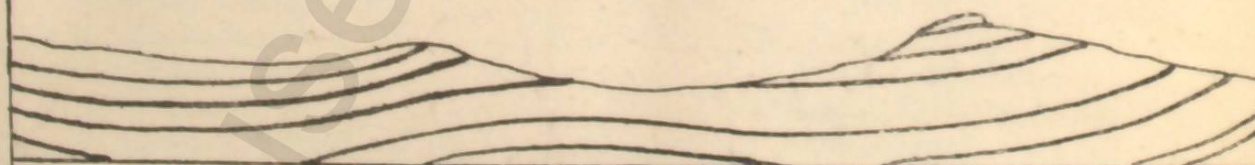
10. Earl's Hill Collieries CO TIPPERARY.



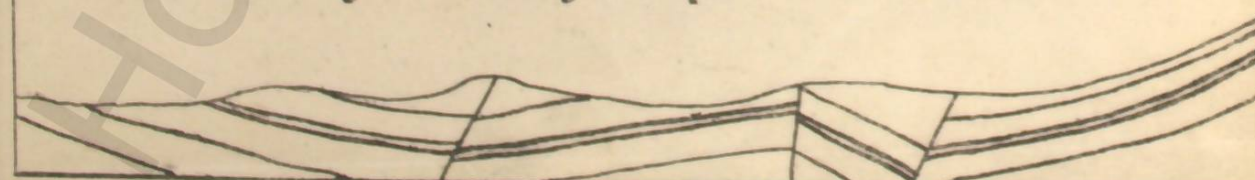
11. The Common's Collieries, CO TIPPERARY.



12. Bilboa Colliery. QUEEN'S COUNTY.



13. Kilgorey Colliery. QUEEN'S COUNTY.



Houses of the Oireachtas

APPENDIX.

No. I.

"Grand Canal Harbour, March 21, 1864.

"SIR,—We beg to note the prices of Kilkenny coals:—

	Per Ton.
	s. d.
First quality, delivered at Athy or Carlow,	25 0
Second do., do., do.,	23 4
Third do. (Jarrow), do., do.,	17 6
Fourth do. (Wolfhill), do., do.,	13 6
For prices in Dublin, add 5s. 6d. per ton to the above prices.	

"JOHN KELLY AND SONS.

"H. O'Hara, Esq., 51, Stephen's-green."

No. II.

COLLIERIES OF IRELAND.

I. ULSTER COAL-FIELD.

Co. Antrim.

Name.	Proprietors.
1. Ballycastle,	— Boyd, Esq.
2. Murlough Bay, <i>not</i> W.*	J. M'Donnell, Esq.

Co. Tyrone.

1. Annahone, <i>not</i> W.,	—
2. Coal Island,	Messrs. Staples.
3. Drumglass, W.,	T. Hughes, Esq.

Co. Cavan.

1. Kill, <i>not</i> W.,	Moore and Co.
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II. CONNAUGHT COAL-FIELD.

(Lough Allen District.)

Counties of Leitrim, Sligo, and Roscommon.

1. Tullynaha, W.,	P. Buchanan, Esq.
2. Tullymurphy, W.,	Do.
3. Seltanaskeagh, W.,	Do.
4. Meenashammer, W.,	W. Cronyn, Esq.
5. Gobarudda, W.,	E. M'Dermott, Esq.
6. Geevagh, W.,	} Different Colliers, on their
7. Greagnageeragh, W.,	
	own account.

* W. signifies that the colliery is at present working; and *not* W. implies that it was not in operation at the time this list was prepared.

III. LEINSTER COAL-FIELD.

(Castlecomer District.)

Co. Kilkenny.

Name.	Proprietors.
1. Curragh, W.,	Hon. Mr. Wandesforde.
2. Massford, W.,	Do.
3. Coolbawn, W.,	Do.
4. Rock, W.,	Do.
5. Monteen, W.,	Do.
6. Jarrow, W.,	Do.
7. Upper Reisk, <i>not</i> W.,	Pat. Fenlon.
8. Broom Park, W.,	Do.
9. Crutt, <i>not</i> W.,	Hon. Mr. Wandesforde.
10. Monala, <i>not</i> W.,	Do.
11. Skehana, W.,	Do.
12. Firoda, <i>not</i> W.,	— Freyke, Esq.
13. Banshafia, <i>not</i> W.,	Lord Ormonde.
14. Coolcullen, <i>not</i> W.,	M. Phillips.

Carlow and Queen's County Collieries.

1. Bilboa, W.,	H. Rochfort, Esq.
2. Agharne, <i>not</i> W.,	Sir J. Butler.
3. Ridge,	Mr. Phillips.

Queen's County.

1. Wolfhill, W.,	Perrot and Co.
2. Aughamafa, W.,	Do.
3. Mullaghmore, W.,	Do.
4. Kingscote, <i>not</i> W.,	Rev. Sir H. Walshe.
5. Modubea, <i>not</i> W.,	Perrot and Co.
6. Rushes, <i>not</i> W.,	Rev. Sir H. Walshe.
7. Holly Park,	B. B. Edge, Esq.
8. Meeragh, W.,	Do.
9. Geneva, W.,	Do.
10. Glen, W.,	Do.
11. Towlerton, <i>not</i> W.,	W. Edge, Esq.
12. Kilgorey, W.,	B. B. Edge, Esq.
13. Ardataggle, <i>not</i> W.,	T. Fitzmaurice, Esq.
14. Coorlaghan, W.,	Do.

IV. MUNSTER COAL-FIELDS.

(Slieveardagh District.)

Co. Tipperary.

Name.	Proprietors.
1. Coalbrook, W.,	Mining Company of Ireland.
2. Boulea, W.,	
3. Knockalonga, W.,	
4. Earl's Hill, W.,	
5. Ballynastick, W.,	
6. Ballynahinneen, <i>not</i> W.,	
7. Mardyke, <i>not</i> W.,	
8. Coolquill, <i>not</i> W.,	
9. Glangoole, W.,	
10. Lickflinn, <i>not</i> W.,	
11. Garranacole, W.,	Beatty and Co.
12. The Wood Colliery, W.,	Mining Co. of Ireland.
13. Ballincurry, W.,	Meadows and Co.
14. Foyleacamin, <i>not</i> W.,	Do.
15. Knockinglass, W.,	Mining Co. of Ireland.
16. Kilcooly, W.,	Do.
17. Ballynenty, W.,	Meadows and Co.
18. Manslat, W.,	Do.
19. Graigue, W.,	

(Kanturk District.)

Co. Cork.

1. Dromagh, W.,	N. P. Leader, Esq.
2. Lisnacon, W.,	Mining Co. of Ireland.
3. Drumskehey, W.,	

(Limerick District.)

Co. Limerick.

1. Tulligoline, W.,	Lord Devon.
2. Crataloe, W.,	Archdeacon Gould.
3. Sugarhill, <i>not</i> W.,	Mr. Maunsell.
4. Kockaboula, <i>not</i> W.,	Lord Clare.
5. Coalhill, <i>not</i> W.,	Do.
6. Rockview, <i>not</i> W.,	Do.
7. Glin, <i>not</i> W.,	Knight of Glin.

Houses of the Oireachtas