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INDUSTRIAL EDINBURGH

A Book issued by
THE EDINBURGH SOCIETY FOR THE
PROMOTION OF TRADE
In furtherance of the Movement
In favour of
Developing New Industries and
Extending Existing Industries
In Edinburgh, Leith,
and
The Lothians

Edited by
THOS. STEPHENSON, F.R.S.Edin.
Hon. Secretary, The Edinburgh Society for the Promotion of Trade

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AND MANUFACTURES

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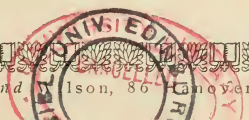

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Monument to
Sir Walter Scott

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Foreword

by the Editor

IN presenting this brochure on the development of Industry in the Lothians, the Edinburgh Society for the Promotion of Trade feels that it is making a preliminary contribution to that development which all interested in the welfare of the City desire ardently to see. The advantages of Edinburgh and its immediate vicinity in this respect have long been known, but until now no systematic compilation of information on the subject has been attempted, and it is with the view of stimulating interest in the development of an area rich in possibilities that this book has been prepared. It is hoped that its perusal by those desirous of extending their field of enterprise will lead to an increased appreciation of the possibilities of Greater Edinburgh and the utilisation of these to the advantage both of those concerned and of the City itself.

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The Burns Monument

THE EDINBURGH SOCIETY FOR THE PROMOTION OF TRADE

Incorporated under Licence from the Board of Trade

Objects & Work

BEFORE 1914, the movement in favour of developing new industries and extending existing industries in Edinburgh, Leith, and the Lothians was strongly supported by many of the representative citizens throughout these areas, and received the encouragement of the various Town Councils and of the existing commercial organisations. Since 1914, the necessity for an organisation specifically devoting itself to the promotion of this movement, and representative of all classes of the community, has become more vital. The establishment at Rosyth of a great Naval Base, finding employment for thousands of workers, adds considerably to the other advantages hitherto offered, as do the conversion of Colinton into a great Military Centre, and the establishment within the area of sections of the Flying Corps. Further, as a result of the War, it may confidently be anticipated that there will be a radical redistribution of trade, involving a marked increase in our home manufactures, and also opening up new markets abroad to the enterprise of British manufacturers. It is therefore desirable that everything possible should be done to press forward the advantages available in the Edinburgh, Leith, and Lothians area, and to facilitate the establishment therein of new industries and the extension of existing industries. With this in view, the Edinburgh Society for the Promotion of Trade has been incorporated under Licence from the Board of Trade.

The main objects of the Society are as follows :—

(*a*) To collect and disseminate information regarding the commercial advantages and opportunities available throughout Edinburgh, Leith, and the Lothians area, with special reference to the establishment of new industries and the extension of existing industries, and, by advertisement and otherwise, invite inquiries and supply all available information desired by inquirers regarding trade openings, markets, shipping and railway facilities, sites, rates and taxes, power, raw material, labour, wages, etc.

(*b*) To promote, study, extend, and develop the home and foreign trade of the district, and to represent and express the views of the mercantile and commercial communities on commercial and industrial questions.

(*c*) To collect, publish, and disseminate commercial intelligence relating to home and foreign trade and commerce and manufactures,

to supply members with all information available regarding commercial openings at home and abroad, and to supply them with information in regard to their own specific industries from official sources.

(*d*) To investigate and to report upon specific proposals for the establishment of new industries and the extension of existing industries in the district, and to further and encourage such establishment and extension, where approved of.

(*e*) To collect and disseminate among its members commercial intelligence relating in particular to the import and export trade hitherto done by Continental countries; the production in the district of goods imported therefrom; and the promotion of local trade in the markets hitherto supplied by these countries.

(*f*) To assist local manufacturers and merchants seeking new markets and new sources of supply of goods and raw material, by putting them in communication with Government and commercial agents abroad, and to obtain and put at the disposal of its members from time to time specific information regarding, *inter alia*, markets available, current prices, tariffs, freights, trade methods and customs, advertising and cataloguing, and the preparation and translation of price lists.

(*g*) To collect for reference and for the general use of members all official trade publications and periodicals, and to supply members with information therefrom, so far as bearing upon their particular industry, by means of reports and other publications.

(*h*) To encourage co-operative organisation for the purpose of meeting foreign competition.

(*i*) To obtain fair terms of contract and preference for British goods by Government Departments.

The work of the Society is carried on by the office-bearers of the Society, whose policy is to secure publicity in every possible way for the City of Edinburgh and the surrounding district; to tabulate data as to sites, price of lands, rates and taxes, light and power, labour supply, raw materials, facilities for distribution, etc.; to arrange for the Society to act as intermediary between outsiders desirous of introducing new industries and local business men interested in the particular trade to be dealt with; to communicate with every centre where trade might be secured; to collect and disseminate all information dealing with the objects of the Society; to reply to inquiries from members desiring commercial intelligence on specific points in which they are interested; and to keep actively in touch with other enterprising communities working on similar lines elsewhere, with the view of co-operating with them in furthering the objects of the Society.

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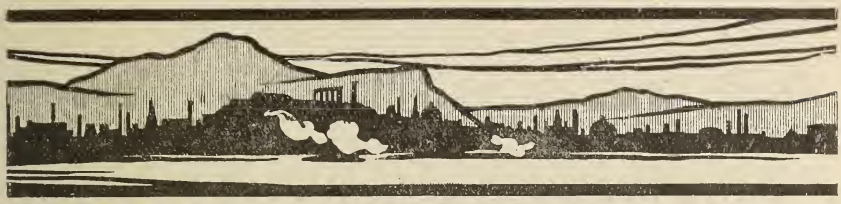
Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

EDINBURGH CASTLE FROM PRINCES STREET GARDENS



EDINBURGH

The Capital of Scotland

As a centre for visitors and tourists, Edinburgh stands unrivalled, not only on account of its situation, natural beauty, and historic interest, but also because it offers exceptional facilities for visiting the "show places" of Scotland quickly and conveniently. The Land of Scott in the south, the Border Country by Selkirk and St Mary's Loch, the Forth Bridge, the Trossachs and Loch Lomond, and even far awa' Aberdeen, may be visited in a single day, the visitor being back in his hotel in Edinburgh at a comfortable hour of the evening.

Of the situation and beauty of Edinburgh little need be said. The outlook from Princes Street, with the ancient Castle opposite, and leading down towards Holyrood the rugged sky-line of the Old Town, is unique. The views from the Castle, looking north, south, east, or west, are all full of fascination. To the north, Princes Street and the New Town become dwarfed before the vista of the waters of the Forth and the Fife and Perthshire hills; to the west we see the undulating slopes of Corstorphine Hill and the Pentlands; to the south appear the fertile valleys of Midlothian; while the easterly view reveals on a clear day North Berwick Law, that conical hill which stands sentinel over the land as the Bass Rock, not far from it, guards the sea. The smart buildings and modern shops of the New Town make the streets a promenade of which visitors never tire; and the old houses and antiquated tenements of the Old Town carry one back to the days depicted in Stevenson's "Catriona" or in Scott's "Heart of Midlothian."

It is the historic interest of Edinburgh that furnishes most food for thought. The grim old Castle has been known to exist since the days of the Picts—indeed its origin appears to date back to the years B.C. The Royal Mile, as the line of streets leading from the Castle to Holyrood is termed, teems with old memories; more Scottish history has been made within its short limits than in all the rest of Scotland. Holyrood Palace, where our present King and Queen reside on their frequent visits to the Scottish Capital, is an interesting old pile. Here it was that Prince Charles Edward in 1745 gave the dazzling ball described by Sir Walter Scott in "Waverley," and here may be seen the apartments occupied by Mary, Queen of Scots.

Edinburgh has attractions for all classes. It appeals to the artistic through its lovely scenery; it attracts the antiquarian by its historic associations; the architect is charmed by its buildings; the literary man is drawn to it through its associations with such men as Scott, Burns, Carlyle, De Quincey, Robert Louis Stevenson, Dr John Brown, and a host of others. There are ample facilities for sport and for amusement. Indeed there is no class of tourist or traveller who will not find some attraction in the city.

Apart from its own attractions, Edinburgh offers, as we have said, facilities for the payment of one-day visits to the principal places of interest in Scotland. In the summer-time regular char-à-banc trips are made daily to Abbotsford and Melrose, to Selkirk and St Mary's Loch, to North Berwick and Dunbar, and to other places of similar distance. These excursions leave in the morning and, stopping at suitable places for meals, arrive back in Edinburgh at a comparatively early hour of the evening. The rail, coach, and steamer circular tour to the Trossachs and Loch Lomond is accomplished in a similar time, returning from Glasgow by an evening train. The rail service to Perth, Dundee, and Aberdeen is excellent, and permits of the best part of a day being spent in any one of these cities while the visitor is back in his hotel in Edinburgh at night. Half-day excursions to interesting spots in the environs —Roslin, Swanston (the home of R. L. Stevenson), Carlops on the Pentland Hills, etc.—are made daily, while buses run to the Forth Bridge and Queensferry all day long.

Thus it will be seen that tourists and visitors are attracted not only to the City itself, but are tempted to make it a centre for sight-seeing throughout Scotland, and thus to prolong their stay beyond the few days necessary to see Edinburgh itself. When to these attractions are added the facilities for industrial development described elsewhere in this volume, it will be seen that the Capital of Scotland attracts not only for pleasure but for profit, and offers attractions as a place of residence to those who wisely decide to make it the scene of industrial enterprise.

City Observatory *Nelson Monument*

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

HOLYROOD PALACE—ARTHUR'S SEAT IN BACKGROUND

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

INLAND REVENUE OFFICES GENERAL POST OFFICE

EDINBURGH

As an Industrial Centre

BY ROBERT WILSON and JAMES S. WATERSTON

I. INTRODUCTORY.

EDINBURGH is not merely a City of the Past folding her hands in complacent resignation, dreaming of the times that have been, pleased with her position as an Educational centre, with the natural beauty of her surroundings, with her many fine buildings and ancient institutions. There is a new spirit abroad in this grey metropolis of the North. She has seen what civic enterprise can do for the great cities in England; she knows and is secretly proud of the growth and power of Glasgow, her near neighbour and rival, the Second City of the Empire. She realises that she has possibilities in and around her that, properly handled, can raise her to a new and greater eminence amongst the cities of the world.

The centre of a new and enormous coal-field, as yet only in its infancy, and of a splendid railway system; the possessor of a great and rapidly extending seaport; of a limitless water supply; of unequalled, well managed, cheap electrical power; of an up-to-date gas works; of thousands of acres of unoccupied land; in close juxtaposition to the huge new naval base at Rosyth; in intimate touch with the great distributing centres of the Continent—Edinburgh is indeed a city of vast possibilities,—a city which, now that she is amalgamated with her seaport, Leith, will one day, not far distant, prove to the world that to be ancient does not imply stagnation, and that to be academic does not imply commercial slackness or lack of enterprise.

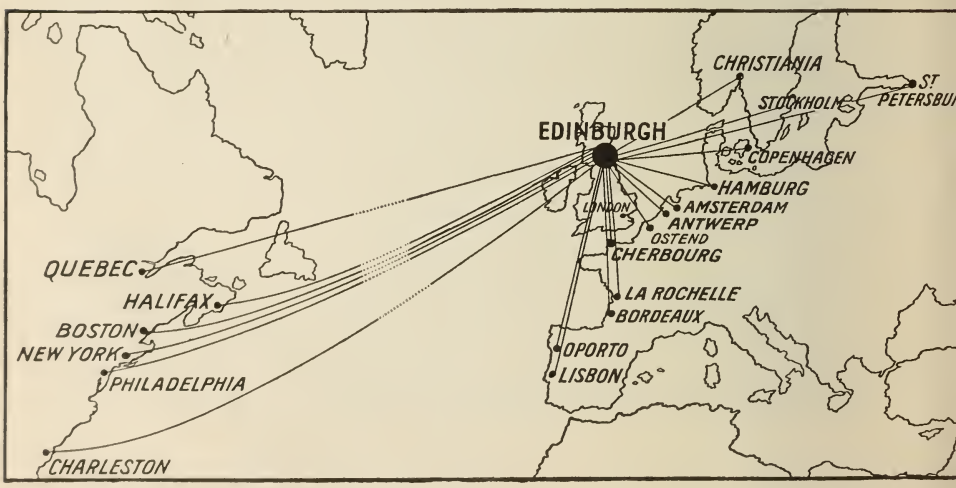
A Commercial City.—Those who think they know Edinburgh, particularly our visitors from the States and the Continent, are apt to overlook the fact that our city is a commercial centre of peculiar importance. Many trades have found its advantages so unique that they have been enabled to build up a world-wide connection. Edinburgh is the greatest Printing centre for its size in the Kingdom; it is the largest Bookbinding centre out of London; its Brewing industry is of extraordinary importance; it is the headquarters of the biggest Distillery Combine extant; the Midlothian Paper manufacturers have made their produce the standard

of excellence throughout the trade; its position in the Drug and Chemical trade is undisputed; its Bakeries do an enormous business. There are many other trades which carry the name of Edinburgh to every civilised country — Cox's Glue and Gelatine, Bruce Peebles' Electric Motors, Cochrane's (Challenger) Golf Balls, North British Rubber Co.'s Shoes and Clincher Tyres, Bartholomew's Maps, Melrose's Teas, etc., etc.

A City of New Industries.—It should be borne in mind, too, that a very large proportion of Edinburgh's commerce is a thing of yesterday as compared with the City's age and history. The great book-printing industry as now organised is a plant of only 70 years' growth. Its flour mills, its biscuit factories, its drug trade, its mining, its engineering shops, to mention only a few of its industries, are all entirely modern. Its population has doubled within half a century.

Many factors have tended to produce this, and in addition to those already enumerated, we might instance the completeness of its facilities for technical education (referred to in another article); the extremely low municipal rates; the adaptability of its local labour to a wide variety of trades, due partly to the wonderfully efficient educational facilities, and partly to the innate characteristics of the Scot; and last, but not least, the City's extraordinarily equable climate.

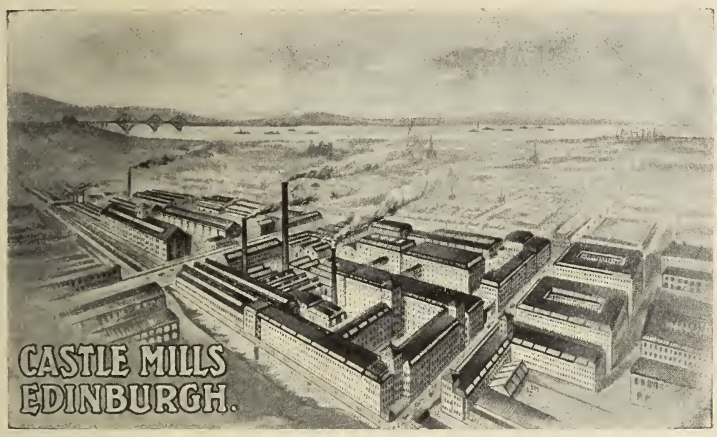
It may be of interest to give in some detail many of the trades that have made Edinburgh famous, and thus dispel, if it be necessary, the idea possessed by so many of our visitors, that Edinburgh's interests are confined solely to those that are historical, literary, and educational.



Edinburgh as a Distributing Centre

II. AS A DISTRIBUTING CENTRE.

It must be apparent to the most casual observer that the City's direct connection with many of the principal Continental ports, and its almost unique combination of facilities for transport by rail, canal, road, and sea, have placed it in a conspicuous position as a distributing centre for goods arriving either from Germany and the North of Europe on the one hand, or from the States and Canada through Glasgow, only an hour's journey away, on the other, and have undoubtedly assisted greatly in developing her own many great industries. Nor can there be much doubt that this important feature of distributive capacity must tend to increase in value along with the growing need for economy in the world's commercial requirements. Edinburgh's position on the map, coupled with her great transport facilities, have proved and will continue to prove almost her greatest business asset.



III. A NOTEWORTHY FACT.

It is a significant fact, and one worth quoting at this point, that these features had a great deal to do with making our City one of the great rubber manufacturing centres of the country. Rather more than 50 years ago, when a syndicate of Americans visited Great Britain with the object of establishing a rubber factory there, they inspected many of our important industrial centres and made exhaustive inquiries as to their suitability for the new venture. It must be remembered that this was an industry entirely new to this part of the world; that the machinery, the material, and the methods were different to our established trades, and that local

labour had to be trained. The fact remains that out of many possible centres Edinburgh was selected as the site for what is now the largest factory of its kind in the British Empire, making every conceivable article in rubber, vulcanite, and celluloid; and the knowledge that this decision was arrived at only after the most careful consideration of its natural advantages, coupled with distributing facilities, immensely improved even since then, affords an object lesson not to be lost sight of by those intending to manufacture in this country. There are many other rubber works in the City which have followed in the wake of the gigantic establishment at Castle Mills, and their rise and progress are in large part due to the same advantageous circumstances.

IV. RAILWAYS.

The two principal railways in Scotland have large stations for passenger and goods traffic, and they have organised a scheme of railway transit between all parts of the district and every part of the United Kingdom. Great importance has been attached to providing direct, rapid, and constant communication between the district and every important station and seaport in Great Britain. Wagons containing goods for shipment at ports in Scotland and England are taken alongside vessels without breaking bulk.

The charges for conveyance of passengers and goods by railway from the stations of the local railway companies compare favourably with those in operation elsewhere.

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

Entrance to Leith Docks

V. DOCKS.

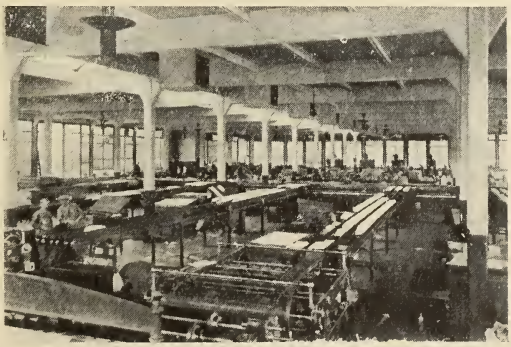
The Harbour and Docks of Leith extend over an area of about 350 acres, and £3,000,000 sterling have been expended on the works. They are excellently equipped with the latest appliances for loading and unloading vessels. The length of quayage is over 20,000 feet, and there exist a wide range of sheds, numerous cranes, and an efficient system for shipping coal, as well as grain elevators and warehouses. They are in direct communication with both the chief railway companies, and in that way goods can be expeditiously taken from the sea front to the farthermost corners of the country. A scheme for doubling the present capacity of the Port is now under consideration.

VI. COAL MINES

The working of the Coal-fields in and around the City of Edinburgh has only now begun in earnest. Greatly increased capital by the intervention of wealthy syndicates and combines has given vitality to the industry, the importance of which in a commercial city it is unnecessary to enlarge upon. In another article some particulars of this industry are given.

VII. PRINTING.

Printing is undoubtedly the chief industry of Edinburgh at the present moment by reason of the number of hands employed. It had its origin in the history and long association with the famous authors and the great works which they produced in the Augustan age of Edinburgh's literary reputation. The citizens were not slow to see the commercial possibilities which the residence of so many famous writers at that time gave them. Although the beginnings of the industry can be traced to this origin, yet it has been greatly increased in volume by the enterprise of many of the principal firms in attracting to the City printing for the London and American book markets. The reputation which this School of Printers has attained is world famous, and the mark of an Edinburgh printing



A Corner of Thomas Nelson & Sons Book Factory

house is a hall-mark of printing excellence in the literary world. One of the great features of the work of the book printers of the City is in the careful reading before the book is sent to press. Mistakes are uncommon, and many authors and publishers prefer to get this guarantee of typographical excellence rather than to entrust work to cheaper book centres where carelessness may prevail. But round this printing industry recently has grown up a virile section of the trade who are catering to the requirements of the great advertising world, and who are attracting to the City a quantity of printing which is set in the most modern fashion, and which conforms to the idea of the best advertising experts in creating sales for the advertiser. In addition to the book printers who print for the London market, there is in the City a considerable number of publishers who have factories.

VIII. PAPER.

The presence of so great an industry in the City has led to the establishment of many allied industries, such as Bookbinding, Electrotyping, Type-casting, and so forth, but the most important, as it is also the most famous, is the Paper-making industry. Fine printing, writing, and account book papers, also art or coated papers for illustrated books and magazines, are produced at the many mills on the River Esk and Water of Leith, where paper for practically every ordinary purpose is manufactured.

IX. BREWING.

With the introduction of railways and steamers in the nineteenth century the Brewing trade of Edinburgh, begun probably in the twelfth century, advanced by leaps and bounds, as it was widely recognised that the ales brewed there were of exceptionally fine quality, until at the present time this City is the principal centre of the industry in Scotland and sends its products not only all over Scotland, but also very largely to the North of England and to London and the South, while its export trade embraces practically the whole world.

Originally the Edinburgh Ales were heavy and sweet in style, but gradually a change in the public taste set in for lighter beers, and at the present day Pale Ales of a delicate character are almost exclusively in demand.

Whilst recognising the skill and enterprise of those engaged in the trade, there is not the slightest doubt that it would have been impossible for them to achieve the success they did had the abundant supplies of water obtainable from the wells in Edinburgh not been

particularly suitable for brewing, and to this is to be attributed primarily the high reputation which Edinburgh Ales have always had from the twelfth century onwards.

Edinburgh is the Burton of Scotland, and produces seventy per cent. of the whole of the beer brewed in Scotland. It is admirably situated for obtaining good home barleys from the neighbouring counties, as well as supplies of foreign barley from the granaries of sunnier climes.

As evidence of the importance of the brewing industry in the district, it may be stated that there are in Edinburgh twenty-four breweries, some of them amongst the largest in the Kingdom, that before the war a capital of over five million pounds was employed, and that the annual net turnover was nearly £3,000,000 sterling. Such is the fame of Edinburgh Ales that it may be said that they are used in nearly every country in the world.

X. WHISKY.

(a) *The Blenders and Dealers.*—With the equalisation of the spirit duties between England and Scotland in 1863 an impetus was given to business in whisky south of the Tweed, and as the advantages of securing a uniform article by the progress of blending were more fully realised, the volume of business gradually increased until the trade developed into almost gigantic dimensions, not only with England, but all over the world, facilitated by the convenient means of transit from Leith and *via* Glasgow.

It is very difficult to estimate the amount of money employed by these private firms, but probably an aggregate capital of about £5,000,000 will not be far out.

(b) *The Distillers.*—Scotland is essentially the home of Distilling, and the two largest Distilleries are located in Edinburgh. This fact speaks for itself. There are, in addition, several smaller distilleries, induced by the suitability of the water supply, by the existence of so many blenders in the district, and by the facilities for distribution.

The capital employed may be put down at £4,000,000 to £5,000,000, and the output at nearly 5,000,000 gallons per annum.

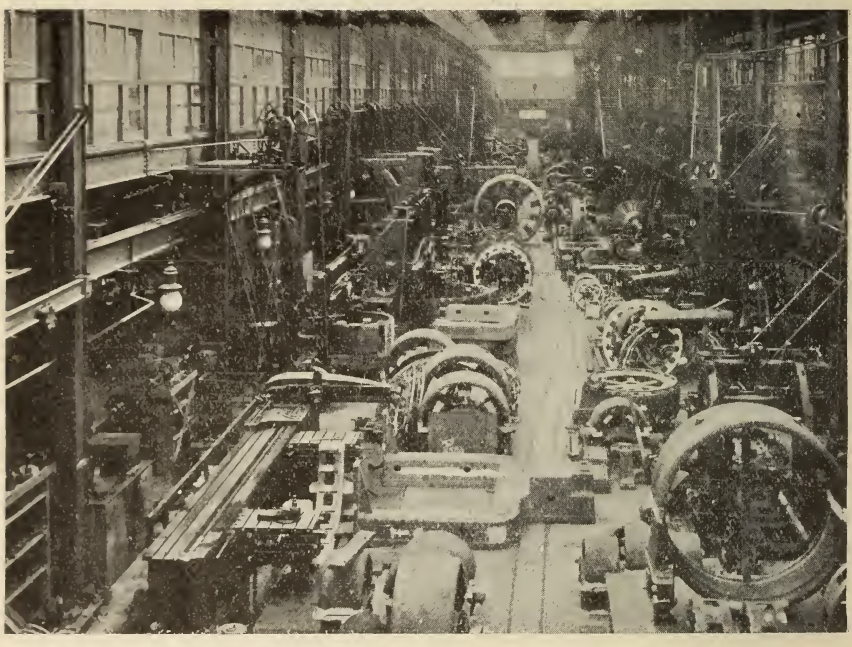
One Company of Distillers, having its headquarters in Edinburgh, practically controls the raw grain market, and as almost all the whisky consumed is a blend of raw grain and malt, Edinburgh may be accurately described as the " hub " of the whisky trade.

XI. ENGINEERING.

The Engineering industry of Edinburgh is largely the result of the various other industries which are in existence in this city. For instance, several firms are engaged in supplying paper makers

with chilled rolls, paper mill machinery, printing and bookbinding machinery, brewing and distillery plant, as well as considerable business in flour mills, bakery machinery, and chemical plant. There are, in addition to this, several firms which have with great success taken up the manufacture of gas and water fittings, gas meters, etc. This trade extends not only to the British market, but also to the Colonies and foreign countries. Consequent upon the existence of a famous University, there is considerable business done in the making of philosophical instruments and clock-making.

A large and thoroughly equipped Electric Motor-building works has found lodgment on the north side of the City and already has a European and Asiatic connection.



Bruce Peebles & Co.'s Electrical Works

XII. BAKING.

Scotland is well known to be the Land of Cakes, and as Edinburgh is its capital City, it is not surprising that in an item so important it should lead the way.

Baking, and particularly Biscuit making, is a highly important trade, if only by reason of the enormous export business done. The advent of machinery as applied to biscuits shortly after Queen

Victoria came to the throne, and the promptitude with which it was installed in Edinburgh, laid the foundation of a most successful industry. It is not only an industry, but a highly scientific one. It, too, owes not a little of its successful world-trade to the admirable distributing advantages at its doors.

XIII. MILLING.

Close on the heels of the Baker comes the Miller, if this is not rather putting the cart before the horse, and when we remember that Edinburgh is the Heart of Midlothian and that the Lothians, with their highly organised and scientific method of farming, produce the finest grain in Great Britain, which in turn leads the world as far as quality is concerned, it is only natural that the many fine mills in the City and its immediate neighbourhood should possess a trade quite disproportionate to the City's size and population.

XIV. PHARMACEUTICAL CHEMISTRY.

It is perhaps due to the great influence of the Medical Schools and teachers so intimately associated with our City, that the science of Pharmaceutical Chemistry has attained its present eminence. One instinctively brackets Sir James Simpson with chloroform, Lord Lister with antiseptics, and Dr Gregory with morphine, and it is little wonder that where the originators flourished their inventions would also grow. In Morphine alone (Morphine Hydrochloride, that is), Edinburgh leads the world, and supplies enormously to the United States and even to so highly scientific a country as Germany, and that blessed anaesthetic, Chloroform, is likewise world-wide in its distribution.

XV. GLUE AND GELATINE.

Another highly scientific industry should not be overlooked—that of Glue-making. "Scotch Glue" in every corner of the world is known and appreciated, and probably no makers are more widely recognised than J. & G. Cox, Ltd., established so long ago as 1725, and now the largest business of its kind in the United Kingdom.

XVI. TWEED.

As an instance of Edinburgh's adaptability to almost any kind of trade that demands rapid and convenient distribution, it may be worth while mentioning the new and rapidly growing business of tweed and hosiery manufacture, hitherto allied, as far as Scotland

is concerned, with the principal Border towns. Messrs Munro & Co.'s factory at Restalrig is an excellent example of what enterprise and Edinburgh can do, and its rapid rise as a local industry is one of the features of the modern and commercial side of our "own romantic town."

XVII. BANKING.

Edinburgh has always been associated in the public mind as a great banking centre. The Head Offices of five of the great Scottish Banks are situated in this city, and the ramifications of these institutions are world-wide. The Scottish Banking System, which dates from 1695, has adapted itself to the expansion of the country, and has readily adjusted itself to modern conditions of trade and industry.

XVIII. INSURANCE.

Next to London, Edinburgh is the most important Insurance centre in the United Kingdom. Fifteen Companies have their Principal Offices located here, and possess assets amounting to £102,000,000, and giving an annual income of over £14,000,000.

Photo by G. Victor Wright, Pharmacist, Edinburgh

THE MERCAT CROSS

Municipal Chambers in background

Photo by C. Victor Wright, Pharmacist, Edinburgh

SPIRE OF ST GILES CATHEDRAL

THE LOTHIANS AREA

ITS INDUSTRIAL POTENTIALITIES

BY H. J. PEDDIE, F.R.S.G.S.

THE country has embarked on a great programme of reconstruction the ultimate issue of which it is impossible to forecast; but it may reasonably be assumed that it will lead to a great industrial development, and attention is naturally directed to the most suitable and promising districts for industrial expansion. In this respect the area of the Mid, East, and West Lothians stands out prominently as designed by Nature to take a leading place.

GEOGRAPHICAL POSITION.

For geographical position the Lothians area is most favourably situated, being mainly on a sheltered seaboard, with a fine, safe roadstead, the envy of many a port. The Firth and river run far inland and are available for water carriage. It is admirably served by large, convenient, and well-equipped ports, such as Leith, Granton, and Bo'ness. Its position is favourable for cheap water transport to London and East Coast British ports, and those of the Low Countries, Denmark, Scandinavia, the Baltic, the new "open-all-the-year" ports of the Murman Coast and Archangel, and also the ports of Northern France. It can trade through the present Forth and Clyde Canal, by means of motor craft of suitable size, with the Clyde, British West Coast ports, and Irish East and North Coast ports. "The North About" or Pentland Firth route provides it with a deep-sea route for its larger vessels to the New World and other overseas countries. It is also admirably served with an excellent railway system and well constructed roadways adapted and used for road transport. Moreover, it is the seat of an important fishing industry, and is the finest and best cultivated agricultural area in the United Kingdom.

NATURAL RESOURCES OF THE AREA.

Then its natural resources are valuable, important, very varied, and conveniently situated. They comprise an almost inexhaustible supply of valuable cannel and other excellent coal, oil-shale, limestone, sandstone, whinstone, igneous rock, fire clay and ordinary clay, gravel, and sand. Copper is reputed to exist in the parish of Currie, and lead has been obtained at the head of the North Esk on the south side of the Pentland Hills. Silver mines were once worked near Bathgate and may yet again be exploited. Iron ore of good quality is also found, though in uncertain quantities, but capital iron ore can be brought by cheap water carriage from Bilbao in Spain, from Sweden, or from Lapland.

INDUSTRIAL FACILITIES.

As regards facilities, an ample supply of electric energy for power is available at moderate rates, and a new electric power station with a capacity of 30,000 kilowatts is now being built. There is a first-class supply of water, coal for fuel, gas, and electric light. Rates and assessments are moderate. There is also ample and conveniently situated land for factories and workers' dwellings, and under the Housing Scheme a large number of new workers' dwellings are to be erected. Labour is readily obtainable in ordinary times. It is intended to make a large extension of the existing tramway system, which is to be electrified, and also of the excellent system of motor buses now existing and serving various parts of the area.

THE CAPITAL OF SCOTLAND.

The area in question possesses a special asset in Edinburgh, the Capital of Scotland, one of the most beautiful cities in the world. The City has been aptly described as " the Modern Athens," " a poem in stone," and is referred to as " mine own romantic town " by the great Wizard of the North. All visitors are acquainted with the historic Palace and Abbey of Holyrood, the ancient Cathedral of St Giles, and the latest built of modern cathedrals, the handsome St Mary's. Edinburgh is the seat of the highest legal and ecclesiastical courts of Scotland, and of academic learning ; its world-famed University, the first medical school in the world, has unrivalled classical, scientific, and commercial educational facilities. Edinburgh is also the headquarters of the Scottish Banks and Insurance Companies. Its noble Infirmary and numerous benevolent institutions, its fine architecture and intellectual attractions, are valuable assets. It is one of the finest and most attractive residential cities in the world and a convenient tourist centre, and is only a few miles distant from the world-famed Forth Bridge and Rosyth Naval Base. Its war-battered fortress, the Castle, is perched high on its rugged eyrie in the centre of the City ; Arthur's Seat, like a couchant lion, and the beetling Salisbury Crags watch it on the east, whilst the halo of its historic and literary fame lingers around it like the grey mist which ever and again veils its fair face and hides its peerless beauty.

PRESENT INDUSTRIES IN THE AREA.

Little wonder that with all its great attractions and advantages Edinburgh has become an important industrial centre, which, although not yet of first magnitude, is of considerable importance, and in the not far distant future will develop into one of the most important in the United Kingdom. This is evident from the following list of existing industries in the area : shipbuilding and repairing, marine and other high-class engineering, steel constructional and chilled casting work, rubber and vulcanite, biscuits and confectionery, spade,

shovel, motor and motor car works, brewing, distilling, malting, and chemical industries, chemical fertilisers, soap, salt, cement, paper, glue and gelatine, glass, earthenware and pottery, bricks and tiles, tanning and leather, carpets, hosiery and woollen goods, dye and bleaching, printing, bookbinding, lithography, and publishing, creamery, furniture and upholstery, wire drawing and aeroplane accessories, flour, meal, fishing nets, printing ink, and solidified oil industries, and a number of other important minor industries. The Lothians are also the seat of the oldest and greatest shale oil industry in the world. If the present borings at West Calder and D'Arcy for free petroleum in commercial quantities turn out as successful as anticipated, the area will become a most important natural oil-producing centre, beneficially affecting all Scotland and drawing industries of all kinds to itself.

FUTURE INDUSTRIES THAT MAY BE EXPECTED.

As regards its future development, space will permit of my indicating only a few of the more important industries that will no doubt expand or be drawn to the area as its advantages become known. These comprise great extensions of existing industries. Then in an area with resources such as have been described, and close to Rosyth Naval Base, the manufacture of pig iron and steel bars, plates, rails, and rolled girders, the *new alloy, tantiron*, heavy ordnance and gun mountings, high explosives and aerial craft, "capital" ships *with the new electric drive*, and pontoons, etc., also ship repairing and marine steam and internal combustion engineering industries should establish themselves. The construction of smart sailing craft with motors and detachable propellers should be carried on. The former locomotive building, sugar refining, and bottle industries should be revived. The manufacture of motors for land and marine purposes, for oil and gas fuel, powdered coal, and vegetable oil, now coming so rapidly to the front, malleable castings, so greatly improved of late, iron and steel castings, ferro-concrete and cement articles, electric cables, synthetic rubber, aluminium, both from Bauxite and from Labrador stone, carbon and graphite electrodes, the new Vulcot fibre, and paper and gun-cotton from seaweed, the new French waterproofing, the canning of fish, powdered granite and felspar for fertilisers, hollow ware asbestos, carpets, corrugated packing paper and wall paper, leather board, Manila paper, parchment, vellum, tinfoil, and tissue paper should spring up. But, further, the Lothians area is essentially the *locus* where great chemical industries should arise and greatly flourish. Amongst these may be enumerated atmospheric fixation of nitrates for fertilisers and explosives, nitric acid, calcium carbide, cyanide, nitrate of lime (nitrolim), sulphate of ammonia, acetylene, potash from the furnaces, caustic soda and hydrochloric acid from common salt by the electrolysis process, suction and low-

grade gases, water or blue gas now so much used, and gas-making plant, liquified gas, for which a premium of £1000 has been offered, Admiralty, navy fuel of petroleum and dehydrated coal tar, for which a premium of £2000 has been offered, benzine, toluene, synthetic phenol, xylene, lyddite, T.N.T., arcorundum, benzoic acid, saccharin, phosphorus, oil of almond, and a host of other marketable drugs. Then the cultivation of the sugar beet, of chicory, and of the castor oil bean, and the extraction of the excellent lubricating oil it yields, should be prosecuted. These are some of the industries which, from the advantages and facilities that the district offers, should gravitate toward it and flourish in it. But there is also a host of *spécialité* industries springing up which would find it to their advantage to trek to the Lothians district, once its advantages and facilities are properly recognised and appreciated.

GREATER EDINBURGH.

Since the above article was written, Edinburgh and Leith have been amalgamated, and a slice of the county also incorporated. This should prove highly beneficial. "Edinburgh-Leith" is now the metropolitan seaport of Scotland, and ranks high among British seaports. The combined enterprise and resources of the incorporated area should prove very important in developing the great natural resources of the district, especially in dealing with such important matters as the water supply, drainage, light, power, urban and rural transport, and the development of Leith and Granton harbours. The proposal to construct locks at the end of Leith pier is an excellent one, and would prove of the utmost value to the water-borne traffic. Leith would then stand in the unique position of being the only port in the United Kingdom from which vessels could sail, or make entry, at any hour or at any state of the tide, without affecting the water level of the fairway, harbour, or docks, and with the regularity and punctuality of trains at a railway station. This would not only benefit the sea-borne commerce, but also the shipbuilding and ship-repairing industries of the port, which is entitled to demand a subvention from the Development Commission in carrying out such a scheme. Another important matter which the amalgamation brings to the front is the establishment of a "Commercial Library," like the Mitchell Library in Glasgow, or better still, of a commercial institution on similar lines to the Philadelphia Museum or the Colonial Institute of Hamburg. These valuable institutions are the meeting places of manufacturers and consumers, exporters and importers from home, colonial, and foreign lands; they afford most valuable information to those interested in trade, and offer excellent facilities for forming business connections.

The Blackford Hill science extensions of the University should greatly extend the usefulness and enhance the reputation of the

famous seat of learning. The Royal Scottish Geographical Society has recently decided to admit free to its highly popular and instructive lectures the scholars of the secondary schools in the City. This will attract still more scholars to the already crowded scholastic institutions of the City. Of course the Lister Institute, when it is called into existence and in operation, will also still further enhance the usefulness and fame of the world-renowned medical school of the Modern Athens.

In connection with the suggested resuscitation of the glass industry of Leith, may I here state that the British Glass Industries, Ltd., is establishing huge new glass works at Canning Town, at Charltown, and at Queenborough, and are introducing the most modern and up-to-date plant and machines, including bottle-making machines. At Camden Town the Daubenspeck machine is installed, and the annual output of the works, it is estimated, will reach 185,000,000 bottles, whilst it is expected that 1000 employees will find work in the factory. At the Charlton Works the Owen bottle machine (the 15-arm machine which will turn out 2000 16-oz. bottles per hour) is being used. At the York Glass Works the Lynch machine is employed, and in various British glass works there are other types of excellent glass bottle-making machines at work. Now Leith is well adapted for the successful prosecution of the glass trade, and it seems to me that if a powerful syndicate were to establish the glass industry there, using such plant, etc., as has been above indicated, a large and flourishing glass industry might again arise in the Port.

Finally, if the Scottish borings for petroleum turn out successful, the effect on the Lothians area will be enormous, not only providing a natural source of cheap power and light, but converting Leith and Granton into most important oil-fuel ports with advantages that no other port in the United Kingdom will possess. The English borings have hitherto not turned out—as yet any way—as successful as was expected, but a steady if not very large flow is obtained. Hardstoft well yields about 1200 gallons per day, and the prospects, especially in Norfolkshire, are considered excellent. The borings at Calder have been suspended for the present, but those at D'Arcy, near Dalkeith, are steadily progressing, and the prospects are considered very good there. The importance of this matter can be gauged when the enormous demand for oil-fuel, especially for marine engines and now also being used for land locomotives, is taken into account, and the fact that, at the present rate of consumption (and the consumption is steadily increasing), the United States natural oil-fields will be exhausted in thirty years. Whatever may be the outcome of the Scottish petroleum quest, there can be no possible doubt of the value of the Scottish paraffin shale-fields, and that the most valuable deposits still lying dormant in the area about Straiton, towards Penicuik, and, I understand, probably near D'Arcy, will before long be duly turned to account.

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

THE FORTH BRIDGE

OPENINGS FOR SPECIFIC INDUSTRIES IN EDINBURGH

BY ALEXANDER JOHNSTON, J.P.

Managing Director, North British Rubber Co., Ltd.
President, Edinburgh Society for the Promotion of Trade

GEOGRAPHICALLY and economically Edinburgh is admirably placed. It dominates from the East that part of Scotland known as the mid-Lowlands, which by reason of the fertility of the soil and immense mineral wealth has always been its most densely populated region and the mainspring of its agricultural, commercial, and industrial activity.

Centrally situated, and at one and the same time a seaport of first-class importance and the pivot of the Scottish railway system, Edinburgh is to the highest point accessible from every side. The City is, in short, endowed with precisely those features and advantages which are the root essentials of manufacturing success—on the one hand, outstanding locational suitability and natural resources, and on the other hand, unsurpassed facilities and avenues for the procuring of raw materials and the subsequent distribution of the finished product.

The great extension of the City's boundaries, following on Edinburgh's recent amalgamation with the famous port of Leith and neighbouring areas, has had the immediate effect of enhancing and throwing into relief the industrial possibilities that undoubtedly exist. Up till now these possibilities have been only faintly realised, but none the less a goodly number of considerable and healthy industries have flourished in Edinburgh for very many years. And probably the readiest method by which to indicate the openings for the successful introduction of new industries that are held out by Greater Edinburgh will be to adopt the eliminative process and specify the few that are already fully and firmly established. These are : brewing, distilling, printing, shipbuilding, rubber manufacture, ropemaking, papermaking, flour-milling, and several others of lesser importance, including specialised branches of the engineering and chemical industries.

The major industries, it will be seen, are conspicuously absent. Though engaged in largely in other parts of Scotland, manifestly not nearly so well located, the great textile industries—cotton, wool, linen, and jute—with one notable exception in the knitted wool trade, have no representative in Edinburgh. This is a matter for no small wonder, for not only is there a large local market for specialised goods required by industries carried on in and around Edinburgh, but Edinburgh has at her door an outlet for textiles that is without parallel—the vast Continental market.

Certain it is that with anything like normal world conditions, a steady demand for all kinds of fabrics must sooner or later be forthcoming from that quarter alone, and Edinburgh properly

equipped commands a geographical position which would enable spinners and weavers to operate efficiently, economically, and profitably.

Complete success in the manufacture of cotton goods has long been recognised to depend to a material degree on the atmospheric factor; and in this connection passing reference may be made to the fact that the atmospheric conditions obtaining in Edinburgh are considered by experts to be no less favourable than those prevailing in Lancashire.

As to woollens in particular, there is, in the first place, a stable general demand for the home and the export trade, and secondly, a special and very substantial demand arising from the tourist trade. Edinburgh is pre-eminently the centre of the Scottish tourist trade, and the favour which Scottish-made tweeds enjoy in the estimation of American, Continental, and Colonial visitors would, naturally, be more than ever evinced towards fabrics actually manufactured in the Capital of Scotland.

There are equally encouraging reasons for directing attention to Edinburgh's suitability as a centre for the linen and jute industries. Compared with other areas in Scotland to which these industries have gravitated, Edinburgh's superiority is evident. Edinburgh lacks none of the features that distinguish these other centres, and, to boot, far overtops them in positional advantage.

Altogether there is sound foundation for affirming that the outlook for the progressive growth of any of the textile branches established in Edinburgh is distinctly inviting. And the same remarks apply to the linoleum and floorcloth industries. Especially so in regard to the latter, since the reputation of the floorcloth for long manufactured in the adjacent town of Kirkcaldy is world wide; and an Edinburgh-made article of quality would—if only from reflected goodwill—meet with interested consideration on the part of the discriminating buyer.

Again, not many seats of industry are better circumstanced than Edinburgh for the development of the several branches of the iron and steel trade. Supplies of ores, both native and foreign, are readily available; and cheap and good fuel is abundantly to hand, coal mining being engaged in on large scale lines in the immediate vicinity. But the enterprise and initiative of the experienced ironmaster and manufacturer are needed to turn to account Edinburgh's latent power to provide primarily for the needs of the shipbuilding industry on the Forth and East of Scotland, and to assist in satisfying the world hunger for iron and steel that remains as a legacy from six years' interruption of fresh construction, renewals, and repairs.

In the general engineering and machinery section there is ample room for the laying down of modern plants covering a wide range of engineering work—from the production of micrometer gauges to railway plant and rolling stock. Textile machinery, distilling, gas-

works and woodworking apparatus, tubes, pipes, air compressors, blowing engines, pumps, cooling towers, safes, hydraulic presses, lifts, elevators, machine tools, high speed repetition machines, boxmaking appliances, rivet, bolt, and nut manufacture, and many kindred productions are all lines that would repay intensive development.

Whilst there are already in the district a number of engineering shops, those of any real importance have in the past confined themselves, as above indicated, mainly to specialised productions, such for instance as gas-meter and paper-mill machine making. The less important concerns play only a restricted rôle in the industry owing to equipment limitations. Everything taken into consideration, therefore, and having regard to the high reputation attaching to Scottish engineering work all over the world, the field open to the general engineering trade is one in which great progress can be looked for in Edinburgh in the not distant future.

There are also excellent prospects for the development of the electrical side. Electrical power adequate for all requirements is supplied at moderate rates from the Power Stations of the Edinburgh City Authority. Large quantities of electrical plant are already in use in Edinburgh and the neighbourhood, further installations are in view, and the demand from other large buying directions is continually expanding. With only one local firm of importance catering for the trade, the prospective demand will be met with difficulty, and only by having recourse to outside sources.

The motor car and motor vehicle industry also merits mention. Edinburgh from its ideal and central situation is becoming the hub of the motor trade in Scotland. Private motorists and commercial users are coming to regard Edinburgh as the purchasing centre of Scotland, with the result that during the past few years the turnover of pleasure cars and commercial vehicles has nearly trebled. In these circumstances the ground is already laid for organisations adapted to turning out cars and vehicles of the highest grade, as well as productions of the middle class, the demand for which in especial bids fair to go ahead by leaps and bounds.

Likewise, there is a niche in Edinburgh's industrial programme for the aluminium, brass, and sheet metal industries. The local demands are by no means entirely satisfied and other districts have to be drawn on for supplies.

There is every possibility, too, of developing and stimulating the chemical industry in Edinburgh, particularly in respect to those branches in the case of which raw materials are easily procurable, for example, the utilisation and refining of gasworks by-products. Very suitable sites are available for the erection of works, and there is no reason why satisfactory results should not be attained in producing by coal-tar distillation many of the intermediate products required in the coal-tar dye industry.

Benzol and solvent naphtha are in large demand by local in-

dustries, while refined tar and road pitch are, in view of modern transport developments, coming into greater prominence every day for use in road-making and for similar purposes.

Other products of initial distillation, such as toluene, phenol, anthracene, and naphthalene would find a prompt market amongst firms associated with the dye-making industry. Further steps might also be taken in the preparation from these products of intermediates insistently called for by the dyeing and pharmaceutical industries such as aniline and aniline salts, toluidine, nitrotoluenes, and naphthols. These again on successful production might be further developed, working up finally to complete dye-stuffs.

The sulphides incidental to the purification and elimination of sulphur from gas manufacture could also be handled to advantage in the production of sulphuric acid and ammonium sulphate, and in turn for the production of hydrochloric acid, ammonium chloride, and hypochlorite

On the heavy chemical side, the manufacture of lithophone and blanc fixe could be usefully considered. Their production could certainly be put on an economic basis, there being a market at hand in the paper and linoleum industries.

Beet sugar refining has attractions that are well worthy of investigation. Statistics show that the visible output of sugar is insufficient to meet the world's increasing requirements, and European and other buyers are of necessity going short. Edinburgh is exceptionally well placed to tap the best markets on the Continent for supplies of the raw material; but beyond this, the agriculturists in the district are already growing beet, and are obviously alive to its cleaning and clearing qualities, and the opportunities generally which the cultivation of the root offers from their point of view. The factor of low cost of production admittedly must bulk largely in the case of this particular industry, and here the close co-operation that would be possible between the local grower and the manufacturer would be of inestimable advantage, and—apart from delivery conveniences—would give the Edinburgh beet product a definite pull over the principal competitive cane sugars coming from Cuban and West Indian sources.

Further, the enormous expansion in consumption of high-class sweetmeats, fruit preserves, and candied goods throughout the world in recent years is a matter of everyday knowledge, and in supplement to the abounding home demands, manufacturers of these goods who may be operating in Edinburgh are in a unique position to be able to develop with well-directed effort an export trade of handsome dimensions.

Cocoa manufacture, food preservation, and the working up and distribution of dairy produce represent additional openings of no inconsiderable promise. None of these industries has so far been developed in Edinburgh to any appreciable extent, and organisations devoting themselves to these branches and working on up-to-date

manufacturing principles would find ready channels for the disposal of their output both at home and abroad.

It would be tedious to detail in its entirety the whole miscellany of industries that could find remunerative scope with Edinburgh as a base ; but besides those referred to one can hardly omit to mention the leather industry—the manufacture of boots and shoes particularly. The home consumption of boots and shoes in normal times amounts approximately to a value of £40,000,000 per annum. At the present time nearly all of this huge trade is the preserve of the home factory-made article. The competition from America, felt some fifteen to twenty years ago, has been for the most part eliminated, owing to two influences—the successful adoption by British manufacturers of perfected appliances and the marked preference of the British public towards the British-made article, which is considered much superior in wearing qualities to any outside production. The foreign market, moreover, has been as yet inadequately developed by the home boot and shoe manufacturers, and this aspect in itself provides point for the recommendation of Edinburgh as a suitable boot and shoe manufacturing centre.

In the same connection, fancy leather goods may be singled out, whilst, passing to the general list, further attractive possibilities present themselves in the development of such industries as pottery, glass, horn, brush, and starch making, the manufacture of vegetable and animal oils and margarine, as also crude oil refining. Even with the addition of these the writer cannot affect to have proffered anything but an enumeration that serves to convey merely a shadowy outline of the possibilities of profitable operation that are extant in Edinburgh for manufacturing enterprise.

The achievement of full success by virtually every description of manufacturing organisation, ably conducted and amply capitalised, is certainly not an expectation that would appear to " overload the future with golden hope." In any event Edinburgh's leaders are all unitedly for the encouragement and promotion of industry within her gates. The City, in a word, is thinking industry and means business. And the new-comer may rest fully assured of an interested, inspiriting, and fraternal welcome.

"THE WAVERLEY"—The Largest Through Station in Great Britain

RAILWAY TRANSPORT FACILITIES

BY ALEXANDER FULTON

District Traffic Superintendent,
Caledonian Railway

IT is an axiom that the industrial rate of progress of a nation, or any particular portion of it, is measured by its relation to its transport facilities.

This important feature has probably been evidenced to a greater degree during the past decade or two than at any previous time in our history, and so much importance has been placed on the question of transport that it is recognised as the life-blood of a nation, and as such forms one of the essentials to progress.

The railway portion of this important subject in its application to the industrial and commercial position of the City forms a very close connection, and is worthy of more attention than is often paid to it.

Greater Edinburgh has been no exception to the general rule, and with the extension of the industries and commercial activities within and without the City boundaries there have grown railway facilities which a generation ago would have been looked upon as little short of impossible.

The history of Railway Transport in Edinburgh and district—like many other districts—sounds more like a romance than actual hard fact, and while it cannot be claimed that the first railway line was opened for traffic in or near the Capital, it is worthy of note that the old Edinburgh and Dalkeith Railway, the terminus of which now forms the St Leonard's depot of the North British Railway, was opened for traffic in 1831, or about six years after the opening of the first public railway in Britain—viz., the Stockton and Darlington Railway. This line was originally worked by horses, and a portion of it by a haulage rope, and after the general adoption of steam power it was known for many years as the "Innocent Railway."

The Edinburgh and Glasgow Railway—with its connection with the oldest of the railways in the West of Scotland—had its terminus at the Haymarket, and was opened for traffic in 1842; but five years later the terminus in the western district of the City was removed to the Waverley by the extension of the railway through the Princes Street Gardens and under the Mound.

This extension formed an important phase in the railway transport system, and demonstrated the ability of the railway authorities of the day to provide facilities without interfering with the amenity of the finest portion of the New Town, or destroying its historical interest and association.

It was not, however, until 1846—when the railway mania was at its height and no less than 272 Acts of Parliament were passed in that year for new lines—that any great extension of the iron roads affected Edinburgh.

In that year the first section of the North British Railway was opened—which was the Edinburgh and Berwick line—the depot of which was on the site of the present Waverley Station.

In the same year, 1846, the Edinburgh, Perth, and Dundee Railway, with its connecting ferry over the Firth of Forth between Granton and Burntisland and terminating near the present Waverley Station, was opened for traffic. A portion of this railway forms the Heriothill Branch and depot of the North British Company, while the tunnel which carried the line to the Waverley Steps is still used for storage purposes. For a number of years the tunnel was successfully utilised for the propagation of mushrooms.

Two years later, 1848, the Caledonian Railway, which extended from Carlisle, was opened into Edinburgh, and had as its terminus what is now the Lothian Road Goods Depot of that Company.

The position of the railway undertakings generally in and around Edinburgh was consolidated by the various amalgamations which took place in 1865 and 1866, the two Companies, North British and Caledonian, entering into a spirited competition with each other in the provision of facilities by the opening of new lines, etc., the result of which has been to place the City and district in a remarkably good position at the present time in the matter of railway transport.

The further amalgamations following those of 1865 of the smaller companies which had been built to the east of the City, and the extension of the Caledonian Company's line from the western side of the City to Granton and Leith, and along the Water of Leith to Currie and Balerno, together with the building later on of the North British Railway Company's South Side and Suburban line and their Leith lines, provided railway facilities in each of the districts of the City, which gave a strong impetus to the industrial life of the community. The opening up of the Lothian coal-field—which event marked an epoch in the life of the City's activities—called for further extension of the railways in the provision by the North British Railway Company of the Lothian lines, and in turn provided a further incentive to the industrial progress of the City.

It cannot be overlooked that the rapid extension of the railways, in this as in other districts, was entirely due to the voluntary competitive system, without which it is highly improbable that the City would have been in the position which it occupies at the present time.

It is a curious fact that in most of the great centres industries of a like nature grow together, for instance, the iron and steel works in Lanarkshire, the shipbuilding on the Clyde, the jute trade in Dundee, where in each of the towns or districts it is found that the various works are built almost as close together as they can conveniently be placed, but in and around Edinburgh this can hardly be said, for the staple industries are not confined to particular sections of the City, but occur in each of the industrial districts.

This may in some measure be attributed to the excellence of the railway facilities, as the result, no doubt, of there being originally four distinct companies operating within the City, each providing depots for the particular part to be served. The growth of trade and industry has long since outgrown the provision made in former times, and has necessitated the establishment of new and larger depots, but portions of the original depots still remain and carry on successfully the business for which they were built.

Within the boundaries of Greater Edinburgh there are 29 railway depots, with over 200 public and private sidings, the latter of which serve upwards of 250 traders, or works, of a various character. A reference to the map inserted in this book shows the positions of the stations, depots, and principal sidings.

As already mentioned, the staple industries of the City and its neighbourhood are not confined to any particular district; in dealing with the transport facilities it is necessary to do so in a general way by sections, but before proceeding to this task it is interesting to observe that as a result of the various extensions in the railway lines it is now possible to trace three circular lines of railway around the City, each of which might be utilised to the advantage of the industrial activities of the City and district.

These circular lines may be described as follows :—

1. *From* the Southern, Western, and Northern Main Lines of the Caledonian Railway, and the Western and Northern Main Lines of the North British Railway, *to* the Western and Northern portions of the City, and affording direct connection with the Docks at Leith and the Harbour at Granton, *via* the Caledonian Railway Company's Granton and Leith Branches and New Leith Lines, on to the North British Railway Company's Main Lines at Portobello, and *vice versa*.

2. *From* the lines of railway above described on the Western side to the Southern and Eastern portions of the City, *via* the North British Railway Company's South Side and Suburban Railway, and on to that Company's Main Lines at Portobello, and *vice versa*.

3. *From* the lines of railway above described on the Western side, *to* the Eastern portion of the City, *via* the Haymarket Tunnel, Waverley Station, and North British Railway Granton and North Leith Branches, affording direct connection with the Docks at Leith and the Harbour at Granton.

The Western and Northern portions of the City are served by the principal depots of the Caledonian Railway at Lothian Road (Goods) and Morrison Street (Mineral), and the North British Railway Company's Haymarket depot (Goods and Minerals), at each of which there are ample facilities for dealing with every description of traffic, while the Gorgie area is equally well served by the depots of each of the Companies there. The Caledonian Railway Company's principal marshalling yard at Gorgie is of considerable importance to the transport system, the traffic from and to the various sections being dealt with there.

In addition to the depots referred to, there are numerous private sidings, serving the works and factories in the district, including the important Corporation undertaking of the Electricity Department at Dewar Place, close to Princes Street Station.

The establishment of the Cattle Markets and Abattoirs at Gorgie necessitated the provision of railway facilities, and direct connection with the main lines of both railways is provided by the Gorgie Cattle Markets Branch of the North British Railway and the Slateford Cattle Markets Branch of the Caledonian Railway, provision being made for connecting up these two branch lines, and thus admitting of another possible circular line of railway within the City, affording facilities for future extensions of industrial concerns in this area.

The extension of the boundaries in the Western section has brought the greater part of the Balerno Branch Railway, with its paper mills, into closer touch with the industrial life of the City, providing at the same time facilities for the largest military establishment in the country—viz., Redford Barracks.

The Caledonian Railway Company's Granton and Leith Branch, with its depots at Murrayfield and Craigleith, and marshalling sidings at Crewe Junction, provides further facilities in this area, and gives direct connection with the Harbour at Granton and the Docks at Leith, serving also the Corporation Gas Works—the largest of its kind in Scotland—as well as the engineering and shipbuilding yards in the district.

The railway transport facilities in this area are such as would serve a considerable extension of the present or new industries for which the district is eminently suited.

The Eastern portion of the City, as well as the Northern portion, is provided for by the North British Company's numerous lines of railways. The principal depots of the Company at Waverley (Goods), Rose Lane (Mineral), and Leith Walk (Goods), provide ample accommodation for dealing with all descriptions of merchandise in large volume, while the Granton Branch, which connects with the Forth Ferry to Burntisland, gives access to the Duke of Buccleuch's railway, which in turn serves the works and stores along the foreshore, as well as connecting up from the Northern side the Corporation Gas Works, affording facilities for the conveyance of coal from the Lothian coal-field. The corporation Electricity Department, Eastern Station, in M'Donald Road, is served by a siding off this branch beyond Leith Walk depot.

The industrial and commercial value of the recent amalgamation of the Burgh and Port of Leith with the City can probably be best realised by a reference to the map, on which there are shown four railway lines to Leith, ten depots for dealing with the goods and mineral traffic of the district, and four accesses to the Docks, two on the eastern side and two on the western side, the whole equipment being capable of a very large turnover in business.

Railway Transport Facilities

Apart from the very considerable traffic to and from the Docks, which ranks as the second largest in Scotland, there is a big business in the town which requires liberal transport facilities, and these are provided by the two Railway Companies as follows :—

Caledonian Railway.

(*a*) Leith Branch, with principal goods depot at North Leith and mineral depots at George Street and Newhaven.

(*b*) Leith New Lines Branch, with general depots at Bonnington, Leith Walk, and Leith South.

North British Railway.

(*a*) Leith South Branch, with principal depot for both goods and mineral traffic at South Leith. This branch is in direct connection with the main line at Portobello and the Lothian coal-field, and consequently forms a very important unit of the railway transport service. The new installation of the Corporation Electricity Department, which is in course of construction at King's Road, is situated alongside this branch, from which there is a siding.

(*b*) North Leith Branch, with general goods depot at North Leith, mineral depot at Junction Road, and general depot at Bonnington, and numerous sidings for dealing with certain descriptions of traffic.

(*c*) Leith (Central) Branch—direct line from Waverley Station.

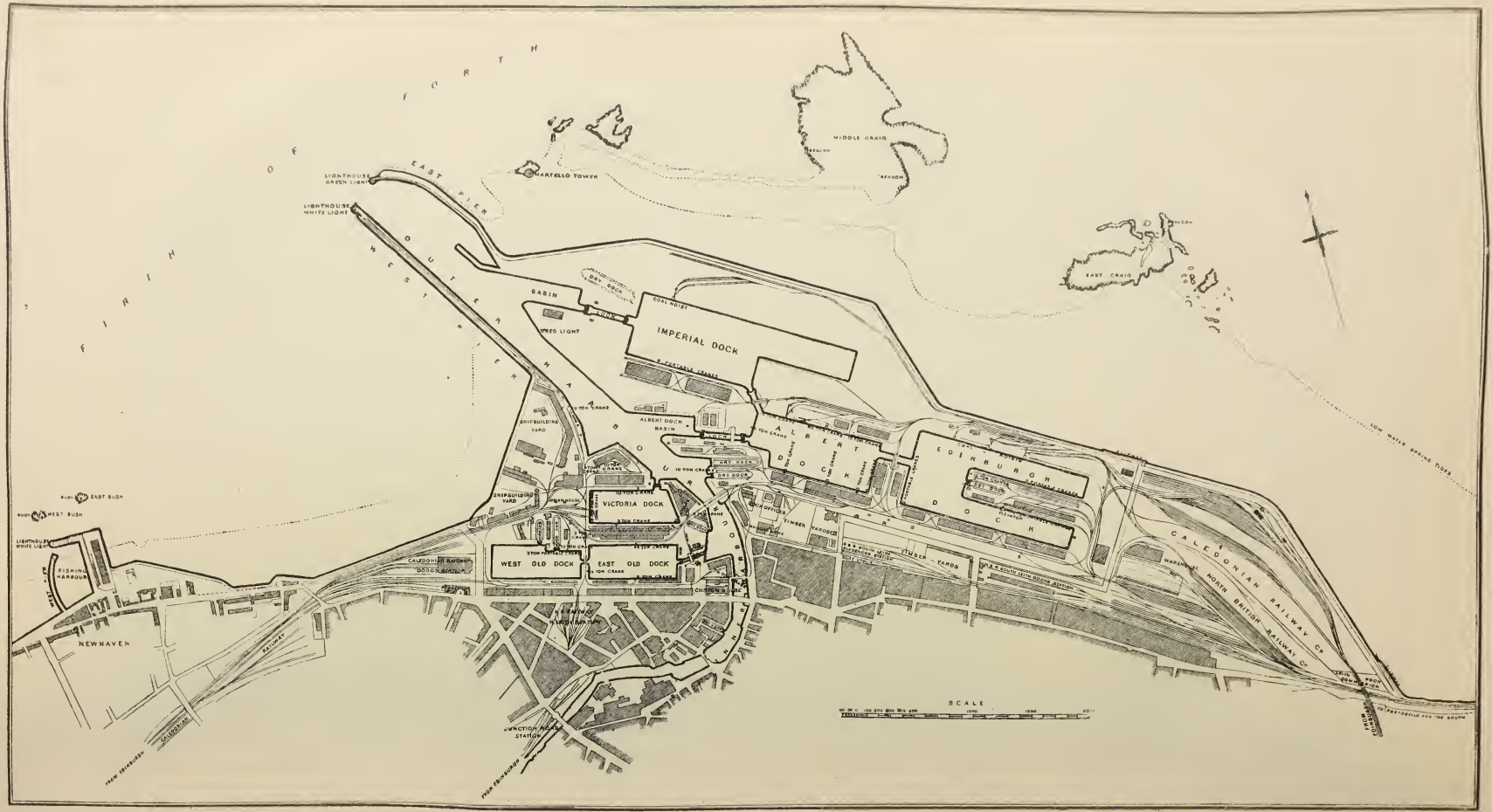
The Southern portion of the City is served by the North British Railway Company's South Side and Suburban line, and the St Leonard's Branch already referred to.

Depots on this line are situated at Morningside Road, Newington, and Duddingston (which provides the necessary facilities for the numerous breweries in the vicinity), Niddrie (at which point there is a marshalling and distributing yard for the traffic East and West), and Portobello, at which there is also the largest marshalling and distributing railway centre in the district.

The North British Railway Company's new Lothian lines converge on the main lines at this point, and provide ample facilities for the supply of fuel to each of the industrial portions of the City.

While the railway transport facilities for the various districts are amply provided for by the various lines in and around the City, the outside areas beyond the control of the Corporation have not been overlooked, and it is also worthy of note that in arranging the various lines to meet the needs of commerce and industry, present and prospective, due regard to the City's position as a residential and tourist centre has not in any way been interfered with.

Ample provision has also been made by the railways for the conveyance of workmen to and from the various industrial districts —train services being specially arranged where these are required for their convenience.



"THE ENGINEER"

GENERAL PLAN OF LEITH DOCKS

SWAIN SC.

DOCKS AND SHIPPING

BY PATRICK J. PRINGLE

Chairman of the Commissioners for the Harbour and Docks of Leith

NOT the least of the many favours which Edinburgh enjoys is her commanding position on the Firth of Forth with its free outlet to the seas and ports of the world.

The Harbour and Docks of Leith, formerly the property of the City of Edinburgh, but now administered under Statute as a public seaport, is the largest port on the East Coast of Scotland, and provides the most modern and efficient accommodation and appliances for dealing with a large volume of Ocean, Continental, and Coastwise tonnage, at charges which are based on the actual cost of the services rendered, while the Harbour of Granton affords additional facilities for Continental traders and fishing vessels.

The capacity for expansion of these facilities is considerable, and the City and its surrounding districts are therefore in a most favourable position for the maintenance of world-wide commercial relationships.

Leith Docks are well protected from the sea, are in direct communication by rail with all stations in Great Britain through the North British and Caledonian Railways and their connections, and have ample reserve sidings for the storage of coal, ore, etc., for export.

The principal modern *Wet Docks* with their dimensions are :—

	Imperial.	Edinburgh.	Albert.	Victoria.	Old Docks.
Water area . .	19½	16½	11	5	10 acres.
Length . . .	1900	1500	1100	750	750 feet.
Breadth . . .	550	650	450	300	300 ,,
Depth (H.W.O.S.T.)	29½	25	25	23	17 ,,
Width Entrance	70	60	60	60	35 ,,

The Dock gates are open from two to three hours before high water on every tide, but for the maintenance of express traffic access can be obtained through locks between tides by vessels of about 300 feet in length.

This is a great facility for the Continental Express service and for vessels requiring urgent despatch.

Dry Docks—	Length.	Width of Entrance.	Depth of Sill (H.W.O.S.T.)
Imperial	550	70	24 feet.
Prince of Wales . . .	382	60	22·6 ,,
Alexandra	330	48	20 ,,
Edinburgh	300	40	18·6 ,,
East Commercial . .	266	35	16·6 ,,
West Commercial . .	165	34	15·9 ,,
Lower (Menzies & Co.)	174	35	Tidal.
Upper (Marr & Co.) .	174	30	Tidal.

Shipbuilding.—The Port is provided with five yards in which vessels up to 350 feet in length can be built and engined.

Ship Repairing.—The number and variety of dry docks, all readily accessible and conveniently equipped for cleaning and repairing ships, permits of vessels carrying out an overhaul without shifting port, which is a great convenience and economy. There are several repairing firms capable of carrying out the heaviest work, as well as cranes for lifts up to 130 tons.

Shipping.—The traffic dealt with inwards and outwards in 1913 was $5\frac{1}{2}$ million net register tons. There are regular lines of steamers to America, Canada, and all the principal Continental and United Kingdom ports.

Imports and Exports.—The total tonnage dealt with in 1913 was almost 5 million tons; the imports consisting of grain, flour and meal, sugar, syrup and treacle, ale and beer, fish, butter, eggs, fruit, vegetables, and other foods, cattle, horses and ponies, feeding stuffs, seeds, oils, manures, chemicals, china clay, paper, paper-making materials, ores, iron and steel, timber, cement, flax and hemp, textiles, etc., and the exports of coal, ale, beer, and whisky, grain, flour and meal, feeding stuffs, sulphate of ammonia and chemicals, sugar, paper, herrings and salt fish, iron and steel goods, oils, seeds, potatoes, textiles, etc.

Coal Export.—In 1913 the total export was $2\frac{1}{4}$ million tons. Shipment is effected in bulk by five hydraulic coal hoists and three cranes. Rapidity of despatch compares favourably with that of any of the larger coal ports.

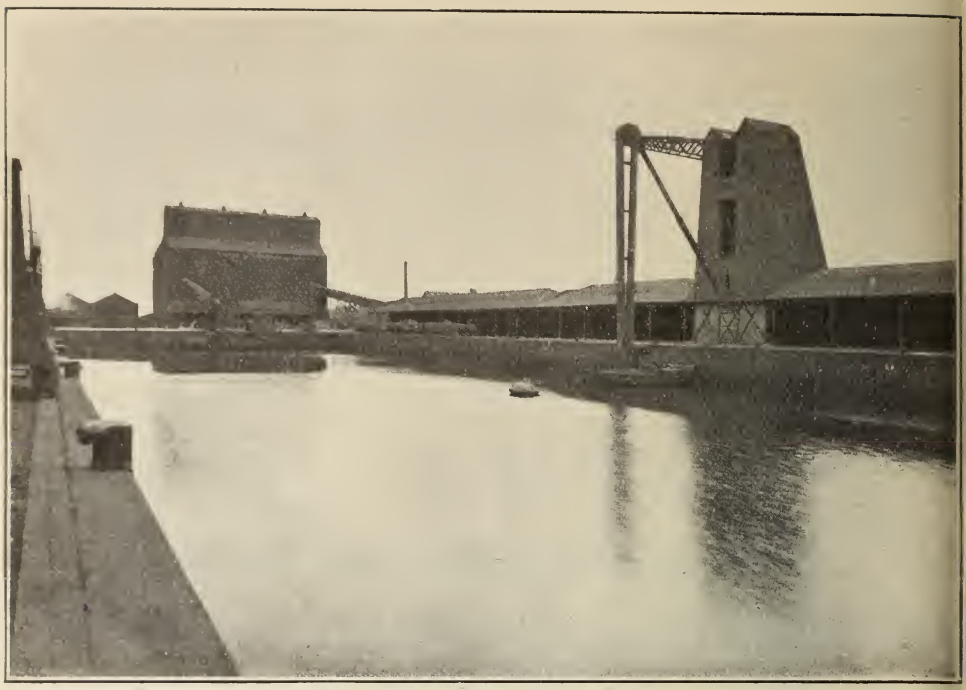
Grain Imports.—The pre-war traffic was about 450,000 tons. The Port of Leith long held a reputation for quick discharge by hand tackle. The modern appliances consist of bucket and pneumatic elevators with automatic weighing, which discharge by belts into silos in the warehouse. The maximum capacity is 220 tons per hour; 5300 tons of grain have been discharged in 28 hours, or 190 tons per hour. The warehouse accommodation is designed for 106,000 quarters. The provision of further accommodation is contemplated. Four sets of deck elevators with travelling bands and piling machines have been recently installed for discharging grain in bulk into quay sheds during times of pressure.

Timber.—The normal annual import is about 100,000 tons. During the war the Port dealt with 171,297 tons in one year. As this article requires considerable space for stowage, additional ground is to be specially provided in the western extension referred to below.

Fish.—In addition to an annual export of about 50,000 tons of cured herrings and dry salted fish, about 18,000 tons of fresh fish are sold by auction in the Newhaven Fish Market. The remainder is despatched by rail to Glasgow and other markets. This promises to be a very important trade in the future. The facilities necessary are being provided in the western extension of the Docks.

Extension and Improvement of Facilities.—Among the new works contemplated is a large shed on the north quay of the Imperial Dock, additional grain warehouse accommodation, new berthage in the harbour, tanks for bulk handling of molasses and oil, a large dock extension enclosing 200 acres on the western side providing quays for general trade, ground for timber storage, a fish harbour and market, additional dry-docking facilities, ample ground for the accommodation of the present shipbuilding yards, and sites for new shipbuilding and repairing yards and quays, or for other industries. Improvement of existing facilities consists of the introduction of additional cranes from 2 to 5 tons lift on the quays of the Victoria and Albert Docks, and of double lines of rails to speed up the handling of through traffic from and to the Continent. The electric power supply is being overhauled and considerably extended to meet the demands of the shipbuilding and repairing yards.

No. 4 Hoist, Imperial Dock, Leith



Elevator Leg and Warehouse

View from Grain Elevator

SHIPPING FACILITIES

BY G. A. FINDLAY

Secretary, North British Rubber Co., Ltd.

GIVEN good docks and adequate shipping facilities, all experience proves that ports which serve, as Edinburgh does, large industrial and closely populated areas are invariably rapidly progressive.

Glasgow, Liverpool, Antwerp, Hamburg, and New York, to name only a few, are outstanding examples of this class. All have advanced enormously in importance within no very extended period. Edinburgh, thanks to her geographical situation, has a great deal in common with these notable centres, and, through the amalgamated Port of Leith, has equally made big strides as a shipping port in a comparatively short time and from most modest beginnings.

Under normal conditions, the total imports and exports registered at Leith have shown a steady increase year by year. As mentioned elsewhere, in 1913 they amounted to 5,500,000 tons, and it is worthy of notice, as marking the perfection of the railway connections at the docks at Leith, that at least one-half of this traffic was loaded into or discharged from railway wagons at the ships' sides. Recently, too, motor traction has played an important part in providing expeditious and efficient means of transport from the docks to the surrounding districts, and even as far as Glasgow. As the rates are low and the results accruing from the adoption of this method of transport have been highly satisfactory, substantial developments are looked for in this direction, with a consequent speeding up in delivery from seller to buyer.

The shipping facilities of Edinburgh are of a character at once extensive and convenient, both as regards the inland and the oversea trade.

The completeness of the coasting service from Edinburgh has always been an advantageous feature. A long-established service of large and fast steamers affords cheap transport to and an invaluable connection with the chief ports of Britain. Amongst these numerous services, that between Leith and London probably has pride of place. Two lines operate on this route continuously, and large quantities of goods are handled, to the great benefit of trade and industry alike.

Other excellent services of steamers run weekly between Leith and Newcastle, as also between Leith and Hull; and a recent combination of coasting lines provides a series of regular sailings from Leith to Liverpool, Manchester, Bristol, Cardiff, and Dundee and Aberdeen. The North of Scotland is further well catered for by a regular service from Leith, taking cargo for Aberdeen, Wick, Thurso, Kirkwall, and Lerwick.

The rates of freight in every case are normally moderate, and where direct comparison with the railway carriage rate is possible,

the coasting rate shows a material saving, the present advantage, for instance, in favour of shipments to London over railway transit amounting to approximately 40 per cent.

Edinburgh's nearness to the Continent makes its docks an unrivalled gateway to the world's greatest import and export markets. Spain, Portugal, France, Belgium, Germany, Denmark, Holland, Norway, Sweden, Russia, and the Baltic States are all within easy reach. Amsterdam, for example, is only 370 miles distant from Edinburgh by sea, Antwerp 420 miles, Hamburg 490 miles, and Gothenburg 500 miles. By way of contrast it may be here mentioned that the distance between Edinburgh and London by rail is 400 miles.

The Continental and other short distance services from Leith are extremely comprehensive—indeed so numerous, varied, and interlocked that it is possible in the space at command to indicate them only in scanty form. The principal routes, however, are :—

Leith to Bilbao and Santander.
Leith to Oporto, Lisbon, Seville, Cadiz, Malaga, Almeria, Valencia, and Barcelona.
Leith to Dunkirk and Calais; Leith to Tréport (*via* Southampton).
Leith to Dieppe, Rouen, Nantes, and Bordeaux.
Leith to Antwerp and Ghent, Amsterdam, Rotterdam, Hamburg, Bremen, and Danzig.
Leith to Copenhagen ; Leith to Aalborg, Aarhuus, and Odense.
Leith to Gothenburg.
Leith to Stravanger, Bergen, Aalesund, and Trondhjem.
Leith to Iceland and the Faröe Islands.

That this direct communication is a real economy is illustrated by the following figures, which represent freight rates applying at the time of writing :—

Leith to Antwerp	50/- per ton (weight).
Leith to Dunkirk	45/- per ton (weight).
Leith to Amsterdam . . .	40/- per ton (weight).

Overland transport of the same quantity and for the like distance would almost unavoidably cost 75 per cent. to 100 per cent. in excess of these charges.

The services previously maintained from Leith to Libau, Windau, Riga, Reval, Petrograd, and Archangel are meantime interrupted, but it is expected will be resumed at an early date.

If it went no farther, Edinburgh's shipping activity would still be of first importance. But in addition to those outlets to which prominence is given above, Edinburgh's shipping service has a greatly wider sweep, and, amongst others, the Near East, the Far East, and the Western markets come within its outer orbit. Thus, regular services are maintained with Malta and Alexandria *via*

Gibraltar; well-known heavy lines operate respectively from Leith to Rangoon, Singapore, Port Swettenham, Hong-Kong, Kobe, and Yokohama; and from Leith to New York, Philadelphia, Baltimore, and Charleston; also, in the season, to Montreal; while last, but not necessarily least, many auxiliary services are available as and when occasion arises.

For the sea-borne outlet of manufactured products or the inflow of raw materials and other supplies, the maritime facilities of Edinburgh are, in their entirety, hardly surpassed, and it is reasonable to assume that such an extensive use as Edinburgh is able to make of "the boundless highway of the World" cannot fail to be a vital factor in fostering the City's further industrial advancement.

South Quay, Imperial Dock, Leith

LEITH DOCKS

COAL & OTHER MINERALS

BY HENRY BRIGGS, O.B.E., D.Sc., A.R.S.M.
Professor of Mining, Heriot-Watt College, Edinburgh

A PRIME necessity for an industrial city is cheap power, and that, under present conditions, entails a plentiful supply of coal. Edinburgh is situated on the fringe of one active coal-field and within short distances of others. It is the nearest large town to the important oil-shale field of East and Mid-Lothian, which is undoubtedly destined to play an increasingly important rôle in the affairs of industrial Scotland.

The relative importance of the mineral-producing counties of the East of Scotland can be judged from the following figures for 1913—the last year of normal trade :—

County.	Tons raised in 1913.			Value, in £ sterling.			Persons engaged in mining.	
	Coal.	Oil-shale.	Iron-stone.	Coal.	Oil-shale.	Iron-stone.	Under-ground.	Sur-face.
Midlothian .	3,203,680	723,766	22,903	1,441,354	176,541	6,871	9,405	2,308
East Lothian	1,117,020	..	..	468,345	..	..	2,933	696
West Lothian	2,057,324	2,556,066	41,669	914,562	645,771	21,712	8,299	1,906
Fife . . .	9,680,208	..	2,128	4,715,827	..	578	24,176	5,146

The coal-field of Midlothian, though relatively small in area, has a development of seams unparalleled in Scotland, and about 80 per cent. of the available coal is in beds over 2 feet in thickness. In this area coal is being wrought both in the Upper (or True) Coal Measures and in the Lower (or Edge) Coal Measures. Geologically the field may be compared with a great trough, having roughly a north-and-south axis, and with the northern end hidden under the estuary of the Forth. The seams " crop " all round the edge of the trough, where they often rise very steeply to the surface. Under the centre of the basin the beds are approximately level. While the high inclination of many seams near their outcrops increases the difficulty of working, it adds greatly to the quantity available under a given surface area. It is noteworthy that the field is richest at its northern side, that is at the part which lies nearest to the coast and to Edinburgh. The Midlothian and Haddingtonshire coal-fields are undoubtedly joined to that of Fife under the Forth, and at Prestongrange and Prestonlinks Collieries undersea working is being carried forward on an important scale. Considerable though the distance is between the coasts, there is every likelihood that much of this undersea coal will be obtained in the future, and it will be principally approached from the southern side.

On a conservative estimate, the resources are such that the pre-war coal output of the three Lothians could be maintained for 600 years.

The following are analyses of four well-known local coals. The first three are bituminous coals and the last a cannel, in which variety the district is unusually rich :—

Coal.	Colliery.	Class.	Calorific Power (Evaporation Units)	Volatiles per cent.	Fixed Carbon. per cent.	Ash. per cent.	Sulphur. per cent.	Moisture per cent.
Jewel . . .	Whitehill	House	..	27.5	55.6	3.9	0.5	12.5
Newbattle Steam	Newbattle	Steam	13.4	31.3	55.0	3.4	0.4	9.9
Crown Jewel .	Prestonlinks	Gas	12.5 (value for coke)	30.7	58.6	5.8	0.7	4.2
Arniston Cannel	Arniston	Gas	12.8 (value for coke)	52.2	42.5	3.1	0.9	1.3

In pre-war days the coal exported from Fife and the Lothians was almost one-half of that from the whole of Britain—the Scandinavian countries, Holland, and Germany all being heavy buyers. During 1913, 1,424,922 tons of coal, coke, and manufactured fuel of the value of £840,805 were shipped from Leith alone, while Granton was responsible for another 129,045 tons of the value of £84,051. The Scottish coal export trade was profoundly affected by the war, and for many years to come the political and financial conditions in Europe must militate against a return to a pre-war status in that trade. With decontrol of the mines of this country will therefore come a period during which competition to secure local markets for coal will be acute—a state of affairs which must redound to the advantage of the owners of factories situated in Edinburgh or its neighbourhood

THE OIL-SHALE INDUSTRY OF THE LOTHIANS

BY SIR JAMES WALKER, D.Sc., Ph.D., LL.D., F.R.S.
Professor of Chemistry, University of Edinburgh

THE traveller approaching Edinburgh from the west cannot fail to have his attention arrested by great artificial mounds, which in some states of the atmosphere seem to rival the Pentland Hills in magnitude, if not in beauty. These mounds of spent shale mark the seat of an industry interesting on account both of its unique character and of the variety and value of its products.

The shale-fields of Linlithgowshire and Midlothian occupy a V-shaped area, which may be roughly defined as having the point of the V at Cobbinshaw reservoir and the terminations of the two limbs on the Forth, the most westerly near Blackness and the other near Dalmeny. Besides this main area, an abandoned outlier at Straiton may be noticed. The oil-shale occurs in seams often 5 or 6 feet thick, and is mined in much the same way as coal.

The shale when heated gives off gases and vapours, part of which condense on cooling. The heating is done in benches of long upright retorts which may be over all some 60 feet in height. The upper (coolest) portion of the retort is made of iron, and the lower (hottest) portion of firebrick. The retort is heated internally by the combustible gases which have been obtained in a previous distillation, or have been specially produced from coal in a gas-producer. The shale is charged through a hopper at the top of the retort and takes some thirty hours to find its way to the bottom, from which the spent shale is withdrawn. The introduction of superheated steam in the lower part of the retort is found to be useful in increasing the amount of permanent combustible gases and of ammonia. The modern retorts are all of the continuous-working type.

The gases and vapours are withdrawn through a pipe under the charging hopper, and pass through a series of condensers in which they deposit a crude oil and an ammoniacal liquor, which are further worked up. As previously stated, the uncondensed gases are burned as fuel for the retorts. These retorts are situated directly over the mines, and the crude oil is despatched to central refineries where it undergoes chemical treatment and careful distillation to separate it into portions of different boiling-point, which are commercially important.

Amongst the marketable products are :—

I. *Shale Naphtha and Shale Spirit.*—These are the most volatile portions, and are used (*a*) as motor spirit, (*b*) as illuminants in specially constructed naphtha lamps, and (*c*) as solvents for greases, gums, and resins, *e.g.*, in wool-washing, paint-mixing, and linoleum-making.

II. *Burning Oils.*—These oils are used to feed ordinary paraffin lamps, and it is satisfactory to learn that the Scottish shale-oils have given rise to remarkably few lamp accidents. Specially purified oils are used for buoys, light-ships, and lighthouses.

III. *Intermediate Oils.*—These oils are used for the production of oil-gas, and for combustion in oil-engines. The Admiralty uses large quantities of them as fuel.

IV. *Lubricating Oils* and *Batching Oils* from shale may be used either in conjunction with animal and vegetable oils or alone.

V. *Solid Paraffins* or *Paraffin Waxes* of many grades of hardness and melting-point are obtained by the distillation. They are employed for a great variety of purposes, *e.g.*, for making candles; for dipping the splints of matches in order to carry the combustion from the head to the stick; for miners' lamps; for vestas, tapers, and night-lights; for waterproofing; for electrical insulation; for microscopic section-cutting; for waxing thread; as a medium for salves; and as a material supplied to bees for making comb.

VI. *Still Grease.*

VII. *Paraffin-Coke.*—This is the residue left in the stills and is superior to coal-coke for many purposes as it contains practically no ash.

All these substances are obtained from the crude oil, but a product of almost equal importance to them is the ammonia obtained from the ammonia water. The water is heated in specially constructed stills, whereupon the ammonia is evolved as a gas and is made to unite with sulphuric acid for the production of sulphate of ammonia, which is a very valuable manure employed in enormous quantities in agriculture. Did the shale produce oils only, the industry could not have competed with the American and Russian petroleum, but as sulphate of ammonia is obtained at the same time as the oils, the shale industry survived the keen struggle with foreign competitors.

The oil industry was originally started in Scotland in 1850 at Bathgate, where the Torbane Hill mineral was worked, yielding about 100 gallons of crude oil per ton, but the supply of this mineral became exhausted in about a dozen years, and oil-shale took its place. The richest shales yield only about 45 gallons per ton, and some are worked yielding as little as 16 gallons. At the same time, however, as much as 70 lb. sulphate of ammonia per ton may be obtained from them, although the average is about 40 lb.

The industry gives employment to 10,000 men, rather less than half of whom are shale-miners.

The following statistics for 1910 are available :—

Shale distilled	3,130,000 tons.
Crude oil produced	273,000 ,,
(Equal to 70,000,000 gallons.)	
Sulphate of Ammonia produced	54,000 ,,

From the crude oil the following were obtained :—

Motor Spirit	600,000 gallons.
Naphtha	4,400,000 ,,
Lamp Oil	20,000,000 ,,
Intermediate Oils	12,000,000 ,,
Lubricating Oils	10,000,000 ,,
Paraffin Wax	25,000 tons.

The total value of the products was estimated at £2,000,000, that of the mined shale itself being £863,000.

In process of time the shale industry became concentrated in the hands of a few companies which ran five refineries dealing with the crude oil from thirteen works. The process of concentration reached its final stage in November 1919, when the separate concerns were merged in Scottish Oils, Limited, a company subsidiary to the Anglo-Persian Oil Company, which in turn brings the Scottish Company into association with the Burmah Oil Company and the British Government. Hereby a degree of stability has been conferred on the industry which it hitherto lacked; from being an isolated struggling concern it has become a valuable component of a great imperial undertaking. All the mining centres are at present at work, and the output of shale is fully maintained at the 1910 figures. The refineries at Addiewell and Uphall have, however, meanwhile been closed down, their crude oil being refined at Pumpherston, Broxburn, and Oakbank. By increased centralisation of administration and working, important economies will no doubt be effected, and there is now every prospect of this highly specialised local industry continuing to flourish.

THE USHER HALL in which all great Municipal functions are held

ELECTRICITY SUPPLY OF EDINBURGH

BY COUNCILLOR W. BRUCE LINDSAY

Convener, Electricity Committee, Edinburgh Town Council

IN 1891 the Corporation obtained powers to provide the City with a supply of electricity. The site of the present station in Dewar Place was acquired. The erection of the station was duly proceeded with, and on 11th April 1895 delivery of current was commenced. The demand for current grew rapidly, and extensions at Dewar Place were made from time to time until no further extension on the site was possible. In 1899 the station at M'Donald Road was commenced. Still the demand grew, and it became necessary in 1912 to devise means of meeting it. The choice then lay between extensions at M'Donald Road, with the addition of cooling towers for cooling the water required for condensation purposes with the new type of turbo-alternator, and a site near the sea where abundance of sea-water would be available. The erection of cooling towers was rejected by the Corporation on grounds of amenity. In any case, an extension at M'Donald Road would only have provided additional supply for a few years at most.

Various sites were inspected, with the result that the choice lay between a site alongside the Gas Works at Granton and that at Portobello upon which the new station is now being erected. The Granton site was nearly half a mile from the sea and 100 feet above sea-level, whereas the Portobello site is at the seaside and only 25 feet above sea-level, a most important consideration in view of the power required to pump the sea-water to the power house for the condensers.

In 1914 the Consulting Engineer, Sir Alexander Kennedy, was instructed to prepare plans and obtain tenders for the buildings and plant. It was then thought sufficient that two turbo-alternators of 5000 kw. capacity each would meet the requirements.

Shortly after the outbreak of war, the Ministry of Munitions withheld permission to proceed, and all work had to be stopped.

In 1918 the matter was taken up with the Board of Trade, and in consequence of the Report to the Ministry of Reconstruction by the Coal Conservation Sub-Committee, the Board indicated that approval of our scheme would only be given if the size of the proposed station were increased so that it might supply electricity not only for the City of Edinburgh, but for the whole surrounding district.

The Corporation then approved of the proposal of Sir Alexander Kennedy to provide at Portobello a station capable of containing three 10,000 kw. sets (see Notes), but so designed as to be capable of containing ultimately 100,000 kw. of plant. In June 1919 the Board of Trade approved of the site and the amended plans generally and gave sanction for the work to be proceeded with. By the end of October 1919 contracts were placed for the new foundations, for the sea-work, the boilers, and the turbo-alternators.

Since that date, contracts have been placed for practically all the buildings and plant necessary to complete the station as well as the plant for the sub-stations and main cables.

The general features of the power station will show the power house, boiler house, and sea-work all on the north of the main street leading into Portobello, while the connection with the North British Railway and the necessary railway sidings will be constructed on the ground to the south.

I have referred to the immense importance of an abundant supply of cold water for condensing purposes. This is provided for in the arrangement of the sea-work. Three vertical shafts, 9 feet diameter, have been sunk to a depth of 60 feet. From the bottom of each of these shafts, a tunnel is driven seawards to beyond low-water mark, a distance of 1500 feet. Each tunnel is 4 feet 9 inches in diameter. At the sea end of each tunnel is a vertical shaft to admit the sea-water. In operation, two tunnels will be admitting the water to the land shafts, while the third will be discharging the heated water from the condensers. It is an open question whether this heated water might not be utilised to provide an open-air bathing and swimming-pond before discharge into the sea.

The normal temperature of the sea-water is about 55°. The temperature of the water discharged from the condensers will be about 67° and sometimes higher still. Judging by the extensive use of the ponds at such towns as North Berwick, St Andrews, etc., with the water at sea temperature, it seems not unreasonable to expect that a pond or ponds so warmed would be well patronised and prove a great boon to the City.

When the station is producing electricity, 3-phase current will be generated at a pressure of 6600 volts. The current will be carried to the sub-stations in the City at this pressure by cables composed of three cores, each 0.3 square inch. The three principal sub-stations will be the Cowgate, Dewar Place, and M'Donald Road. From these centres, again, there will be fed sub-stations at Granton, Gorgie, Causewayside, Liberton, and Leith, and certain factories in the district. The sub-stations perform an important duty. The current to be made available for ordinary use must be converted or transformed as the case may be. For ordinary lighting the pressure must be reduced from 6600 volts to 230 volts. This is effected by means of a static transformer, which will lower the 3-phase high voltage to 400 between phases and give an alternating current at 230 volts by means of a 4-wire 3-phase system. When direct and not alternating current is required, *e.g.*, for tramway motive power, the rotary converter comes into play. This machine is driven by the alternating current and produces direct current at, say, 460 to 500 volts.

Regarding the financial aspect of the enterprise, it is unfortunate that war costs have added very largely to the expenditure. Since January 1919, when the first estimates were framed, the cost of

plant has increased about 30 per cent. and of buildings about 100 per cent. Still, operations could not be delayed. The older stations were being worked up to their capacity. Constant demands were and are being made for additional supply. The requirements of the Docks at Leith and the shipbuilding yards must be met, and a large amount of industry in the district generally is dependent upon an abundant and cheap supply of electric power. The total cost of the whole undertaking will not, it is confidently believed, exceed £1,750,000. Even at this cost, and allowing for interest and redemption of capital, it should be possible to produce below present costs and sell below present charges, which latter even to-day bear favourable comparison with the price charged for current anywhere else in the country.

As a last word, and that to the ordinary lighting consumer—Do not use carbon filament lamps. Buy the best quality of metallic filament. Do not imagine that you *consume* the current. The current leaves the generator at the station, passes to your house *via* the cables and your own wiring, and again *via* the cables back to the generator minus a certain loss proportionate to the distance (see Notes). Electricity meters in consumers' premises generally measure the current, and this is proportional to the number of lamps in use. The current is not consumed by you any more than a water-mill consumes the water that drives the water wheel. The filaments of metal lamps can be raised to a very much higher temperature than carbon filaments, and in consequence they give a much greater amount of light than carbon filaments for the same amount of electricity, that is, they are very much more efficient.

NOTES.

Kilowatt.—For horse-power add one third.
10,000 kw., say 13,333 h.p.

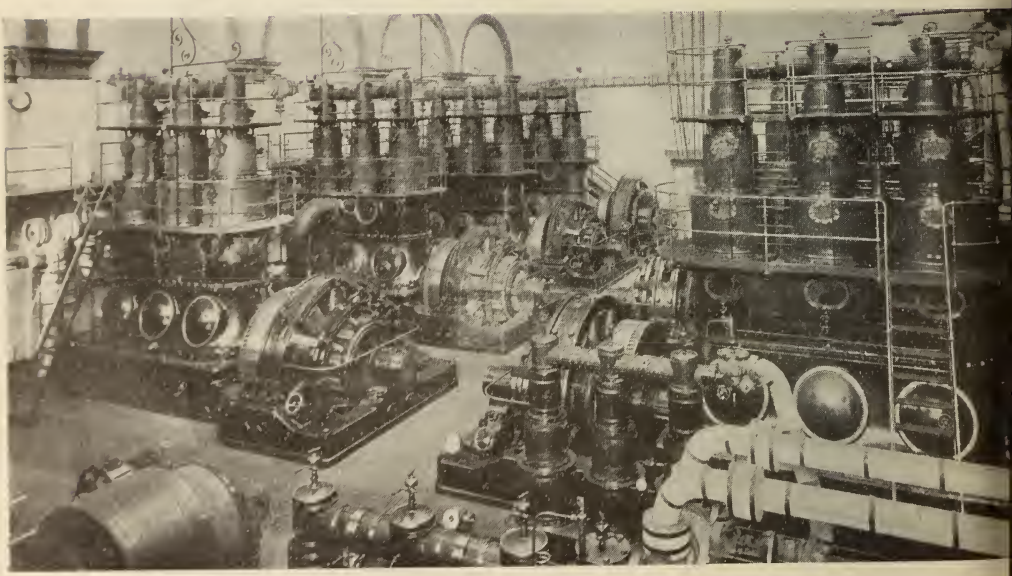
Loss in transmission.—The resistance to the passage of the current is measured in ohms. An ohm is the resistance which requires a pressure of one volt to drive a current of one ampère through it. About 600 yards of copper wire one-tenth inch diameter offers a resistance of one ohm. The resistance will increase or decrease as the wire may be longer or shorter.

Units sold in each year ending 15th May are as follows :—

Year.	*Units Sold.*
Year to 15th May 1903	8,995,808
,, ,, 1904	10,604,865
,, ,, 1905	11,648,501
,, ,, 1906	12,914,119
,, ,, 1907	14,257,848

Electricity Supply of Edinburgh

Year.	*Units Sold.*
Year to 15th May 1908	14,947,008
,, ,, 1909	15,255,465
,, ,, 1910	15,309,483
,, ,, 1911	16,228,906
,, ,, 1912	17,047,645
,, ,, 1913	17,934,781
,, ,, 1914	18,940,948
,, ,, 1915	17,875,406
,, ,, 1916	17,373,558
,, ,, 1917	17,997,251
,, ,, 1918	20,945,404
,, ,, 1919	20,565,249
,, ,, 1920	24,401,273
,, ,, 1921 . . (estimated)	32,000,000



A Small Section of Edinburgh Corporation Electricity Plant

GAS SUPPLY OF EDINBURGH

BY ALEXANDER M'ASTERTON
Ex-Engineer and Manager
Edinburgh Corporation Gas Department

THE Gas Supply of Edinburgh, as well as that of the surrounding area, is manufactured by the Edinburgh Corporation Gas Department at their Works situated at Granton on the shores of the Firth of Forth, and between three and four miles from Edinburgh G.P.O All the gas is now made at these works and is pumped up to the storage holders and distributing stations through a 48-inch main, and afterwards delivered through the district governors (about thirty in all) at suitable pressures to meet the varying demands and to compensate for the different altitudes at which the gas is required. In the winter season the maximum demand reaches over eleven million cubic feet in twenty-four hours, and for this output about 1000 tons of coal are necessary.

The price of gas varies according to the use to which it is put as well as the situation of the premises where it is to be consumed. For ordinary domestic purposes, such as lighting, heating, and cooking, the present price within the City and municipal boundaries is 5s. 4d. per 1000 cubic feet. Gas used for the same purposes outside these boundaries is charged at 6d. additional per 1000 cubic feet, or 5s. 10d. For power and specified trade uses through separate meters, and under stipulated conditions regarding approximately equal weekly quantities, and where the gas is chiefly used during daylight hours, it is supplied at 4s. 11d. and 5s. 5d. per 1000 cubic feet within and without the City respectively.

Increased facilities are also given for the use of gas for cooking purposes in restaurants, hotels, and other catering establishments. Where this gas is consumed in fairly equal weekly quantities and during daylight hours through separate meters and fittings, 4s. 11d. and 5s. 5d. per 1000 cubic feet respectively are charged inside and outside the City area. This concession is, however, dependent upon 500,000 cubic feet of gas per annum being taken for the purpose, and in order to assist caterers to secure this concession the consumpts of all their various premises can be added together at the end of the year.

The rates for gas for motor traction through separate meters and fittings are 5s. 2d. in the City and 5s. 8d. outside. The cost of the special meters and piping in these cases has to be borne by the consumer.

All the foregoing charges are subject to rebate in accordance with the following scale, conditional upon the accounts being paid within one calendar month of delivery:—

Annual Consumption.	Rate of Rebate.
350,000 and under 700,000 cubic feet . .	$2\frac{1}{2}$ per cent.
700,000 ,, 3,000,000 ,, . .	5 ,,
3,000,000 ,, 6,000,000 ,, . .	$7\frac{1}{2}$,,
6,000,000 cubic feet and upwards	10 ,,

Additional special terms are given to consumers of 9,000,000 cubic feet and upwards per annum where high pressure gas is utilised for lighting, etc. These terms are secured by several of the larger consumers and the discounts and rebates are much appreciated.

These are as follows :—

Special Rebates.

Annual Consumption.	Rate of Rebate.
9,000,000 and under 12,000,000 cubic feet .	11 per cent.
12,000,000 ,, 15,000,000 ,, .	12 ,,
15,000,000 ,, 18,000,000 ,, .	13 ,,
18,000,000 cubic feet and upwards . . .	14 ,,

Special discounts are also offered for prompt payment of the above as under :—

Amount of Annual Account.	Rate of Discount.
£1200 to under £1600	1½ per cent.
1600 ,, 2000	3 ,,
2000 ,, 2400	5¾ ,,
2400 ,, 3000	7¼ ,,

The price of gas in Edinburgh will perhaps by some be considered high, but the present figure is due to the great increases in cost of material and labour which have taken place during, and owing to, the war. Prior to the outbreak of hostilities, the price of gas for ordinary domestic use in the City was 2s. 8d. per 1000 cubic feet, so that the advance represents 100 per cent. over that figure; this will compare favourably with the percentage increase in other towns, taking into account the high calorific value of the gas manufactured, and also that materials have advanced by over 165 per cent. and wages as much as 170 per cent. over pre-war standard. It is hoped, and the Gas Committee in fixing the present rate had in view, that the highest point has now been reached, and that it may be possible at no distant date gradually to reduce the price if no unforeseen adverse circumstances arise. Even at 5s. 4d. per 1000 cubic feet it is claimed that gas is still considerably cheaper than electricity, which has also had to be advanced for the reasons given above. It should likewise be kept in mind that gas lighting with the incandescent burner gives a particularly soft and evenly distributed illumination very desirable and much appreciated for sewing, reading, writing, etc., and that scientific observers have proved conclusively that it is thoroughly hygienic, and in many cases more so than its rival, owing to the assistance that it affords to ventilation and the better circulation of the air which it ensures. Many physicians consider that electric light is injurious to the eyes and their opinion is supported by important medical authorities.

It must not be overlooked that the incandescent burner gives off heat as well as light and thus assists in the warming of the apartment where it is burned. This is of importance in the winter time as well as in the autumn and early spring when the evenings are chilly and fires are not in use.

To show the economy of gas for lighting even at the present figure it may be mentioned that a modern incandescent burner, properly regulated and adjusted, will burn for five hours giving an illumination equal to about sixty candles for one penny-worth of gas, which is little more than half the cost of electricity at the current figure, while the maintenance of the gas burner is much below that of the electric filament lamp. The Gas Committee have showrooms in Edinburgh, Leith, and Portobello, where all the latest types of burners, mantles, and artistically designed fittings can be obtained at moderate prices.

The advantages are much more marked when gas for lighting is used under high pressure. This form has greatly developed for lighting industrial premises. Burners can now be obtained to consume from $1\frac{1}{4}$ cubic feet per hour, giving a light of about 65 candles, up to 50 cubic feet per hour for 3000 candle-power. With this system between 12 and 13 lighting hours with an illumination of 65 candles can be obtained from one penny-worth of gas. With the higher units about 1000 candle hours for one penny are secured.

To encourage the use of gas for cooking, the Gas Committee give out on loan and fix free, cookers, hotplates, oven burners, grillers, and boiling burners, and also maintain these appliances in good order. As showing the extent to which these articles have been adopted, it may be mentioned that there are already over 22,600 cookers fixed and more than double that number of the smaller appliances. In fact scarcely any house in the City is now without one of these important adjuncts, and parties desiring to let or dispose of their premises generally advertise the fact that gas cookers, fires, etc., are already fixed. It is hardly necessary, considering the large number of appliances in use, to go into the merits and advantages of gas for cooking, as these are so well known and appreciated ; but it might be of interest to add that it is possible with judgment and care to cook a four-course dinner on a modern gas cooker with about 2d. worth of gas, and at the same time to obtain hot water for washing up.

The old prejudice against gas fires for heating is now happily speedily disappearing owing to the rapid spread of knowledge regarding this most useful apparatus. This has probably been greatly assisted by the medical profession who, by introducing them into their own houses, especially in their waiting rooms and surgeries, and recommending them for sick rooms, have dispelled ideas which had grown up against gas fires, doubtless owing to the bad construction and inefficient fixing of the older forms of appliances. Since scientific ideas have been applied to the manu-

facture and fitting and a careful study made of the conditions, with special reference to hygiene, the use of the gas fire as a heating agent has gone up by leaps and bounds; and although for continuous heating it has not yet reached the stage of competing economically with the coal fire, still for intermittent use, and where proper allowance is made for its labour-saving qualities, it has come to stay. The fact that the Gas Committee now give out gas fires on simple hire or on hire-purchase, and fix them up without further charge, has helped to bring these important articles before the public and to demonstrate their healthy, hygienic, economical, and labour-saving characteristics. There are nearly 9000 gas fires fixed on hire, to say nothing of the many others which have been purchased outright. This goes to show that when properly designed appliances, fixed in a workmanlike manner and selected with due regard to the prevailing circumstances, are available, the public will take advantage of them. Having once learned their benefits they will be slow to part with them.

The medical profession have been enthusiastic supporters of gas fires once their true benefits and hygienic value were demonstrated, and they are now recommended for the sick-room and the hospital and even for the operating theatres without hesitation. When properly constructed and fixed, cleanliness is ensured; there is no smell, no dust, no dirt, no coals to carry or ashes to remove, and an equable temperature at any desired degree can be procured and maintained; also, which is very important, they are now constructed to burn without noise. Some years ago the *Lancet* appointed a special committee to make exhaustive tests on gas fires, and their report has vindicated the gas fire and given it a new lease of life. In that report it was stated that gas fires could be employed for warming efficiently, without prejudice to health and without the formation of fog-forming constituents or air-contaminating products. Most minute tests failed to find any deleterious products in the air notwithstanding that no special precautions had been taken to ensure ventilation. Gas fires can be depended upon to heat up a room much more rapidly than a coal fire, by merely turning on the tap and lighting it. It can also be shut off as soon as it is not required, and all the bother of lighting a coal fire with paper, wood, and coal is saved. It is the kindling and rekindling of the coal fire which makes it so wasteful, and the smoke and dust which cause it to be unhygienic. Gas fires can be recommended for drawing-rooms, dining-rooms, bedrooms, libraries, billiard rooms, studies, and other occasional rooms, and will be found cheaper than coal and infinitely more convenient and useful. There are other indirect savings, such as in the cost of cleaning and in the wear and tear on curtains, carpets, blinds, tapestries, and such like delicate fabrics, cleaning and polishing of grates, and the sweeping of the chimney. In many houses by the introduction of gas fires, etc., it has been possible to dispense with the services of a maid. Lastly,

by the use of gas fires we aid in smoke abatement and help towards a clearer and purer atmosphere.

The utilisation of gas for the maintenance of a proper hot-water service is now an essential for domestic purposes as also in many industrial works. The wastefulness of providing a coal range for this purpose is now recognised, as the fire has to be kept on almost continuously in order to be sure that hot water is available when required. With the gas-heated apparatus, once the water is heated up to the pre-determined temperature, gas is consumed only when supplies are actually being drawn off, with the exception of a few jets to prevent the water from cooling. This service is rapidly extending, and in connection with the various Housing Schemes of the Local Authority these gas-heated appliances are being largely made use of in working-class dwellings. Many of these houses are also being fitted with gas-heated washing boilers, and the usual cumbersome and costly coal boiler dispensed with.

The cheapest power is that generated by gas engines. They have superseded the steam engine because they save boiler space, stokers' wages, coal, and do away with dust, ashes, and smoke. They do not require skilled labour ; they can be started and stopped at once, so that they need only run when actual work is being performed. They therefore use fuel proportionate to the work done. Taking a 20 h.p. gas engine of first-class manufacture, this can be run under full load for approximately 400 cubic feet of gas per hour.

I should like to conclude with a note of a few of the processes in which gas is used industrially. These are :—annealing, blow-pipe work, branding, brazing, case hardening, coffee roasting, dental work, drying, japanning, laundry work, metal melting, muffle furnaces, riveting, soldering, steam raising, tailors' irons, tempering, tinsmiths' stoves, welding, etc. The Gas Committee keep a trained staff to advise on all matters connected with the foregoing and to provide estimates and all other information free of cost.

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

New Medical School

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

M'Ewan Hall

WATER SYSTEM OF EDINBURGH

BY EX-BAILIE J. M. RUSK, J.P.

Formerly Convener of the Law Committee of the Edinburgh and District Water Trust

THE Water Supply of Edinburgh and District, which until recently was under the administration of the Edinburgh and District Water Trust—a corporate body composed of representatives from the City of Edinburgh and the town of Leith [1] —is obtained from three different ranges of hills lying to the south and south-west of Edinburgh. The earlier supplies to the City, which began to be introduced during the years 1621-80, are obtained from the Pentland range, lying directly to the south-west. This supply consists of two distinct systems by means of which the northern and southern watersheds are tapped, the water being collected in a series of reservoirs on both sides of the hills. These two systems, extended from time to time, supplied the requirements of the City for two hundred years, down to the year 1874. At that time another and separate system was introduced from the Moorfoot Hills on the borders of Midlothian and Peeblesshire ; and a third system—the largest of all—was introduced in the year 1905 from the mountains in the south of Peeblesshire, known as the Talla system, the water being supplied principally from the Talla and Gameshope streams. The water brought from the Pentland systems, both north and south of the range, is largely composed of pure spring water. Several of the springs supply water so pure and clear that it has been carried direct into the pipes for domestic consumption without filtration. The water from the Moorfoot and the Talla systems is gathered from the mountain streams into two large basins which are now designated the Gladhouse and Talla reservoirs.

The sources from which the water is supplied under these various systems provide not only an abundance of water, but water of various grades of hardness and softness. For example, the spring water from the Pentlands, coming as it does from deep fissures in the rocky subterraneous formation, is clear, hard, and pure, while that supplied from the mountain streams of North and South Peeblesshire is characterised as soft water. Under recent extensions of the works of the Water Trust, the whole of the systems are now linked up by a series of conduits and pipes outside the City area, so that the hard water from the Pentlands can be mixed with the soft water from the Peeblesshire hills. The result is that the water is of the very highest class for domestic purposes both as regards purity and consistency. In this respect it stands pre-eminent among the water supplies of Great Britain, as many of the supplies to large cities are obtained from one central source which provides only a particular quality of water, and in some

[1] In consequence of the amalgamation of Edinburgh and Leith, the water supply is now administered under the combined Corporation

cases it has to be artificially treated for either softening or hardening effects.

It is also possible to give off supplies of soft water without mixing it with the hard water, and in many cases this is found to be very adaptable for manufacturing purposes. For example, the Talla water is eminently suitable for paper-making, an industry which demands water of a special character.

The most exhaustive examination and analysis of the water supplies to Edinburgh, especially that from the Talla, were made in the years 1911 and 1912 by various experts, including Sir A. C. Houston, Director of Water Examination, Metropolitan Water Board, London.

The details of the analysis are too elaborate to repeat here, but the following excerpts from his report may be given as an indication of his conclusions on the subject of the Talla water which was then under special examination :—

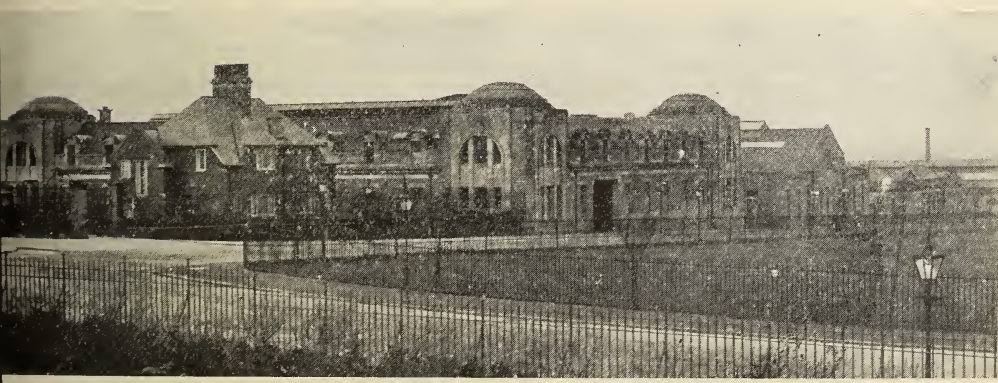
> " In my opinion there is no ' safer ' water supply in the United Kingdom for drinking purposes than the Talla water."
>
> " Having for many years past strongly advised the mixing of ' soft ' with ' hard ' waters, it affords me considerable satisfaction to find that the, relatively speaking, ' hard ' Pentland spring water is not only admirably adapted for mixing with the ' soft ' Talla water supply (either antecedent or subsequent to filtration), but that its utilisation for this purpose is apparently not an impracticable measure."
>
> *Note.*—As mentioned above, the water system has now been extended to provide for the mixing of these waters.
>
> " The Talla gathering ground is practically cut off from all sources of human pollution and compares favourably with the finest gathering grounds in the United Kingdom."
>
> " The Talla water, in my opinion, could be drunk with perfect safety antecedent to filtration. The filtration process is really only required to render the water clear, bright, and sparkling."
>
> " If the future of the Talla water is committed to the care of the experts advising the Water Trust, I predict with confidence that the supply will soon become a source of pride to the citizens of Edinburgh."

The cost of the water to the ratepayers is charged upon the gross rental. The rate for domestic purposes is, in the year 1920-21, 1s. 2d. per £1 of rental payable by the occupier, with 2d. per £1 as a general public water rate payable by the owner and occupier equally, the total rate payable by occupier and owner being thus 1s. 4d. per

£1. There are reduced rates payable in the case of shops, offices, etc. The water is also sold by meter to large consumers, the rate being 9d. per 1000 gallons within the City area, with an addition of 30 per cent. to consumers outside the area. These rates compare very favourably with similar charges in other cities in England and Scotland.

The number of reservoirs throughout the various areas from which the water is collected and distributed for consumption and for compensation purposes is fifteen. The largest of these are the Talla and Gladhouse reservoirs, which occupy an area of 300 and 400 acres respectively, their capacity being about three thousand million and two thousand million gallons of water. The gathering area of the Talla supply, which is now the principal individual system for the City, extends to 6180 acres or nearly 10 square miles. Almost the whole of this area, mainly hill pasture, is the property of the Corporation, which is thus enabled to preserve the purity of the water draining into the reservoir.

The supply of water from the various sources above referred to is estimated to be ample for the requirements of the City and the district for many years to come. The need for any further extensions in the future has already been anticipated in the selection of the Talla area, and a very large additional supply can be acquired from a neighbouring watershed to drain into the Talla system at a moderate cost.



Cattlemarkets and Slaughterhouses

THE CHEMICAL PROPERTIES OF EDINBURGH WATER SUPPLY

BY THOMAS W. DRINKWATER, Ph.D., F.R.S.E., F.I.C.

Lecturer on Chemistry, Edinburgh School of Medicine

THE quality of a water and the nature of its dissolved solids have an important bearing on manufacturing operations.

For example, a hard water has to be softened before it can be used for boiler feed, and a water which contains iron cannot be used for dyeing without some previous treatment. It is obvious that if chemical treatment of a water supply is needed before it can be used for manufacturing processes, the working expenses will be correspondingly increased.

The majority of our manufacturers are keenly alive to the problem of water supply, and before erecting new works usually ascertain the quality of the water and the amount available for their use.

The following is a partial analysis of the Edinburgh supply. The sample was drawn from a main tap on the south side of the City :—

	Grains per gallon.
Total dissolved solids	5.2
Fixed saline residue	4.4
Volatile residue	0.8
Free and saline ammonia	0.0022
Albuminoid ammonia	0.0034
Chlorine	0.85
Oxygen absorbed in four hours	0.13
Hardness, Clarke's scale	3.22
Removable hardness	2.80
Nitrogen as nitrates	absent
Total lime (combined)	1.72
Iron oxide	absent

These results show that the water is a very pure sample as regards organic matter. The small amounts of free and albuminoid ammonia indicate absence of organic pollution. The hardness is so slight as not to interfere with any manufacturing operations. On boiling under pressure only three grains per gallon were deposited ; this fact is important in selecting a water for steam-raising purposes.

All things considered, the Edinburgh water supply is well suited for manufacturing operations, and very few towns can offer such a valuable supply either in quality or quantity for the purpose.

SITES FOR INDUSTRIAL WORKS

BY NEIL M'LEOD, J.P.

Lord Dean of Guild, Edinburgh

THE City of Edinburgh is most fortunately situated for the continued development of its industrial resources. That these resources are immense, as regards both mineral wealth and latent local capital, is admitted, and it requires only the joining of hands of capitalist and scientist with the man of commercial affairs to find in the City of Edinburgh and the immediate surrounds of the City a fertile field for the setting down of new industries. Now is the day of Edinburgh's opportunity. There is great pressure on all industrial works, not only for the recovery of four or five years of arrears, but for the turning to practical account in the arts of peace of many of those inventions that have been evolved and utilised in war.

Where, then, is Edinburgh to accommodate these new industries for which this City of ours is so well situated and adapted? For answer to such a question, a glance at her water-ways, her railways, and her highways reveals the natural location of these industries.

In her water-way of the Forth, the City possesses a frontage to the sea almost unequalled in its natural channel for navigation, and that at all states of the tide; its deep-water channel, its excellent and extensive docks at Leith and Granton with their splendid quayage, their loading and unloading facilities, and their transport convenience brought right up to the ship's side, combine to demonstrate the truth that Edinburgh well merits the cognomen of Scotland's premier seaport.

But it is not only in and upon the sea that Edinburgh's future lies; it is also upon the land, by that great network of railways which find in Edinburgh and Leith their centre and focus.

These railways are the North British and the Caledonian, with their associate railway systems of the United Kingdom, penetrating the great industrial zone of Scotland and the industrial hives and commercial centres of England. In the possession of such a system of great inland transport, Edinburgh and her ancient seaport of Leith vie with their Western neighbour, Glasgow. Together they serve the continent of Northern Europe on the East, and on the West that still greater continent of America and our own Dominion of Canada. It is then in such world-wide binding relation that Edinburgh and Leith with their seaboard and their systems of railway transport stand out for such pre-eminent service to the cause and claims of international industry.

But it is not only in her natural, deep water-way and railway systems that the City makes her claim upon the manufacturing world; it is also upon her highways. These highways are just as important to the local convenience and economy of the factories as the water-way and the railways are to the export and import business of the factory, and in this important local service of good,

wide, well-paved highways the City of Edinburgh occupies a premier place.

A city possessing these *three* essential adjuncts to industrial development cannot be in the by-wash of industrial output, at least in so far as relates to the selection of suitable sites. Where are these to be found ? A glance at the map inserted in this book will satisfy the inquirer after factory sites.

On the seafront, or down by the docks of Leith and the natural harbour of Granton.

Upon the land, intersected by those many miles of railways that traverse and penetrate the city.

Just off the lines of highways that serve, arterially, the traffic of Edinburgh and of Leith. These, primarily, are the natural locations of industrial output. To name the sites is not difficult and may be helpful to those who, in search of sites suitable and convenient for the settling of factories, see in a city so favourably placed the potentialities of profit.

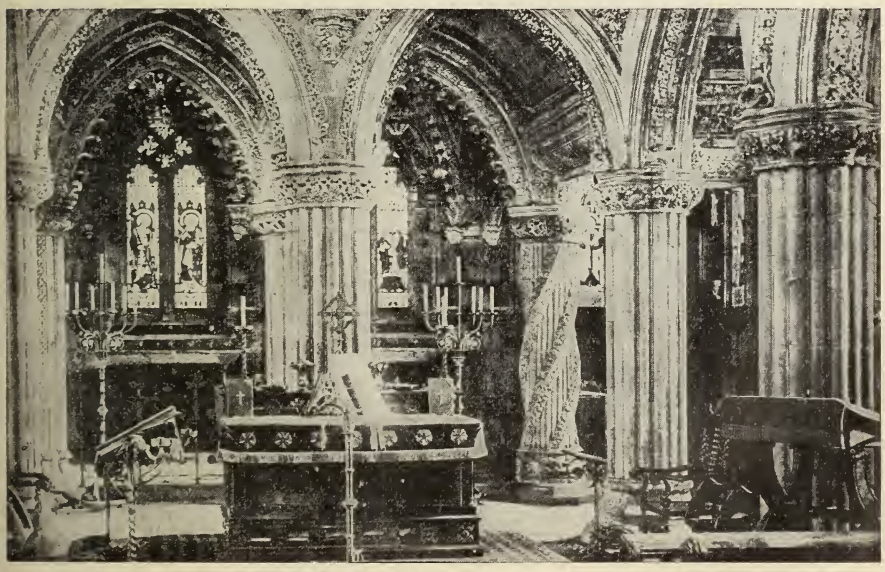
To commence, then, with the water-way, there is that stretch of seaboard frontage, as yet in the main unappropriated but ripe for development, extending from Granton to Cramond, with the Cramond Island as the natural western terminus. Under excellent shelter of the Forth Defences, suited to the laying down of railway lines and sidings along the front, capable of easy reclamation, with a reasonably deep water-channel at high tides, and accessible by roads readily adaptable for local passenger and transport service ; that excellent frontage to the sea is well suited for shipbuilding, especially of the lighter craft, and also for engineering and chemical works. The presence of the City Gas Works invites indeed the selection of such a site for its chemical ally. Granton itself, with its natural harbour, and its timber, trawling, and engineering trades already settled there, offers exceptional inducement for further settlements in these or kindred lines. On the railway lines there are the industrial districts of Duddingston and Craigmillar, and the flat lands of Brunstane, Portobello, Craigentinny, and Seafield, in close proximity to the Leith Docks, with great railway sidings already laid ; whilst just inland are the districts of Abbeyhill and Lochend on the east ; and towards the south and west (by the side of the Suburban Railway) are the industrial districts of Gorgie, Tynecastle, and Damhead. To the north-west of the City are Craigleith and Pilton, with land cheap and levels flat, roads good and railway sidings all ready made.

Off the highways that permeate the City, and which through the medium of town planning are undergoing expansion, there are many sites that offer peculiar attraction to the manufacturer, who would find in Edinburgh a city low in rates, excellent in its resources and inducements for the planting of those further industries that bring profit to the trader and undoubted good to the community. Edinburgh is already no mean city industrially. It

has great manufacturing establishments of long years' standing. These find in the City obvious advantages to themselves, and of benefit to the community in the work they bring.

Who under the new régime will be the first to enter upon this proved heritage of profit to themselves? Manufacturers in the City—and their name and class of trade are almost legion—find in the City a place of good health, as well as of industrial wealth, and that is the surest and most attractive test to any commercial undertaking.

Reference is made in this connection to the excellent information which the Burgh Engineer, 1 Parliament Square, can lay before inquirers as to eligible building sites for industrial development throughout the City, and at rates either of purchase or of feuing which need not discourage entrants to an area and a city so full of promise for the manufacturer requiring skilled labour, excellent and cheap water supply, and unrivalled electric power. An enumeration of the factories already established for long years in Edinburgh would be witness to the eligibility of the City and its sites for the still further development of Industrial Edinburgh. Maps and full particulars of the City's resources and capabilities for manufacturing industry are available for inspection at the Offices of the Department I have named above; the more important vacant sites are indicated on the map inserted in this volume.



Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

Rosslyn Chapel

Courtesy of Munro & Co., Publishers of Official Guide to Edinburgh

UNIVERSITY BUILDINGS

NOTES ON THE LAW OF SCOTLAND REGARDING LAND TENURE

BY SIR JOSEPH DOBBIE

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WHILE the Commercial Law of Scotland is now practically identical with that of England, the laws of each country affecting heritage remain distinct. Which system is preferable it is not for me to say. We in Scotland are proud in particular of our exact method of registration of Titles, but we admit that a benighted foreigner, even from England, may be forgiven if he confesses that he does not understand the meaning of such legal terms as " Feu," " Burgage," " Casualties," " Superior," "Vassal," "Compositions," "Duplicands,"—all familiar as household words to Scotsmen.

Such terms necessarily recur in references to Scottish Heritable Property, *i.e.*, Heritage, and in negotiations for its purchase. A brief explanation of the Scottish system of Land Tenure may therefore be useful to business men who may have occasion to seek information regarding business premises or business sites in Edinburgh.

The English Law term " real property " and the Scottish Law term " heritable property " are synonymous, and both refer to land or buildings or rights connected with either.

The theory of the feudal system, on which the Scottish law of land tenure is based, is that every piece of ground, with the buildings thereon, is held from a " superior " by the owner, who is known as the " vassal,"—this being a legacy from the old times when each great landlord, who himself held from the Crown as over-superior, gave off part of his estate to his supporters. Originally, on the death of the vassal the property reverted to the superior, who was free to deal with it as his own. Gradually the right of the eldest son, or of the vassal's heir by will or otherwise, was recognised, but as a condition of the superior waiving the right to resume possession on the death of the vassal last entered or recognised by him, he stipulated that he should receive " casualty " money as a condition of entering the new vassal or proprietor.

As the nation developed, traders began to establish themselves in the towns and get privileges for their burghs. The Sovereign bestowed land on them under the Tenure of " Burgage," which in its origin was also a military holding. The Corporation of the burgh, not the individual burgess, was the vassal of the King, but each burgess was called upon to perform watching and warding. The " watching and warding " have vanished, and no cash payment has been substituted, but " burgage," although inferring no annual payment, still remains as a holding. In Royal Burghs, therefore, land is held immediately under the Crown without any annual payment.

A feu is in effect a sale of land in perpetuity by its owner, the "superior," for a stipulated annual payment or ground rent called the "feu-duty." It has distinct advantages over the Long Lease system prevalent in England. The tenure being for ever, it gives the purchaser (the "feuar" or "vassal") every inducement to erect buildings of a substantial and durable character. With a leasehold tenure there is little inducement to erect lasting buildings. A feu being perpetual, the value of the land is likely with the lapse of time to appreciate in value, while it is in the nature of things that the leaseholder may usually expect to see his property depreciate in value as time runs on.

A landowner with ground suitable for building purposes usually portions out his land into lots for building purposes according to a plan. When he "feus" he does so by means of a Feu Charter or a Feu Contract. The Charter is a deed granted by the superior to the feuar: the Contract is one between them, and is signed by both. These provided for payment to the superior not only of the stipulated annual feu-duty, but also of certain occasional payments called "casualties." These casualties in modern times took the form of a fixed "composition," the feuar then being bound usually to pay, say every nineteenth or twenty-first year, a "duplicand," or year's feu-duty, over and above the feu-duty for the year. Under old charters the feuar in some cases has to pay, in addition to the feu-duty, a year's net rent of his property on every transmission, or on the death of the person who had paid the previous untaxed casualty, and that even although the annual rent value of his property may have increased tenfold since the date of the original charter.

An Act passed in 1914—The Feudal Casualties (Scotland) Act—effected a much needed alteration in the law by making casualties redeemable on easy terms, and by providing that if they were not redeemed within fifteen years, they were to be held as extinguished. In feus granted after 1914 a superior cannot create any casualties. The feu-duty must be of fixed amount and a further payment cannot be stipulated for unless the amount and the due date are certain.

One of the merits of Scots Conveyancing Law is the national system of Registration in the Land Registers of all Deeds forming the title to, or affecting property. In Scotland duplicates or official copies of titles can readily be obtained from the Land Register, which is known as the Register of Sasines, while in other countries where titles have disappeared in a fire or other catastrophe, serious loss has followed. In Scotland, no deeds not appearing in the register can affect the rights of a proprietor or lender, or those deriving a title from him.

In the case of a modern feu, all that the proprietor requires to do when he sells is to grant a conveyance called a "disposition" to the purchaser, and give a notice of change of ownership to the superior. This has the effect of relieving the seller from any

further claims for feu-duty and of substituting the purchaser in his place.

A proprietor may sell his property outright, or he may sell it in return for an annual payment or feu-duty payable to himself and his heirs, thus leaving to himself a " mid-superiority " between his own superior and the purchaser. In that case he becomes the purchaser's superior, while he himself remains directly liable to the over-superior. This feu-duty can be sold by him, the purchaser paying a capital sum as the price in return for the right to the annual payment.

When a proprietor dies, his heir or legatee usually completes his title by a Judicial Decree establishing his right, called a " Service," and the Decree of Service must be recorded to make the title effectual. In some circumstances, the dead proprietor's trustees complete and record a short title in narrative form, called a " Notarial Instrument," and executed by a Notary Public.

Superiors in Scotland occasionally endeavoured to prevent the creation of sub-feus by inserting a prohibition against these in their charters. To defeat this prohibition a device was resorted to, especially in towns where there was much sub-division of land for building and other purposes, of creating a " ground annual," usually by means of a " Contract of Ground Annual." In practice, this course is now frequently followed as an alternative to creating a sub-feu. It is in effect a sale of property in return for payment of a sum annually for ever. A ground annual is thus a real burden laid on the land of a fixed annual amount, and is in effect practically the same thing as a feu-duty, the periodical capital payment being called not a " casualty " but a " grassum."

The Scottish " Bond and Disposition in Security " is equivalent to the English mortgage over real property. The bond on being recorded in the Register of Sasines creates a security over the lands, and confers a preference to the lender over all subsequent lenders. Until it is recorded he has only a personal claim against the borrower. The registers, which are invariably " searched " or examined preliminary to the completion of every transaction, let a purchaser or lender know with absolute certainty if he is safe to purchase or to lend.

An owner of property the foundation of whose title is a recorded and irredeemable Deed followed by possession for twenty years, has what is called a good " prescriptive progress." So fortified, he need not trouble about any possible objection to the prior titles.

An " equitable charge," under which an owner of real property in England may give a measure of security to a lender or creditor by delivering or pledging his title deeds, is unknown to the law of Scotland. No such transaction would have any legal effect in Scotland, as registration of a bond in the Register of Sasines must take place before there can be any effective charge.

Creditors of an owner of Scottish heritable property may attach it by certain processes of Law. One of these is an action of "Adjudication"—the object of which is to get the Court to transfer the property to the creditor in satisfaction of the debt, with power to the proprietor to redeem within a certain time. After that time has expired the creditor may get the adjudication converted into an absolute right of property. When a proprietor has been made bankrupt by the Court under the Scottish process of "Sequestration," his property passes to the creditors for the purposes of the Bankruptcy Acts.

In Scotland a creditor may also by an "Inhibition," *i.e.*, an attachment or arrestment, notice of which is entered in the Land Registers, put a legal veto on his debtor disposing of his heritable property to his disadvantage. He can do this on the eve of raising an action for payment before his action is disposed of or is even in Court.

A lease of Scottish heritable property should be in writing. A verbal lease for a year is good, but while that is so, a verbal lease for more than a year is not good, even for a year, unless followed by possession. A lease of thirty-one years or more, or a lease for a less period containing an obligation to renew so as to endure for at least that period, may be recorded in the Register of Sasines, and no purchaser of the property can dislodge a tenant under such a lease.

While neither the Feudal Casualties Act nor the Rent Restriction Act strikes at a contract for payment of a premium as a condition for a lease of Scottish heritable property, the recent Rent Restriction Act prohibits such premiums in leases under fourteen years' duration, so far as regards the houses to which the Act applies, *i.e.*, houses where the standard rent or rateable value does not exceed £90 a year.

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

Portobello Beach

LOCAL RATES: A COMPARISON

BY ROBERT PATON
City Chamberlain, Edinburgh

FROM either the commercial or the residential point of view, the question of local rates is at all times an important one, and this is particularly so at present when higher standards for Local Government Services are being established. Those cities which have pursued a progressive and enlightened policy may be well abreast of modern requirements; others, which have lagged behind, may be compelled in the near future to meet largely increased rating burdens.

Judged by the standard either of efficient and up-to-date communal services or by the lightness of her local burdens, Edinburgh takes a foremost place among the cities of the United Kindgom. Her local services, with one exception perhaps—that of tramways, which is now in course of being remedied—are all of the most modern kind. In providing these she has had to spend large sums, but she is regularly making adequate provision for the rapid repayment of the debt incurred. *Notwithstanding this, Edinburgh is to-day a low-rated city.* To some extent this is attributable to the fact that she is the home of a large number of wealthy companies and corporations connected with Banking, Insurance, Investment, and other callings, all housed in valuable buildings, which thus take a considerable share of the burden of the local rates. These buildings constitute the nucleus of Edinburgh's inherent ability to bear local burdens. The total annual value of property in the City (£4,700,000) is per head of the population higher than that of any of the large cities of the United Kingdom, with the exception of the City of London.

Before quoting actual local rates, it may be of advantage to make clear one or two points of difference in the rating systems of England and Scotland respectively.

In England local rates are, as a rule, payable wholly by the occupier, and are levied according to "rateable value," that is, gross value (or actual rent) less a deduction for the cost of maintaining the property in a lettable condition.

In Scotland the rates are payable partly by the owner and partly by the occupier. Those imposed by the Town and County Councils (for Police, Roads, Public Health, etc.) are, generally speaking, levied on the gross value, *i.e.*, the actual rent; those imposed by Parish Councils (for Poor and Education) are levied on the net or rateable value. These variations must be taken into account and a common basis adopted when making comparisons between different cities.

In the following table of rates in the principal cities in Scotland, *gross value*, which is the basis for municipal rates, is adopted for both municipal and parish rates :—

Local Rates: A Comparison

	Total Rates.[1] Year ending Whitsunday 1914. s.	d.	1919. s.	d.	1921. s.	d.
Edinburgh	**4**	**9½**	**5**	**1**	**8**	**1**
Glasgow	7	2	8	5	14	7¼
Dundee	5	8¾	6	9½	10	2½
Aberdeen	6	5	7	6¼	12	3½
Leith	5	5¾	5	8½	9	0¼

[1] Exclusive of Domestic Water Rate, as this is not levied on Industrial Undertakings.

In the following table the Edinburgh rates are stated alongside the rates of certain cities and towns in England, and for the purpose of true comparison are calculated at what they would be if levied according to *rateable value* as in England :—

	Total Rates Levied 1914. s.	d.	1921. s.	d.
Edinburgh (if levied on rateable value as in England)	**5**	**9**	**9**	**8**
Accrington	7	4	15	0
Birmingham	9	0	17	6
Blackburn	8	0	16	8
Bradford	9	0	16	10
Brighton	6	10	12	3½
Bristol	8	8	15	3
Burnley	6	8	13	4
Burton-on-Trent	7	8	16	0
Cardiff	7	10	15	10
Coventry	7	11	19	0
Croydon	7	4	12	4
Derby	8	0	18	3
Dewsbury	8	4	13	5¾
East Ham	10	6	21	0
Gateshead	7	1	14	6
Halifax	10	0	19	9
Huddersfield	8	4	13	0
Hull	9	6	17	8
Islington	7	10	17	3
Leeds	9	1	16	8
Leicester	8	2	15	10
Liverpool	8	8	17	5¾
Manchester	8	5¾	16	3
Middlesborough	8	4	16	0
Newcastle	6	5½	13	0
Northampton	7	7	15	0

	Total Rates Levied 1914. s.	d.	1921. s.	d.
Norwich	11	0	20	9
Nottingham	8	1	16	2
Plymouth	7	3	14	11
Portsmouth	6	8	13	0
Preston	8	8	15	0
Rotherham	9	6	17	6
Salford	8	6	18	0
Sheffield	9	$3\frac{3}{4}$	17	8
Southampton	8	$5\frac{1}{2}$	16	$9\frac{1}{4}$
South Shields	7	9	15	8
Stafford	8	0	13	10
Stockport	7	10	17	6
Stockton-on-Tees	7	11	15	4
Stoke-on-Trent	9	$11\frac{1}{2}$	20	$6\frac{3}{4}$
Sunderland	7	8	14	8
Swansea	8	7	18	8
Tynemouth	7	10	15	6
Wakefield	8	10	17	10
West Ham	11	3	22	4
West Hartlepool	7	10	13	6
Westminster	6	$9\frac{1}{4}$	11	$1\frac{1}{2}$
Wigan	9	$0\frac{1}{2}$	14	6
Wolverhampton	9	3	16	8
York	8	$1\frac{1}{2}$	14	11

Note.—The figures relating to rates in *England* are taken from tables of Local Rates compiled by Mr W. Allison Davies, Borough Treasurer, Preston.

From the foregoing tables it will be seen that the burden of local rates in Edinburgh is light compared with that in other cities and towns whether in Scotland or in England. As already stated, this is largely the outcome of her inherent ability to bear local burdens. It has not been attained by any failure to provide her citizens with all the means and services necessary for the attainment of a high level of moral, intellectual, and social well-being. Nor has it been obtained by following a policy of rate subsidy from trading undertakings. The aim of the Edinburgh administration has been to provide such of the elements as enter into first cost of production, —viz., water, gas, electricity, and transport—at as cheap prices as possible, and consequently no transfers are made from trading undertakings in relief of rates.

Edinburgh, for example, is one of the greatest educational centres in the world. In addition to its famous University, it possesses among other Educational Institutions a Veterinary College, a College of Agriculture, a College of Art, a Dental School, and a Technical and Commercial School. The last-named (the Heriot-Watt College) has a normal enrolment of students (day and

evening) of 3000. A unique feature of the educational facilities of the City is the number of Secondary Schools, some of them founded and endowed by Edinburgh merchants of bygone days. Of these there are five. The Education Authority, which administers public education in the ordinary Elementary Schools, has also established a number of Higher Grade Schools of a secondary class, as well as two Higher Grade Technical Schools. In connection with the University, and closely associated with its medical school, is the Royal Infirmary, an up-to-date and palatial institution standing in 13 acres of ground and having 1000 beds. The Municipality has provided, at a cost of £350,000, a large modern Infectious Diseases Hospital, with 600 beds for ordinary cases, and 230 beds for the treatment of phthisis. The Municipality has also spent within recent years over £300,000 in clearing congested areas and providing houses for the working classes. Provision is at present being made for additional housing accommodation in areas which will be laid out in accordance with the most modern methods of town-planning. New public parks have been acquired at a cost of £160,000. Edinburgh, indeed, is fortunate in the number of its public parks and open spaces, the area of public parks alone being 1500 acres. Liberal provision has been made therein for games and sports, including cricket, football, tennis, and golf, as well as public bowling-greens, of which there are twenty-nine. There are also in the City six sets of public baths and six public wash-houses. Further, there is a large free library and six branch libraries. In connection with the free library, ample facilities have been provided in the way of books of reference necessary for commercial and industrial purposes. The City possesses an efficient Fire Brigade equipped with all up-to-date appliances.

The Gas and Electricity undertakings are secured on the rates, but it has never been necessary to rate for any deficiency on these undertakings, both of which contribute to the efficient lighting system in Edinburgh.

An effective Sewerage System has been combined with modern methods of Housing Sanitation, and a material contribution to the City's healthfulness has thus been made.

There is an abundant Water Supply, provision having been made to cover all possible needs for a considerable time to come.

Edinburgh has a bracing and invigorating climate and enjoys a large share of sunshine. In its elevated situation it is open to the sea and to the hills, and the currents of air blow freshly in from both. The prevailing winds are westerly. The rainfall is about 25 inches per year. The average death-rate is 15 per 1000.

The healthfulness of the City is unquestioned, and its natural charms, its architectural beauty, its romantic history, and its liberal provision for education and training, as well as its facilities for recreation and amusement, make it a very desirable home for its workers.

CAPITAL

BY A. K. WRIGHT, D. L.

General Manager, Royal Bank of Scotland
Ex-Chairman, Edinburgh Chamber of Commerce

CAPITAL is one of Industry's most clamant needs in the present period of reconstruction, and the demand will no doubt be maintained unabated through many subsequent years of industrial development. Edinburgh is an important financial centre, and outside of London it is questionable if there is any city in the Kingdom which controls capital resources of such magnitude. It is the headquarters of Scottish Banking, a system which has stood the test of over 200 years and has proved the backbone of Scotland's prosperity. Insurance is more strongly represented in Edinburgh than in any city in the Kingdom, with the exception of London; its Financial Companies of various types (Investment, Trust, Mortgage, etc.), enjoy a high reputation and have control of large sums of money; and its many legal firms of high standing have the charge of extensive funds belonging to a wealthy clientèle. In this connection it is not generally known that more income tax is paid in Edinburgh than in Glasgow, Scotland's commercial capital and most populous centre.

Surplus resources gravitate to the banks; and, owing to its intimate connection with the financing of industry, banking naturally deserves most attention in this survey. All the Scottish Banks are represented in Edinburgh. Five of these have their headquarters there, the two Glasgow banks have local head offices, and the remaining bank, with its head office in Aberdeen, has a branch office in the City. There are no fewer than 99 branch bank offices, well distributed to supply the industrial and residential districts of Edinburgh—including Leith, Portobello, Newhaven, and Granton. The banks have also various branches in the County districts, no community of importance requiring banking facilities being neglected. The City of Edinburgh averages 3444 inhabitants to each banking office, while Glasgow and the best banked English provincial city average 4240 and 5300 inhabitants respectively. With one exception, the Scottish Banks have old-established offices in London, and there are 1294 branch establishments throughout Scotland.

Deposit and advance business of every description is transacted. The rates of interest allowed on deposit receipts and the discount charges and rates for overdrafts, loans and advances on Cash Credit accounts are based on the Bank of England Rate. The Cash Credit is of Scottish origin, and was introduced by the Royal Bank of Scotland in 1728. It has proved invaluable in the development of new industries where the initial capital is small and the borrower is in a position to provide personal security. In addition to advances on personal security by way of bond, guarantee, or approved bill, accommodation is granted against Stock Exchange securities, life insurance policies, and, to a lesser extent, against shipping and also

goods in transit or in warehouse. Edinburgh, with so many head offices in its midst, is peculiarly well fitted to deal with industrial demands for accommodation. Every reasonable and legitimate proposal receives the direct consideration of an up-to-date and broad-minded management, keenly alive to the varied needs of modern trade, supported by boards of directors with an intimate knowledge of local conditions.

The Scottish banking charges for the collection of cheques, bills, etc., have recently been reduced, and compare favourably in their incidence with the English practice of levying a charge on the turnover of the customer's current account.

Recently the banks have devoted particular attention to preparation for the development of foreign exchange business and the extension of Scottish trade with foreign countries. Several of the leading banks are making a speciality of this, and are able to handle foreign business on terms as advantageous to their customers as any offered by their English and Foreign banking rivals. Besides transacting all kinds of foreign banking business, the Scottish banks are able to furnish reports of trading conditions in foreign centres, as well as information regarding the financial standing of business houses abroad. With correspondents in all parts of the civilised world, they are well equipped to meet the requirements of customers with foreign connections. Scottish banking has a world-wide reputation for the shrewd management which has contributed in a marked degree towards the development and prosperity of the country. It is indeed well known that the Scottish system has formed the model for the banking organisations of other lands ; and many of the leading positions in the great banks of India and the Colonies, as well as of England, are held by men who received their early training in Scotland.

The following figures taken from the latest published accounts of the eight banks disclose great financial strength, and are indicative of the remarkable progress made in recent years :—

Total Capital—Subscribed	£28,997,500
Do. Paid-up	10,077,000
Total Reserve Funds and Undivided Profits .	9,118,000
Total Deposits and Credit Balances . . (£107,231,168 in 1911)	273,241,000
Total Notes in Circulation	29,655,675
Total Cash in Hand, Government Stocks, and other Investments	173,898,000
Total Bills Discounted, Advances, Loans, and Acceptances . . . . . (£66,972,341 in 1911)	155,315,000
Total Assets . . . . . (£138,840,920 in 1911)	333,638,000

A feature of the position is the large sum of, say, £30–40,000,000 invested in British Treasury Bills, which represents liquid assets, a proportion of which will in due course become available for employment in the country's industries. These figures show that the resources of our Scottish Banks are amply sufficient to meet all legitimate demands.

Edinburgh has always held a reputation for thrift, and this allied with her patriotism is evidenced by the fact that her subscriptions to the various British War Loan and War Bond issues and to National Savings Certificates present one of the finest records in the kingdom.

A good indication of the saving habits of Edinburgh's industrial classes is shown in the following figures taken from the Edinburgh Savings Bank's latest Annual Report :—

Number of Transactions.	Number of New Depositors.	Number of Open Accounts.	Amount Deposited (with Interest).	Amount repaid (with Interest).	Total due Depositors.
566,632	12,918	128,627	£3,179,050	£2,938,329	£7,653,778

Year's increase in deposits, £240,721.

Average amount due to each depositor in the years stated :—

1860—£18, 1880—£22, 1900—£40, 1911—£46, 1918—£66, 1920—£74.

Fifteen Insurance Companies have their head offices in Edinburgh, and these, with assets aggregating well over £100,000,000, have command of large sums for investment. In addition, most of the other leading offices are represented in the City.

The local Stock Exchange has sixty-six members, and draws business from a wide area.

There is a good range of local industrial securities, and, with plenty of investment money available, these are generally well supported.

Bank of Scotland

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

OLD TOWN AND NATIONAL GALLERY

LABOUR IN EDINBURGH

BY JAMES S. WATERSTON, J. P.
Managing Director, George Waterston & Sons, Ltd., Edinburgh

IF there is one quality above all others that the factory workers in Edinburgh can be credited with it is *adaptability*. Whether this arises from the circumstances of their environment, the variety of occupations to which they can turn their hands, or the kind of education they have received, is difficult to determine. Probably, however, the last-mentioned is the greatest contributing factor. It is well known that Edinburgh is one of the great educational centres of the United Kingdom—for its size easily the greatest. Its School Board, now denominated the Education Authority, has been well served with interested and capable members, whose policy has been progressive and sound from every point of view. The schools are splendid institutions, well fitted up, well built, airy, and well lighted. The City draws to itself the best class of the teaching profession, and the status of an Edinburgh teacher secures a hall-mark which few other localities can give.

To show what is meant by education having its effect on Labour in this City, it may be of interest to mention that while the ordinary school teaching is, of course, compulsory, the evening and day continuation classes, both technical and general, are voluntary, and meet, year after year, with extraordinary and increasing success. This shows that the old Scottish characteristic of a desire for education for education's sake is still extant, and when it is pointed out that of these voluntary scholars a very large proportion are factory workers, it proves that there is, among the Labour class in Edinburgh, a broader outlook and a higher standard of education than obtains throughout the country as a whole. No doubt the presence of this spirit is largely due to the splendid opportunities afforded by the local Educational Authorities. The comprehensively equipped Heriot-Watt Technical College; the workshops and classes conducted by the Education Authority; the Workers' Educational Classes under the University; and the University itself, are all powerful factors in creating this rather indefinable quality amongst the workers of this City.

Apart from these educational facilities and the public-spirited support given by the employers as a whole, it should not be overlooked that the staple trade of Edinburgh is printing and publishing, in itself an elevating and instructive business. There is, therefore, a large nucleus of workers in the City who are intelligent by profession, and this, in its turn, has an influence on the class as a whole.

This broader outlook, this desire to get out of the rut, this love for self-improvement, all fostered by a variety of circumstances, have produced the quality already referred to—that of adaptability. In this connection it would not be unfair to say that even a trade so exotic as that carried on by the huge North British Rubber

Company owes some of its success to the readiness of Labour to turn its hand to a type of work that was quite new to the workers and to the district.

Yet another factor in moulding the many-sided capabilities of Edinburgh Labour is the extraordinary variety of industries which have found a home in this historic City. Probably no trade centre in the country, excluding perhaps London, can exhibit such a range of products. Apart from printing, shipbuilding, engineering, mining, brewing, distilling, flour-milling, rubber working, hosiery and tweed manufacture, all notable in their way, industry passes through a whole series of minor trades to the finer industries of chemicals, drugs, fine glass, and mathematical-instrument-making. It frequently happens that a working-class family of father and several sons and daughters represents half a dozen completely different trades. This means the introduction of a more or less intelligent acquaintance with the nature of several trades, and what effect this has on the outlook of an ordinary household can be easily surmised.

Labour is well organised in the City and surrounding district, and there is, of course, a corresponding representation of Trade Unions; but, speaking generally, the local temperament is one of moderation. What one might call the revolutionary element is almost absent, and class conflict, as compared with what is occasionally seen in other industrial areas—Clydeside, for example—is conspicuous by its absence. The local Labour M.P., Mr William Graham, is a fine type of the City characteristics—logical, persuasive, and moderate. The Trades Council of Edinburgh, a sort of general executive of all local organised labour, is a public body of considerable authority. Its views and actions show a sane and intelligent appreciation of most political and industrial movements, and its services have proved of considerable public utility on more than one occasion. Here, again, the great body of printing trade opinion has, on the whole, a steadying influence on its fellow Trade Unionists.

As a further instance of the healthy tone of public opinion in the ranks of Edinburgh Labour, it may be remarked with pride, that of all the great cities of the country, Edinburgh holds the premier position with regard to recruitment, and particularly voluntary recruitment, during the Great War.

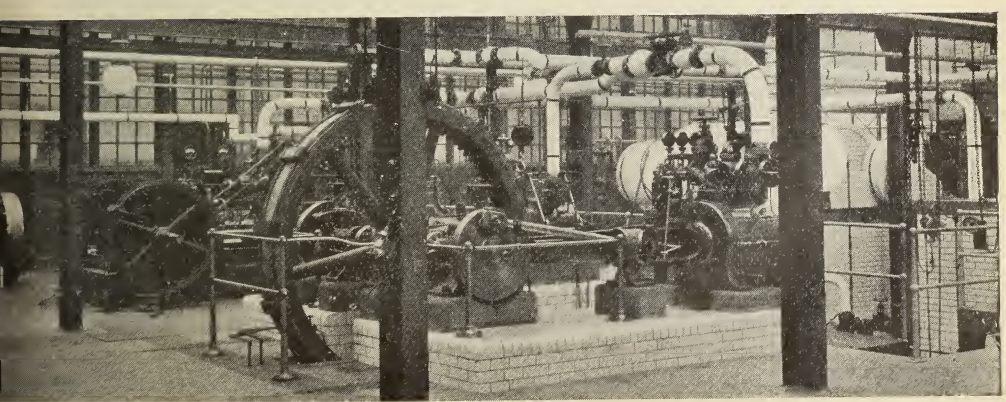
Female labour in Edinburgh forms an important factor in the community. Except for such great industries as jute, hosiery, and textile trades in general, where the female element predominates, there are few cities in the country to compare with Edinburgh in respect of the quality of girl and the variety of her tasks. Education and environment, with the woman as with the man, have had their effect in producing what is, on the whole, a finer and more intelligent type of operative.

It is pleasant to be able to add that the " married woman " class in Edinburgh industry is conspicuous by its absence, and what this means to the home and social life of the worker and of the com-

munity, only those can appreciate who have lived and worked in centres where the factory mother is a regular feature.

Women also have become well organised, particularly during the last eight or ten years, but mostly in conjunction with the men's Trade Unions. This feature, of course, is not confined to Edinburgh, as it has been one of the great recent movements in Labour throughout this country.

In Edinburgh, therefore, as compared with other industrial centres, Labour is of a more intelligent and better educated type ; there is a broader appreciation of the requirements of industry ; there is a keener insight into the varied needs of the community as a whole ; and, above all, there is, as has been already pointed out, a greater readiness and a quicker ability to meet the demands of any industry, however novel or complex, that may seek its home in this old City which, while full of historic memories, is yet keenly appreciative of the progress and development necessary to maintain its place, and lead the way in the industrial world of the future.



"Prime Movers" in the Heriot-Watt College

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

FETTES COLLEGE

THE EDUCATIONAL FACILITIES

BY ROBERT DICKSON, M.A., F.E.I.S.
Headmaster, James Clark Technical Higher Grade School, Edinburgh

IT is being more and more recognised and acknowledged by public men in almost every department of the nation's life and activity that our industrial and commercial future is in very great measure dependent on the character and extent of the education given in the schools in the country. There was expressed during the progress of the war in very many quarters a determined resolve to grapple seriously with the problems then thrown up, and almost everywhere it was realised that the immediate solution of many of these problems was eminently desirable, and that ere long the country would be compelled to take some steps in the direction of a fuller, wider, and more liberal education for our young people, but especially the adolescent portion of the community. This was needed, it was felt, in order that they should have the opportunity not only of acquiring the increased skill, intelligence, and resourcefulness required to maintain and retain our position in the commercial and industrial competition confronting us in the present and immediate future, but also of regaining, if possible, much of what we have lost in productive power during the years of the war.

It was during those critical years impressed on men's minds, as a result of the demands and necessities forced upon us by the exigencies of the war, how much we were dependent for many of our key industries on other countries; how greatly we were being handicapped in the struggle through the want of technical skill and knowledge; how far some of the other European countries had advanced in mechanical expertness and initiative during the decade preceding the war, and how little comparatively our industry and commerce had developed during those years, largely owing to the country's apathy and indifference towards technical training and specialised instruction; and it was fully admitted by many that we should quickly lose our place in the van of nations and that, if we allowed the same state of matters to prevail during the period of reconstruction and repair, the consequences to the future well-being and prosperity of the nation would be disastrous.

The ranks of commerce and industry are now looking for men and women equal in intelligence, skill, and initiative to those who are entering the various professions. In fact it is every day becoming more and more evident that those possessed of the best brains, the highest intelligence, and the widest and fullest education will be required if the nation is to keep its place—a place which seems likely to be threatened even more in the very near future. The same holds good in the case of a city as in that of a nation, and seeing that the foundation of all industrial and commercial prosperity so greatly depends on education, it is a matter of extreme gratification to know that Edinburgh is so well furnished and equipped with educational facilities of all kinds, thus enabling the best

opportunities to be given to its young people to obtain a good, sound education along the lines most in accordance with their needs and aspirations.

It is essential in any schemes for the improvement of trade within the City that provision should be made for the training not only of those who are to be the guides and captains of commerce and industry, but also of those who are to take their place among the rank and file. The need for educated " hands " is no less urgent than for educated " heads."

Edinburgh still maintains the very high place it has always enjoyed among the cities of the world in the matter of education, so that it can be said to-day with as great force as at any time in its history that the leading industry of Edinburgh is education. This is, indeed, a valuable asset to the City in connection with any schemes for its development as an industrial and commercial centre. From the Primary School to the University the educational facilities it offers are almost unrivalled. Pupils come from all parts of the world to receive their education at its secondary institutions, many of which enjoy a world-wide reputation, while Edinburgh University, with its famous medical school, well merits the praise recently bestowed upon it by His Majesty the King, as " the great Scottish seat of learning, which, perhaps beyond all other Universities, attracts to itself the aspiring youth of the Empire."

The educational facilities of Edinburgh for the sake of clearness may be briefly considered under several groups.

I. UNIVERSITY EDUCATION.

The University has six Faculties, namely—Arts, Science, Divinity, Law, Medicine and Surgery, and Music, in all of which full instruction is given and degrees are granted. The wide scope of the Arts curriculum permits of the combination of Arts, Science, Medical or Special studies, and by the successes obtained by Edinburgh University students in the Civil Service Examinations, both for home and the Colonies, it has been shown that it is possible to combine the study for degrees in Arts, Science, or Law with preparation for these and other special examinations. Lately there was also instituted the degree of Bachelor of Commerce. Degrees in Science may be taken in Pure Science, Engineering, Public Health, and Veterinary Science, as well as in Agriculture and Forestry. The faculty of Medicine has a full curriculum in Medicine and Surgery, and is equipped with very complete laboratories and all the other necessary appliances for practical teaching. It possesses ample facilities for clinical instruction at the Royal Infirmary and hospitals of the City. Four degrees of Medicine and Surgery are conferred by the University, and these qualify for practice in all parts of His Majesty's dominions and for admission to the naval, military, and

other public medical services in the United Kingdom. Edinburgh's School of Medicine is generally recognised as one of the best, if not the best, in the world. Women are admitted to the classes in all the faculties and to graduation in Arts, Science, Law, Medicine, and Music. Numerous valuable bursaries, scholarships, and fellowships—amounting to fully £21,000 annually—are awarded to students and for the prosecution of research in scientific and other subjects to graduates.

The lectures given at the School of Medicine of the Royal College qualify for the University of Edinburgh and other Universities. Under the new ordinances of the Edinburgh Commissioners, one-half of the classes required for University graduation may be attended in this school, while the whole education required for graduation at the University of London may be taken at this institution.

II. TECHNICAL, ART, AND PROFESSIONAL INSTRUCTION.

There are a large number of schools and colleges dealing with these important branches of education. The Heriot-Watt College offers complete courses of instruction of from three to four years in Mechanical Engineering, Electrical Engineering, Applied Chemistry, and Mining in the Day Technical Department. A course for the training of architects has been arranged in conjunction with the College of Art. The College is recognised by the Institute of Chemistry, and many of the classes are recognised by the University of Edinburgh as qualifying for the degree of B.Sc. in Pure Science. Advanced Evening Classes in various departments of Pure and Applied Science, Commerce, and Languages are also held in the College.

The Edinburgh College of Art provides for the study and teaching of the Fine Arts and of the Decorative Arts and Crafts. Teaching is arranged in the separate departments of Painting, Sculpture, Architecture, Design, and Crafts.

Classes for a full course of instruction in the science and practice of Agriculture and Forestry are held in the Edinburgh and East of Scotland College of Agriculture. Attendance at the classes qualifies for the College Diploma, the College Certificate in Horticulture, and the degrees of B.Sc. in Agriculture and in Forestry at the Edinburgh University.

In addition to these may be mentioned the Royal (Dick) Veterinary College, with its well-equipped science laboratories and other necessary appliances; the Dental Hospital and School; the School of Cookery and Domestic Economy, which, besides the usual function of such a school, also trains teachers of Cookery and Domestic Science; the Training Colleges for Teachers—Provincial,

Episcopal, and Roman Catholic—where training is provided for teachers who intend to enter either primary or secondary schools. In the Burgh of Leith, which is now included in Greater Edinburgh, there is the Leith Nautical College.

III. SECONDARY AND INTERMEDIATE EDUCATION.

Edinburgh is liberally supplied with schools of this type. Fettes College is conducted on the same principles as the public schools of England. The instruction at the College embraces all the branches of a liberal education of the highest class, and is intended to qualify for the Universities, the Civil Service, and the various professions. There is a modern as well as a classical side. Fifty foundationers are maintained and educated at the College free of charge. Non-foundationers are received as at other public schools, and for their accommodation there are three boarding-houses under the charge of College masters. Scholarships to the amount of about £300, tenable for residence at the College, are open to competition annually. A number of Exhibitions, varying in amount from £100 to £60, and tenable for three to four years at the English Universities and at Edinburgh University, are also open for competition each year to boys at the College.

The Edinburgh Academy consists of two departments—a Preparatory and an Upper School. The former takes the boys from six to nine or ten, and the latter continues their education till eighteen or nineteen. Provision is made for education to fit boys for classical, historical, mathematical, and scientific scholarships at Oxford and Cambridge, Woolwich and Sandhurst Entrance Examinations, Entrance Examinations for Indian Forest and Police Services, and all ordinary professional and University Entrance Examinations.

To this group also belong Merchiston Castle School and Loretto, which latter is situated about six miles to the east of the City. Among the private schools may also be mentioned St George's High School for Girls—a high-class school—and Edinburgh Institution for Boys.

While provision is made for teaching all the subjects required for entrance to the Universities, George Heriot's School is essentially modern in its organisation and course of work, and specially prepares its pupils for commercial and scientific pursuits. There are annually awarded a number of scholarships and bursaries.

The Edinburgh Merchant Company Endowed Secondary Schools for boys—George Watson's College and Daniel Stewart's College—are intended to provide boys with a liberal education qualifying them for professional and commercial life, the Civil Service, and the Universities. For girls, the Merchant Company have the Edinburgh Ladies' College and George Watson's Ladies' College. The course

of study at these two institutions is that of a high-class secondary school, and has as its aim the preparation of girls for a cultured home life or for a university course and those professions now open to women. Special Secretarial Courses have also been instituted for girls who wish to qualify for posts as private secretaries and foreign correspondents.

Under the Edinburgh Education Authority's administration is the Royal High School. The course of study in this school is designed to meet the advancing demands of the age. Although at first its curriculum was exclusively classical, it now provides systematic instruction in all branches of a scientific and commercial as well as of a liberal education. Boroughmuir and Broughton Higher Grade Schools are also administered by the Edinburgh Education Authority of the City and have a five years' curriculum. There are attached to these schools Junior Student Centres, where those who desire to enter the teaching profession can receive special training. Leith Academy and Holy Cross Academy came under the Edinburgh Education Authority in May 1921, when amalgamation took place. St Thomas of Aquin's Higher Grade School, formerly a voluntary school conducted by the Roman Catholics, is now under the jurisdiction of the Educational Authority of Edinburgh.

Intermediate education in Edinburgh is served by James Gillespie's, Portobello Burgh, James Clark, and Tynecastle Higher Grade Schools with a three years' course of study, the instruction in the two last-named being of a predominantly industrial or technical type, intended to provide a definite preparation for future employment both in commerce and in industry without being vocational in aim or scope. Trinity Academy, previously under the Leith Education Authority, provides intermediate instruction for pupils in that burgh.

In all the secondary and intermediate schools under the administration of the Edinburgh Education Authority, with the exception of James Gillespie's and the Royal High School, no fees are charged and school books are supplied free.

IV. PRIMARY EDUCATION.

The Edinburgh Education Authority have some seventy-five schools situated in different parts of the City for pupils between the ages of five and fourteen, while Leith have seventeen. The whole of these schools came under the Edinburgh Education Authority in May 1921, when the amalgamation of the two educational areas took place. The schools are provided with a staff of fully qualified teachers and the education given in them is of a most thorough character.

V. SPECIAL SCHOOLS AND INSTITUTIONS.

There are a number of important endowed hospital schools, where the scholars are boarded and educated from moneys chiefly obtained from grants and endowments. Among these are Donaldson's Hospital, John Watson's Hospital, Trades Maiden Hospital, and The Orphan Hospital. Two very valuable institutions are the Royal Blind Asylum and School and the Institution for Deaf and Dumb.

VI. CONTINUATION CLASSES.

Edinburgh has acquired a great reputation for the work done in its continuation classes. These are at present established on a purely voluntary basis, and it is gratifying to learn that seven-tenths of the pupils who leave the day school enrol in these classes. The Edinburgh Education Authority have set up in connection with them a system of advisory committees allied to the various trades and industries, and thus have secured the valuable co-operation of employers, employees, and social workers. These classes, too, are linked up with the advanced classes held in such central institutions as the Heriot-Watt College and the School of Cookery and Domestic Economy, and in this way the students are enabled to pursue their studies more fully.

There are a number of evening institutions for instruction in Commercial Subjects. The courses extend over three or four years, and include Shorthand and Typewriting, Book-keeping, and Modern Languages. At these classes are granted certificates entitling the holders to go to the Heriot-Watt advanced classes. There are also evening classes for the training of apprentices in the various trades of the City. Spacious workshop accommodation is provided in some of the schools in connection with the leading industries. Provision is made in others of the schools for the training of shop assistants, while classes are also held in Domestic Science, providing for the teaching of Dressmaking, Millinery, Cookery, Laundry, etc.

The whole system of continuation classes in Edinburgh is so complete that it may be said that every young person who wishes to improve or extend his education or to equip himself more thoroughly for the vocation he has selected will find the amplest opportunities for so doing. The classes are all practically free of charge and the necessary text-books are supplied gratis.

THE DEGREE IN COMMERCE (B.Com.) AT EDINBURGH UNIVERSITY

BY J. ALBERT THOMSON

Chairman, Edinburgh Chamber of Commerce

TO Edinburgh belongs the honour in this country of initiating the Degree in Commerce, for it was at a meeting of the Edinburgh Chamber of Commerce in April 1916 that the suggestion was made and the first steps taken. Following upon this meeting, the University Authorities were consulted, and as they received the suggestion of the new Degree with warmth and satisfaction, the matter went forward until now it is an accomplished fact. In October 1919 the first classes were opened to a new race of students.

For years Edinburgh University was the premier medical school and drew its students from every corner of the globe. If to-day it does not retain its unique position in the medical world, it still ranks high and still draws its students from far and wide, but especially from the outposts of our Empire. The new Degree should, if properly advertised, bring added honour to our academic glory, and, by adding to the fame of our fair City, make it in deed as in word the Modern Athens.

Education must be an important factor, if it be not the essential factor, in deciding our future as a nation, and if we would improve our position as a Commercial people we must give heed to the claims of Commerce in our schemes of National Education. But to make this possible, Education must abandon the pose of academic isolation. It must step down into the market-place—into the world of men and affairs. As its chief object is to develop the whole personality, to enable a man to make the most of his faculties—moral, mental, and physical—so the best education for the commercial aspirant must strengthen his character, exercise his mind, and impart knowledge—all in specific relation to his future business career.

Edinburgh through its Degree in Commerce offers this specialised training in a course which extends over three years, and which will be of the highest value to—

Men who propose to enter merchants' houses, or the commercial side of manufacturing concerns ; and to those engaged on the manufacturing side who none the less desire to have a knowledge of the principles of commerce.

Men who wish to enter the Consular Service ; or to qualify as Teachers on the Commercial side in day schools or continuation classes.

Men who hope to reach the higher ranks of their profession, as Bankers, Accountants, Insurance Managers, and to Lawyers who wish to cultivate a commercial clientele.

The curriculum embraces full courses in seven subjects, and a large freedom of choice is allowed to meet the requirements of the varied branches of Industry and Commerce. A full course consists of not less than seventy-five meetings of the whole class on separate days, with additional meetings for tutorial or practical instruction where such is provided. In certain subjects only a half course is given, and two of these count as one full course.

It is impossible to cover all the adaptations of the curriculum, but two courses may be selected to prove the utility of the Degree.

First, the case of the man who intends to follow the career of a merchant—one whose business will be that of distribution as distinct from that of production. There are the compulsory courses which must be taken by all candidates, viz. :—

A full course in Economics, and a half course in—
Organisation of Industry and Commerce.
Accounting.
Mercantile Law.
Economic Geography, and
Economic History.

One modern language is compulsory, and the candidate may choose French, German, Italian, Spanish, or Russian. Supposing a man intends to enter an Export House with interests in South America, he will choose Spanish. As he is permitted to take a second language, which will count towards the Degree, he will doubtless take French. To complete his curriculum one and a half courses have still to be taken, and from those available he will probably select a half course in—

Banking.
Advanced Organisation of Industry and Commerce.
Advanced Economic Geography, or
Imperial and Colonial History.

Next, consider the needs of a man who intends entering the commercial side of a manufacturing business. Like the previous student, he must take the compulsory courses already indicated; the selection of the remaining subjects will be determined by the nature of his intended occupation.

The candidate will naturally select the language most likely to prove helpful in his career, just as he will take a course in a Scientific or Technical subject allied to his future occupation.

There remain three half courses which may be selected from the following subjects, viz. :—

Realistic Economics.
Finance.
Advanced Organisation of Industry and Commerce.
Advanced Mercantile Law.
Advanced Economic Geography.
Imperial and Colonial History from 1783.

Banking.
Statistics.
Public International Law, and
Industrial Law.

The course on Organisation of Industry and Commerce was included in the curriculum on the special recommendation of the Chamber of Commerce. This subject will offer great possibilities in the hands of an able and broad-minded teacher; one who—realising that commercial conditions are dynamic, not static—will keep an open mind and will deal with the practical rather than the theoretical aspect of affairs. His lectures will cover questions of capital, production, distribution, labour, State control, etc. On the producing side will be considered questions affecting factory construction, such as lighting, heating, power supply, ventilation, and sanitation; questions of scale and scope of manufacture, labour-saving machinery, and scientific management. On the labour side will be the various methods of remuneration, hours of labour, housing, apprenticeship, welfare work, and technical education. On the administrative side will be questions of purchasing, costing, estimating, and recording. The distributing side will deal with methods of wholesale and retail buying and selling, with methods of advertising and publicity, and with the problems of transport by rail, road, water, or in the air. Foreign trade will include questions of credit, currency, exchange, tariffs; while insurance will cover fire, marine, life, accident, loss of profit, and so on. Industrial combinations will deal not only with Trade Associations and Syndicates, but also with Trade Unions and Friendly Societies. The influence of the State on industry will call for serious consideration, and the student will learn something of manufacturing conditions as affected by the regulations of the Board of Trade. Questions of Employers' Liability, Workmen's Compensation, National Health and Unemployment Insurance, will be dealt with, and the assistance given to Commerce and Industry by the Consular Service will also have consideration.

There are many other important matters, but enough has been said to show the great scope and the fascination of this subject, which, in the hands of the right man, would—in my opinion—be the most important in the whole curriculum.

It is not suggested that the courses of study outlined are the last word in Commercial Education, but they are a step in the right direction, and it is submitted that the young man who succeeds in graduating Bachelor of Commerce at Edinburgh University cannot fail to have had his mind broadened, his sympathies enlarged, his powers of observation quickened, and his business judgment developed. He will have learned how great a thing business is, how interesting intellectually, and how large a field it offers for the exercise of his highest powers for the general good of the com-

munity as well as his own. He will have learned, too, that in business there is no room for pettiness—here, if anywhere, the call is for the larger outlook and the broader view.

Such a man will realise the many and varied interests of business life, will have a clearer vision and a truer perspective than one whose whole business training has been inside an office or factory. He will go forth from the University with a wider business horizon, with larger scope for his efforts, with fuller interest in his work, and with greater opportunities for successful accomplishment.

Courtesy of Wm. Ritchie & Sons, Ltd., Edinburgh

North British Station Hotel

HOUSING SCHEMES IN EDINBURGH

BY A. GRIERSON

Town Clerk, Edinburgh

IN Edinburgh, as in most other towns, the provision of houses for the working classes has in the past been undertaken by private enterprise, and not on any large scale by employers for their own workers or by the local authority. In all parts of the City, "lands" or tenements, containing generally eight or nine separate houses, have been reared by speculative builders, who have gone out of business temporarily for reasons which are well known. Their place for the time has been taken by the Town Council, who have embarked upon several large housing operations in districts where the shortage of accommodation is marked, or where the greatest benefit is likely to follow. This new form of enterprise was imposed on the local authority by the Housing Act of 1919, under which a scheme has been prepared designed to meet the housing needs of the working classes. This scheme is twofold in its character—one part of it relating to the building of new houses, and the other to the improvement or reconstruction of existing houses and areas where overcrowding exists or where properties do not satisfy public health requirements.

When the Housing Act, 1919, was being passed, it was recognised that houses could not be erected to yield an economic return in the exceptional circumstances which then prevailed, and which may continue for several years to come. The Act, therefore, made provision for a State subsidy which would meet the annual loss on housing schemes in Scotland, under deduction therefrom of a sum not exceeding the estimated annual produce of a rate of four-fifths of one penny in the pound. There was thus created a certain relationship between the State and the local authority, under which the houses were to be built by the latter on the footing that the State would meet all the loss in excess of this four-fifths of a penny rate. Certain conditions were laid down, the most important of which was that the Housing Scheme, so far as it related to new erections, should be completed within three years. This period has proved to be altogether inadequate and has been extended to five years. So far as the Housing Scheme related to the improvement of areas, the limit of time was fixed at six years, but this period also may require extension, as insanitary areas cannot be interfered with until there exists surplus accommodation available for the people who must be dispossessed of the houses they now occupy.

The Housing Scheme of Edinburgh Town Council, as framed in 1919, provided for the erection of 3000 houses and for the acquisition and adaptation of 750 houses. This represented a full programme for the three years' period, and it was recognised that the scheme would only be feasible if circumstances were entirely favourable. On the contrary, the experience of one and a half years has been a disappointing one, owing to the shortage of labour and material,

here and elsewhere. The scheme was on the point of being modified when an official announcement was made that the subsidy period would be extended to five years. The Town Council will consider at an early meeting how far this extension will enable them to adhere to their original proposals.

The following sites have been acquired and negotiations are proceeding for others :—

Site.	Area in Acres.	Price paid per Acre.	Total Price.
1. Gorgie	48	£250	£12,000
2. Saughton	49.65	250	11,797
3. Wardie	73	250	18,250
4. Abercorn	39.25	300	11,775
5. Craigleith	42	325	13,650
	251.9		£67,472

The lay-out plans for all of the sites which have been acquired (except Craigleith) have been approved by the Scottish Board of Health. The Board have also approved of plans of houses to be provided on these sites (with the exception of the houses to be provided on the Craigleith site) to the extent following, viz. :—

Site.	No. of Houses of— 3 Rooms.	4 Rooms.	5 Rooms.	Total No. of Houses.
1. Gorgie	188	20	68	276
2. Saughton	202	76	32	310
3. Wardie	240	86	34	360
4. Abercorn	92	60	44	196
5. Craigleith	252	112	36	400
	974	354	214	1542

The above houses will be provided in buildings of the following descriptions :—

(*a*) Cottages	624
(*b*) Flatted houses (two storeys)	804
(*c*) Tenements (three storeys)	114
	1542

Contracts have been entered into for the erection of houses on the various sites, as follows :—

Site.	No. of Houses.	Estimated Amount of Contract.
Gorgie	272	£290,000
Wardie	360	408,246
Abercorn	196	212,000
Total	828	£910,246

Tenders have been received for the erection of 310 houses on the Saughton site, and for 190 tenement houses on the Abercorn site, and these are at present before the Housing Committee.

Tenders have not yet been invited for the erection of houses on the Craigleith site.

Contracts have been entered into or tenders received for the formation of roads (foundations only) and sewers on the various sites, as follows :—

Site.	Proportion of Site to which Contract applicable.	Amount of Tenders.
Gorgie	Acres 50	£15,000
Saughton	,, 24	13,000
Wardie	,, 30	16,000
Abercorn	,, 30	16,000
		£60,000

The following summary of the building cost of houses, so far as already contracted for and now in hand, may be given :—

Site.	Material.	Cost of House of 3 Rooms.	Cost of House of 4 Rooms.	Cost of House of 5 Rooms.
Gorgie (1st Period)	Stone	£808	—	£961
,, (2nd Period)	Brick	800	£1261	1050
Abercorn	Brick	968	1124	1267
Wardie	Concrete	1070	1218	1464

The Corporation have purchased fifty-two army huts, at a total price of £7469, for the purpose of adapting them as bungalow houses. These bungalow houses are being erected on sites off London Road, at St Margaret's, and at Iona Street, Easter Road, etc.

These huts as reconstructed will provide :—

Bungalow houses of two apartments and scullery	105
,, ,, three ,, ,,	20
,, ,, four ,, ,,	14
Total	139

The estimated complete cost of this scheme is £70,000, or an average cost per house of £518, including the purchase price of the huts. This scheme, while only a temporary expedient, will, in the opinion of the Director of Housing, provide really good habitations with an estimated life of not less than twenty years.

It is expected that these houses will be ready about Whitsunday 1921.

The following is a statement of the rents of the new houses at Gorgie which have been approved of by the Board :—

Chesser Avenue.

6 maindoor houses of	3	apartments and scullery	.	.	£32
6 upstairs ,,	5	,,	,,	.	. 40

Riverside Road.

20 maindoor houses of	3	apartments and scullery	.	£29 10	0
10 upstairs ,,	3	,,	,,	29 10	0
10 ,, ,,	4	,,	,,	32 0	0

These rents may be taken as typical, and it should be mentioned that the amounts stated are inclusive of rates.

The Housing Scheme was prepared in 1919 when the area of the City was 10,877 acres and its population estimated at 336,500. The Extension Act of last year added to the City the Burgh of Leith, with a population estimated at 84,700, and certain suburban districts, with a population of 23,281, giving a total population of 444,481 and a gross acreage of 32,402.

Housing Schemes had been prepared by the Burgh of Leith and the County Council of Midlothian, the former providing for 216 houses and the latter for 94 houses, and prior to amalgamation certain sites had been acquired. These schemes were originally prepared as independent schemes, and it is possible that they may be modified by the Town Council in revising their own scheme with which they now fall to be combined.

The preliminary work necessary for dealing with insanitary areas is now well advanced in the Public Health Committee, in connection with which a careful survey has been made of all parts where overcrowding or slums exist. The intention is to deal with these evils in a radical manner, so that the population in these areas may be housed under healthful conditions, and where the excessive number of dwellings falls to be reduced, rehousing will be provided on adjacent sites wherever this can be done. It is recognised that certain classes, from choice or necessity, must continue to live in and about the High Street, Canongate, and neighbouring districts. There must, however, be some measure of decentralisation to remedy the intensive building of last century, and to reduce the density of population in the wards to figures consistent with public health and with the interests of the people as a whole. It is hoped that this result will follow when the new houses at Gorgie and elsewhere have materialised, and the process will be aided as the transport facilities of the City improve.

It may be added that the improvement schemes will take in a number of buildings of historical and archaeological interest, but these assets of the City will not suffer, since it is the intention of the Housing Committee to entrust their reconstruction to architects who possess special qualifications for such work.

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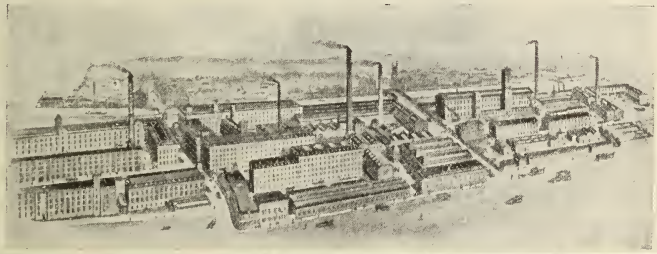

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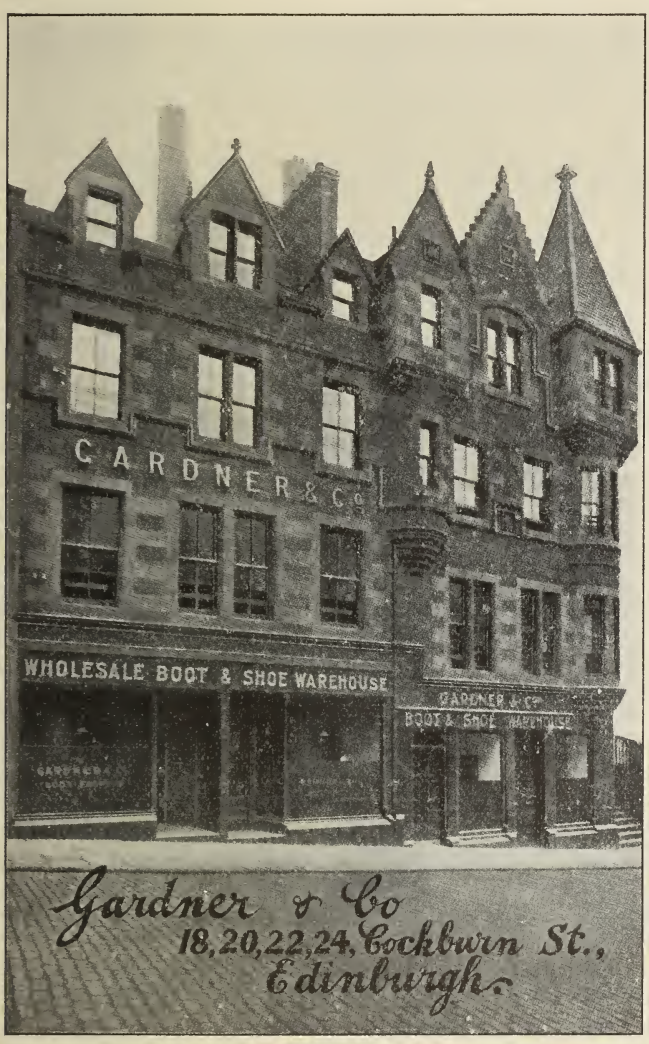

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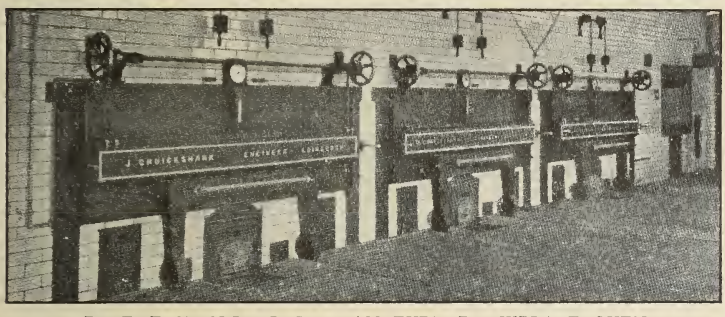

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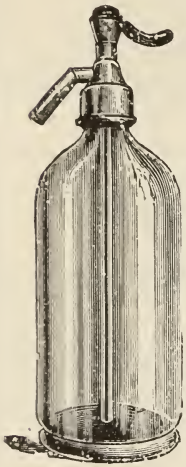

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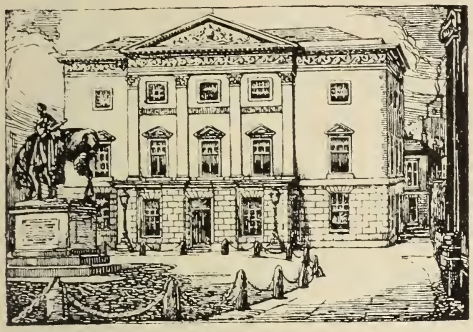

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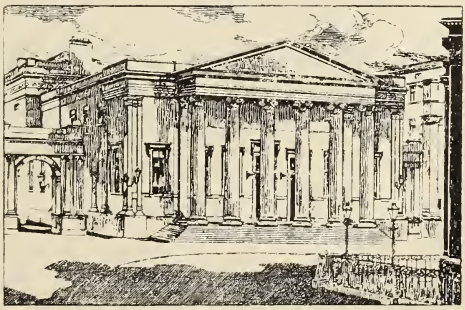

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HAYMARKET	SOUTH BRIDGE	GORGIE MARKETS
LEITH WALK	SOUTH NEWINGTON	(*Sub Branch*)

Every form of Banking Business transacted, including Colonial and Foreign Business

The National Bank of Scotland

LIMITED

Incorporated by Royal Charter and Act of Parliament ESTABLISHED 1825

CAPITAL SUBSCRIBED	£5,000,000
PAID UP	£1,100,000
UNCALLED	£3,900,000
RESERVE FUND	£1,000,000

HEAD OFFICE—EDINBURGH

WILLIAM CARNEGIE, *General Manager*. GEORGE A. HUNTER, *Secretary*

LONDON OFFICE—37 NICHOLAS LANE, LOMBARD ST., E.C. 4

THOMAS C. RIDDELL, *Manager*. DUGALD SMITH, *Assistant Manager*

GLASGOW OFFICE—47 ST VINCENT STREET

JOHN H. ALEXANDER, *Manager*. JAMES REID, *Cashier*

JOHN RIDDELL, *Foreign Exchange Manager*

LEITH—25 BERNARD STREET

H. D. LATTA, *Agent*—With 1 District Branch

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All Officers of the Bank are bound to secrecy as regards transactions of customers.

The Clydesdale Bank Ltd.

ESTABLISHED 1838 — *Incorporated under the Companies Acts, 1862 to 1880*

SUBSCRIBED CAPITAL - - - - - - - - £5,000,000
PAID-UP CAPITAL - - - - - - - - - - £1,000,000
RESERVED SURPLUS FUND - - - - - - £1,200,000
DEPOSITS at 31st December 1920 - - - £38,341,332

Head Office—GLASGOW · 161 BRANCHES

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LONDON OFFICE—WILLIAM LOCHHEAD, *Manager;* GEORGE REOCH WILSON, *Assistant Manager.*

EDINBURGH (Chief Office) — JAMES ARCHIBALD FERGUSON, *Manager;* ROBERT J. L. HENDRY, *Assistant Manager.*

LEITH—HENRY JOHN DONALDSON, *Agent.*

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Affiliated with the London Joint City and Midland Bank Limited, with 1484 Offices.

The Union Bank of Scotland

ESTABLISHED 1830 — **LIMITED**

SUBSCRIBED CAPITAL . . . £5,000,000
PAID-UP CAPITAL £1,000,000
RESERVE FUND £1,000,000
DEPOSITS (April 1921) . . . £32,702,296

Head Offices—

GLASGOW—191 Ingram St. *Manager*—GEORGE H. MORITZ

EDINBURGH—64 George St. *Manager*—JOHN A. INGRAM

(Edinburgh Office is the successor of the old houses of Messrs John Coutts & Company, and Sir William Forbes, James Hunter, & Co., Bankers there.)

The Union Bank has 161 Branches throughout Scotland

London Office - 62 Cornhill, E.C. 3 *Manager*—JOHN ALEXANDER

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Letters of Credit on all places abroad, and Cable remittances arranged.

Duties of Trustee and Executor undertaken.

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At London Office Current Accounts and other business conducted on the usual terms of London Banks. Deposits received at interest. NORMAN L. HIRD, *General Manager.*

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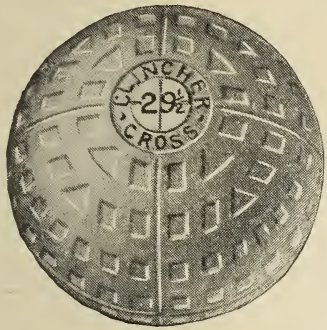
The New "CLINCHER CROSS" Golf Balls



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The New "29½" "Clincher Cross" is of maximum weight, but approximately the same size as the favourite "31," and is made in the well-known markings—Mesh, Dimple, and Bramble.

"1·62"

The "1.62" is made only in Dimple marking, and meets the demand for a ball of minimum size and maximum weight.

In addition to the special care that the new phase of Golf Ball manufacture demands, we are retaining the stringent **X-RAY EXAMINATION** of every "Clincher Cross" that leaves the Factory.

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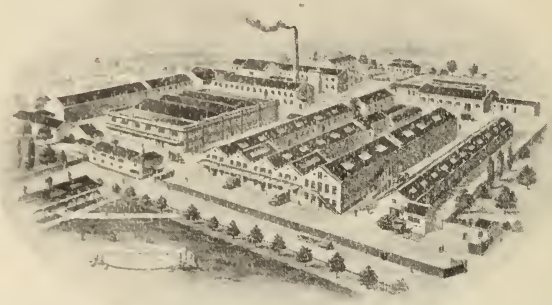

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We specialise in the following classes of boxes:—

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"SANDY MAC" . In Black Quart
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Pure Pot Still Malt Distilleries
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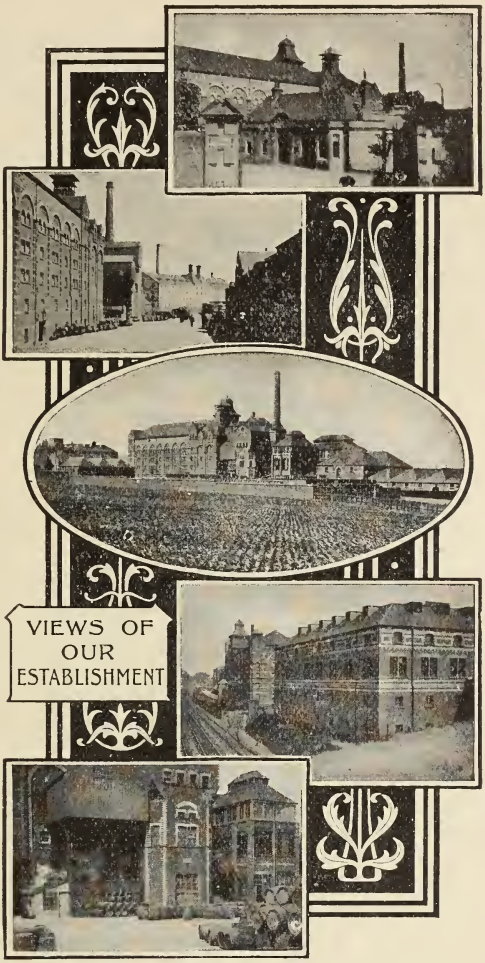

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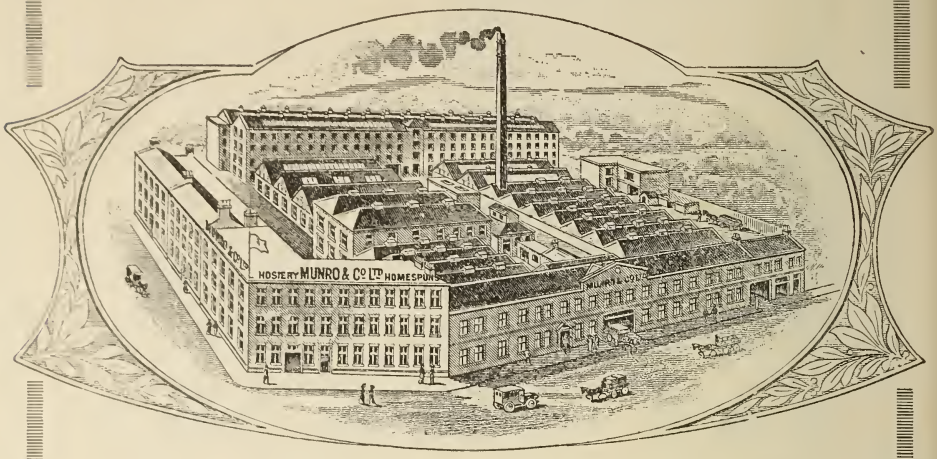

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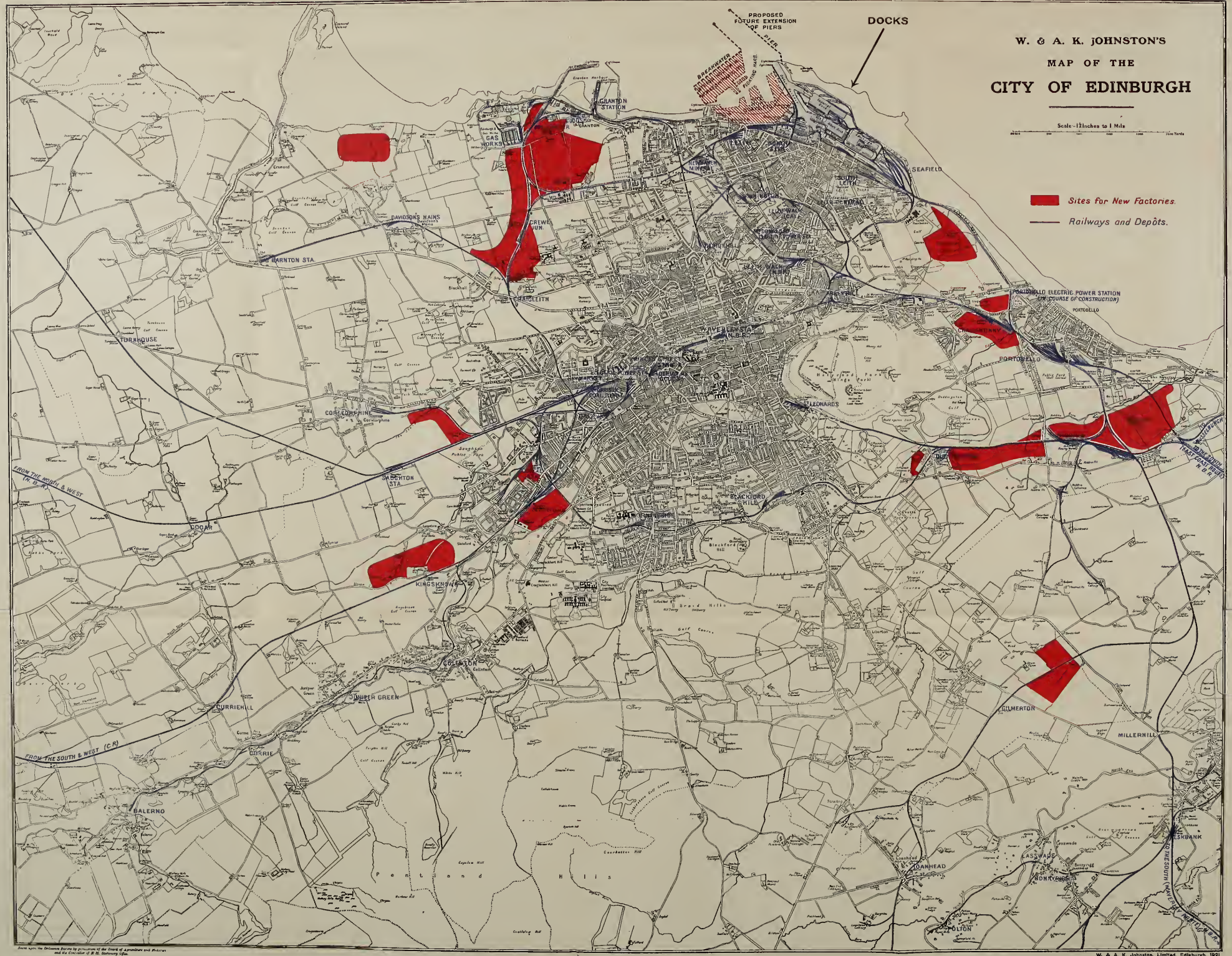

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