

**THE INDUSTRIES OF
GREATER LONDON**

THE INDUSTRIES OF GREATER LONDON

BEING A SURVEY OF
THE RECENT INDUSTRIALISATION
OF THE NORTHERN AND WESTERN
SECTORS OF GREATER LONDON

BY

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WITH A FOREWORD BY

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FOREWORD

THE Survey of Industrial Development to the north-west of London which Dr. D. H. Smith has made, is one of great value in itself, and of even greater value as indicating the kind of information which ought to be available for the whole of the London region, and for many other districts where industrial expansion is taking place, or where efforts to promote it are badly needed. Those engaged upon town and regional planning find the greatest difficulty in obtaining the kind of information upon which their proposals should be based. Many statistics are collected for such purposes as factory inspection, unemployment insurance, population, and so forth; but the planner finds usually that some important element is missing to give a complete picture of what has taken place. He may know the number of new factories opened; but how far they are fresh ventures, or how far they have migrated, or, if the latter, whence they have come, is not recorded. Yet the most vital matter for the planner may well be to know whether he is faced with an industrial drift to London from the north of England or abroad, or whether it is a decentralising movement from the heart of London towards the outskirts. He may seek to check results with figures for unemployment insurance or population; but even so, may be puzzled to know how far London is attracting industries in a positive way, or how far depression in other districts impels them to move in spite of difficulties.

For these reasons such a careful investigation as that here published is very welcome; the results are enlightening and helpful to the planner, and one must hope that other districts will be dealt with. Moreover, such studies should help to show how the collection of information and the compiling of statistics for different purposes, and by different authorities, might be the better co-ordinated, not only to

serve each its individual purpose, but each to contribute a helpful quota to a more complete and valuable survey of conditions.

I strongly commend this survey of recent industrialisation to all who are interested in industrial, social or planning progress.

RAYMOND UNWIN.

March 31st, 1933.

PREFACE

IN 1924 I visited certain parts of Greater London and came to the conclusion that the growing industrialisation, which was then apparent, would probably be accentuated in the next decade. The subsequent development of new industries in the northern and western sectors of Greater London has justified this assumption.

At the time I found little statistical material available indicating the nature and direction of this growth. I therefore determined to undertake an industrial survey of the area and collected evidence directly from industrialists and the local authorities. This volume gives the results of my investigations.

If this book stimulates further enquiry into new developments of industry in other parts of the metropolis, it will have been worth the effort expended. While many attempts have been, and are still being, made to trace the growth of industries and population in the metropolitan area, much field work remains to be done. If we are to be proud of the greatest metropolis in the world, we should at least endeavour to remove some of the social tumours caused by the sporadic growth of residential areas in juxtaposition to factories, with no regard to the health, safety, and æsthetic welfare of the people. The stimulus of economic gain, with entire freedom from control, has not always proved to be productive of good planning in the past. This enquiry does, however, show that the pressure of economic forces is leading to a decentralisation of industries from overcrowded areas in London—a movement which is all to the good, provided we do not perpetuate on the fringe of Greater London the evils which have been allowed full play in certain parts of London itself.

I am indebted to Professor J. F. Unstead for his advice and stimulating influence during the four years in which I had the pleasure of working under his guidance at Birkbeck College.

To my friends and colleagues, Thomas Beach and Edwin C. White, I am grateful for constructive criticism and advice, given freely during my whole period of research ; and to the local authorities for giving me all the information they had at their disposal.

To my wife, I am indebted for the typing and re-typing of the MS. and for the support and encouragement without which this book would not have been written.

D. H. SMITH.

LONDON,
April, 1933.

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SECTION ONE
SCOPE OF THE WORK

THE RECENT INDUSTRIALISATION OF THE NORTHERN AND WESTERN SECTORS OF GREATER LONDON

SECTION ONE

SCOPE OF THE WORK

THE object of this work is to analyse the recent industrial development of that part of metropolitan England adjacent to London, which is bounded on the east by the Lea Valley extending from London to Ware, and on the west by the Thames Valley extending from London to Windsor. The area subjected to study covers a stretch of country which is approximately the north-west quadrant of Greater London. It includes the whole of Middlesex; but inasmuch as economic development is not necessarily related to administrative boundaries, the area is not conterminous with Middlesex. In tracing the growth of factories it has been found necessary to extend the analysis along lines which reach beyond the boundary of Middlesex. The industrial development of the Lea Valley, for example, does not cease at Enfield, but continues northwards towards Ware and Hertford.

Similarly, development of industry north-westwards along the Hendon-Edgware line does not cease at Hendon, but is being extended to Watford and beyond. Again, the western development of industry is almost continuous from London to Slough.

Thus, although most of the industries analysed in this work are situated in the county of Middlesex, it would be incorrect to describe the subject-matter as an examination of the industries of this county only; but rather as a study

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of industrial growth along radial lines which start from London and extend north, north-west and west.*

The purpose of this work is to trace the growth of industrial development which has been a continuous process during the last thirty years in this sector of Greater London. The decentralisation of the industries of London, the growth of new industries, the occupation of agricultural land round London with factory buildings, are changes which are apparent to the casual observer. For some years past the Government and various municipal bodies have realised the urgency of analysing this growth "with a view to securing the better distribution of population and industry throughout the region." † A Committee, consisting of representatives of the Government and other interested authorities, has been formed to deal with the problem of regional planning and traffic control in Greater London. Regional planning, town planning and traffic control are all constructive schemes to control the somewhat sporadic growth in industry and population, and to divert the future growth towards channels which will be productive of the greatest social and economic welfare of the inhabitants of Greater London. ‡

* The number of factories studied in (a) Middlesex; (b) outside Middlesex, e.g., Bucks, Herts, is as follows:—

Bucks (Slough)	.	.	.	.	.	.	95
Herts	.	.	.	.	.	.	77
Middlesex	.	.	.	.	.	.	455
							<hr/>
Total	.	.	.	.	.	.	627
							<hr/>

† Page 3 of the Interim Report on "Decentralisation," by Sir Raymond Unwin, F.R.I.B.A., for the Greater London Regional Planning Committee, January, 1931.

‡ The utilitarian aspect of this work is reflected in the number of articles which have appeared from day to day in *The Times* during the past four or five years, dealing with the establishment of factories in the south-east of England. That the subject is of social and economic importance to the nation as a whole is patent from the nature of the problems. Such problems are: the depopulation of the traditional industrial centres; the waste of social and industrial capital consequent upon the decline of the older factory areas; the setting up of new centres of population with the increased cost of social services; the housing of population; the effect of the new factory areas on the countryside; the utilisation of derelict areas and factories. These are a few of the questions which are daily being asked in the papers.

is more intimately related to the practical activities of regional planning organisations.

INDUSTRIES EXAMINED

In the treatment of this subject, only those industries have been examined which are working for a market other than a local one. There are certain industries, or rather industrial establishments, which are necessarily a concomitant of the development of new areas and increasing population. Such establishments are gas and electric light works, tramway depots, garages, small repair shops, motor 'bus depots, builders' yards, laundries, bakeries, printers, joinery works and similar undertakings, in which workers are engaged in the making of products, or the rendering of services, which satisfy local needs. These auxiliary industries have been disregarded, as the reason for their growth is obvious.

Attention has been focussed mainly on industries which are engaged in the manufacture of products for a national or international market; industries, that is, which might have grown up in other industrial parts of Great Britain. Where figures have been quoted for the number of workers engaged in any district, such figures would differ widely from official or trade statistics giving the total number of workers engaged in that area, as the latter figures would probably include all insured persons irrespective of the

There is no standard definition of Greater London; the expression is applied to the following areas:—

(a) An outer ring of country extending rather vaguely round the L.C.C. area. If industries and population continue to expand at the same rate as they have done in the last decade, the expression "Greater London" will, in the course of time, refer to a larger and larger area of metropolitan England.

(b) The metropolitan police area. In the west this area approximately coincides with the Middlesex boundary, but includes such districts as Barnet and Cheshunt, which are in Hertfordshire.

(c) The area adopted by the London and Home Counties Traffic Advisory Committee. In this connection "Greater London" extends to a distance which is approximately twenty-five miles from Charing Cross in all directions.

(d) The economic region jointly defined by the Ministry of Labour and the Economic Advisory Committee. It includes a number of areas served by Employment Exchanges and differs very little from the metropolitan police area.

nature of the product manufactured or of the markets for which the goods are intended.*

METHOD OF COLLECTION OF DATA

In this work, information was obtained chiefly by the following means :—

(a) Lists of industries were obtained from rural and urban district councils, together with the names of the most important manufacturing firms in their districts. These lists formed a comprehensive basis upon which to undertake the research.

(b) A questionnaire was sent to each manufacturing firm in the district asking for information relative to the type of product manufactured, the date of establishment of the factory, the causes for the location of the industry, the area from which the firm has migrated (if any), the nature of the raw material and its sources of origin, numbers engaged, etc. Approximately one-third of the firms circularised submitted replies.

(c) In all cases where no reply was received from the firm, a personal visit was made to the factory with a view to collecting information from a responsible official of the firm, relative to its origin and organisation. By far the greater part of the information was thus obtained from direct sources as a result of the many personal visits made to firms.

(d) Local knowledge was sought wherever possible by means of interviews with local government officials or responsible persons resident in the district.

Much of the information could be obtained only by personal interviews, and it has not been possible to verify all such information by reference to publications or printed statistics. In arriving at certain conclusions, weight had to be given to a consensus of opinion among the heads of business units, rather than to the opinions of any one individual.

* The number of insured persons working in, and resident in, the districts of Tottenham, Enfield and Edmonton in July, 1930, was 72,000. The estimated number of workers engaged in these districts in industries of a non-local character was approximately 35,000 at that date.

In seeking information as to the causes of the location of particular industries, some difficulty was experienced in the case of the old-established business, for the reason that the original opinions of the founder of the firm were not recorded. Where industries are fifty years old, the fact that the founder resided in the district is often stated to have been the determining reason for the location of the factory.

In endeavouring to estimate the number of workers employed in any particular factory, it was found impossible to obtain any static figures, for the reason that industries fluctuate very considerably in their output from time to time. In many of the industries, seasonal fluctuations affect the number of workers employed; in others, the industries may be passing through a period of depression. In several districts, *e.g.*, Park Royal and Brentford, many of the factories are only just beginning to operate, and the numbers engaged are but a small percentage of those which will be required when the industries are fully developed. Again, the prevailing trade depression (1931-32) is adversely affecting most of the industrial establishments in Greater London, with the result that factories are working considerably below their normal capacity.

In estimating the numbers employed, averages were taken wherever possible. Thus, in one firm, the number of workers varied from 1,500 to 2,500, and consequently it was assumed that in this case it would be judicious to adopt the figure of 2,000 as representing the *personnel* of the firm.

ANALYSIS OF THE AREA

The area was first subjected to a geographical examination, with a view to establishing the relationship, if any, between natural geographical influences and the economic development of the area.*

* It will be noted in the course of this work, that although soil and relief have in some cases influenced to a minor extent, and rather indirectly, the existence of some industries such as brick-making, the nursery industry, etc., it is probably true to say that the influence of geographical environment over industrial growth is not commensurate with, or materially responsible for, the growth of factories during the past quarter of a century.

After a preliminary investigation of the distribution of factories, it was found that the area could be divided for analysis into a number of units representing industrial and residential localities respectively. In some districts the line of demarcation between an industrial and residential type was less definite, *e.g.*, in Wood Green and Chiswick, although these districts are chiefly residential, there is evidence of a quasi-industrialisation. Both these types of settlement (industrial and residential) appear to have a radial direction of development from London outwards, definite lines of industrial expansion alternating with areas of residential growth. The construction of arterial roads and the consequent increase of factories along these roads are influences which will tend to emphasise this direction of growth.

Factories have been established along the main lines of communication which radiate from London outwards in a rather star-shaped arrangement.* This is typical of economic development in suburban areas, *viz.* a number of lines of industries concentrating on one point. As we go further from the focus of this industrial growth we find that the land, in between the lines of factories, is still undeveloped or is occupied by embryonic residential centres. But in the part of Greater London now being studied, the process of the filling up of these empty spaces between the major

* "The study of the Region (Greater London) confirms the view that, in spite of the sporadic character of the development, three definite tendencies may be recognised:—

"(a) There is the tendency for new development to take place around the fringe of existing development.

"(b) There is a marked tendency for development to follow main radial roads outwards.

"(c) There is also a noticeable tendency for new units of development to spring up detached from the main mass of the town. This is so common as to form one of the characteristic ways by which a town expands. The units sometime develop round an old village or small town; but frequently they are stimulated by a railway station and develop in a new place, with a definite business centre of their own. . . .

"In so far as method (a) of accretion operates, the town grows as a continuous mass. In so far as method (b) prevails, it tends to form a star shape. To the extent that method (c) holds good, it takes the form of a central mass with satellite units springing up at a distance, and by their mutual growth the mass and the satellites ultimately coalesce."—Extract from Report by Sir Raymond Unwin, F.R.I.B.A., on "Decentralisation," submitted to the Greater London Regional Planning Committee.

lines of development is rapidly proceeding. If imaginary lines be drawn from London to Edgware, and from London to Hayes, it would appear that industries are growing so rapidly that the whole sector of this part of Greater London is tending to become one of the largest industrial areas of England and Wales.

On the appended map the distribution of factories throughout the area is indicated by means of squares. By arranging these in groups we obtain a classification of the major industrial and residential zones as follows :—

(a) *The Lea Valley Industrial Area.*—This comprises the districts of Tottenham, Edmonton and Enfield, with an incipient industrial growth towards Waltham Cross and Ware. It includes the industrial section of Walthamstow immediately adjacent to the River Lea. The spread of factories from East London northwards along this section of the Lea Valley suggests that this area is one of the major industrial zones of Greater London.

(b) *The North Middlesex Residential Area.*—Westward of the Lea Valley, Greater London appears to have become a residential rather than an industrial locality. This area includes the essentially residential districts of Southgate, South Mimms, Friern Barnet, Finchley, Hornsey, and the partly industrialised district of Wood Green. With this area might be coupled the expanse of country in Hertfordshire which stretches westward from the Lea Valley to Watford. The bulk of this part of Hertfordshire is still rural or residential, rather than industrial.

(c) *The Industrialised Area of West Middlesex.*—The area includes the highly industrialised zone immediately adjacent to West London, comprising such districts as Willesden, Park Royal, Greenford, Perivale, Hendon, Southall and Hayes. This is a very much younger area, judged from the point of view of factory development, than the Lea Valley. The bulk of the factories are of post-war origin.

(d) *The Residential Area of West Middlesex.*—The outer section of West Middlesex is chiefly rural or residential, and comprises the districts of Harrow, Wealdstone, Ruislip, Harefield, Uxbridge, etc. Apart from a small nursery

SECTION TWO

GEOGRAPHICAL SURVEY OF THE AREA

GEOGRAPHICAL BOUNDARIES

THE area of country considered in this work lies within that part of metropolitan England covered by the appended map. In attempting to find the natural limits of the area analysed, two problems presented themselves :—

(a) The difficulty of finding any natural geographical boundaries which bound this area of industrial growth ;

(b) The expediency, for practical purposes, of limiting the subject of study.

(a) It is impossible to fix any natural geographical boundary to the area of development, as a study of the location of factories must necessarily involve a consideration of economic factors which often cut across any lines of natural geographical growth. The incidence of rents and rates, town-planning schemes, the construction of arterial roads, and the proximity of particular parts of London, are some of the economic factors which make it difficult to establish precise geographical boundaries to industrial areas of this kind.*

(b) Inasmuch as some practical limit had to be set to this area, it was considered convenient to accept the Lea Valley as the eastern extremity of the region. The Lea Valley forms both a geographic and an administrative boundary.

* On the indefiniteness of the divisions of the London Basin, Dr. Hilda Ormsby has written : “. . . and lying right across these natural divisions, the vast agglomeration of humanity known as Greater London forms a geographical fact that so masks and modifies natural divisions . . . that we find ourselves forced to make physical divisions subsidiary to others which define units of a more complex origin.”—*Essay on the London Basin*, by Dr. Hilda Ormsby, p. 50. *Great Britain* : “ *Essays in Regional Geography*.”

The Lea Valley depression has influenced industry in three directions :—

1. It has facilitated the development of transport systems by road, rail and canal to and from London.
2. The flat, rather swampy land adjacent to the river has drawn to it manufacturing industries on account of the unsuitability of the land for residential purposes.
3. Owing to the swampy nature of the left bank, east-west roads are few, with the result that factories have tended to grow up on the right bank.

The fact that the River Lea forms the administrative boundary dividing Middlesex from Essex, further supports the choice of this boundary.

To the south, the Thames Valley from Windsor to London forms a convenient geographical and administrative boundary to the region.

To the north-west the boundary is less definite. Inasmuch as industry tends to follow radial lines of development outwards from London, it is probable that industrial growth may extend north-westwards in the following directions * :—

- (a) St Albans—Luton.
- (b) Edgware—Watford—King's Langley.
- (c) Uxbridge—High Wycombe.

At the present time factories have not yet appeared in sufficient number beyond St. Albans, Watford and Uxbridge to justify a consideration of the extension of industrial Greater London beyond these points.

The north-western boundary of the region broadly follows a series of river depressions at the foot of the tertiary escarpment in Hertfordshire. In the north, the valley of the Lea from Hatfield to Ware suggests a natural boundary to the region. The glacial drift extending along the Vale of St. Albans in a direction south-westwards, divides the chalky

* The following numbers of insured persons indicate the growing industrialism of these districts :—

District.	1927	1929	1931
Luton . . .	27,940	30,230	32,481
High Wycombe . . .	11,390	12,430	13,510
Watford . . .	17,240	18,560	21,210

uplands to the north and north-west, from the London clay to the south. This stretch of glacial drift, varying in width from two to four miles, covers the floor of the vale with boulder clay. It is not true clay, but a stony loam, and appears to have created a geographical boundary which limits the north and north-western portion of the region under analysis.*

To the north-west, the River Colne, rising near Hatfield, and flowing near to St Albans through Watford and Rickmansworth to Uxbridge, finally discharging into the Thames at Staines, follows a depression of a rather swampy nature, and is the western boundary of Middlesex; it thus appears to be a convenient line for the limitation of the area in the west.

The valley of the Colne runs through a strip of alluvium three-quarters of a mile wide, and separates the London clay area of North Middlesex from the plateau gravel of Hertfordshire and Buckinghamshire. Plateau gravels form suitable sites for residential growth, while clay soils are unhealthy but can be used for factory buildings. It is probable, therefore, that the Colne Valley may, in the course of time, become a suitable area for the lay-out of factory sites, in which case an industrial development, similar to that of the Lea Valley, may occur.† It seems practicable, therefore, to accept the Colne Valley as the western boundary of the region treated in this work, subject to the investigation being extended to the isolated industrial area of Slough.

* On pp. 248 *et seq.*, *R. G. S. Journal*, Vol. LXXVIII., No. 3, September, 1931, S. W. Wooldridge and D. J. Smetham wrote on the Glacial Drifts of Essex and Hertfordshire: "... the ice sheet, splitting on the north-western angle of the south Hertfordshire plateau, sends one branch along the Vale of St. Albans, and one down the Lea Valley. The true chalky boulder clay of the Vale of St. Albans is to-day largely under cultivation, while those portions contaminated with eocene material (chiefly London clay), have reverted to pasture. Thus it is that the southern margin of the boulder clay tracts gives a colder and wetter soil less suitable for cultivation than the true chalky boulder clay, though superior to the London clay. In other words, there is a natural transitional zone which blurs but does not destroy the sharpness of the geographical contrast."

† The West Middlesex Town Planning Committee has definitely allocated a portion of the Colne Valley north of Uxbridge for factory development.

TOPOGRAPHY OF THE REGION

A stretch of hilly country extends from Harefield north-eastwards through Northwood, Bushey and Barnet to Bayford. It varies in width from three to four miles in Harefield to seven miles in between Barnet and London Colney. It consists of a series of undulating hills which reach altitudes of nearly 500 feet in places, giving the northern sector of Greater London a diversified topography and offering a setting of scenic merit which may have been a factor in the continued existence of the large private estates between St. Albans, Hatfield, Barnet and Hertford. These large private estates have tended to retard industrial development.

Rising from this stretch of undulating country is a ridge of high ground extending from Bushey, through Elstree to Barnet, and then northwards to Potters Bar. From Barnet, a spur of high ground runs southwards through Whetstone, Finchley and Hampstead. There are, therefore, two outstanding topographical features in this area: (a) the backbone of hills running from Potters Bar to London; (b) the high ridge extending from Bushey to Potters Bar and sloping towards the Lea-Colne depression. The latter ridge is referred to as the "tertiary escarpment."

The whole region is drained by the Thames and its tributaries, and slopes gradually in a south-easterly direction towards London. The Hampstead-Potters Bar ridge forms a water divide to the east and north; the area is drained into the Lea by a number of small tributaries which are merely streams, the chief of which are Cuffley Brook, Pymme's Brook and Spital Brook. Westwards of the Hampstead-Potters Bar ridge, and southwards of the uplift stretching from Harefield to Bayford, the area is drained by the Colne, the Yeading and the Brent. The Dollis Brook, rising near Barnet, drains the Finchley area; the Silk stream drains the country round Edgware.

The southern portion of West Middlesex is low lying. The 100-foot contour line approximates to the course of the Grand Union Canal. South of this the ground is under

100 feet above sea level. Drainage in many places is indefinite and the land is marshy, and subject to flood in winter. The even topography of much of West Middlesex has probably influenced the construction of railways. The variety of lines and services west of Edgware Road are in contrast to the lack of railway facilities in the northern sector.*

The low-lying nature of a large part of West Middlesex in such districts as Yiewsley, West Drayton, Colnbrook, Cranford, etc., suggests the need for the adoption of schemes for improved drainage, road construction and town planning, (See the Report of the West Middlesex Town Planning Committee.)

THE GEOLOGY OF THE REGION

The whole sector lying within the points of Ware, Watford, Slough and London is part of the Thames basin, and its structure is therefore conditioned by the forces which have contributed to the geomorphology of the London basin.

The region can be considered as the northern half of the great syncline in which the London basin is formed. The dip of the underlying strata is towards the south-east. The sub-soil of the greater part of the region is the London clay beneath which lie the Woolwich and Reading Beds. Chalk outcrops only in the northern section. In the upper Colne Valley, which lies at an altitude varying from 250 feet to 400 feet, it outcrops on either side of the river basin. At Harefield the chalk is masked by hill gravels and loams. The chalk outcrop continues as far as North Mimms and is again observed in the Lea Valley between Hertford and Ware.

The London clay is covered in many places by sands, gravels, alluvium of pleistocene age, and by boulder clay and morainic deposits left by the ice sheet. These drift deposits are specially prevalent in Hertfordshire south of the upper section of the Lea basin. Terrace gravels cover the

* See p. 42, " Issue of Workmen's Tickets on Underground Railways."

London clay along the right bank of the Lea, and again in the southern portion of West Middlesex, *i.e.*, in that part of the Thames basin lying between Staines and Chiswick.

These gravels and sands have given some diversity to the soil, and have been an important element in the location of residential districts.

An analysis of the area reveals the following major geological regions :—

(a) *The Lea Basin.*—A stretch of alluvium and river gravels characterises the Lea basin from Ware southwards. The Lea follows a monoclinical fold* with a downthrow to the east. Its right bank is covered with gravel deposits overlying the London clay. These deposits consist of Taplow gravel and brick-earth, a factor of some importance in causing a concentration of population along this bank, and giving rise to valuable brickmaking and nursery industries. The strip of brick-earth starts in Hailey and continues south to Tottenham. It varies in thickness from 16 feet at Hailey to a few feet in Tottenham. The greater portion of the brick-earth has been removed for brickmaking, and most of the brickfields north of Cheshunt have closed down.

The River Lea has cut into its left bank, which consists of clay and alluvium. It is low-lying and marshy, with the result that population and industries are scanty. The nursery industry is the exception.

(b) *The Thames Flood Plain.*—From Chiswick to Chertsey river gravels cover the banks of the Thames. These gravels form terraces, the lower one varying from 10 feet to 50 feet above the river alluvium. The Taplow gravels form an escarpment to the flood plain; they vary from 50 feet to 120 feet in altitude. From Chertsey to Staines the Thames flood plain is covered with alluvium consisting of a variety of substances from fine silt to coarse sand or gravels, with stretches of clay and peat. The area is swampy and subject to flood in winter. It is therefore of little use for agriculture or for residential purposes in view of the unhealthy soil. Where river gravels cover the clay along the Thames

* "Minor Structures of the London Basin," by S. W. Wooldridge. *Proc. Geological Society*, Vol. XXXIV., p. 182.

flood plain, residential suburbs have grown up, e.g., Twickenham, Teddington, Walton and Egham.

(c) *The Colne Flood Plain*.—Near Watford the Colne flows through a flood plain three-quarters of a mile wide and increases to two miles at its confluence with the Thames at Staines. The physical conditions of this river basin are somewhat dissimilar from those of the Lea basin, in that the river is bordered by steep escarpments north of Uxbridge with the chalk outcropping in its upper course. The river flows through its winding course, flooding its banks in winter. The swampy river bed of the Colne and its tributaries has favoured the growth of watercress beds along the irrigated flood plain of the river. Above the escarpments on either side the gravels have given rise to residential settlements.

(d) *The Belt of Gravels and Brick-earth*.—A somewhat irregular line running from Uxbridge through Hillingdon, Hayes, Southall, Ealing, Acton, Chiswick, and continuing to the Lea Valley, divides the southern region of predominantly gravel sub-soil from the stretch of London clay which covers the northern part of Middlesex. Uxbridge, Hillingdon and Ealing occupy gravel sites bordering the clay plain. From earliest times the gravel sub-soil has favoured the growth of villages in these places rather than in the London clay region farther north.

A stretch of brick-earth extends from West London to Slough, widening out in West Middlesex, between Hounslow and Yeading, to a width of four and a half miles, with a break at the River Colne. This covering of brick-earth has provided the locality with a fertile soil, the easily-worked, friable loams giving rise to a large fruit and nursery industry. The intensive vegetable culture which still exists in Uxbridge and the surrounding districts is attributable to this belt of fertile soil.

(e) *The London Clay Plain*.—North of the line referred to in (d) there is a wide stretch of country extending northwards to the Colne-Lea depression. The area is covered with London clay, varying in depth from 300 feet at Hangerhill to a few feet near the Colne. It is a bluish clay with a yellowish tinge near the surface, resulting from hydration,

and it gives rise to gently undulating country with sluggish streams liable to flood. Owing to the swampy, unhealthy nature of this clay soil, economic development has been slower in the direction of residential settlements than in the gravel areas. The recent expansion of London during the past ten years has given rise to extensive building operations on the London clay, *e.g.*, Wembley, Hendon and Acton.

(f) *Island Sites of Gravel-capped Hills.*—Lying on top of the London clay there are a number of hilly regions capped with sandy soils, gravels, boulder clay and drift material. Towards the surface, the stiff London clay in some districts merges into seams of clay and sand; they are known as Claygate beds and vary from 50 feet in thickness at Harrow to 100 feet at Hampstead. These beds in turn merge into the Bagshot beds on which Hampstead is built up. Claygate beds have been of some importance in the past for brick-making.* Bagshot sands originally covered the whole of the London clay, but now only isolated patches remain, *e.g.*, at Harrow-on-the-Hill, Hampstead and High Barnet. The sands and gravels which have been laid down on top of the clay give rise to many of the hills throughout the region, *e.g.*, Stanmore, Elstree, Bushey Heath, Chipping Barnet, Winchmore Hill and Highgate. Harefield and Hillingdon have grown up on island sites of plateau gravel. Boulder clay, the legacy of the ice sheet, together with glacial gravel, remains on top of several of the higher regions, *e.g.*, Finchley, Whetstone and Hornsey. The gravels have influenced the residential growth of these areas. In that part of Middlesex immediately west of Edgware Road there is an absence of villages where clay sub-soil exists; on the other hand, where gravel formations are found, *e.g.*, at Pinner, Ruislip and Northwood (Reading beds), the districts have become residential areas.

(g) *South-east Hertford.*—Lying between the upper course of the Lea and its middle course from Ware southwards there is a stretch of country which slopes in undulating hills

* "The pits are mostly abandoned, but may be seen at Harrow Weald Common, Brockley Hill, Elstree, Woodcock Hill, Arkley"—"Geology of North London," p. 26.

from the tertiary escarpment south-eastwards. On the edge of this escarpment, *i.e.*, along the Colne-Lea depression, the chalk is just beneath the surface, and outcrops in many places. The chalk dips south-east and is capped by a variety of gravels, and in places by boulder clay. The tertiary escarpment, consisting of Reading beds and London clay, extends north-east from Radlett (450 feet) to Great Amwell, and is the chief topographical feature of this district. It is drained into the Lea and the Colne. In Hatfield there is an area of two square miles where the water is drained into holes in the chalk.

The Reading beds, which stretch from Radlett to Bayford, consist of mottled clay, sand, pebbles, etc., with traces of ironstone. From Bayford to Little Amwell boulder clay predominates. A large part of this area is capped with pebbles of pleistocene age, giving rise to undulating hills which add a charm to this part of Hertfordshire.

INFLUENCE OF GEOLOGY ON THE ECONOMIC DEVELOPMENT OF THE AREA

Apart from the strips of brick-earth referred to on pp. 20 and 21 the geology of the region has had little direct influence on its recent industrialisation. There is an entire absence of mineral wealth throughout the region. The lack of industrial growth prior to 1900 may, in a measure, be accounted for by the absence of the raw materials of industry. Brick-making is an old industry, and has been carried on wherever suitable sub-soil existed. Such points have been Ayot Station, Tabbly Park, Welwyn, Datchworth Green, Ware, Hertingfordbury, Hailey, Cheshunt, Enfield and Tottenham, but most of this brick-earth has already been removed. Brick-earth is found in the Lea Valley as well as in the Thames Valley, in three terraces :—

- (a) Boyn Hill.—Upper terrace.
- (b) Taplow.—Middle terrace.
- (c) Flood Plain.—Lower terrace.

Consequent upon the growth of London, with the demand

for bricks, the bulk of the brick-earth has been extracted from (b) and (c) in the course of the long history of the Metropolis. Practically the only extensive brickmaking fields now lie along the Lea Valley from Tottenham to Enfield. The depth of brick-earth at Enfield, east of Forty Hill, is 12 feet, at Edmonton 7 feet, and at Tottenham 6 feet.

SOILS AND AGRICULTURE

Whilst the recent industrialisation of the area cannot be attributed to the direct influence of geological conditions, it has to be remembered that agriculture, although rapidly declining throughout Greater London as a result of the encroachment of urban and factory development, cannot be disregarded entirely in a survey of existing industries. Inasmuch as agriculture is intimately connected with geology and soils, a reference, at this point, to the agriculture of the area is germane to the subject for the following reasons :—

- (a) The importance of agriculture in the area up till 1900.
- (b) The rapid displacement of agricultural land since 1900.
- (c) The existence of such industries as market gardening and fruit growing in Middlesex.
- (d) The importance of agriculture in Hertfordshire.

From early times this sector of Greater London has been noted for agriculture and market gardening, and in the Middle Ages, West Middlesex was the chief market-gardening area for London. The importance of this industry has survived to modern times, its chief centres now being the Lea Valley and the country round Uxbridge.

Wherever brick-earth predominates, the land is generally fertile ; where clay predominates, it is mostly grassland and woodland. Bands of glacial deposits at the foot of the tertiary escarpment render the land suitable for arable cultivation.

In Hertfordshire, where chalk soil is found, the land is partly arable and partly pasture. The process of urbanisation, which has been going on since the eighteenth century, has been accentuated during the past twenty-five years, and as a consequence land has gone over from arable to permanent

GEOGRAPHICAL SURVEY OF THE AREA 25

pasture, and, finally, has been withdrawn for residential purposes or factory sites.

The following figures, extracted from the annual statistics of the Board of Agriculture, indicate the extent to which land has been transferred from rural to urban uses since 1900 :—

	1900.	1914.	1928 (including London).
MIDDLESEX			
Total acreage under grass and crops	100,237	87,027	61,348
Permanent pasture	73,215	63,443	40,674
Small fruit	4,231	3,307	4,698
Sheep	16,175	12,570	9,888
HERTFORDSHIRE			
Total acreage under grass and crops	332,187	324,736	307,320
Permanent pasture	120,786	124,628	131,109
Cattle	35,732	42,122	45,461
Sheep	112,413	67,850	68,765

These figures indicate the economic transition that is taking place in the two counties. In Middlesex, permanent pasture has declined by 50 per cent. since 1900, arable land by 40 per cent., showing that it has been rapidly urbanised for building purposes.

In Hertfordshire, the process has hardly yet developed; the land has gone over from arable cultivation to permanent pasture concurrently with an increase in cattle. The increased demand for milk in the Metropolis has justified this transition. It remains to be seen to what extent industrialism will encroach on agriculture in the next decade in Hertfordshire.

It is possible that the area will continue to offer two contributions in agriculture. Firstly, the demand for milk in London may lead to a more scientific concentration of dairy farming at centres which are within easy reach of the Metropolis. In Hertfordshire, the pasture land may be utilised for the breeding of milch cows. Secondly, there

may be an increase in the nursery industry, in vegetable culture and in poultry farming. At the present time large tracts are devoted to market gardening and orchards, the two most important being the strip of brick-earth which traverses Chiswick, Brentford and Uxbridge, and the Lea Valley. The suitability of the soil for intensive cultivation, and the ease with which the products can be marketed, will favour the growth of the nursery industry.*

THE INFLUENCES OF PHYSIOGRAPHY ON RECENT INDUSTRIALISATION

Physiographical influences on the distribution of factories since 1900 in this sector of Greater London operate in an indirect manner. The preceding survey of geographical and geological characteristics suggests that physical conditions have indirectly influenced recent industrialisation in the following ways:—

(a) The general slope of the country, including the area under survey, is towards the City of London, thus promoting the economic construction of lines of communication by water, road, and rail, converging on the Metropolis. It is natural, therefore, to expect that factories will spring up along trunk roads and railways. Topography has stimulated factory growth along lines of communication.

(b) The diversified soils have promoted an unequal development in this area of Greater London. During the growth of residential areas upon gravel soils, the flat, rather swampy, clay soils have been slow to develop. With the demand for extension of factories outside the Metropolis, and the spreading of population from Central London, these areas have been utilised within the last twenty years.†

* "The special suitability of the soil for intensive cultivation, and the ease with which the produce can be marketed, combined with the fact that beyond Hounslow the absence of railway or canal facilities renders this part of the region unlikely to develop into an industrial area, would seem to suggest that the best interests of the region, and of London as a whole, would be served by the reservation of a wedge of highly productive land . . . for intensive vegetable culture."—Extract from the Report of the Town Planning Committee of West Middlesex, p. 17.

† "The study of population, based on the census returns, indicates that there has been a definite geographical selection in the expansion of London.

COMMUNICATIONS

Whatever the nature of the topography of the surrounding country, a great city such as London will, in the course of centuries, naturally influence lines of communication. These lines must necessarily converge on London in a radial formation, influenced only in details by the advantages offered by topography. It has been fortunate for the development of London that the land to the north-west of the Metropolis is, on the whole, level, with a slope towards the south-east, thus favouring the lay out of roads and railways.

From the Lea Valley to the Thames Valley, all lines of communication converge on London; the area is well provided with main lines of transport. The concentration of main lines of railways is more marked in West Middlesex than in the northern sector of Greater London. It is probable that the hilly nature of North Middlesex, between Edgware and Enfield, has retarded railway development.

Lines of communication fall under the following headings:—

1. Rivers and canals.
2. Early trunk roads.
3. Recent arterial roads and ring roads.
4. District roads.
5. Railways—steam and electric.

1. *Rivers and Canals.*—The region is supplied with two navigable rivers, the Thames and the Lea. The Lea is navigable as far as Ware; the smaller rivers are of little use for navigation.

There are two canals: (a) the Grand Union, which runs from Paddington westwards through Southall to the Colne Valley, and then northwards *via* Uxbridge and Rickmansworth; (b) the Brent Canal, which follows the course of the River Brent, discharging into the Thames at Brentford.

Except in the centre and east, where the influences of the market and the growing port were strong, the marshlands have been avoided until recent times; insalubrity coupled with difficulties of drainage and water supply being the main contributing causes."—Essay by Dr. Hilda Ormsby on the London Basin.

The waterways are not used to the extent one might imagine, and do not in any way reflect the recent industrialisation of the area now being studied.

Although there is no marked increase in industries along the Thames from Westminster to Windsor, it is necessary at this point to analyse the Thames traffic, for the reason that the area of potential development, extending from Chiswick westwards to Staines, has an outlet for the transport of finished goods and raw materials *via* Brentford Dock and the Thames. The following figures indicate the tonnage of goods conveyed by that part of the Thames which serves the area.

Year.	(a) Traffic in tons, Teddington to Windsor, or <i>vice versa</i> .	(b) Traffic in tons, Teddington to Staines, or <i>vice versa</i> .
1910 .	692	14,313
1914 .	772	13,855
1920 .	3,075	3,034
1928 .	1,332	19,173
1929 .	1,184	22,826

Traffic under (a) is not included in traffic under (b).

Before 1920 no statistics were kept of the nature of the tonnage carried, but since that year the records show that timber, coal, tar and gas oil were the largest commodities carried. The carrying is done by lightermen who carry for firms on the river, the largest commodity conveyed being timber. The coal is carried principally for the Metropolitan Water Board Pumping Station at Hampton and the Kingston Electric Power Station. Except for a few Dutch motor craft the traffic between Teddington and London Bridge is barge traffic; no statistics appear to be available for this section of traffic. The increase in traffic between Teddington and Staines is accounted for by the increased demand for coal, chiefly used by the works indicated above. The decrease in the traffic from Teddington to Windsor is due to the fact that materials, formerly conveyed by river, are now conveyed by motor lorry.

In the case of the Lea Navigation some statistics have been submitted in connection with the section dealing with the Lea Valley. From articles that have appeared in the Press and from information obtained from firms, it would appear that the Grand Union Canal will assume a more prominent rôle in the transport services of West Middlesex in the future than it has done in the past.* *The Times* of May 8th, 1931, outlined a scheme for the development of the Grand Union Canal, in the course of which it stated that "£1,000,000 is to be spent on making the canal suitable for motor-driven craft of large capacity. In spite of the depression . . . it is stated that a score of large firms with premises on the canal between London and Cowley Lock increased their tonnage last year by comparison with 1929."

ROADS

The following types of roads exist in this region :—

- (a) National or trunk roads.
- (b) Old radial arteries.
- (c) New arterial roads.
- (d) Ring roads.
- (e) District roads.

National or Trunk Roads.—The early main roads were mostly Roman roads, constructed on high ground wherever

* "Although the traffic statistics which have been supplied to us by manufacturing firms indicate that little use is made of the canal (Grand Union Canal) for the despatch of goods from factories, the water-borne traffic to the factories is considerable, being, in fact, rather more than a quarter of the total tonnage. This fact is evidence that canal traffic is by no means dead and that its development is a subject worthy of closer investigation."—Extract from p. 48 of the Report of the West Middlesex Town Planning Committee, by Adams and Thompson. (It should be noted that this report was drawn up in 1922, before the industrialisation of West Middlesex had assumed its present magnitude.)

"The Royal Commission on Transport," Part XIII, 1925, p. 763, para. 12, states "that without any additional expenditure the canals could accommodate many times the volume of traffic at present passing over them."

Ibid., p. 769. "About 10–12 years ago Messrs. Lyons & Co. spent about £1,000,000 on a dock and buildings on the Grand Union Canal in order to be able to bring their goods in bulk from the ship . . ."

possible, in order to avoid the swamps. In the region under analysis such roads are :—

1. The Great North Road from London to Hatfield (A.1).
2. Watling Street from London to Edgware (A.5).
3. London-Staines (A.30).

These roads are now included in the national or trunk roads, which are the main arterial roads through England. In addition to the Roman roads indicated above, the trunk roads include the following :—

4. The Bath Road (A.4).
5. London-Carlisle (A.6).
6. London-Oxford (A.40).

Old Arterial Roads.—There are three main roads converging on London of equal importance to the trunk roads from the point of view of traffic. Such roads are :—

7. The Old Cambridge Road following the Lea Valley (A.10).
8. Green Lanes from Wood Green to Enfield (A.105).
9. London-Harrow-Rickmansworth (A. 404).

These roads are rather more winding than the trunk roads, suggesting that their original function was less that of trunk or national roads than main roads connecting up villages around Greater London.

New Radial Arteries.—Following on the recommendations of the Greater London Arterial Road Conference, 1912-16, a system of new radial arteries was commenced during the period 1919-21. This system of roads was designed to relieve the existing roads of the rapidly increasing traffic due to the development of motor transport for commercial and private purposes, to provide more direct links between points and to offer widely and more strongly constructed roads to take the heavy traffic.

Within the area the following new radial arteries have been constructed during the period 1920-30 :—

- A.108. The New Cambridge Road, midway between A.10 and A.1, connecting London with the main Cambridge Road just north of Cheshunt.

- A.5092. The Barnet By-pass from Hampstead and Highgate through Mill Hill, South Mimms, west of Barnet to Hatfield, relieving the traffic on the Great North Road.
- A.5088. The Watford By-pass from Elstree through Aldenham to Kings Langley, relieving the traffic along the Edgware Road.
- A.403. Western Avenue, connecting West London to the new industrial districts of Perivale and Greenford, and running just north of Uxbridge. It connects London and Oxford by a more direct route than by A.30, and relieves the traffic on the latter road.
- A.4. The Great West Road from Chiswick to Hounslow.
- A.30. The Staines Road from West Hounslow to Staines, relieving the traffic on the Trunk Road from Chiswick to Staines (A.315).
- A.305. The Chertsey Road, at present under construction, connecting Twickenham to Chertsey.

Ring Roads.—Communication in a direction east-west throughout Greater London, or between the main radial roads leading to and from London, has always been poor. With the growth of Greater London, this has demanded attention, and an attempt was made to remedy this deficiency by linking up the suburbs by means of ring roads or circumferential routes. During the period 1920–30, a circular arterial road has been made which almost encircles Greater London at a radius of about seven miles from Charing Cross. This circular or ring road has been constructed by widening old roads in places and 'cutting new roads in others.

The district roads of Greater London, especially those on the outskirts of this region, are in much the same condition as they were during the middle of the nineteenth century. Except where urbanisation has demanded it, there has been little change, either in the way of new roads or alterations of existing ones. Where factory or residential areas have appeared, new roads have, of course, been constructed in considerable number to meet local needs, but inasmuch as they do not take any of the main commercial traffic, they

do not influence the larger problem of industrial transport throughout this region.

THE RELATIONSHIP BETWEEN ROADS AND INDUSTRIES

It would appear that the new arterial roads are a direct cause of the location of many of the factories which have appeared during the past ten years. Up to the present time there is no evidence to suggest that industries in this area have dictated the direction of the new arterial roads, which have been constructed in order to relieve the national roads. Questions of gradient, the cost of the ground, the nature of the soil, etc., have largely determined the actual lay-out of the roads. Arterial roads are therefore a cause of the location of factories, and not an effect of the factories. The fact is patent that since the commencement of the road construction schemes in 1919-20 the growth of factories along arterial roads, or within easy access of arterial roads, has been influenced by the reduced transport charges brought about by these roads. Information on this matter appears under sections dealing with the industrialisation of the various parts of the region.

RAILWAYS

Railways perform two important functions in the industrial development of this region : (a) the carriage of raw materials and finished products ; (b) the transport of workers to and from the new factory areas. It is probable that the satisfactory passenger services which have been organised to and from such areas as Park Royal, the Lea Valley, Slough and Hendon,* have stimulated the erection of factories in these areas. The absence of labour is still a difficulty which many firms experience in Greater London ; a good system of railways with cheap and quick services is, therefore, a very important economic factor which influences firms in the choice of a factory site, and in the promotion of the general movement towards the decentralisation of London's manu-

* See p. 42.

facturing industries. This factor will, however, become of less importance as housing estates are developed in new factory areas.

The Metropolis is served in its north-west sector by a fairly comprehensive system of railway lines. The long history and commercial importance of London have operated to bring about this system of radial transport, rather than any basic geographical factors, other than the general even topography of the London Basin. There is a marked absence of railway communication between the main lines, *i.e.*, in a north-south direction in West Middlesex, and in an east-west direction in North Middlesex. This absence of circumferential railway lines is due to the fact that until 1900 the greater part of West and North Middlesex was rural, and contained a population whose commercial activities mainly centred in London. Prior to that date the industrialisation of the area had hardly begun, and there was little demand for cross-country lines.

With the migration of population and industries outwards from London in the past thirty years, the need has been felt for such transport facilities. The demand has to a large extent been met by the organisation of a network of bus routes, an extension of the electric railway, the construction of ring roads, and the more extensive use of motor transport. The larger firms are able to supply their own conveyances for workers to and from the more densely populated districts.

The absence of electric services in the part of North Middlesex lying between Enfield and Edgware is partly responsible for the lack of industrial development in this region. The following extract from the Report of the London and Home Counties Traffic Advisory Committee, 1925, throws some light on travelling facilities to and from North London and the Metropolis.

“ Steam railways—so far as concerns the suburban services of the L.N.E.R., it was generally admitted that if regard be had to their statutory obligations and to the limitations of a steam railway, there was little fault to be found with the manner in which the Company carried out their local lines, but in not

electrifying their suburban system they have exhibited a want of consideration for the needs of suburban traffic which the travelling public in the northern suburbs feel they are entitled to expect from an important company possessing a monopoly of railway facilities in the area north of Finsbury Park."

The construction of the underground line from Finsbury Park through Wood Green to Southgate is largely an answer to the indictment contained in this report.*

The importance of the Underground Electric Service in promoting the daily movement of workers between Central London and certain districts of Greater London is indicated by the following figures, which give the number of workmen's journeys credited to the lines or stations indicated for the years 1923 to 1932.

Year.	Edgware Line.	Hounslow Line.	Harrow Line.	Finsbury Park.	Highgate.
	(in millions).				
1923 .	—	2·2	1·1	2·4	1·4
1924 .	—	2·1	1·7	2·5	1·3
1925 .	1·8	2·4	1·5	2·3	1·4
1926 .	2·8	2·4	1·4	2·3	1·5
1927 .	4·9	2·9	1·7	2·2	1·4
1928 .	5·0	2·9	1·8	2·7	1·4
1929 .	5·5	2·8	1·8	2·7	1·4
1930 .	6·3	3·2	2·5	2·8	1·5
1931 .	6·3	3·2	3·0	2·7	1·5
1932 .	5·6	3·3	2·7	2·7	1·4

It will be noticed that in the case of North London the supply of workmen's tickets has only increased very slightly, whereas in West London the increase is more marked.

In the case of the Edgware line the workmen user has increased from 1·8 millions in 1925 to 6·3 in 1930. This fact is indicative of the development of factories in the western sector of Greater London in contrast with the absence of industrialisation in the northern sector.

* It was estimated by the Underground Railways that 30,000 people a day had, in the past, to travel by bus or tramcar between their homes and the Piccadilly Tube at Finsbury Park.

THE RELATIONSHIP BETWEEN TRANSPORT SERVICES AND INDUSTRIAL DEVELOPMENT IN GREATER LONDON

The improvements in transport facilities between Greater London and Central London during the past thirty years have made possible the growth of industry in the northern and western sectors of Greater London. These improvements have promoted mobility of labour and the cheap and rapid transport of merchandise, and have been a powerful influence in the decentralisation of the people and industries of the Metropolis.

The improvements in transport have been effected through train, tram and bus services, and through the increasing use of the motor for passenger and goods traffic. Up to 1900 people were dependent upon the steam railways for movement outwards from London. The termini of many of the main lines are not located in the heart of London. When the main lines were originally constructed the companies looked to long distance traffic in passengers and goods to make the lines pay. No allowances were made for development of suburban traffic, with the result that in the north and north-west of London the termini were rather removed from centres of commercial activity. The Great Eastern and the South Eastern and Chatham and Dover lines had termini in the City (Liverpool Street, Holborn, London Bridge, Fenchurch Street), with the result that south and south-east London developed along suburban lines sooner than the north and north-west of Greater London.

After 1900 local railway lines in London were electrified, and with the increasing construction of such lines the difficulties enumerated above have largely disappeared.

We find that about the years 1905-07 there was considerable activity in the extension of factories in the northern and western sectors of London. This coincides with the development of electrification of lines.* Further, about the period 1906-08, the London County Council co-operated with

* The electrification of such lines as the Central London, City and South London from 1900 to 1905; the Bakerloo and Piccadilly lines, 1906; the Hampstead and Highgate line, 1907.

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tramway authorities in inaugurating a unified system of control of electrified tramways.

Again, in the post-war period from 1920 onwards, the remarkable growth of factories in Greater London coincides with the growth of omnibus traffic, and this form of transport for passengers has increased very considerably at the expense of rail and tram transport.*

It may be safely deduced that the growth of industries in the northern and western sectors of Greater London is coincident with, and materially influenced by, the improved transport facilities indicated.†

* P. 186, "New Survey of London's Industries."

Percentage of Journeys made in Greater London by the three main forms of Public Transport, 1902 to 1928.

	Rail %	Tram. %	Omnibus. %
1902	42	33	25
1907	39	39	22
1912	34	39	27
1923	28	33	39
1928	24	27	49

† P. 194, "New Survey of London's Industries."

Greater London Passenger Transport.

	1900.	1913.	1929.
Local and Underground Railways—			
Passengers	214 (millions 1907)	474 (millions)	648 (millions)
Route miles	95	110	120
Main Line Railways—			
Route miles	561	558	534
Omnibuses—			
Miles	300	467	1,170
Passengers	264 (millions)	735 (millions)	1,912 (millions)
Trams—			
Route miles	115	350	345
Passengers	340 (millions)	812 (millions)	1,076 (millions)

SECTION THREE

A SURVEY OF THE INDUSTRIES OF THE LEA VALLEY

THE INDUSTRIAL HISTORY OF TOTTENHAM, EDMONTON AND ENFIELD

THE early industries which tended to attract labour to these sections of the Lea Valley were :—

1. The Small Arms factory at Enfield Lock, erected in 1855-56.

2. The horticultural industry, established about 1880, with the allied industries of timber and potteries, which supplied nurserymen with equipment for greenhouses.

3. The brickmaking industry, the oldest industry of the Lea Valley, resulting from the existence of the stretch of brick-earth extending from Tottenham to Hailey (see Section I., pp. 20 and 21).

Of these industries the Small Arms factory was important in attracting skilled or semi-skilled labour to Enfield. In 1872 the railway line from Hackney Downs to Enfield was completed; this line passed through Tottenham and Edmonton. Cheap fares for workers were offered by the railway company in order to attract an adequate supply of labour to the Enfield Arsenal. From 1880 onwards there was a marked increase in the population of this section of the Lea Valley. The erection of the railway line and the provision of cheap travelling facilities undoubtedly helped to encourage the migration of population from the East End of London to these districts.* The supply of labour was

Population

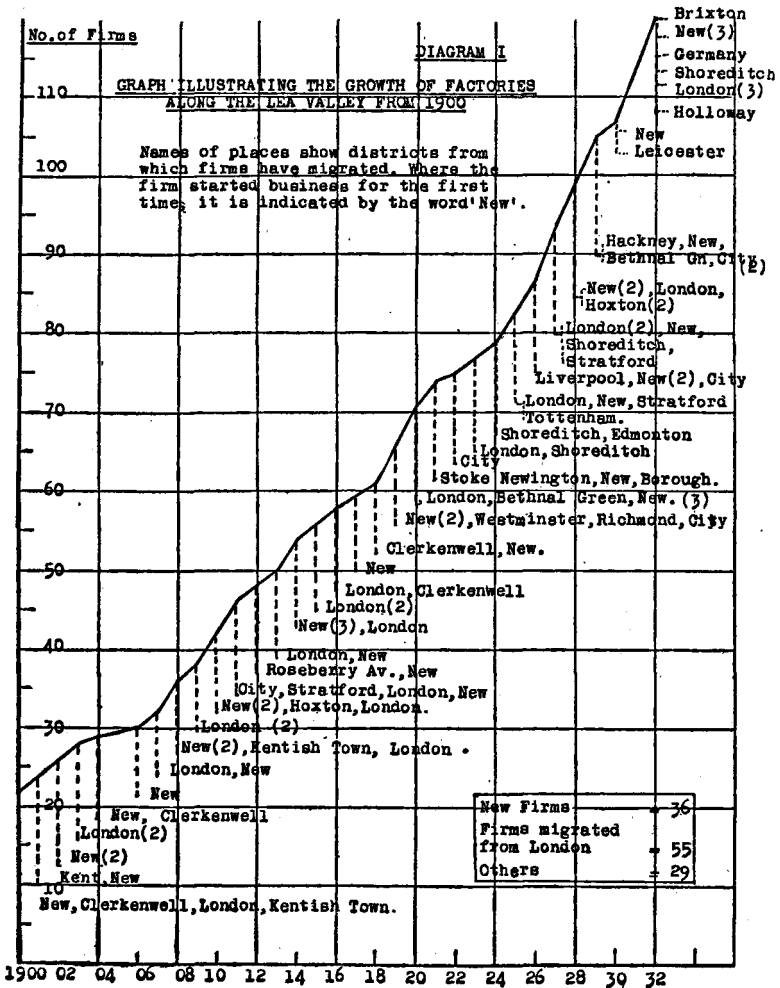
District.	1881.	1901.	1911.	1921.	1931.
Tottenham	46,456	102,541	137,418	146,711	157,748
Enfield	19,104	42,738	56,338	60,738	67,869
Edmonton	23,463	46,899	64,797	66,807	77,652

further increased by the migration of foreigners, who were drawn from the East End, engaged mostly in the timber trades. A wave of housebuilding of a cheap and inferior kind between 1880 and 1900 tended still further to attract working-class people to settle in Tottenham and Edmonton. Up to 1880 good-class property was found in those districts; after about 1880-90, the forces enumerated above tended to lower the social status of the district.

The massing of people along this section of the Lea Valley from 1880 to 1900 tended to attract factories. With the exception of a large linoleum works at Angel Road, Edmonton, a jute manufacturing establishment at Enfield, and a large cabinet making factory at Tottenham, there were no signs of any intensive industrialisation of the area during the decade 1890-1900. It appears that it was not until about the years 1900-05 that a marked growth of manufacturing industries occurred. After the latter period, furniture and clothing factories moved from London, accompanied by an exodus of skilled workers from London along the Lea Valley. These workers were mostly engaged in cabinet making, metal working and clothing industries.

It should be noted that the increase in population in Tottenham, Edmonton and Enfield between 1911 and 1921 was not commensurate with the increase in factories between those years. Population in the Lea Valley appears to have increased at a greater rate than the growth of factories from 1880 to 1911. After 1911 factories have tended to increase faster than population. This is accounted for by the fact that the workers engaged in the factories were not necessarily resident in these districts, while some sections of the population of this part of the Lea Valley were migrating to other suburbs. A reference to population figures for the years 1911 and 1921 shows that during the intercensal period 1911-21, Tottenham had lost 8,633 by migration to other districts of Greater London, *e.g.*, Southgate, Friern Barnet, Hendon and Wembley; all these districts show increases by immigration during the period in question. As early as 1911, therefore, part of the population was migrating from Tottenham to less crowded districts. A re-orientation of

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the population was taking place. Tottenham, Edmonton and Enfield were receiving the migrating population from the East End, while other sections of the population were moving outwards.* From 1900 to the present time there has been a steady increase in the number of factories along this valley. Diagram I. indicates the steadiness of this growth. Since the year 1918 the rate of growth has been, however, markedly greater than from the years 1900 to 1918.

The existence of a large working population of skilled, semi-skilled and unskilled workers, including women and child labour, has proved to be a factor of some importance in attracting factories to the district since the war. In the case of fifteen of the manufacturing establishments visited, it was stated that the plentiful supply of local labour was an important reason for the selection of the particular site for a factory. Apart from the attraction of a plentiful supply of labour there would have been a normal expansion of industry from London outwards on account of the increasing land values in the Metropolis. Diagram I. indicates the direction from which factories have migrated. In the case of fifty-five firms which have migrated to the Lea Valley from London, the desire for more space for the erection of a larger factory, coupled with high rents in London, has actuated the move outwards. Of the fifty-five firms which have migrated in this way, twenty-nine stated that this was the prime motive in moving to this part of the Lea Valley, while in a large number of cases it was a secondary motive for the location of the factory.

At the period when this migration of factories began, *i.e.*, from 1900 onwards, land was relatively cheap and rateable values were low in Tottenham and Edmonton compared with Central or East London. During the past twenty years the massing of people and the concentration of industries in these

* Adams and Thompson, on p. 20 of their Report on the "North Middlesex Regional Planning Scheme (1928)," in dealing with the movement of population, stated: ". . . taking the districts separately there are six showing appreciable losses by migration, *viz.*, Edmonton, Enfield, Hornsey, Tottenham, Willesden, Wood Green. Gains by migration are registered for the suburbs outside this area, particularly in the Hendon district. It is clear therefore that population is leaving the overcrowded urban areas on the immediate fringe of London and moving further out."

districts have increased both rents and rates. Very little land is now available in Tottenham for further industrial development, and the high rates levied from 1920 to 1928 were driving firms away. From inquiries made in the district in January, 1931, it would appear that the application of the Derating Act had so relieved local industry that in two cases manufacturing firms which had left the district in 1928 had returned in 1930.*

With the erection of every new factory the supply of labour becomes more restricted in relation to the increasing demand. In some trades competition exists between factories for the local supply of labour.†

THE LEA VALLEY IN 'RELATION TO TRANSPORT

The River Lea, with its stretch of flat land on either side of the river, has been a factor of some importance in the growth of this area as an industrial region, in that it has favoured road and rail transport to and from London. There are three main systems of transport available to industry :—

- (a) Canal or river.
- (b) Rail—both a passenger and a goods line.
- (c) A good system of roads.

Water Transport.—The traffic on the River Lea seems to suggest that water transport in these districts is in an almost static condition. The following figures give the traffic on the Lea at intervals from 1878 onwards :

Year.	Traffic in Tons.		
1878	.	.	549,306
1880	.	.	588,995
1901	.	.	783,695
1905	.	.	642,991
1910	.	.	575,934

* The effect of de-rating for the relief of industry is to slacken the rapidity of migration of firms outwards from London. In some industries it is more economical to pay the increased rates of a highly-rated district (after receiving the statutory allowances) than to stand the cost of increased transport charges for raw materials and finished goods.

† Notably unskilled female and child labour.

Year.	Traffic in Tons.		
1915	.	.	617,890.
1920	.	.	531,562
1925	.	.	562,467
1926	.	.	608,104
1927	.	.	594,463
1928	.	.	658,771

The nature of the traffic carried on the Lea is analysed in the following table. The articles of merchandise have been arranged in the order of their importance, and have been analysed between the various sections of the river.

Commodity.	Total Tons carried.	Amount carried North of Lea Bridge.	Remarks.
Coal and coke .	171,527	66,116	(Goods unloaded at) Mostly at Edmonton and Enfield.
Timber	157,894	36,614	Mostly at Edmonton.
Oil	40,824	8,106	All at Edmonton.
Flour and meal.	29,919	424	Mostly at Ware.
Beans, peas, rye, etc.	27,939	492	Hoddesdon.
Manure, etc. . .	23,890	810	Mostly at Edmonton.
Wheat	15,486	9,353	Hoddesdon and Ware.

The above items constitute 75 per cent. of the traffic carried on the river. It will be noted how little of this is conveyed over the river north of Lea Bridge, showing that within that part of the Lea Valley now being considered water transport is little used.*

Reviewing the tonnage carried on the River Lea for the past half century it would seem that the increase in traffic is in no way commensurate with the increase in industry along this section of the Lea Valley. The cheap road transport resulting from the improved arterial roads has taken much of the increased traffic. Whilst the Lea has attracted such industries as furniture making, saw mills,

* This confirms the evidence received directly from firms along the Lea Valley. In very few cases does the existence of the waterway prove to have been an economic attraction in the establishment of factories.

chemical works and metal industries to its banks, its importance in this respect must not be over-estimated. It is surprising to find that the firms which possess admirable sites along the banks do not use river transport, the raw

Year.	Roads.	County.	Location of Census.	Estimated Number of Tons of Heavy Traffic Daily.
1911 .	A.10	Hertford	Main road at Broxbourne.	1,566
1913 .	A.10	Middlesex	Lower Fore Street, Edmonton.	2,950
1922 .	A.10	Hertford	Ware district (near milestone; London fifteen miles).	2,660
	A.10	Middlesex	Enfield: 100 yards west of Bullsmoor Lane.	5,146
1925 .	A.10	Hertford	Ware: quarter mile south of Broxbourne.	5,004
	A.10	Middlesex	Enfield: One mile north of junction with A.110.	7,861
	A.10	Edmonton	Town Hall	13,479
1925 .	A.108	Hertford	Cheshunt	2,226
	A.108	Middlesex	Tottenham	5,010
	A.108	"	Enfield	3,222
1928 .	A.10	Hertford	Ware	7,834
	A.10	Middlesex	Tottenham	26,362
	A.10	"	Edmonton	17,245
	A.10	"	Enfield	8,899
1928 .	A.108	Hertford	Cheshunt	4,438
	A.108	Middlesex	Bullsmoor Lane. . .	5,661
	A.108	Tottenham	Northern boundary of Tottenham U.D.	8,069

materials and finished goods being conveyed by rail or road.

Rail Transport.—A reference has already been made to the facilities offered by rail transport along the Lea Valley. The district is well supplied with sidings, and a special line from Liverpool Street takes the goods traffic (running

through Tottenham, Northumberland Park and Angel Road). Rail services to and from London appear to be satisfactory, judging by the opinions expressed by responsible officials of many of the firms visited. It was, however, noted that in several cases a complaint was made of the inadequate connections with the Midlands, from which comes much of the raw material in the metal industries.

Road Transport.—The Lea Valley is supplied with two good main roads communicating with London: A.10, the London-Cambridge road, and A.108, the new arterial road from London to Cheshunt. There are no official statistics which throw light on the comparative use of roads before and since the war. It is impossible to obtain any statistical measurement of the extent to which the roads were used prior to 1922. Since that date, censuses of traffic have been taken during the years 1922, 1925 and 1928, and the following figures indicate the traffic passing along these roads at certain points in the Lea Valley. Only heavy motor transport is considered.

In the case of A.10, a comparison is possible between the years 1911 and the post-war years 1922–28. In the case of the new arterial road A.108, no such comparison is, of course, possible.

An analysis of the road traffic figures suggests the following observations:—

(a) "A.10" shows an increase in traffic at Edmonton from 2,950 tons in 1913 to 17,425 tons in 1928, *i.e.*, an increase of 496 per cent. Between these years factories had increased by 100 per cent., *i.e.*, from fifty factories in 1913 to 100 factories in 1928. There is, of course, no means of estimating from the traffic census figures the origin or destination of the traffic at any one point; but the fact that the road traffic has increased within this period five times as fast as the growth of factories, confirms the accuracy of the statements made by so many firms in this section of the Lea Valley that road transport is being used more and more to the exclusion of traffic by rail or canal.

(b) No traffic census was taken at Tottenham or Edmonton in 1922; it is therefore impossible to estimate the increase

in traffic from 1922 to 1925 along this section of A.10. In the case of A.108, 1925 is the first recorded census year. At Tottenham, traffic increased from 5,010 tons in 1925 to 8,079 tons in 1928, *i.e.*, 60 per cent., while at Cheshunt traffic had doubled within these periods. Reliable comparisons of the increase of road traffic along all sections of A.108 and A.10 are therefore only possible from 1925 onwards.

(c) If the percentage increase of heavy commercial traffic at points common to both the census periods 1925 and 1928 be computed, the following results are obtained :—

		Census Point.	Percentage Increase from 1925 to 1928.
		Per cent.	
A.10 .	Broxbourne .	.	56
	Enfield .	.	14
	Edmonton .	.	30
A.108 .	Tottenham .	.	60
	Enfield .	.	75
	Cheshunt .	.	100

The average percentage increase during this period at the six census points is 56 per cent. During this period factories had increased from 83 to 100, *i.e.*, 13 per cent. Here again we notice the great increase of road transport relative to the increase of factories along this section of the Lea Valley.

AN ANALYSIS OF EXISTING INDUSTRIES IN THE LEA VALLEY

LOCATION OF FACTORIES

The concentration of industries in Tottenham, Edmonton and Enfield suggests that the Lea Valley north of Upper Clapton, and south of Enfield Lock, can be considered as a more or less continuous industrial area. The larger factories are located in close proximity to the L.N.E.R.

line which passes from the Hale, Tottenham, to Enfield Lock, or on the right bank of the Lea (*i.e.*, westward of the Lea Navigation). Generally speaking, the factories occupy a stretch of flat ground between A.10 and the Lea Navigation. Smaller factories and workshops are scattered up and down the Lea Valley at various points, both east and west of A.10, but these factories are engaged in local industries, such as laundries, bakeries, small repair works, etc., and in most cases employ less than fifteen workers, and their existence does not affect the development of the larger factories now being analysed. The following are the chief groups of factories :—

Tottenham : (1) The Hale, Tottenham.—There is a large cluster of factories in the vicinity of the Hale, Tottenham, notably in Fountayne Road and Fawley Road, with a smaller group in Ashley Road. All these factories are situated west of the L.N.E.R. line. The factory of Lebus, the cabinet-makers, stands rather apart, lying in between the railway and the canal. The use of the canal for conveyance of timber, no doubt influenced the location of the site immediately west of the Lea Navigation. Apart from this large factory, it will be noted that there are no factories between the railway and the canal. This is accounted for by the fact that the land is marshy, and subject to flood in winter.

(2) Northumberland Park.—A group of ten to twelve factories is located west of Northumberland Park Station, an older section in Tariff Road, midway between A.10 and the L.N.E.R., and a newer section in Park View Road, immediately adjacent to the railway.

(3) The Vale, Amhurst Park.—A small group of eight or nine factories, mostly of pre-war origin, occupies part of a stretch of waste land at the junction of Seven Sisters Road and Amhurst Park. In Ashley Road, on a piece of waste ground immediately adjacent to the railway, are three factories which are the result of the adaptation of buildings erected during the war.

Edmonton : (4) Angel Road Colony.—There are a few factories, mostly engaged in cabinet making, located in

buildings which originally belonged to a linoleum firm. The works date back to 1880 and are immediately adjacent to the Lea (left bank). The original works cover a large stretch of ground, but they are more or less derelict, and at the present time (1931), are being adapted to modern industrial requirements. These works suffer from the fact that they are only accessible by a narrow lane leading from Angel Road; there is no outlet in any other direction, and until roads are built eastwards of this site it is probable that the estate will not develop.

There is a group of rather large factories in Angel Road between Angel Road Station and the River Lea. Most of these were erected between 1900 and 1908.

(5) Bridport Road.—A piece of waste land adjacent to Bridport Road (west of A.10), was zoned for factory development. During 1931 and 1932 eight factories have already appeared on this site.

Enfield: (5a) Ponders End.—A group of factories, mostly dating from about the year 1900, occupies a stretch of ground on the right bank of the Lea at Ponders End.

(6) Lincoln Road.—West of A.10 and east of A.108, there are two groups of factories, one in Lincoln Road and the other in Queensway. Most of these are of post-war origin.

(7) Brimsdown.—A cluster of factory buildings occupies the right bank of the Lea. The older factories are immediately adjacent to the Lea; the newer ones are extending towards Brimsdown Station.

(8) Southbury Road.—An embryo settlement of three factories—all of post-war origin.

It will be noted that in Tottenham, factories have grown up west of the railway line, *i.e.*, away from the Lea, whereas in Edmonton and Enfield they are found immediately on the right bank of the Lea.

Throughout the Lea Valley (north of Walthamstow) there is an absence of industrialisation eastward of the Lea, *i.e.*, on the Essex side. This is due to the fact that the ground is low and swampy, and is covered with water in rainy seasons. Moreover, a large part of this section of the Lea

Valley has been utilised for the erection of reservoirs. The opinion was expressed by several industrialists in the locality, that until the land in question can be thoroughly drained it will not be used for any building purposes, as the water level is only two feet below the surface.

The Effect of the War on the Industrialisation of the Lea Valley.—The demand for munitions during the war led to the erection of buildings near London. Extensions were made to the Small Arms Factory at Enfield, and other buildings were erected along the Lea Valley for the manufacture of munitions. This caused a large female population to be employed in this area during the war. With the transition to peace conditions the munition factories were taken over by manufacturing firms at favourable prices, with an existing female population ready to hand. In fifteen cases firms have stated that their migration to this part of the Lea Valley was partly due to this cause. It may be added, in parenthesis, that the growth of factories in other parts of Greater London is also due to the transfer of government buildings to industrial enterprises after the war, e.g., in Hendon, Acton and Slough.

QUANTITATIVE ANALYSIS OF THE INDUSTRIES

The following figures indicate the number of factories visited in the districts mentioned. The visits were made over a period of time extending from September, 1928, to April, 1932. The manufacturing firms visited embrace practically every large and medium-size factory. Although several small local repair shops and factories were omitted from this survey, no firm was disregarded in which the nature of the industry might throw any light on the general object of this thesis.

District.	Number of Firms Visited.
Enfield
Edmonton
Tottenham
Part of Walthamstow
	} 131

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GROUPING OF INDUSTRIES IN THE LEA VALLEY

(1) Group.	(2) Product Manufactured.	(3) Number Employed.
<i>A.</i>	<i>Office Requisites</i>	
1	Stationery	} 2,750
2	Carbons, ribbons	
3	Duplicators	
4	Pencils	
5	Ink	
<i>B.</i>	<i>Clothing</i>	
6	Ready-made clothing	} 6,425
7	Hosiery	
8	Boots and shoes	
9	Gowns	
10	Rainproof coats	
11	Furs	
<i>C.</i>	<i>Furniture</i>	
12	Household	} 3,690
13	Shop Fittings	
14	Mattresses	
<i>D.</i>	<i>Electrical Equipment</i>	
15	Miscellaneous parts, e.g., switches, bulbs, etc.	} 6,750
16	Accumulators and batteries	
17	Electric instruments	
18	„ meters	
19	Wireless sets	
20	Insulators	
21	Mouldings	
<i>E.</i>	<i>Machinery (not electrical)</i>	
22	Food machinery (bacon)	} 2,720
23	Refrigerating machinery	
24	Experimental machinery	
25	Gas meters	
26	Machinery for acetylene welding	
27	Dies and Tools	

52 INDUSTRIES OF GREATER LONDON

GROUPING OF INDUSTRIES IN THE LEA VALLEY—*continued*

(1) Group.	(2) Product Manufactured.	(3) Number Employed.
	<i>Metals</i>	
F.		
28	Window casements	} 960
29	Iron Foundry products	
30	Products of rolling mill	
31	Refined metals	
32	Metal shutters	
33	Tin boxes	
G.	<i>Cables, Wires, Tubing</i>	
34	Flexible tubing	} 1,225
35	Cables and wires	
H.	<i>Musical Instruments</i>	
36	Gramophones, etc.	} 630
37	Pianos	
I.	<i>Foodstuffs</i>	
38	Chocolates	} 1,160
39	Flour products	
40	Grain products	
41	Confectionery	
42	Miscellaneous	
J.	<i>Chemicals</i>	
43	Miscellaneous (fine)	} 1,695
44	Soap and glue	
45	Oxygen	
46	Cleaning powders	
47	Abrasives	
48	Paint	
49	Chemical apparatus	
K.	<i>Building Materials</i>	
50	Timber, mouldings, etc.	} 725
51	Bricks	
52	Concrete mouldings	
L.	<i>Motor Industry Products</i>	
53	Engines	} 1,450
54	Tyres	
55	Safety glass	
56	Panels for cars	

INDUSTRIES OF THE LEA VALLEY 53

GROUPING OF INDUSTRIES IN THE LEA VALLEY—*continued*

(1) Group.	(2) Product Manufactured.	(3) Number Employed.
	<i>General Household Requisites</i>	
M.		
57	Brushes	} 350
58	Thermos flasks	
59	Floor coverings	
60	Clocks	
	<i>Paper Products</i>	
N.		
61	Christmas crackers	} 380
62	Paper bags	
63	Bookbinding	
	<i>Sports Goods and Toys</i>	
O.		
64	Toys	} 100
65	Sports goods	
	<i>Leather Derivatives</i>	
P.		
66	Dressed leather	} 550
67	Suit cases	
	<i>Rubber and Rubber Products</i>	
Q.		
68	Waste rubber	} 800
69	Roofing	
70	Ebonite	
	<i>Miscellaneous</i>	
Z.		
71	Army equipment	} 2,545
72	Cotton thread	
73	Surgical instruments	
74	Sparklets for bottles	
75	Show cards	
76	Explosives	
77	Helmets	
78	Celluloid labels	
79	Artists' materials	
	Grand Total	34,905

Note.—The numbers in column (1) headed "Group," refer to the distinct products manufactured—not necessarily to the number of factories engaged in the manufacture of these products.

NATURE OF THE PRODUCTS MANUFACTURED

In the classification given on pp. 51-53, the products manufactured have been arranged in groups according to the similarity of the use to which the finished article is to be applied. An analysis of the list shows that the comparative importance of the larger industries of this portion of the Lea Valley, judged by numbers employed, is as follows:—

Electrical apparatus	6,750
Clothing	6,425
Furniture	3,690
Stationery	2,750
Machinery	2,720
Motor engines	1,100
Boots and shoes	1,950
Duplicators	1,000
Cables and wires	1,000

The approximate total number of workers engaged in industries of a non-local character in Tottenham, Edmonton and Enfield is 35,000. These workers are not necessarily resident in the area, although there is a large residential population of male and female workers. The figure does not include those engaged in the nursery industry, particulars of which are given on pp. 60 and 61.

Most of the products manufactured are articles which, when finished, are small and easy to transport, such as parts of motors, accumulators, stationery, pencils, toys, etc. It is more important for these industries to be located near to the markets for the finished goods, *i.e.*, London, or near to points whence export is easy, *e.g.*, the London Docks for firms engaged in the export trade, or near to London railway termini for distribution throughout the United Kingdom. The quantity of the raw materials used in the manufacture of most of these products is small. There is, therefore, little need for the industries to be located near the source of supply of raw material, which in most cases can be obtained easily by rail or road. The raw materials in many of the industries consist of such articles as copper rods, sheet metal, wire, etc., all of which articles can be easily conveyed to the

factories by motor transport from the Midlands. The furniture industry is an exception; but in this industry the River Lea is available for the transport of timber, while the finished products can be easily transported and packed in lorries or sent by rail.*

SOME CAUSES OF THE LOCATION OF INDUSTRIES

In communicating with the manufacturing firms in the Lea Valley, the first question put to these firms related to the reasons for the location of the factory. The answers received were vague in many cases, while in other cases, especially with the older firms, the reasons for the location of the factory were not definitely known. Most of the reasons given fall into certain categories, and it has been thought advisable to tabulate the replies under the headings indicated on the following page:—

Causes of the Location of Factories.	Number of Firms offering this Reason.
1. Neighbourhood of London.	
(a) Extension of premises—more space desired	29
(b) Desire to be near London markets	11
(c) Cheaper land, cheaper rent and rates	12
2. Transport Facilities.	
(a) Canal or river	4
(b) Rail	7
(c) Road	5
3. Cheap Labour.	11
4. Existing Buildings.	
(a) Taken over from Government after the War	5
(b) Other suitable buildings already there	10
5. Other reasons.	
(a) Owner lived near the factory	16
(b) Suitable soil, cheap water or other geographical advantages	4
(c) Open spaces for isolation of works, e.g., in dangerous trades	4
(d) Migration from the north of England	2
6. Unknown reasons, i.e., either unable or unwilling to give reasons.	11

This classification is naturally only an approximate guide to the causes of the location of factories in view of the

* For a more detailed analysis of the raw materials, see p. 59.

fact that many firms offer more than one of the above reasons for the choice of the site. In classifying them under the above headings, the main reason given by the firm has determined the category in which that firm has been placed.

Although many of the manufacturing firms located in this area have grown to dimensions in which they now manufacture for a world market, it is true to say that the existence of London, with the demand arising from a population of nine millions, is the most common factor in the type of industry carried on in the Lea Valley. Most of the finished products are those in great demand from a town population, *i.e.*, they are made for the consuming public rather than for manufacturers. The demands of town people have thus influenced the location in the Lea Valley of factories for the manufacture of furniture, clothing, electrical equipment (such as bulbs, switches, wireless apparatus), office equipment (*e.g.*, stationery and pencils), and musical instruments (*e.g.*, gramophones and pianos). An analysis of the industries enumerated in this section shows that it is the industries which supply these commodities which are the largest, and in many cases the oldest established firms, in some instances dating back to 1900.

There appears to be an increasing tendency here, as in other parts of Greater London, for factories to be built for the making of small parts of a highly specialised nature, or for the assembling of parts obtained from various countries, *e.g.*, in the case of bacon-cutting machinery or refrigerating apparatus.*

There is an increasing demand for unskilled or semi-skilled labour, and in this respect the Lea Valley has the economic advantage of being able to draw on a plentiful supply of residential labour of this kind. One exception to the increasing demand for unskilled labour is afforded by the furniture industry. In this industry skilled labour is chiefly used, and is drawn from Shoreditch, Bethnal Green, Hoxton, and other parts of London in the lower Lea Valley.

* There is a marked absence of food-producing factories in the Lea Valley. This type of industry has grown up in West Middlesex, *e.g.*, Park Royal, Southall, etc., owing to the cleaner and purer air which is found in the latter districts.

The localisation of skilled labour in the furniture industry is one reason for the concentration of this industry in the Lea Valley. Although the chief customers of some of these firms are in the north of England, it is more economical for the firms to manufacture in the Lea Valley on account of the close proximity of the requisite skilled labour. There is a marked tendency for the furniture industry to migrate from East London northwards along the Lea Valley. Most of the furniture factories, and boot and shoe factories, found in Tottenham, Edmonton and Enfield, have migrated from the East End of London.

ANALYSIS OF THE RAW MATERIALS USED IN INDUSTRIES IN
THE LEA VALLEY

The following table indicates the nature of the raw material used by most of the firms in this area. In all cases the quantity of these raw materials desired by individual firms is so small that even if the total local demand be considered, there would not appear to be any economic justification for the growth of local sources of supply. Raw materials such as heavy chemicals, glass, metals, rubber, paper, etc., can be more economically manufactured or prepared in bulk in other parts of the country, and be transferred quite easily by road or rail to the Lea factories. There seems to be no indication of any likelihood of a migration of the heavier industries from the industrial north.*

RAW MATERIALS USED IN THE LEA VALLEY AND THE
PRODUCTS INTO WHICH THEY ENTER

<i>Timber.</i>	<i>Chemicals.</i>
Pianos.	Soap and cleaning powders.
Furniture.	Sweets.
Greenhouses.	Cartridges.
Pencils.	Colours.
Toys.	Ink.

* There are, however, two firms engaged in the manufacture of rubber or rubber goods from crude rubber, also one firm engaged in the dressing of leather.

Chemicals (continued).

Oxygen.
Glue.

Cotton, Artificial Silk.

Sewing cotton.
Hosiery.
Flex for wiring.
Ready-made clothing.
Mattresses.
Typewriting ribbons.
Army equipment (belts).

Metals.

Electrical equipment.
Wires and cable.
Castings.
Spring mattresses.
Pianos.
Sparklets.
Flexible tubing.
Metal casements.
Gas meters.

Rubber.

Roofing material.
Cables.
Tyres.

Paper.

Boxes.
Crackers.
Paper bags.
Stationery.

Glass.

Electric light bulbs.
Electric mathematical instruments.

Clay, Sand, etc.

Bricks.
Concrete mouldings.

Cork, Leather.

Linoleum.
Boots and shoes.
Leather dressings.
Suitcases.

With the increasing use of proprietary products and the intensification of specialisation of industry, the "raw material" of many industries has now been transformed into partly manufactured products. In the bulk of the factories along the Lea Valley, and in other parts of Greater London, partly manufactured equipment enters into the finished product at some stage of the manufacturing process. In the following articles, metal parts, pieces of machinery or proprietary equipment are manufactured elsewhere :—

Gramophones.
Bacon-cutting machinery.
Gas meters.
Pianos.
Wireless equipment.

It is only in such industries as furniture, boots and shoes, shop fittings, wires and cables, sweets, soap and cleansing powder, bricks, etc., that the raw material is manufactured into the finished product in the same factory.

From the varied nature of the materials used by factories in the Lea Valley, it is impossible to attempt to classify very comprehensively the areas from which such materials are drawn; their sources are as far afield as Holland, the United States, Birmingham, Manchester and Germany. Generally speaking, however, from inquiries made from the Lea Valley firms, the supplies of raw materials are drawn from the following areas:—

RUBBER . . .	Crude rubber is imported <i>via</i> London Docks. Waste rubber, <i>e.g.</i> , tyres, etc., is purchased from miscellaneous sources.
TIMBER . . .	From London Docks <i>via</i> the River Lea.
LEATHER . . .	From London Docks.
COAL, COKE, PETROL, ETC.	Raw materials for the manufacture of power, are obtained from the docks <i>via</i> the River Lea, or by rail.
CHEMICALS . . .	Partly manufactured chemicals, <i>e.g.</i> , colours, are either obtained from Lancashire or Hull, and are conveyed to the Lea Valley by road or rail.
METALS . . .	Sheet metal, metal rods, rolling mill products, castings, are generally obtained from the Midlands by rail or road. Waste metal, known as "scrap," is often conveyed by canal.
TEXTILE FABRICS	Yarn or textile materials are obtained from Lancashire or Yorkshire, or through middlemen in London.
PAPER . . .	Paper is obtained from Hertford by road, or from Kent by rail or road.
MACHINERY AND SPECIAL PARTS.	The sources of origin are extremely wide; special parts for pianos come from Kentish Town, other parts from Birmingham. Some of the parts for special machinery are imported from Holland and U.S.A. Pieces of equipment in the electrical industry are obtained from Germany, from London, Birmingham and Manchester.

As already explained, the raw material required by any one firm is often so small in quantity that it is purchased through a middleman in London, and the fact that London is the chief market in the country for the purchase and

sale of such raw materials as rubber, timber, leather, metals, etc., is an inducement for small firms to be located near to the market.

THE NURSERY INDUSTRY OF THE LEA VALLEY

Apart from brick-making, the nursery industry is the oldest industry of the Lea Valley. It dates from about the year 1880. The consumption of tomatoes, cucumbers, and grapes sprang into popular favour towards the last quarter of the nineteenth century. These products had already been grown under glass at Guernsey and Worthing. Mr. Joseph Rochford started the industry in a small way in Cheshunt in 1882; other pioneers soon followed, and the growth of the industry since that time has been rapid.

There is now an area of 1,400 acres under glass in the Valley (cf. 3,000 acres for the whole of the British Isles). In extent it is the first region in the British Isles for the production of horticultural products, Worthing coming second. One reason for the location of the industry, and certainly the chief cause for its rapid growth, is the nearness of Covent Garden Market (16 miles), as compared with Worthing (60 miles) and Guernsey (148 miles by sea and a further 79 miles by rail). Subsidiary advantages are the absence of strong winds in the Lea Valley and the suitability of the brick-earth soil for the nursery industry. The sheltered climate is counteracted by the existence of a cold, damp atmosphere, and the sunshine experienced here compared very unfavourably with that experienced on the south coast.

The nursery industry in the Lea Valley at present extends in the following directions: in the south the southern limit of intensive cultivation is Ponders End; in the east it follows the left bank of the Lea for a distance of two or three miles; in the west the limit is reached by a line running north-south approximately through Goffs Oak and Crews Hill. The area of densest production is limited in the north at Hoddesdon, but there is a strong tendency for newer glass-houses to extend in the direction of Ware.

There is a tendency for the prevalence of a large type of unit along the valley, many of the larger owners controlling 35 acres of greenhouses.

"The distribution of crops is roughly: tomatoes, 875 acres; cucumbers, 275 acres; grapes, 75 acres; roses, 75 acres. The values of the crops are approximately: tomatoes £1,400,000, cucumbers £700,000, grapes £200,000."*

Growers are tending to concentrate on tomatoes and cucumbers. Unlike growers in the Worthing district, they do not grow chrysanthemums or mushrooms in winter, preferring to spend considerable time and money in thoroughly sterilising their houses and the soil ready for the next season. There is approximately £4,000,000 invested in the industry in the Lea Valley. There are 600 growers employing approximately 6,000 men.

The future of the industry appears to be bound up with the question of foreign competition. It is reported that at certain seasons of the year it is impossible to compete with the produce of Holland, whose surplus is dumped in England at prices which are below the cost of production. It is claimed that the margin of profits for many of the growers in the Lea Valley is small, and, although much attention and research are being devoted to new methods of production, there does not appear to be a great future for the industry at present prices. There is, moreover, a tendency for growers to establish themselves in the Worthing district on account of the greater number of hours of bright sunshine.

THE LEA VALLEY NORTH OF ENFIELD

A concentration of manufacturing industries has not yet taken place in the Lea Valley north of Enfield. Apart from the nursery industry, there are few industries of note.

Cheshunt has practically no industries beyond a small sweet manufacturing business which took over the premises of a rubber factory. The nursery industry is here increasing rapidly.

In the district of Waltham Abbey, there is evidence of

* Extract from the *Fruit Grower*, Vol. LXIII., June, 1929—an article by Mr. W. G. Lobjoit, J.P.

the beginning of industrial growth. The following factories are located there :—

1. A cluster of small manufacturing firms at the Abbey Mills (formerly flour mills). There are about four firms here, chiefly engaged in the manufacture of chemicals or products in which chemicals enter very largely, *e.g.*, abrasives, dust and cleansing powders, etc. These firms have all been established since the war. Between them they do not employ more than 200 people.

2. A gramophone factory. This is a post-war concern, but very few are at present working in this factory owing to a trade slump.

3. A factory engaged in the manufacture of tennis rackets and sports equipment. This firm has migrated from London since the war.

4. The Government powder factory.

Good road, rail and canal transport is possible, the air is clean and the neighbourhood healthy. In Hoddesdon there is a small industry connected with the manufacture of sports equipment, such as tennis rackets, etc., employing approximately fifty people. There is also a large brewery and a factory engaged in the manufacture of steel huts and buildings. The latter has migrated from Birmingham (1921), but there does not appear to have been any economic reason for the present location except that a convenient site was found near road, rail and water transport. It should, however, be mentioned that several firms in the Lea Valley, north of Enfield, consider that transport services, both by rail and canal, are rather poor, and that increased facilities in this direction may induce industrialists to settle in some of the districts between Enfield and Ware.

In Ware the chief industry is the manufacturing of malt, for which there are four firms now engaged in production. Some of these firms are over 100 years old. The industry is a remnant of the agricultural heritage of Hertfordshire, but it may be noted that the malting industry is declining ; many of the malting houses have become old-fashioned during the past forty years and have been pulled down. The industry was originally located here owing to the good transport

facilities offered by the Lea Canal and the existence of good barley fields in the vicinity. These advantages no longer obtain. The barley is obtained from various parts of the British Isles, while about 25 per cent. of their requirements is imported. The canal is still used for the conveyance of malt to some of the breweries whose works are adjacent to the canal, but the bulk of the malt is now sent away by rail or road.

There is a small iron foundry in Ware, a factory engaged in the manufacture of envelopes, and a large food manufacturing establishment. All these are relatively old-established firms, having been in the district for over twenty-five years. It is to be noted, however, that two of these firms migrated from London about the year 1905.

Beyond these industries, there has been no material increase in the growth of factories in Ware for many years. The lack of a good train service appears to be the chief factor in retarding the industrial growth of the district, but for which it is considered that there would be a fairly rapid increase in factories. The industrial firms which do exist, use road transport in preference to rail.

The number of workers engaged in manufacturing industries in Ware would not exceed 1,500.

Hertford.—Hertford has been an agricultural, rather than an industrial town, although there is evidence of a paper mill being in existence as far back as the sixteenth century. The principal industries are flour milling, brewing, leather dressing, the manufacture of gloves, chocolates, tooth brushes, gramophones and dog biscuits. In the past the existence of a plentiful supply of water, and the fact that Hertford is situated on the Lea Navigation, have been factors which tended to attract industries. The few factories which have, within recent years, established themselves there, have adopted this location to avoid the excessive cost of land and high rates in the metropolitan area. There is little doubt that the industrial development of the borough has been considerably retarded by the lack of land suitable for the erection of factories. The owners of the surrounding private estates have been unwilling to sell their land for industrial purposes.

The following details throw some light on the nature of the manufacturing establishments which are located in the neighbourhood of Hertford :—

1. *A Tooth-brush Factory*.—This firm migrated from the City since the war owing to the demand for a larger factory and more space for extensions. It is engaged in manufacturing tooth-brushes for a world market. It was stated that the reason for the location of the factory was that land was cheap in Hertford. Further, labour in and around Hertford is plentiful. It is interesting to note that the domestic system of labour prevails in Hertford, much of the work being put out to people who live in the surrounding villages.

2. *A Glove Factory*.—This firm is engaged in the dressing of leather and the manufacture of gloves therefrom. It is an old firm, having been in the neighbourhood for over twenty years. Prior to that time the works were in use by a firm manufacturing chemicals. The present firm has migrated from London, and selected Hertford owing to the existence of a suitable factory and a plentiful supply of labour. Here, again, a large part of the work is put out to people who work in their own houses. It was further stated that the clean air was one of the reasons for the migration of this firm to Hertford.

3. *A Biscuit Factory*.—This is an old-established firm which has grown up in the neighbourhood during the past fifty years. It specialised in the manufacture of dog biscuits, but it now manufactures other types of biscuits besides these.

It would appear from the foregoing facts that manufacturing industries have not yet started to develop to any appreciable extent along the Lea Valley north of Enfield.

CONCLUSIONS ON THE INDUSTRIALISATION OF THE LEA VALLEY

From a study of the industrial development in the portion of the Lea Valley considered in this thesis, the following conclusions can be drawn :—

1. Most of the industries situated in this area supply the needs of a large town population ; they are not necessarily luxury industries, which is the case with so many industries in the western sector of Greater London. Many of them cater for a section of workers with a low standard of living. Furniture and clothing of a rather cheap kind are to be found. The demand arising from a working-class population in East London and in the districts of Tottenham and Edmonton has left its impress on the type of many of the industries. The enormous demand for stationery in the offices of London naturally makes this a suitable district for industries supplying these needs. The fact that approximately 3,000 are engaged in these factories is indicative of the importance of this type of industry.

2. Apart from the industries which have grown up *in situ*, most of the industries have migrated from the lower part of the Lea Valley or districts in the East End of London. Diagram I. indicates the marked regularity of migration of firms from such districts as Bethnal Green, Clerkenwell, Hoxton, Shoreditch, etc. The natural geographical line of expansion would be along the Lea Valley.

3. The good rail and road services to the London Docks attract industries to the Lea Valley. Many of the firms visited appear to have a considerable export trade. The traffic of the Port of London shows a steady increase in recent years, and it is probable that part of this increase is due to the export trade of the Lea Valley industries.*

The facilities available for shipping and the handling of goods at the Port of London will probably react on the development of industrial growth in Greater London, and the northern sections of the Lea Valley may probably obtain an increasing proportion of this industrial growth. But if the districts north of Enfield are to become industrialised, rail and road transport must materially

* Traffic of the Port of London :—

1923	.	.	.	.	.	.	41,215,062 tons
1926	.	.	.	.	.	.	49,278,173 "
1928	.	.	.	.	.	.	55,278,173 "
1929	.	.	.	.	.	.	60,078,355 "
1930	.	.	.	.	.	.	58,083,575 "

improve. Much of the land north of Enfield has still to be developed, and it should be remembered that increasing rents are always tending to drive firms further outwards from London. The economic effect of the new Cambridge Road is a factor which has still to be estimated. It is noted that already two firms, originally located in Edmonton, have moved north along the Cambridge Road. It may possibly prove to be the keynote to a massing of factories between Enfield and Ware. It is reasonable to conjecture that these industries will probably be of a similar nature to those already found in the Lea Valley.

4. There appears to be a marked absence of any tendency for the migration of industries to this area from the north of England or from the Midlands. Out of all the industries or factories whose growth has been examined, only two small firms appear to have moved to this district from the north of England, and one of these is a warehouse rather than a factory. The industries of the Lea Valley, in common with those of Greater London, do not seem to be competitive with the traditional industries of the Midlands or the north of England.

The Lea Valley industries are chiefly engaged in the manufacture of the following types of product :—

(a) New proprietary articles for general consumption, *e.g.*, cleansing powder, radio sets, musical instruments, etc. They are generally small and easily packed.

(b) Clothing and furniture ; in the Lea Valley they appear to be traditional industries.

(c) Products of the nursery industry, the existence of which has been dictated by physical rather than economic factors, such as lower rates and rents.

(d) Small electrical equipment in which unskilled labour is the chief requirement, and nearness to the consumer the second.

(e) Products which are the result of assembling processes, rather than manufacture. Such an industry as food-making machinery is an example of this, in which most of the parts are obtained from abroad and are assembled in the factory.

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SECTION FOUR
THE NORTH MIDDLESEX RESIDENTIAL AREA

SECTION FOUR

THE NORTH MIDDLESEX RESIDENTIAL AREA

To the west of the Lea Valley industrial region there is a sector of Greater London which is predominantly residential in character. The sector comprises the districts of Wood Green, Southgate, Hornsey, Friern Barnet, Finchley, South Mimms, Whetstone and Barnet, together with the stretch of country lying between Barnet and Edgware. The eastern part of this region, *i.e.*, Wood Green and Southgate, has a quasi-industrial development.

The lack of industries in this part of Greater London is, in a measure, due to the lack of transport facilities which are found in other more industrialised areas. In the first instance the topography of this sector does not lend itself to easy transport services ; there are numerous hills reaching 300 to 400 feet, which are unfavourable to railway or tramway construction. There is a complete absence of canals or navigable rivers. Of railways, there are only two lines which serve the area as passenger lines, and on both of these lines the absence of facilities for goods traffic has retarded industrial growth. Railway services are considered to be poor, and there is an absence of sidings and goods depots. The population of the whole area is mostly a dormitory one engaged in industrial or commercial occupations in other parts of the Metropolis.

In North Middlesex and Hertfordshire, the country is still covered with large private estates, with the result that obstacles have been placed in the way of industrial development. There is also a lack of manual workers for factories, most of the population being composed of middle-class people engaged in commercial pursuits. Even if facilities for factory development existed, there would be still a serious labour shortage. It should, however, be pointed out that

the new electric line from Finsbury Park to Southgate may put this sector of Greater London within easy travelling distance of the more densely populated districts of Finsbury Park, Holloway, etc., a factor which is sure to lead ultimately to the exploitation of some of the land for factory development.

Wood Green and that part of Southgate which is contiguous with Wood Green are exceptions to the above statement relating to the non-industrialisation of this sector. Wood Green is, in a sense, a transitional area between the Lea Valley and the purely residential area of North Middlesex. There is a dense population of over 50,000 persons in Wood Green, consisting largely of people engaged in commercial and industrial pursuits, travelling to and from London.

On the other hand, a small section of this population probably consists of industrial workers engaged in industries in the vicinity or in the Lea Valley. Facilities for communication between Wood Green, Tottenham, Enfield and Edmonton tend to promote a decentralisation of population from the Lea Valley westwards.

Two conditions favour the growth of factories in Wood Green :—

- (a) The existence of a large population.
- (b) Good rail and road facilities for transport.

There are a number of small isolated factories in Wood Green which have been attracted to the district because there happened to be a convenient piece of waste land in the locality. Only one industry is situated in Wood Green on account of factors which might be considered definitely geographical, and that is the pottery industry.

The following factories merit consideration in this survey :—

(a) *Pottery Industry*.—Over 150 years ago the good clay subsoil gave rise to a pottery industry. Apart from the existence of suitable subsoil, the fact that the nursery industry is a traditional industry of the Lea Valley has been of some significance in stimulating this local pottery industry. Two firms are engaged in the manufacture of horticultural

THE NORTH MIDDLESEX RESIDENTIAL AREA 71

products which find their largest market among the nursery-men of the Lea Valley.

(b) *Sweets and Confectionery*.—There is a large sweet factory located in Wood Green employing, probably, 1,000 workers (mostly females). This factory has been in existence in the district for over thirty years and no special reasons can be attributed for its present location.

(c) *Screw Manufactures*.—A firm is engaged in the manufacture of screws. It moved from London in 1903 in consequence of a desire to obtain a larger factory and more space for extensions. We see in this move a motive similar to that which actuated the move of so many firms from London along the Lea Valley from 1900 onwards. The firm set up their factory here because of the existence of a suitable piece of land which at that time was cheap. There appears to have been no other reason why this factory should be located in Wood Green.

(d) *Hosiery*.—There is a factory engaged in the manufacture of artificial silk products. The factory was established in 1927; prior to that date the firm had a small factory in the East End of London. The chief reason for the migration of the firm to Wood Green seems to have been the existence of a convenient piece of waste land near to the railway on which a one-storey factory could be erected.*

(e) *Glass Bottles*.—A firm is engaged in the manufacture of glass bottles which are used chiefly for food products, e.g., pickles. The factory was established in 1920. Its location is due to the existence of a suitable site near the railway, and to the fact that it is an advantage to have the works near London.

Apart from these few factories in Wood Green, and a number of minor repair shops, the district is residential. Factory development is unlikely to proceed to any considerable extent in Wood Green, as the district is now largely built over with houses.

* In many branches of industry it is more economical for firms to have a factory consisting of one floor only. Better lighting facilities and easier methods of supervision are among the inducements to such an arrangement. Cheap land is therefore very necessary in cases of this kind, where horizontal rather than vertical expansion is necessary.

FINCHLEY

In Finchley there are two small factories ; one is engaged in the production of boot polish, and the other in the production of motor bodies for commercial vehicles. The latter factory is located on the main road and is, therefore, within easy reach of London, and, *via* the Great North Road, is within four hours of the Midlands.

SOUTHGATE

That part of Southgate which is contiguous to Wood Green is partly industrialised, while a number of small factories have grown up on pieces of waste ground in various parts of the district. The following are the most important industries of a non-local character in the district :—

(a) *Boot Polish and Metal Containers for Polish.*—A factory is engaged in the manufacture of boot polish and metal containers, not only for polish but for a variety of products in which a metal tube is necessary. It migrated from London in 1903 in consequence of a desire for larger premises with room to extend if it were subsequently found necessary. The spot chosen in Southgate was a piece of waste ground at that time. Land was cheap and rates were low, while labour could be easily obtained from Wood Green. Since the factory was erected the immediate neighbourhood has developed on residential lines. Such a condition illustrates the importance of schemes for town and regional planning in Greater London.

(b) *Enamelled Iron Signs.*—The manufacture of enamelled iron signs is carried on by a firm which has been in the district for over fifty years, the founder having lived in the vicinity.

(c) *Clothing Manufactures.*—A factory is engaged in the manufacture of high-class clothing (chiefly raincoats). It is a branch of a larger works in the north of England. The firm migrated from the City in 1925 owing to increasing business and a desire to have a factory within easy reach of London, as it is one of those trades which must be in immediate contact with its clients.

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(d) *Tin Box Manufactures*.—A firm of metal box manufacturers has a branch works in the district. It opened these works in 1927, as its factory in London could not cope with increasing trade. In coming to Southgate it took over an old building and adapted it to its requirements by alterations and additions. The choice of this district resulted from the existence of suitable premises which were purchased on favourable terms.

In addition to these industries there are a few small works engaged in the manufacture of such miscellaneous products as powder puffs, celluloid equipment, wireless apparatus and gramophones, but the *personnel* in each of these factories is under fifteen.

THE CONTRIBUTION OF NORTHERN MIDDLESEX TOWARDS INDUSTRIAL GROWTH

The reference to the manufacturing industries mentioned on pp. 70-72 does not detract from the statement that North Middlesex is essentially residential. In Wood Green, Southgate and Finchley (the only districts in the area in which factories occur) the population is approximately 150,000. The estimated number of workers engaged in the factories enumerated does not exceed 3,000, and of these, it is probable that a large number live in other parts of Greater London.

This sector of Greater London will probably remain residential in character for many years for the following reasons :—

(a) In Northern Middlesex much of the land is covered with good class residential property, and it is likely that local building regulations will continue to maintain the high level of residential status.

(b) In Northern Middlesex and in that part of Hertfordshire immediately adjacent to its northern boundary, the land consists of large private estates. Although some of these are going over to commercial enterprise there are still sufficient to justify the assumption that the country will

remain rural and residential rather than industrial for the next two decades.

(c) While there are still parts of Greater London, *e.g.*, the northern Lea Valley or parts of West Middlesex, such as Southall, Hayes or Park Royal, which offer better facilities for transport and factory development, it is unlikely that this sector will be exploited industrially.

(d) The region has a natural protection from industrialisation in its undulating hills and its rural charm, which must enhance its value for residential development. And, although much of the wooded country in the vicinity of Newgate Street and Essenden is coming under the axe of the speculative builder,* it is difficult to imagine that, in an age of town planning and a general awakening to the responsibility of protecting the countryside, factories will be allowed to appear in that quadrangle of country lying between St. Albans, Hertford, Enfield and Barnet.

One ominous influence which may in the course of time affect the dictates of æsthetic judgment referred to in (d) is the construction of the Watford By-Pass and the Barnet By-Pass. The excellent facilities for transport offered by these roads will entirely alter comparative values of land for building and industrial purposes. Already large sections abutting on to these arterial roads are offered for factory development.

* In April, 1932, two large estates near Northaw, Hertfordshire, each over 700 acres, have been sold for building purposes.

SECTION FIVE

THE WESTERN INDUSTRIAL SECTOR OF GREATER LONDON

GENERAL SURVEY OF THE AREA

THE area of Greater London which is here subject to analysis comprises a wedge of country lying between Edgware Road in the north and the Staines Road in the west. If Hyde Park Corner be taken as the apex of a triangle, and lines be drawn from this point to Watford in the north, and Staines in the west, with a further line from Watford to Staines forming the base of the triangle, practically the whole area under consideration will lie within the triangle so formed. The whole of West Middlesex will be included in the area, together with those portions of Hertfordshire and Buckinghamshire immediately adjacent to the Colne Valley.

The area is not homogeneous in its development. As indicated in the first part of this thesis, there is a tendency for zones of industrial growth to alternate with residential areas. There is no ordered arrangement in the distribution of factory sites in West Middlesex. No exception is to be found here to the generally haphazard growth of factories characteristic of industrial growth of other parts of Greater London. Factory sites are dotted somewhat indiscriminately around areas of residential growth, and in too many cases dwelling-houses have been erected in close juxtaposition to factories regardless of the efforts of town planning organisations. Fortunately, in many cases the industries carried on in these factories are clean industries, and their existence, therefore, is less detrimental to the residential population than might otherwise be the case.

There is a wedge of industries in the districts immediately adjacent to London, *i.e.*, in Willesden, Wembley, Hendon,

Acton and Perivale. Collectively, these districts form the apex of the industrial triangle indicated above. From this area of concentrated growth, lines of factories seem to be extending outwards and westwards: (a) from London to Watford; (b) London to Hayes and Slough; and (c) London to Staines. In the districts immediately adjacent to West London, little land now remains for development. But in the parts of the area more remote from London the land is still largely rural and undeveloped, with island sites of residential districts, such as Pinner, Harrow, Northwood, Hillingdon, etc.

THE DISTRIBUTION OF INDUSTRIAL CENTRES IN THE AREA

There is no clear line of demarcation between industrial areas in many parts of West Middlesex; one industrial zone merges almost imperceptibly into another, e.g., the factories of Cricklewood are continuous with those of Hendon; industrial districts in Willesden merge into Park Royal, Perivale and Greenford.

(a) *Edgware Road (Hendon District)*.—There is a stretch of factories established along the Edgware Road from Cricklewood to Colindale. At present factory development seems to have halted at the latter point. The factories are scattered on either side of the main road, grouped somewhat intermittently with shops and houses and with stretches of vacant land. At the Hyde, Colindale, there is a concentration of factories which originated largely through the transfer in 1920 to commercial enterprises of Government buildings erected during the war for aircraft and munitions. The existence of suitable sheds and buildings stimulated industrial development on this site. Most of the other factories along the Edgware Road are recent, i.e., they have been built specially for firms since 1920. This line of factories is served by the L.M.S. line and the electric line to Edgware. The latter offers excellent facilities for the conveyance of passengers, and the ease with which goods can reach the West End or the City by road has caused a number of London factories to migrate to this district.

Until 1928-29 this line of factories was separated from other groups in Wembley by country chiefly under grass, though during the past two years a number of factories have been built along the North Circular Road connecting Brent with Wembley. At the present time these factories lie chiefly along that part of the North Circular Road adjacent to Edgware Road; but with the increase of factories along the North Circular Road the industries of Hendon and Wembley tend to be contiguous. There is much land north of the Brent Reservoir still under grass, but already along the Kenton Road, which runs from the Hyde to Harrow, there is an embryonic settlement of factories a quarter of a mile from the junction of the Edgware Road with the Kenton Road.

(b) *Wembley Factory Area.*—Factory growth here can be arranged in two sections:—

1. A highly concentrated group of factories in the grounds of the Wembley Exhibition.

2. Scattered factories, situated in various parts of the district, such as Ealing Road, Perivale Lane, Honeyport Lane, Lancelot Road and East Lane.

Industrial growth in Wembley is essentially post-war, the largest group of factories in Wembley Exhibition grounds, resulting from the leasing of the grounds to private manufacturing enterprises at the conclusion of the Exhibition.

(c) *Perivale-Greenford Area.*—Contiguous to Wembley on one side, and to Park Royal on the other, is the incipient industrialised area of Perivale and Greenford. The district is still rural, but one or two large factories have appeared since the war. The construction of the arterial road known as the Western Avenue, and the excellent railway facilities offered by the G.W.R. and the electric line, make this district eminently suitable for factory development. The close proximity of the Grand Union Canal is a further factor which is not to be entirely disregarded in considering the transport facilities of the district.

(d) *Park Royal Area.*—The area of the greatest industrial growth is centred in Park Royal. The rapid development of factories in this district is truly remarkable, and it is

doubtful if any other area of Greater London has been so rapidly industrialised. The area covers a stretch of flat country bounded on the north by the Grand Union Canal, on the east by Willesden, on the south by the Great Western and the L.M.S. lines, and on the west by Ealing Road. Prior to 1914 the whole district was practically rural and under grass. Its rise to industrial importance was therefore essentially post-war, and, in common with the Hyde, Hendon, it is largely due to the transfer of land and buildings from the Government services to commercial enterprises in 1920.

The parts in which the most dense development of factories has occurred are : (1) the Great Western Trading Estate ; (2) the Chase Estate ; (3) Victoria Road. Both (1) and (2) were important munition centres during the war. In 1929 only the edges of the Chase Estate had been opened up to factories, but in January, 1931, the greater part of the estate was covered with factories, either completed or in course of erection.

Park Royal offers exceptional facilities for the transport of goods and passengers in that it is served by two branches of the G.W.R., the L.M.S., and an electric line, and a good service of trams and buses which enable workers to be drawn from the thickly populated districts of Willesden and Harlesden. It is connected by a satisfactory service of trains with the Midlands, from which much of the raw material for its industries is obtained. Furthermore, its close proximity to London by road attracts a type of luxury industry for which showrooms and offices have to be located in the West End of London. In 1920 it was the nearest stretch of vacant land to London for potential industrial development, and, apart from the economic impetus derived from the existence of suitable buildings and transport facilities, the development of this district could not have been long retarded.

Although a large part of the land in the Park Royal area has now been turned over to factories, there is still as much as 25 per cent. which is available for further building operations, and one can safely assume that this district may

ultimately prove to be the largest single centre of industrial activity in the south-east of England. In the course of inquiries made from the firms in the vicinity, many of the business men of the locality definitely subscribed to the view that it was "the coming engineering centre of Southern England." In an area covering approximately two square miles, it is estimated that there are at present at least 130 distinct factories in operation, employing between them 18,000 to 19,000 workers. In computing these figures, allowance must be made for the fact that there is, at the time of writing, a trade depression, and that factories, in many cases, are working with a staff which is 50 per cent. below that number which would be required in times of normal trade.

(e) *The Vale, Acton.*—There is a group of factories in the Vale, Acton, of pre-war origin. They do not form part of the post-war migration of industries from London outwards. The larger firms in this district appear to have migrated from London to Acton between the years 1900 and 1908.

(f) *Southall, Norwood and Hayes.*—In Southall and Hayes we see an extension westwards of the line of factory growth which starts in Willesden and Park Royal and continues to Slough. The factories in these districts are partly pre-war and partly post-war. There were a few factories in the district over twenty years ago, but the chief industries in those days were horticulture and brick-making, both of which have now declined very considerably, much of the brick-earth having been used up.

In the recent growth of factories the existence of the Grand Union Canal, good rail and road services, and low rents and rates, have been prominent factors which have induced firms to settle in the neighbourhood. With the general tendency for migration of factories westward in the post-war period, these districts have proved attractive. The valuable belt of brick-earth and loamy soil which runs through Middlesex tended to promote a considerable fruit-growing industry half a century ago, and the existence of four large jam-making firms in West Middlesex is considered to be a legacy of this traditional industry. One of

the firms in question definitely stated that the factory was originally built in the district on account of the fruit-growing which was carried on locally.

Apart from the industries referred to above, the factories are as varied as any of those in other parts of Greater London. It is to be noted that one or two small chemical firms have settled in the district. The Grand Union Canal has been a significant factor in the location of these factories inasmuch as the raw material of the industries is conveyed by water. From inquiries made, however, it would appear that more and more of the raw material is being transported by road or rail. One chemical firm stated that they do not use the canal. Opinions relative to the future of the district are varied. In some cases it is stated that Southall and Hayes should prove attractive districts for future factory development, while in other cases the opinion is expressed that local restrictions placed on the types of industries were driving firms away.

The development of any district for industrial purposes can be advanced or retarded by the action of the local council in adopting either a progressive or a restrictive policy with regard to the erection of factories.

(g) *Chiswick and Brentford*.—In Chiswick and Brentford we again have industrial growth of two types: a pre-war growth of industries and a post-war growth which has developed chiefly along the new arterial roads. There are a number of breweries and bottling establishments which have been established in the locality for over thirty or forty years. The existence of the dock at Brentford, and its connection with the Thames traffic, has left its impress on the industrial development of the district in the existence of such industries as flour mills, cement works, iron foundries, tug repairing shops, chemical works, etc., which are of pre-war origin. Apart from a large factory engaged in the manufacture of boot polish, most of the pre-war firms are small, employing under fifty workers per factory. The majority of the larger factories are of post-war origin.

The post-war factories are established along the Great West Road, yet factory development along this line has only

just commenced, the bulk of the land bordering the Great West Road being still under grass. Factories are being drawn to this area on account of the cheap and rapid transport to and from London, and also on account of the excellent publicity offered by a frontage on the main road. The increasing use of floodlighting at night has emphasised the importance of this fact.*

(h) *Heston and Isleworth*.—There are about fifteen factories in these districts, but with the exception of two of them, they are of pre-war origin. They are generally small firms employing under 100 workers. One exception to this is the case of a large firm of soap manufacturers.

(i) *Staines and Feltham*.—There is an extensive stretch of country lying within the area bounded by a line running through Heston, Cranford, Colnbrook, Staines, Ashford, Hanworth and Twickenham; it comprises the urban districts of Staines and Feltham. The country is still undeveloped and largely under grass. There are two or three factories of recent origin, but, generally speaking, the country has not yet become industrialised, although it would appear that it offers favourable prospects for factory development.

THE ADVANTAGES OF WEST MIDDLESEX FOR INDUSTRIAL PURPOSES

The advantages of this sector of Greater London for industrial development are included in pp. 104 and 105, giving the reasons offered by firms for the choice of their factories. Generally speaking, they are similar to those obtaining in other parts of Greater London.

Transport facilities seem to be the dominating feature of

* It is probable that as floodlighting of factories becomes a cheaper and more popular form of publicity, factory sites along arterial roads in rural areas may be sought after, in view of the very attractive advertisement which is afforded by the contrast of coloured lighting against a dark background. It might be difficult to find any more striking example than that of the floodlighting of the factory of the Firestone Tyre Co. in the Great West Road.

A manufacturer of an article of general consumption which is known to the public is likely to set a higher valuation on the advertisement possibilities of floodlighting than a manufacturer of an industrial product which is not consumed directly by the general public. Moreover, as the factories

the geographical advantages of this area. As already indicated, there are excellent facilities for the transport of goods between the Midlands and London *via* this area ; and this fact has been of some significance in the location of many firms which draw their supplies from the north, *e.g.*, those of motor factories. Further, the area is served by five main lines of railway, and an electrified line which accommodates passengers by a quick service of trains running between London and the outer edges of the area.

The arterial roads bring most of the factories within twenty-five minutes of the West End of London. While main roads leading to London are numerous in this sector and have been adequately increased by the construction of new arterial roads, there is still a marked absence of good roads running north-south or connecting up the various sections of this part of Greater London. The new ring roads, to which a reference has already been made, are an attempt to provide facilities for communication between the different parts of this sector.

The Grand Union Canal has probably drawn a few industries to the area,* but inasmuch as comparatively little use is made of water transport, we must not assume that the extraordinary growth of factories in West Middlesex is to any large degree attributable to canal facilities.

Up to 1919 many parts of the sector were rural and under grass. It naturally followed that the general expansion of industry, which has been going on in Greater London for the past twenty-five years, and accelerated after the war, should find an outlet in this area. In point of time its industrial development is much younger than that of the Lea Valley. Up to 1919 it was the only sector of Greater London within

around Greater London will probably tend more and more to manufacture public-consumers' products, the effect of floodlighting may be to direct factory development along radial lines rather than the creation of satellite industrial towns.

"An extensive field exists for floodlighting of works' exteriors, particularly when they occupy a site adjacent to a main road or railway line. Under these conditions a very striking effect can be obtained for a comparatively small expenditure of energy, due to the darkness of the surroundings affording excellent contrast."—Page 35, "Floodlighting," by the Lighting Service Bureau.

* See p. 33.

a radius of five to seven miles of Charing Cross which was still undeveloped.

As in the case of the Lea Valley, the various opinions

Reasons for the Location of Factory.	Number of Replies.
1. Neighbourhood of London.	
(a) Extension of premises—more space desired	30
(b) Desire to be near London markets	46
(c) Do. do. (foreign firms established in England during 1931-32 in consequence of import tariffs)	22
(d) Cheaper land, cheaper rent and rates	33
	— 131
2. Transport facilities.	
(a) Canal or river	3
(b) Rail facilities	9
(c) Road facilities	17
(d) Nearness to Midlands and yet within easy reach of London	6
	— 35
3. Cheap labour.	
	5
4. Existing buildings.	
(a) Taken over from Government after the war	9
(b) Other suitable buildings already there	29
(c) Do. do. Wembley Exhibition	15
	— 53
5. Other reasons.	
(a) Owner lived near factory	2
(b) Suitable soil, cheap water, or other geographical advantages	5
(c) Open spaces for isolation of work, e.g., dangerous trades	2
(d) Migration from the north of England	2
(e) Dependent on motor industry	7
(f) Healthy atmosphere	15
(g) Publicity of roads, e.g., floodlighting	8
	— 41
6. Unknown reasons, i.e., either unable or unwilling to give reasons.	
	33
	298

offered by firms for the causes leading to the location of their factory, have been listed, and an approximate numerical estimate is given on p. 104. In many cases firms

naturally offered several reasons for the choice of the factory or factory site, and it was sometimes difficult to discover which reason weighed more heavily in their final selection of their factory. The list is therefore only suggestive. The chief reason offered by the firm has determined the selection of the particular category in which the reply has been placed.

Whilst the main reasons for the location of factories in West Middlesex are similar to those received in the case of firms in the Lea Valley, *viz.*, desire for expansion, low rates, cheap land, transport facilities, etc., there are three new elements which enter very largely into the choice of this region for factory development :—

(a) *Relationship with the Midlands.*—The factories are near the G.W.R. and the Grand Union Canal, which give direct and good services for the carriage of goods between London and Birmingham. Many of the firms use raw material or partly manufactured material from the Midlands, *e.g.*, the motor firms.

(b) *The Desire for Healthier or Cleaner Surroundings.*—Although this was not given as the major reason for the location of the factory, 15 firms stated, either in the course of conversation, or through the questionnaire, that a healthy, open environment was desired for their staffs. Several firms attached importance to the psychological influence of more agreeable surroundings on their staffs, and the benefits which could be obtained by the provision of canteens, sports grounds, etc., attached to the works. In one or two cases, firms had noted a reduction in absences of their staffs through ill-health. In the case of industries connected with the manufacture of foodstuffs, cinematograph films, and lenses, it was stated that clean air was essential.

(c) *Close Proximity to the West End Showrooms.*—A "luxury" industry is necessarily a vague expression. The luxury industry of to-day becomes the necessity of to-morrow. But, generally speaking, there are more industries in West Middlesex of the luxury type than in the Lea Valley. The market for the sale of luxury goods is predominantly the

- West End, and in many cases firms stated that their factory must be near their showrooms or shops.

TYPES OF INDUSTRIES

The analysis made of the industries operating in each of the areas enumerated in the following pages indicates the extremely varied nature of the work carried on in these factories and the extensive number of products manufactured. In the course of the survey of the industries of West Middlesex, 298 factories have been studied, *i.e.*, those factories engaged in manufacturing products which satisfy a market other than a local one.

Most of the industries can be grouped under headings similar to those obtaining in the Lea Valley. The grouping has been arranged on the basis of the use to which the finished product is put rather than on the similarity of the raw material used, or the similarity in process of manufacture. In point of fact the nature of the finished product being broadly indicative of the process of manufacture, it follows that the manufacturing processes for articles which are applied to similar uses will vary very little; thus the manufacture of biscuits, chocolates, preserves, patent foods, etc., demands an organisation and *personnel* which are more or less common to all food-producing industries.

Some of the groups of industries can be analysed into a very comprehensive list of smaller groups; *e.g.*, the electrical industries, the motor industry, etc. Generally speaking, the bulk of the industries are engaged in the manufacture of products which are either luxury products, *e.g.*, gramophones, cars, perfumes, or products which are used for the manufacture of other luxury products, *e.g.*, non-splinterable glass, chromium plating, tyres, etc. There is only one industry in which there is a concentration of manufacturing units of any magnitude comparable to the concentration of factories in the north. The motor industry stands apart in the industries of West Middlesex in the sense that there has grown up in this sector of Greater London a complex of

interrelated manufacturing establishments fundamentally dependent on the motor industry.

The Motor Industry (see also pp. 159-161).—It is estimated that at least 20,000 workers are engaged in the assembly, repair and testing of cars, or in the manufacture of motor accessories. The following types of factories are found :—

- (a) Small repair shops.
- (b) Factories for body-building (manufacturing for large firms).
- (c) Factories for the manufacture of accessories, *e.g.*, speedometers.
- (d) Factories for the manufacture of special parts of engines.
- (e) Factories engaged in finishing processes, *e.g.*, chromium plating.
- (f) Repair and service establishments for most of the leading firms.

The migration of the motor industry to this sector of Greater London in the past twenty-five years would appear to be due to the following factors :—

- (a) The facility for communication by road and rail with the Midlands, where the motor chassis is built.
- (b) The location of the chief motor market in the West End of London. Most of the showrooms are only twenty minutes from the factories. It is very important that firms such as coachbuilders should be within easy reach of their clients. Before the advent of the motor car there was a large market for horse-drawn vehicles in the West End of London. Half a century ago, Long Acre and the West End were the centres of the carriage-making industry. Coach-building firms in those days were located in London. With the development of the car and the desire for more space, these firms have migrated outwards and have developed motor body building.

(c) The existence of the motor assembly and coach-building industries has tended to attract all those subsidiary industries which are dependent on the motor trade, *e.g.*, safety glass, sliding roofs, motor outfits, petrol pumps, etc.

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ANALYSIS OF INDUSTRIAL CENTRES IN WEST MIDDLESEX

Edgware Road (Hendon District).—The chief characteristic of factory development in this area is the essentially post-war nature of its growth. Industries and population have increased concurrently in this district in the last two decades, as the following figures indicate :—

Year.	Population.	Number of Factories.
1911 .	38,806	6
1921 .	56,013	16
1931 .	115,682	65

Diagram III. illustrates the nature of this growth and the direction from which the firms have migrated. Generally speaking, they have moved from London. There is a small chocolate factory which is a branch of the main factory in Hull, and a motor factory which has migrated from Huntingdon. Apart from these firms, the others are either new firms or migrations from London.

The factories are distributed through the district in the following groups :—

Group.	Number of Factories.	Number Employed.
Colindale	16	4,120
Edgware and Mill Hill	6	825
Brent Reservoir and Kingsbury	11	1,650
Cricklewood and North Circular Road	32	6,975
		<hr style="width: 50%; margin: 0 auto;"/> 13,570

Some business men consider that in view of the vacant land which is available in this district, the facilities for transport, and the possibility of increased supply of labour, that factories will continue to migrate to Hendon and district. At one time there was a shortage of labour, but it

appears that this will be remedied by the establishment of the L.C.C. Housing Estate at Colindale, which has attracted 20,000 people to this area.

TYPES OF INDUSTRIES

The following list gives the types of industries and the numbers of workers engaged in each industry (not necessarily in each factory, as factories manufacturing similar products have been grouped together) :—

Group.	Type of Product.	Number Employed.
<i>C.</i>	<i>Furniture.</i>	
12	Household furniture	} 600
14	Mattresses	
<i>D.</i>	<i>Electrical Equipment.</i>	
17	Electrical measuring instruments	} 700
19	Wireless sets	
<i>E.</i>	<i>Machinery (not electrical).</i>	
22	Food machinery	} 2,350
26	Acetylene welding	
27	Dies and tools	
27A	Cinematograph machinery	
27B	Telephones	
27C	Fireplaces	
<i>F.</i>	<i>Metals.</i>	
29	Products of iron foundry, e.g., castings, etc.	200
<i>H.</i>	<i>Musical Instruments.</i>	
37	Pianos	} 300
37A	Brass wind instruments	
<i>I.</i>	<i>Foodstuffs.</i>	
38	Chocolates	} 1,050
41	Biscuits and confectionery	

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Group.	Type of Product.	Number Employed.
<i>J.</i>	<i>Chemicals.</i>	
43	Fine chemicals	} 800
46	Cleaning powders and polishes	
49	Chemical apparatus (photographic plates)	
49A	Soap and perfumes	
<i>L.</i>	<i>Motor Products.</i>	
53	Engines	} 4,650
54	Tyres	
56A	Assembly and service	
56B	Body building	
56C	Speedometers	
56D	Sliding roofs	
56E	Outfits for cars	
<i>M.</i>	<i>Household Requisites</i>	
60A	Vacuum cleaners	200
<i>N.</i>	<i>Paper Products.</i>	
62	Paper bags	} 500
63	Bookbinding	
<i>P.</i>	<i>Leather and Derivatives.</i>	
67	Suit cases	100
<i>R.</i>	<i>Containers.</i>	
A1.	Cardboard containers	100
<i>S.</i>	<i>Glass and Derivatives.</i>	
B1.	Plate Glass	} 350
B2.	Lenses	
<i>Z.</i>	<i>Miscellaneous.</i>	
80	Aeroplanes	} 1,325
81	Signs	
82	Artificial limbs	
83	Billiard cues	
84	Razors.	
85	Rawl plugs	
86	Neon lighting equipment	
	Total	13,225

Wembley-Acton-Willesden Area.—The factories in these districts are sufficiently near to one another to justify the treatment of these areas as an economic whole ; there is no geographical justification for separating the analysis of factory growth in each of these districts. Factories are almost contiguous from Willesden Green to Park Royal, Perivale and Wembley. There are two types of industrial development in this part of West Middlesex : (a) scattered factories in various parts of Willesden, many of them having been established before the war ; (b) recent factories erected during the period 1923–32.

(a) A number of factories have been established in various parts of Willesden for the past twenty years ; they are smaller factories and workshops employing under twenty workers, and, as in the case of other districts, such as Tottenham, these factories have become merged into the residential and shopping areas. There are also a number of larger factories which have been in Willesden for many years, such as the works of the British Thomson-Houston Co. Ltd., McVitie and Price Ltd., which indicate the industrial activity of Willesden as far back as 1902. It is true to say, however, that up to 1910 Willesden was largely a dormitory for population finding employment in London, but during and since the war the Cricklewood and Park Royal areas have become industrialised, and a large number of the workers live and work in the vicinity.

(b) Modern factory growth is centred in Park Royal, Perivale, and Wembley Exhibition (the factories in Cricklewood and along the North Circular Road have been included in the Edgware-Hendon Group). Factories have appeared in this area since the war owing to (a) the transfer of Government works and munition factories to private enterprise ; (b) the existence of an important railway centre in Willesden, with its many sidings and facilities for the transport of goods. The L.G.O.C. has two large garages here, and the Metropolitan Railway's generating station and works are on the western boundary of the district. Further, the existence of a large population in Willesden (184,410 in 1931) has attracted industries

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which require large numbers of unskilled male and female workers.

Before 1914 there were only fifteen factories in this area ; to-day there are not less than 140.

Factories are located in groups in the following districts :—

Location.	Number of Factories.	Approximate Number Employed.
Wembley Exhibition	13	1,200
Ealing Road and Greenford	17	5,000
East Lane	3	1,500
Park Royal—		
Victoria Road	28	4,000
Chase Estate	34	4,500
Great Western Estate	5	300
Western Avenue	6	2,500
Cumberland Avenue	10	2,100
} 13,400		
Willesden—		
Hythe Road	3	1,300
Neasden Lane	3	2,500
High Road	3	400
Miscellaneous	10	3,500
} 7,700		
		28,800

TYPES OF INDUSTRIES

The following are the types of industries existing in the Wembley-Park Royal-Willesden area, together with the numbers engaged in each industry :—

Group.	Product Manufactured.	Number Employed.
<i>A.</i>	<i>Stationery and Office Equipment.</i>	
1	Envelopes and account books	} 1,050
4	Pencils and pens	
<i>B.</i>	<i>Clothing.</i>	
6	Collars	} 205
7	Boots and shoes	

Group.	Product Manufactured.	Number Employed.
<i>Furniture.</i>		
C.		
12	Household furniture	} 1,150
14	Spring mattresses	
14A	Furniture for railway carriages	
<i>Electrical Equipment.</i>		
D.		
15	Miscellaneous (e.g., switches, bulbs, special fittings, etc.)	} 5,350
20	Insulators and condensers	
19	Wireless sets	
21A	Electric fires	
<i>Machinery (not electrical).</i>		
E.		
22	Machine tools and dies	} 2,500
27	Food machinery	
27D	Specialised machinery—	
	Timber-cutting machines	
	Magnets for stationary engines	
	Special thread bolts	
	Pneumatic machinery	
	Steam and air meters	
	Dynamoes	
	Machinery for dairies	
27A	Cinematograph machinery	
27E	Refrigerating machinery	
<i>Metals.</i>		
F.		
28	Metal casements	} 1,380
29	Castings	
31	Refined metals	
32	Tin foils	
33A	Metal bearings	
<i>Cables, Wires, Tubing.</i>		
G.		
35	Cables and wires	100
<i>Musical Instruments.</i>		
H.		
36	Gramophones	} 500
37B	Organs	

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Group.	Product Manufactured,	Number Employed.
<i>I.</i>	<i>Foodstuffs.</i>	
4I	Biscuits	} 6,050
42A	Patent Foods—	
	Virol	
	Spearmint	
	Carltona custard	
	Therapeutic foods	
	Potted meats	
	Cocoa (blending)	
	Sauces, etc.	
<i>J.</i>	<i>Chemicals.</i>	
46	Polish	} 1,800
48	Paint and varnish	
49	Photographic material	
49B	Medicines—	
	Oxygen	
	Tooth paste	
	Vaseline	
49C	Salt	
49D	Perfume and face powder	
49E	Miscellaneous	
<i>L.</i>	<i>Motor Industry.</i>	
55	Safety glass	} 5,150
56A	Service stations and assembly	
56E	Miscellaneous equipment for cars, <i>e.g.</i> , valves, brakes, bumpers, etc.	
56B	Coachbuilding	
56F	Petrol pumps	
<i>N.</i>	<i>Paper Products.</i>	
62	Paper bags	} 2,530
63	Bookbinding	
63A	Waxed paper, etc.	
63B	Wallpaper	
63C	Music printing	
<i>O.</i>	<i>Sports Goods and Toys.</i>	
64	Toys and games	} 100
65	Tennis rackets, etc.	

36 *INDUSTRIES OF GREATER LONDON*

Group.	Product Manufactured.	Number Employed.
<i>P.</i>	<i>Leather Goods.</i>	
67	Suit cases	} 200
67A	Belting for machinery	
<i>Q.</i>	<i>Rubber Products.</i>	
70A	Waterproof material	} 200
70B	Miscellaneous	
<i>S.</i>	<i>Glass, Bottles and Containers.</i>	
B3	Glass bottles.	} 1,000
B2	Lenses.	
B4	Containers	
<i>Z.</i>	<i>Miscellaneous.</i>	
87	Pipes	} 400
88	Sporting rifles	
89	Maps	
90	Caps for bottles	
91	Down quilts	
	Total	29,665

The Vale, Acton.—There is an area of industrial growth in the Vale, Acton, which is unrelated to the area analysed in the Wembley-Park Royal-Willesden districts, in the sense that the group of factories in the Vale consists mainly of pre-war manufacturing establishments. The following are the chief industries :—

Group.	Industry.	Number Employed.
<i>D.</i>	<i>Electrical Equipment.</i>	
21A	Electric fires and other heating equipment	50
<i>H.</i>	<i>Musical Instruments.</i>	
37	Pianos	} 250
37B	Organs.	
37C	Music engravers	

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Group.	Industry.	Number Employed.
<i>I.</i>	<i>Foodstuffs.</i>	
4I	Bread and biscuits	200
<i>J.</i>	<i>Chemicals.</i>	
49D	Perfumes	} 1,300
49F	Dyers and cleaners	
<i>L.</i>	<i>Motor Industry.</i>	
54	Engines	} 5,400
56A	Service and assembly	
56B	Coachbuilding	
56E	Miscellaneous, <i>e.g.</i> , starting equipment, carburettors	
<i>Z.</i>	<i>Miscellaneous.</i>	
92	Swords and razors.	} 320
93	Lithographic products	
	Total	7,520

In common with other districts of West Middlesex, the most important industry here is the motor industry, employing nearly 80 per cent. of the workers in the district. Apart from one large motor assembling and service factory, the seven largest factories, employing between them 6,000 workers, are all pre-war firms, having started in the district between the years 1900 and 1908. The reasons offered by these firms for the location of their factories are similar to those offered by firms in other parts of London, *viz.*, the desire to find space outside Central London for the erection of a larger factory.

Southall-Hayes Districts.—Industrial development in these districts dates from about the year 1910. Up to that year there were about eight or nine manufacturing firms located in these districts; after that date there was a considerable increase until 1914, and then a more gradual increase until 1922, with an accelerated growth from 1922 to 1928. There appears to have been less industrial activity in these districts

from 1928-31 than in other parts, such as Slough, Park Royal, Hendon, etc. Diagram IV. indicates the nature of this growth.

As in other districts, the firms are either migrations from London or are newly established concerns. In two cases only there is evidence of migration from the north ; one, a firm manufacturing preserves, and the other an oil refining concern. Both are more or less "assembly" industries, established in the south to meet the needs of customers resident in the south of England. It is estimated that approximately thirty firms are engaged in production, and employ between them 13,000 to 14,000 workers.

The varied nature of the products manufactured in these districts is evidenced by the list of industries on p. 99. From this list it will be noticed that musical instruments, motor buses, preserves and other food products are the most important manufactures.

The importance of the district as a factory area is indicated by the location of the two well-known firms—the Gramophone Co. Ltd. and the Associated Equipment Co. The district offers two contributions towards industrial development : (a) good transport services by rail and canal ; (b) the existence of a local fruit-growing industry.

The reasons given by firms for the choice of these districts for factory development were similar to those offered in other localities, viz., cheap land suitable for factory extension, nearness to London, etc.*

The raw material used in the district consists of metals (copper, brass, steel), metal plates, castings, timber, coal, sugar, fruit and partly finished equipment for assembly. Timber, coal and sugar are conveyed by barge from Brentford Dock ; metals and castings are conveyed by rail or road from the Midlands.

For such industries as musical instruments (pianos,

* One disadvantage of the region for industrial development is the lack of suitable housing accommodation for workers. "Out of 14 firms interviewed in the Greenford-Hayes-Slough districts, no less than 11 laid special emphasis on the need for more housing accommodation."—P. 6, "Interim Report on Decentralisation," by the Greater London Planning Committee.

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gramophones, etc.) many of the parts, such as the actions and keys for pianos are manufactured by specialist firms in London and supplied to Southall firms as complete units. The iron frame is supplied as a finished article, while the remainder of the components, such as steel strings, copper strings, hinges, screws, polish, etc., are manufactured in other districts.

LIST OF INDUSTRIES IN SOUTHALL AND HAYES

Group.	Industry.	Number employed.
<i>A.</i>	<i>Office Requisites.</i>	
1	Stationery, postage stamps, etc.	400
<i>B.</i>	<i>Clothing.</i>	
7	Hosiery	200
<i>C.</i>	<i>Furniture.</i>	
12	Household	400
<i>D.</i>	<i>Electrical Equipment.</i>	
15	Miscellaneous	300
<i>E.</i>	<i>Machinery (not electrical).</i>	
27F	Well-boring plant	} 150
27G	Miscellaneous (General Engineering Products)	
<i>F.</i>	<i>Metals.</i>	
29	Iron foundry products	} 180
33B	Wire baskets	
<i>H.</i>	<i>Musical Instruments.</i>	
36	Gramophones	6,000
<i>I.</i>	<i>Foodstuffs.</i>	
38	Cocoa and chocolates	} 2,630
42B	Jam and other preserves	
42C	Cheese	
42A	Patent foods.	
		250

Group.	Industry.	Number Employed.
	<i>Chemicals.</i>	
J.		
43	Fine	} 270
49E	Miscellaneous—	
	Acids	
	Chemical research	
	Dyes	
K.	<i>Building Materials.</i>	
52	Concrete mouldings	150
L.	<i>Motors.</i>	
56B	Coachbuilding—buses	} 2,700
56E	Motor oil	
Z.	<i>Miscellaneous.</i>	
94	Caravans	} 500
95	Crown cork stoppers	
96	Metal tubes for paste	
	Total	14,130

Chiswick-Brentford-Staines.—The stretch of Greater London extending from Chiswick to Staines is partly residential and partly industrial. The area in question comprises the urban districts of Chiswick, Brentford, Heston and Isleworth, Feltham and Staines.

There are two types of industrial growth: (a) a nucleus of factories in Chiswick, Brentford and Heston, dating back to the pre-war period, many of which originated about the year 1900; (b) a recent growth dating from the beginning of the post-war period. The construction of the Great West Road (A.30) has tended to promote the extension of factories westwards towards Staines, and the most recent factories are erected along this arterial road.

The earlier industries, *i.e.*, those established prior to the war period, were drawn to these districts owing to the cheap land which was then available, and to the existence of good transport facilities offered by the Thames and the Brentford

THE WESTERN INDUSTRIAL SECTOR 101

Dock. The existence of such industries as timber works, small chemical manufactures, breweries, tug repairing, milling, etc., is primarily due to the facilities offered for transhipment at the Brentford Dock.* In recent years road transport has become a more important factor than water transport, and has dictated the location of new factory sites.

If 1914 be taken as the dividing line between the earlier pre-war factories and the more recently erected factories, then we find the following allocation of factories as between the two periods of development :—

	Old Factories.	New Factories.
Chiswick . . .	4	2
Brentford . . .	5	23
Heston . . .	9	4
Feltham . . .	1	2
Staines . . .	1	1

Generally speaking, the older established factories are located in Heston and Isleworth, while the newer ones are situated in Brentford.

THE RATE OF GROWTH OF FACTORIES IN THE AREA

The rate of increase of factories in this region was fairly constant until 1920. From that period until 1926 there was a slightly accelerated rate of growth, and from 1920 the growth is more in conformity with that found in Park Royal, Hendon, etc. Diagram V. illustrates the nature of this growth and tends to show that the dominating influence which has led to increased factory development in this region is the new Great West Road rather than any other inherent economic advantage of the region.

* It has been stated by several firms that if more wharfage for light cargo boats were provided along the river, it would relieve the City and make Brentford almost a river port for the west of London.

TYPES OF INDUSTRIES

There are no special industries which are characteristic of the area, the same extremely varied types being found here as in other districts examined.

Group.	Industry.	Number Employed.
<i>B.</i>	<i>Clothing.</i>	
6	Swimming suits	200
<i>D.</i>	<i>Electrical Equipment.</i>	
20	Insulators	70
<i>E.</i>	<i>Machinery.</i>	
27D	Specialised machinery—	
	Naval instruments	} 400
	Marine engines	
	Water softeners	
<i>F.</i>	<i>Metals.</i>	
29	Foundry products	100
<i>I.</i>	<i>Foodstuffs.</i>	
39	Flour	} 2,100
41	Biscuits	
	Confectionery	
42	Miscellaneous—	
	Wine	
	Potato crisps	
<i>H.</i>	<i>Musical Instruments.</i>	
37	Pianos	30
<i>J.</i>	<i>Chemicals.</i>	
41	Soap	} 2,450
48	Paint	
46	Polish	
49B	Medicines	
49E	Miscellaneous—	
	Graphite	
	Yeast	
	Celluloid	
	Asbestos	

THE WESTERN INDUSTRIAL SECTOR 103

Group.	Industry.	Number Employed.
<i>K.</i>	<i>Building Materials.</i>	
52	Concrete mouldings	} 220
	Reinforced concrete	
<i>L.</i>	<i>Motor Industry.</i>	
54	Tyres	} 1,800
56B	Coachbuilding	
56A	Service stations	
<i>M.</i>	<i>Household Goods.</i>	
59	Floor coverings, linoleum	1,300
<i>N.</i>	<i>Paper Products.</i>	
63A	Paper (parchment)	} 180
62	Paper bags and containers	
<i>Z.</i>	<i>Miscellaneous.</i>	
97	Fire extinguishers	} 2,500
98	Packing cases	
99	Lubricators	
100	Ventilating ducts	
101	Gyroscopes	
102	Tramcar bodies	
	Total	11,350

As in other districts, there would not appear to be a need for the local production of raw materials, which are as varied as the products manufactured. Malt, coal, cement and grain are imported by barge from London Docks, together with small quantities of sand, gravel and clay. Coconut oil, palm oil, tallow, graphite, salt, resin are required for the chemical industries, and are imported *via* London Docks. Metals and machinery are obtained by rail and road from the Midlands, comprising aluminium, brass and bronze castings, sheet metal, rolled steel, asbestos, car fittings, chassis, etc.

GENERAL CHARACTERISTICS OF THE INDUSTRIES OF
WEST MIDDLESEX

1. In common with the industries of the Lea Valley, the industries of West Middlesex consist of the manufacture of products in which organisation and labour play a more important part than the value and bulk of the raw materials used. The raw materials required for each factory can, in most cases, be conveyed by lorries, and the finished products can be despatched equally easily by rail or road.

The industries are of a type which would normally tend to grow up near a large town, *i.e.*, they supply the immediate needs of a large public, rather than manufacture for middlemen or other manufacturers.

2. From inquiries made in many of the factories, it would appear that the majority of firms manufacture for export as well as for the home trade, and the facilities for conveying their finished products to London Docks for export is an important factor in the location of the factory near London. Communication with the London Docks *via* the Thames is an additional advantage.

3. The industries are "clean" industries, *i.e.*, they are generally free from any obnoxious by-products. The factories are invariably installed with electric power, and the materials used in the process of manufacture, together with the finished products, are comparatively clean. The building regulations in some districts, *e.g.*, Wembley, have imposed this regulation on factory development. The fact that electric power is used in the majority of the factories is an indication of the contrast of the industries in Greater London with those of the industrial north (*cf.* heavy iron and steel, chemical and similar industries).

4. The bulk of the factories are engaged in the manufacture of products in which the assembling of small parts by unskilled workers (mostly female), plays an important part. In several cases, *e.g.*, the manufacture of chewing gum or ice-making machinery, the raw materials or the parts required are imported from abroad and assembled in the factory.

5. The manufacture of proprietary articles is a dominating type of industry. A very large number of firms, whose names are household words, have built their factories in this sector of Greater London. We are living in a time which might be described as a "synthetic" period, in which so many of the products which enter into our daily lives are the result of chemical or scientific research; food products especially are becoming more and more artificially created chemical products of the factory, witness the growth of proprietary foodstuffs in the last decade. These products are more economically manufactured and distributed near to large towns than in places near to the raw material. Nearness to the consumer seems to be the dominating control over the location of factories of this type.

6. As in the Lea Valley, there are no industries which can be regarded as competitive with the traditional industries of the Midlands or the north of England. Inasmuch as industry is tending to become more and more specialised, with the resulting increase in branded articles, we shall probably find that factories similar to those now established in this sector of Greater London will grow at a greater rate than the older heavier industries, such as iron and steel, chemicals, textiles, etc.

7. If the size of the industries be compared (judged by the numbers engaged), then the following four largest industries absorb approximately 60 per cent. of the total number of workers engaged in manufacturing processes in this sector of London:—

(a) The motor industry	. . .	20,000
(b) Foodstuffs	. . .	10,000
(c) Electric equipment	. . .	8,000
(d) Musical instruments	. . .	7,500

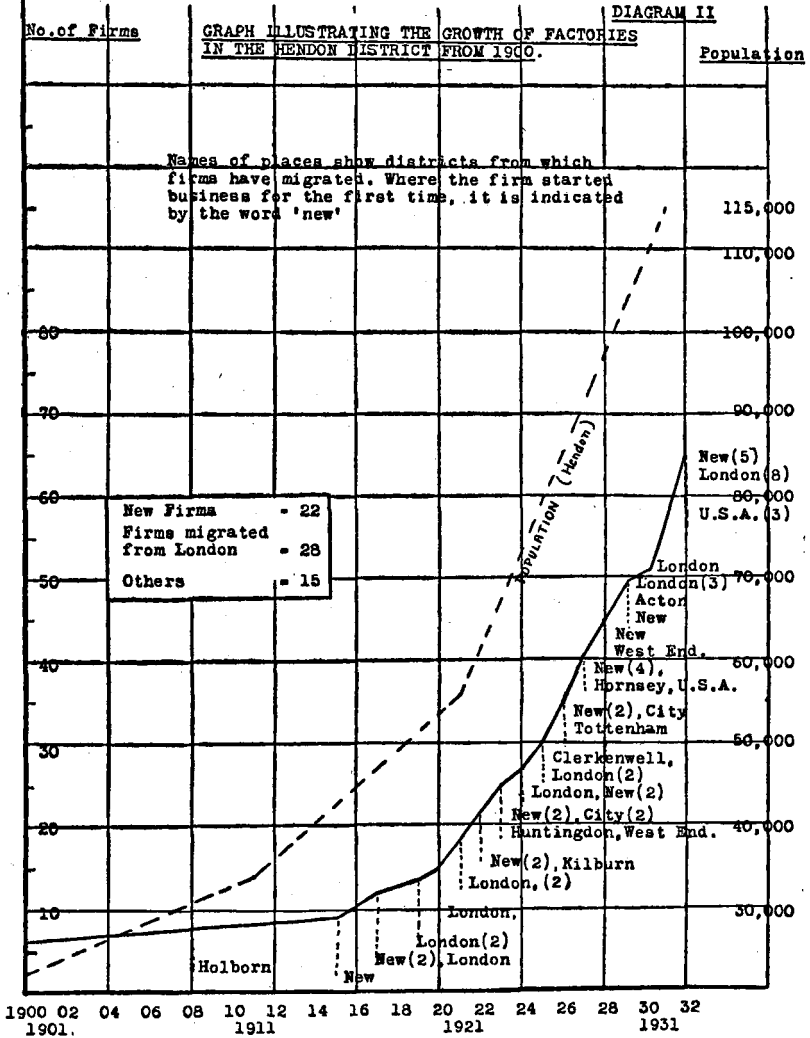
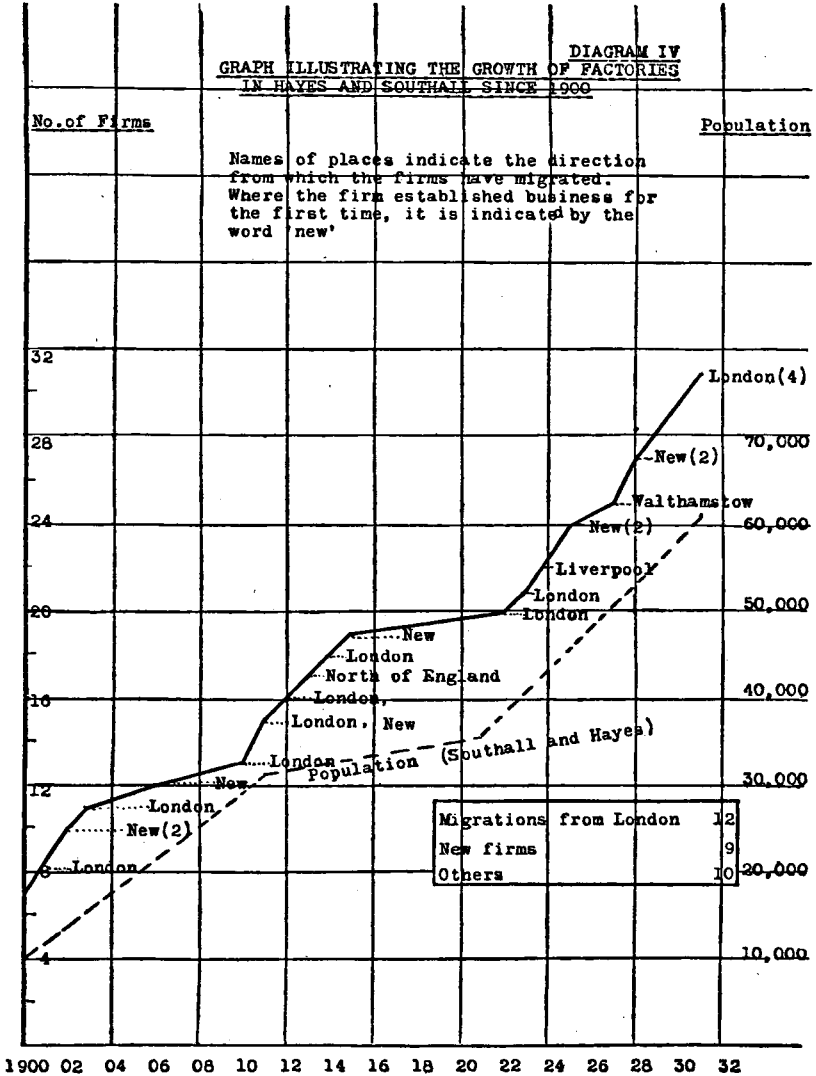


DIAGRAM IV
 GRAPH ILLUSTRATING THE GROWTH OF FACTORIES
 IN HAYES AND SOUTHALL SINCE 1900



SECTION SIX

THE INDUSTRIES OF OUTLYING DISTRICTS, *e.g.*, SLOUGH, UXBRIDGE, WATFORD, ST. ALBANS AND WELWYN

IN limiting the scope of this thesis it was decided to fix the Colne Valley as the western boundary of the region of study. It remains, therefore, to analyse the industrial growth, if any, of those towns which lie within the valley of the Colne, or sufficiently near to the Colne to warrant inclusion in this survey.

In a sense, the industries of such places as Slough, Uxbridge, Watford, etc., might be included in the survey of the industries of the western sector of Greater London ; but inasmuch as each of these towns has grown up under separate economic conditions, not related to the general growth characteristic of such districts as Wembley, Southall, Perivale, Acton, etc., it is advisable to consider their industries separately. Moreover, factory development has not yet spread out so far from London as to exhibit a continuous industrial growth from the metropolis to each of these points ; the latter have not yet become merged into Greater London, and, in a sense, are still separate economic entities so far as industrial growth is concerned. At the present time they are rather in the nature of satellite industrial groups serving the London area than extensions of the star-shaped excrescences of industrial growth which have already been examined.

SLOUGH

Factory development in Slough has assumed two forms :—

- (a) A small concentration of industries which have grown up in the district, many of which are of pre-war

origin, and are not connected with the Slough Trading Estate.

(b) A large concentration of industries due to the post-war development of the Slough Trading Estate. It is owing to the creation of this factory estate that Slough figures so largely as an industrial centre, and warrants separate treatment.

(a) In the town of Slough there are seven firms engaged in manufacturing products of a non-local nature. Such products are :—

1. Patent medicines.
2. Paint and varnish.
3. Malted milk products.
4. Wireless apparatus.
5. General engineering products.

It is probable that between 2,000 and 2,500 workers are engaged in these industries at the present time. In three cases firms have migrated from London, or Greater London, and the desire for more space for factory development attracted the firms to Slough. The good rail facilities, with suitable services for the conveyance of goods to and from London Docks, are further advantages of the district. Three of these firms were established between 1906 and 1908, the remainder having settled in Slough after 1918.

In common with industries of Greater London these factories are engaged in manufacturing commodities which can be easily transported, and in which the quantity of raw material required is small, and can be easily conveyed by rail or road. Such raw materials are oils, resins, solvents, pigments, grain, milk, timber, bottles, packing materials, metals, *e.g.*, brass tubing, steel rods, ebonite, small manufactured parts, etc. There does not seem to be sufficient collective demand for any one type of raw material to justify the erection of a factory for its manufacture.

(b) The post-war development of the Slough Trading Estate is by far the most important single industrial growth which has developed in the whole of the region under examination, with the exception of the Park Royal area,

INDUSTRIES OF SLOUGH, UXBRIDGE, ETC. 115

which, strictly speaking, includes a number of industrial sites.

The Slough Trading Estate was taken over as a commercial enterprise from the Government in 1920. During the war, buildings were erected on the site for the manufacture of munitions. In 1920 there were available for commercial enterprise the requisites for factory growth, *viz.*, good buildings, local labour, transport facilities, etc. With the expansion of manufacturing industries from London outwards during the post-war period it was natural that this area should become attractive.

The estate comprises 380 acres of land, twenty-two miles from London. It is served by the G.W.R., which supplies a good service of trains from Paddington to the estate. Workers can therefore be easily conveyed to and from London, the train journey occupying half an hour. By road it takes just under an hour. At the present time it is estimated that there are approximately 12,000 workers engaged in the factories on this estate. Not all of these firms are necessarily engaged in the production of commodities which enter into national or international trade. Many are engaged in estate development work, *e.g.*, buildings, railways, banks, restaurants, etc. Of the 146 firms operating on the estate, 111 are manufacturers of products of the nature described above, and employ between them approximately 10,000 workers.

It is considered that it will be fifteen to twenty years before the estate is fully developed. It is therefore safe to assume that as many as 20,000 workers may ultimately be accommodated on the estate. It is likely, therefore, to become an industrial area equal in importance to the Lea Valley or the Park Royal district. All these firms have become established on the estate since 1920, but the greatest increase in factories has occurred during the years 1930-32, when forty-six new factories have been built and occupied by firms which are largely of foreign origin.

The reasons for the growth of factories in Slough can be considered under two headings : (a) those common to Slough in general ; (b) those special to the Trading Estate. The

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latter reasons have been indicated above. The advantages of factory development in Slough in general are :—

- (a) Clean air ; fairly free from fogs in winter.
- (b) Nearness to London by road and rail, and to London Docks.
- (c) Good services of trains, both freight and passenger.
- (d) Much undeveloped land—hence cheap rents and rates.

The following types of products are manufactured by firms on the estate :—

Group.	Industry.	Number Employed.
<i>B.</i>	<i>Clothing and Textiles.</i>	
11A	Lace	} 250
11B	Silk ribbons	
9	Gowns	
<i>C.</i>	<i>Furniture.</i>	
12	Household	450
<i>D.</i>	<i>Electrical Equipment.</i>	
16	Batteries	} 570
17	Electric medical apparatus	
21A	Electric fires and fans	
19	Wireless sets	
<i>E.</i>	<i>Machinery (not electrical).</i>	
27D	Compositing machinery	} 380
	Bottle-washing machinery	
	Drills	
	Geysers	
	Water-softening machinery	
<i>F.</i>	<i>Metals.</i>	
22	Tin and lead foils	} 280
31	High duty alloys	
29	Foundry products	
33C	Nails	
<i>G.</i>	<i>Cables, Wire, etc.</i>	
35	Cables	} 350
34	Flexible tubing	
<i>H.</i>	<i>Musical Instruments.</i>	
36	Gramophones	500

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Group.	Industry.	Number Employed.
<i>I.</i>	<i>Foodstuffs.</i>	
41	Biscuits, etc.	} 950
42A	Margarine	
	Orange squash	
	Chewing gum	
42B	Jam	
<i>J.</i>	<i>Chemicals.</i>	
44	Soap	} 520
48	Paint and varnish.	
49E	Miscellaneous synthetic resins.	
49F	Dyers and cleaners	
49D	Perfumes	
49B	Menthol	
	Aspros	
<i>K.</i>	<i>Building Materials.</i>	
50	Plywood	} 150
	Shop fittings.	
<i>L.</i>	<i>Motor Industry.</i>	
56E	Sliding roofs	} 1,250
	Piston rings	
56	Petrol pumps	
56B	Lorries and cars	
55	Safety glass	
<i>M.</i>	<i>Household Products.</i>	
60A	Mops	120
<i>S.</i>	<i>Glass Bottles and Containers.</i>	
B4	Containers, cartons	} 350
	Cans and tins	
<i>Z.</i>	<i>Miscellaneous.</i>	
84	Razors.	} 900
103	Surgical dressings	
104	Celluloid goods	
105	Toilet requisites	
106	Figures for corsets.	
	Total	7,020

THE INDUSTRIES OF WATFORD

Transport facilities seem to have been the dominating cause contributing to the growth of factories in Watford. In the case of practically all the firms visited in this town, the main reason offered for the location of the factory was the existence of a good service of trains connecting Watford with the Midlands and with London. The recent construction of the Watford by-pass road has quickened road transport between the neighbourhood of Watford and London. In one or two cases clean air and healthy surroundings appear to have attracted firms to the district. In one large firm of colour printers the clean atmosphere and the light determined the location of the factory.

The following are the chief industries in Watford :—

(a) Bookbinding and Printing.

1. A large firm of bookbinders moved here from Islington in 1925. The firm desired larger premises and found a convenient factory in buildings formerly used by the Government for munitions. A smaller firm, engaged on similar work, was also drawn to the district on account of existing buildings which proved suitable to their requirements.

2. A large firm of printers moved to Watford in 1916 on account of suitable buildings being available at a favourable price. It appears that the buildings were formerly used by a firm engaged in printing.

3. The manufacture of colour blocks for the printing trade has been carried on in the locality for thirty-five years.

Approximately 1,500 workers are engaged in these three types of bookbinding and printing industries.

(b) Machinery.

1. A firm has been located in Watford since 1905 engaged in the manufacture of speedometers. This firm migrated from Soho.

2. A small firm produces paper-making machinery, having been in the locality for a number of years.

3. A firm manufacturing automatic control switchgear started in Watford in 1910.

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Collectively, these firms employ approximately 700 workers.

(c) *Miscellaneous.*

1. Rubber Hose.—The largest manufacturers of rubber hose in England are located in Watford. The firm was established in England for the first time in 1929, and is located here on account of transport facilities to all parts of England, and its accessibility to London Docks for export. The firm took over an existing building which was suitable to its requirements. The building had formerly been used for the manufacture of sweets and confectionery.

2. Leather Products.—Two firms are engaged in the manufacture of leather for clothing. They moved from Bermondsey in 1925. In Bermondsey, the home of the leather industry, there is no room for expansion, and firms are therefore tending to migrate to other districts. Good transport facilities seem to have been an important feature in the choice of the particular site.

Approximately 500 workers are engaged in this industry.

There are a number of smaller factories employing from fifty to sixty workers in each factory, engaged in the following industries :—

- (a) Machinery for building trade.
- (b) Sensitised paper for photographic trades.
- (c) Buttons.
- (d) Batteries.
- (e) Food products.
- (f) Motor lorries.

It is considered that about 3,000 workers are engaged in factories which manufacture products of a national or international nature. The factories are scattered widely throughout the town; there appears to be no definite section of the town which has developed along industrial lines. Watford is mainly residential, and it would appear from inquiries made in the district that, in the interests of the growing residential population, the growth of further

factories will be watched very carefully. There is much land in the neighbourhood which would be suitable for factory development. The responsible officials of two industrial firms expressed the view that Watford had considerable possibilities as a growing industrial district in view of the advantages already enumerated and the existence of an increasing labour pool. It is interesting to note that in February, 1930, Watford was practically the only town in Great Britain in which there was no unemployment.

At the present time, however, the concentration of factories is not sufficiently great to warrant the view that the future of the district lies along industrial lines. The population of Watford has risen from 45,000 in 1921 to 60,000 in 1931, an increase of one-third. Only 3,000 of these are engaged in manufacturing industries. It rather suggests therefore, that the increasing residential population is growing at a greater rate than local industries.

Of the firms engaged in industry in Watford, about half of them have migrated from London, and of these the bulk appear to have moved to Watford since the war. It can therefore be assumed that the migration of factories outwards from London has reached as far as Watford.

THE INDUSTRIES OF ST. ALBANS

The city of St. Albans has developed along residential, rather than industrial lines, although it appears there has been some industrial activity in the district from the latter part of the nineteenth century. Two branches of industry which have existed in St. Albans for many years are the manufacture of hats and the printing industry. As in the case of Luton, the hat industry became concentrated in the district in consequence of the fact that the straw plaiting industry was formerly carried on in the vicinity, due largely to the local supply of suitable wheat. The manufacture of hats has, however, declined in St. Albans. Forty years ago there was considerable activity in this industry; to-day

there are only three small firms manufacturing felt hats and none manufacturing straw hats.* The number engaged in the hat industry does not exceed 350 to 400. Three of these firms are old-established local firms ; one is a new foreign firm which set up a small factory two years ago.

The printing industry appears to have derived an economic impetus from the fact that the trade here is not hampered with the exacting restrictions of trade unions obtaining in London. It is more economical for a firm to have their factory some distance out of London, and yet within an hour's distance of the City by road. But this is an economic stimulus which is not special to St. Albans. Printing firms are probably more widely distributed in the home counties than any other firms (*cf.* Watford). It is estimated that about 800 workers are engaged in this industry in St. Albans. They are local firms which have grown to considerable dimensions in the course of time, as they acquired contracts for printing for London Houses. There is no evidence of migration from London.

In addition to these industries there are a number of factories engaged in the manufacture of the following products: raincoats, boots and shoes, hosiery, animal fats, *e.g.*, suet, electric equipment, cardboard boxes, brushes, ribbons, rubber waste products.

It is estimated that the industries of St. Albans give employment to about 2,500 workers. From information received from the heads of one or two firms it would appear that these industries have always been sufficient to absorb local labour, and that supply and demand for this type of labour (largely female), has been more or less equated. There is no evidence of much growth of industry. Whilst newer industries, *e.g.*, hosiery and electrical equipment, have appeared in recent years, they have taken the place of the declining hat industry, so that it is probably true to say that

* The decline in the straw hat industry is common both to St. Albans and Luton. Before the war, these two towns were the largest centres for the manufacture of straw hats in Great Britain. Two factors contributed to the decline of the industry: (a) the falling off in the demand for straw hats; (b) the importation of cheap felts from France, Czecho-Slovakia and Italy which have been substituted for straw hats.

the numbers engaged prior to 1914 differed very little from those engaged in St. Albans to-day.

St. Albans does not yet seem to have been appreciably affected by the outward migration of London's industries. It would appear that there are few cases of firms having recently migrated to St. Albans from London or any other part of England. The industries which exist are the result of the normal growth of smaller industries which have existed in the town for a number of years. There are no outstanding large manufacturing establishments. In some cases there has been a change over in the type of product manufactured by some of the firms, *e.g.*, the transition from the manufacture of candles to suet,* from straw hats to cardboard boxes and containers. These are cases of the adaptation of their works by old manufacturing firms to supply new products as the demand for former manufactures has disappeared.

Whilst there is much land in the neighbourhood which could be used for factory development, it is considered that the residential nature of the district, fostered by interesting historical associations, will control its future development, and that the growth of factories (as in the case of Watford), will be carefully watched.

THE INDUSTRIES OF UXBRIDGE AND YIEWSLEY

The industries of these districts can be grouped under two headings: (a) extractive, (b) manufacturing.

(a) The extractive industries consist of the following:—

1. Brickmaking.
2. The nursery industry.
3. Market gardening (vegetables).

The brickmaking industry originated through the existence of the stretch of brick-earth to which reference has been made in Section II. It appears that brickmaking is declining in this part of Greater London, the bulk of the brick-earth having been removed.

* Wiles & Lewis stated that they manufactured tallow candles over 100 years ago. Out of this industry grew the manufacture of wax candles, and finally food products.

The nursery industry started in the locality in 1864. According to the opinion of the head of the most important firm of nurserymen, there does not appear to have been any special reason for the original location of greenhouses. The original founder of the industry happened to live in the district. But it is probable that the same economic conditions which apply to the Lea Valley have operated to stimulate the industry in West Middlesex, *viz.*, nearness to London and suitable soil. According to estimates furnished by the leading firm, the industry employs a minimum of 2,000 in the busy season (*cf.* 6,000 in the Lea Valley).

A very large section of the country round Yiewsley, Harmondsworth, Harlington and Colnbrook is devoted to the growing of fresh vegetables for the London market. Here, again, nearness to the market is the dominating control of the industry rather than any special conditions of soil and climate.

(b) The manufacturing industries of Uxbridge, Yiewsley and West Drayton are largely local industries which have grown up from small firms. There seems little evidence of migration of firms from any other district. The following industries are carried on in these localities:—

1. *The Manufacture of Photographic Materials.*—It is an old-established firm which has grown up in the district, and there does not appear to be any special economic or geographic reason for its location.

2. *Machine-cut Gearing.*—This firm has grown up in the vicinity. There were no special reasons for its situation in Yiewsley.

3. *Wax Polish.*—Two small firms are engaged in the manufacture of wax polish, wood stain, etc. They have been in the district for many years, but originally moved from London.

4. *Concrete Pipes and Allied Products.*—The firm moved from Esher in 1925.

5. *Waste Food Products.*—The making of pig's swill from waste products obtained from hotels is carried on along the banks of the Union Canal. It has been located here for many years and there appears to be no special reason for its

existing situation beyond the fact that it is an industry which avoids residential areas, and relies on canal transport.

6. *Measuring Instruments*.—A small firm is engaged in the manufacture of measuring instruments ; it has grown up in the locality.

Three firms have opened factories recently in Yiewsley :—

(a) A firm engaged in the manufacture of lacquers and engineering packing. It migrated from Brockley in 1930 on account of the necessity of finding suitable factory land in view of the dangerous nature of the industry.

(b) A new firm manufacturing a textile fabric from ramie grass at present imported from China. The firm took over disused sheds and converted them to their own use.

(c) A screw-manufacturing firm. It is a local firm which has grown up in the locality.

In the town of Uxbridge there is little evidence of any recent industrialisation. There is a small firm engaged in the manufacture of welded steel machine parts, steel tanks, barrels, drums, etc. It was established in 1897 in Uxbridge, owing to the nearness to the London market and to good transport facilities.

There are two small printing firms, a factory for the manufacture of glucose, an old-established firm of flour millers, together with the nursery firms to which reference has already been made.

Lying between Uxbridge and Staines there is a wide extent of country which is undeveloped, and is suggestive of a large potential factory area. It is considered by the heads of some of the industrial concerns in West Middlesex that the growth of factories already well established in Hayes, Southall and Slough will ultimately extend to the stretches of vacant land in West Drayton, Harmondsworth and the surrounding districts.* This section of country is served by a branch of the G.W.R. from Yiewsley to Staines and by a good main road to London (A.4) passing through Colnbrook and Cranford. Local roads, however, need improvement if the district is to develop industrially. Land is plentiful and is cheaper than many other districts in West Middlesex, and

* Three factories have appeared in Harlington since January, 1930.

there is a good supply of female labour in winter owing to surplus labour, which is then lying idle from the market-gardening industry. In summer there is a labour shortage.

THE INDUSTRIES OF WELWYN

The district of Welwyn lies within the belt of glacial gravels which cover the floor of the Vale of St. Albans. Geographically it is within the boundary formed by the Lea-Colne depression, and therefore warrants consideration in this thesis. Lying on the River Maran, tributary of the Lea, it occupies a position in the valley which has been cut by the Maran through the chalk uplands which rise on either side to 400 feet in places. It is probable that the district of Welwyn would have had no place in this examination of industrial growth but for the somewhat artificial stimulus which it derived from the creation of the Garden City. It possesses no geographical features which would suggest the special suitability of the district for factory growth. It differs from the manufacturing districts of the Lea Valley, Slough, Park Royal, Southall and Hayes, in that it has arisen to manufacturing importance as the result of a social experiment in the form of town planning. It is not the result of the economic utilisation of waste ground unsuitable for other purposes or the occupation of buildings which have been transferred from Government to private enterprise, as at Slough and Park Royal. Welwyn has definitely been created a satellite town under a town planning scheme; it is the result of design rather than accident, and the industrial section is but one aspect of the growth of the Garden City. Welwyn can hardly be considered part of Greater London; in fact its very creation as a satellite town suggests it has an individuality of its own unrelated to the star-shaped industrial development of many parts of the region which is being examined in this thesis.

A reference to its industries is, however, included in this survey for the following reasons:—

(a) Many of its industries are migrations from London, and it exhibits many of the marks of industrial growth

characteristic of other areas, such as Park Royal, Slough, etc.

(b) It indicates the extent to which town planning can influence the decentralisation of industry and the localisation of new industries, and suggests the potential power of ordered control *versus* haphazard growth in the future.

(c) Its recent phenomenal growth indicates that not only Welwyn but other garden cities may materially alter the distribution of industries in Greater London and throughout the home counties.

The Growth of Industry in Welwyn.—Welwyn Garden City is a town, planned and constructed since 1920 as a self-contained manufacturing centre, *i.e.*, it contains within itself all the requisites necessary for the development of a social and industrial community. Its position on the L.N.E.R. main line, twenty-five miles from London, and within half an hour's train journey from King's Cross, gives it the advantage of being sufficiently far from London to prevent its absorption into the metropolis and yet within reasonable distance for transport purposes to enable it to derive the advantages attaching to a manufacturing centre closely approximated to a large consuming public. Further, it is well within the south-east of England, and the fact that 50 per cent. of the population of England and Wales is within 100 miles of the City is a fact of some importance to its industries. There is direct rail connection with the Midlands and North Britain, and good branch lines giving access to the L.M.S., the East Anglian lines and the Thames-side docks.

The factories at Welwyn are located in a planned and zoned industrial area in which town services, roads and sidings are installed to satisfy the needs of a progressive manufacturing area. Special attention has been paid to the provision of houses within walking distance of the factories at rents from 12s. per week inclusive.*

The growth of industries in Welwyn dates from 1926. Since that date twenty-seven firms have become established, and it is interesting to note that at the present time

* Cf. the lack of housing facilities at Park Royal and Southall.

SECTION SEVEN

SCOPE OF SECTION SEVEN

IN this section it is proposed to make a comparison, in kind and magnitude, of the industries of the region now being studied with those for Great Britain as a whole. This comparison will be considered under the following headings :—

A. Those industries in which the factories in Greater London form an appreciable percentage of the total for Great Britain. Such industries are :—

1. The motor industry.
2. The electrical industry.
3. The chemical industry.
4. The manufacture of foodstuffs.
5. Furniture making.
6. The manufacture of musical instruments.
7. The manufacture of stationery and office equipment.

B. Those industries in which the factories in Greater London produce only a small percentage of the whole output for Great Britain. Such industries are :—

1. The clothing industry.
2. The manufacture of machinery and metal products.
3. The pottery industry.
4. The manufacture of glass products.

C. Those industries, not previously considered in *A* or *B*, which are common to many industrial districts in Great Britain, and are therefore widely distributed. This group will include the rather varied and lengthy list of miscellaneous industries.

In connection with the more important industries an analysis and comparison will be made along the following lines :—

(a) An examination of the type of product manufactured in this area in comparison with similar products manufactured in other parts of the country.

(b) The proportion of the numbers engaged in Greater London over a period of years compared with the total numbers engaged in Great Britain.

THE MOTOR INDUSTRY

This industry, in common with the chemical and electrical industries, comprises a complex group of manufactures. It is difficult to arrive at any accurate estimate of the amount of employment, or the distribution of factories, partly because many firms are engaged in the production of subsidiary products such as wireless, pedal cycles, aero engines, etc., as well as in the manufacture of purely motor products. Coachbuilding firms, for example, are chiefly engaged in the manufacture of motor bodies, but some of the firms are also manufacturers of bodies for horse-drawn vehicles.

The following are the more important groups of manufactured products comprising the motor industry :—

- (a) Chassis.
- (b) Bodies.
- (c) Accessories.
- (d) Tyres.

In addition there are the larger repair and service depots, which, although not manufacturing specific products, are engaged in refitting and assembly processes which contribute very largely to the motor industry.

This industry is one of the youngest of British industries and is the product of the past twenty-five years. The highly specialised nature of its manufactures, and the fact that its products belong rather to the type of light engineering equipment, has enabled factories to be established over wide areas. In contrast to such industries as the pottery and chemical industries, and the manufacture of iron and steel, the motor industry in common with the electrical industry, is less dependent on local supplies of raw material

or other natural resources, and is therefore less localised than the former industries.

The geographical distribution of factories is indicated by the following figures, giving the estimated number of insured persons in the industry. These figures include workers engaged in the manufacture of aircraft and cycles.

District.	Estimated Number of Insured Persons at July.				
	Aged 16 and over.			Aged 16 to 64, inclusive.	
	1923.	1925.	1927.	1929.	1931.
London and district.	31,800	34,140	37,280	39,900	40,200
Midlands. . . .	84,200	91,350	98,120	99,550	98,880
North-Western . .	17,090	19,450	19,220	21,430	23,270
Scotland	9,090	10,100	10,290	10,870	11,310
Great Britain . .	190,430	212,590	230,970	243,230	248,970

These figures indicate that the industry is rather widely distributed throughout Great Britain. Birmingham, London and Manchester stand out as being the three largest centres of production. On the whole the industry is chiefly centred in the Midlands, although it must be remembered that the importance of this district as a motor-producing centre is probably somewhat exaggerated by the inclusion of persons engaged in the manufacture of pedal cycles, since that industry is highly localised in the Midlands.

The following table gives an analysis of the numbers engaged in (a) the manufacture of cars, and (b) the manufacture of accessories. The figures are extracted from a Special Memorandum (No. 18) on the British Motor Industry, by C. C. Allen, published by the London and Cambridge Economic Service, June, 1926, and relate to figures obtained from the Census of Production, 1921.

It will be seen that the manufacture of accessories was more highly concentrated in the Birmingham district in 1921, which produced 74 per cent. of the output of Great Britain.

The importance of the London area in the motor industry is brought out by these figures. Of the 40,000 workers

engaged in the industry in the whole of Greater London it is estimated that slightly more than half are occupied in the

(a) Cars.	Numbers.	Per cent.
Midland Division	91,350	43
London	34,140	16
S.E. Division	24,500	11
S.W. Division	20,500	10
N.W. Division	19,450	9
N.E. Division	11,000	5
Scotland	10,000	5

(b) Accessories.	Numbers.	Per cent.
Birmingham and district	14,924	74
Greater London	3,865	13
Lancashire	508	2
Other districts	2,179	10

northern and western sectors, *i.e.*, approximately 10 per cent. of the total for Great Britain.

THE ELECTRICAL INDUSTRY

It is estimated that the electrical industry comprises the second largest group of factories in this area. This industry includes all factories engaged in the manufacture of electrical equipment of any kind, *e.g.*, switches, lamps, insulators, condensers, dynamos, magnetos, instruments, cables, wire, flex, etc. There are certain characteristic features of the electrical industry which influence its economic organisation :—

(a) There has been in the past decade an enormous increase in the variety and quantity of articles comprising the output of this industry. The increasing application of electricity to all those services and commodities which contribute to the comfort and convenience of everyone has necessitated an ever widening range of electrical appliances. Specialisation

and research have played a large part in the evolution of factories, each manufacturing small parts or special pieces of equipment. It follows, therefore, that this industry is one of the most complex and widely distributed of British industries.

(b) The factories need not necessarily be located near raw material or near to the older centres of the engineering trades. The manufacture of a large part of the electrical equipment can be classified under the heading of light engineering products in which a large labour pool of semi-skilled or unskilled labour is the first economic requisite, and ease of distribution is the second. It is natural to expect, therefore, that factories will spring up near to large centres of population.

(c) The production of electrical equipment lends itself to mass production, and the concentration of production in large manufacturing organisations with many subsidiary by-products. There is a tendency for the larger unit to survive at the expense of the small unit.*

(d) In spite of the operation of economic forces outlined in (c) there is a parallel growth of small manufacturers in and near to large towns. We therefore find a large number of smaller factories producing proprietary articles, growing up in widely scattered areas.

The Geographical Distribution of Factories.—Approximately 85 to 90 per cent. of the manufacturers of electrical equipment are members of the British and Electrical Allied Manufacturers Association. A complete geographical survey of factories comprising the electrical industry has not been made. The most reliable existing index of the geographical location of factories is therefore the estimated number of insured persons engaged in the industry as indicated in the figures supplied by the Ministry of Labour.

The following deductions can be drawn from these figures relative to the geographical location of factories.

1. For the manufacture of heavy equipment, *i.e.*, power plant, London has 16 per cent. of the whole industry.

* See pp. 138, 139 for concentration of cable-making firms and arc lamp manufacturers.

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The factories around Birmingham comprise approximately 33 per cent. of the workers, while those around Manchester comprise about 24 per cent. of the workers. Nearly 72 per cent. of the workers are engaged in these three regions,

*Electrical Engineering.	Estimated Number of Insured Persons at July.				
	Aged 16 and over.			Aged 16 to 64.	
	1923.	1925.	1927.	1929.	1931.
London (a) . . .	6,730	9,230	12,390	13,370	14,710
Midlands (b) . . .	20,410	23,710	24,220	27,830	30,170
North-Western (c) . . .	15,600	19,460	19,080	20,780	21,860
Scotland (d) . . .	1,980	3,320	2,690	2,670	3,430
Great Britain . . .	60,850	75,780	79,050	83,970	91,740

†Manufacture of Electrical Cables, Wire and Flex, Lamps, etc.	Estimated Number of Insured Persons at July.				
	Aged 16 and over.			Aged 16 to 64.	
	1923.	1925.	1927.	1929.	1931.
London	38,350	41,060	43,040	49,060	53,870
Midlands	6,100	8,000	8,180	10,140	13,410
North-Western	15,470	20,050	22,620	21,620	23,650
Scotland	880	540	480	580	580
Great Britain	72,030	91,390	84,470	93,930	108,250

leaving 29 per cent. scattered over the rest of the United Kingdom.

2. For the manufacture of lighter electrical equipment,

* Including the manufacture and repair of alternators, dynamos, electric plant, electric power generators, magnetos, turbo-generators.

(a) London area includes Greater London.

(b) Midlands includes the counties of Derby, Hereford, Huntingdon, Leicester, Northampton, Nottingham, Rutland, Salop, Stafford, Warwick, Worcester.

(c) North-Western area includes the counties of Chester, Cumberland, Lancashire and Westmoreland.

(d) Includes Scotland and the Berwick district.

† Including accumulators, batteries, electric bells, lamps, flash lamps, signs, sparking plugs, telegraph and telephone instruments and apparatus, etc.

i.e., small parts such as switches, flex, lamps, etc., 50 per cent. of the industry is concentrated in the London area, 12 per cent. round Birmingham, and 21 per cent. round Manchester.

3. By combining both sets of figures in the tables given, there are approximately 68,000 workers engaged in the London area out of a total of 200,000 for the whole of Great Britain, *i.e.*, approximately 34 per cent. The London area therefore contributes a very large proportion to the industry as a whole.

Apart from the British Thomson-Houston Co. at Willesden, the General Electric Co. at Hendon, and the Ediswan Co. at Enfield, the factories in the London area are generally smaller than those in the Midlands and the north. According to the list of Members of the British Electrical and Allied Manufacturers Association, there are only ten factories in the Midlands, whereas there are sixty-five in the London area, while there are 43,000 persons engaged in the industry in the Midlands and 68,000 in London. The heavier sections of the industry appear to be located in the Midlands and the north, and the lighter sections in the south. This fact would account for the existence of fewer, but larger, factories in the north, and smaller, but more numerous, factories in the south.

By summarising the numbers employed in electrical industries in the northern and western sectors of Greater London (including such industries as telephones, cables, etc.), we find that between 14,000 and 15,000 are so engaged out of a total of 68,000 for the whole of Greater London. From the fact that only one quarter of the total for the London area is occupied in the region examined in this thesis, it suggests that the industry is widely distributed throughout the London area, a fact which one would broadly surmise from the general heterogeneous nature of the industry, and the ease with which electrical products can be manufactured in any convenient building.*

* The figure of 68,000 would include those engaged in repair work. The actual number of workers engaged in factories on manufacturing processes would be considerably less than 68,000. It is probable, therefore, that the region under consideration occupies a more prominent position in the industry than the figures suggest.

So far as the sector of Greater London, now under consideration, is concerned, there is no evidence to suggest a movement of firms from the north or the Midlands to the south. All those firms examined have grown up *in situ*. Even such large organisations as the British Thomson-Houston Co. and the General Electric Co. have been located in London for over twenty-five years. Many of the larger firms have factories in different parts of the country. Moreover, from the figures indicated in the preceding tables it would appear that from 1923 to 1931, judging by numbers of insured persons engaged in the electrical industry, there is no movement of firms from the rest of the United Kingdom to Greater London. In 1923, 34 per cent. of the whole of the workers engaged in the country in this industry were located in London; in 1931 the same percentage obtains.

THE CABLE MAKING INDUSTRY

This industry is included in the electrical industry, but a separate analysis of the geographical distribution of the factories engaged in manufacturing cables is warranted by the fact that the bulk of the factories are located in Greater London.

The final report of the third Census of Production indicates that 35,000 people are engaged in this industry. Approximately 95 per cent. of these are employed by firms that are members of the Cable Makers Association. Of the nineteen firms which are members of this association, ten of them have their factories located in London or Greater London, *e.g.* :—

- Callender's Cable Co., Ltd., Belvedere, Kent.
- The Enfield Cable Co., Enfield.
- Henley's Telegraph Co., North Woolwich.
- Siemens Bros., North Woolwich.
- The India Rubber and Telegraph Co., Silvertown, E.16.
- Johnson and Phillips, Ltd., Old Charlton, S.E. 7.
- The London Electric Wire Co., Leyton, E.

St. Helens Cable and Rubber Co., Ltd., Slough.
 Union Cable Co., Ltd., Dagenham, Essex.
 Standard Telephone & Cables Co., North Woolwich
 and Hendon.

Three of these cable companies—the Enfield Cable Co., the Standard Telephone Co., and the St. Helens Cable Co.—are situated in the area surveyed by this thesis, and collectively employ approximately 2,500 people.

With the exception of the St. Helens Cable Co., there is no evidence to show that there has been any migration of this industry from the north to the south of England. The Cable Makers Association state that, with the exception of the firm indicated, all the firms in the London area have grown up *in situ*.*

The other important sections of the electrical industry are the manufacture of arc lamps and radio valves. Production, in both cases, is mainly concentrated into the hands of a few large firms which are members of the Electric Lamp Manufacturers Association of Great Britain and the British Radio Valve Association.

The distribution of the factories controlled by the members of these associations is as follows :—

ARC LAMP MANUFACTURERS

Name of Firm.	Situation of Factory.
British Thomson-Houston Co. Ltd.	Rugby and London.
General Electric Co. Ltd.	London (Wembley and Hammersmith).
Ediswan Electric Co. Ltd.	London (Ponders End).
Siemens Ltd.	Preston, Lancs.
Metropolitan Vickers Ltd.	Manchester.
Cryselco Ltd.	Bedford.

* It appears that the reason which led to the cable industry being located near London was the fact that it commenced with deep-sea cable works. This necessitated the works being near the river so that long lengths of cable could be taken straight from the factories and coiled into the holds of ships.

The Callender Cable Co. became established at Erith because this firm originally specialised in bituminous cable, which was, in fact, a branch of a works using bitumen for paving which had originally been located on the Thames because of the import of Trinidad bitumen by ship.

The Union Cable Co. at Dagenham occupies works, part of which were

RADIO VALVE MANUFACTURERS

Name of Firm.	Situation of Factory.
A. C. Cossor Ltd.	London (Tottenham).
British Thomson-Houston Co. Ltd.	Rugby and London.
Ediswan Electric Co. Ltd.	London (Ponders End).
General Electric Co. Ltd.	London.
Marconi's Wireless Telegraph Co.	London.
Metropolitan Vickers Ltd.	Manchester.
Mullard Wireless Service Co.	London.
Six Sixty Radio Co. Ltd.	London.

In the case of both these products it will be noticed that London occupies a prominent position in the location of these industries. This, again, supports the statement that the lighter, new electrical industries tend to grow up near the markets for the finished goods.

THE CHEMICAL INDUSTRY

This industry, in common with the electrical industry, comprises a most complex group of manufacturing processes. There is no simple classification which includes under one heading all chemical industries. A small manufacturer, producing a single compound such as a cleansing powder, can claim association with the chemical industry, as also can the manufacturer of large chemical plant, tar distillers, and the manufacturer of artificial silk. To understand the geographical distribution of chemical factories and the relationship of those in London to the rest of the country is difficult, and statistics are inclined to be misleading in interpreting the magnitude of different groups.

The Association of British Chemical Manufacturers is originally built by a German firm who wished to have works on the water for export reasons.

In Manchester, one of the works was an offshoot of a rubber manufactory which was placed there for other reasons. The firm of Glovers of Manchester grew out of a factory which had machinery for covering hoop-wire for ladies' crinolines, and when the fashion for this ornamental dress went out, the owners of the factory had to find something to do with the machinery, and they took to covering electric wires with cotton; out of this the other departments grew.

representative of about 90 per cent. of all types of manufacturers who can claim association with the chemical industry. The association consists of twelve groups of industries.* The list is indicative of the varied types of products.

Geographical Distribution of Factories.—As previously stated, no complete analysis of the location of chemical factories has been worked out, but generally speaking the larger factories in the various groups are situated in the following areas :—

DYE INDUSTRY	.	Ellesmere Port, Manchester, Grange-mouth, Huddersfield.
ALKALI INDUSTRY	.	Northwich (consequent upon the location of salt in the locality).
THE GLASS INDUSTRY	.	St. Helens (coal, alkali and sand).
ACIDS	. . .	Mersey, Severn and Tyne districts (nearness to imported pyrites).
METALS	. . .	Copper, nickel, zinc works, along the Bristol Channel. Rare metals—London. Antimony compounds—Newcastle.
FATS	. . .	Liverpool and Goole (near facilities for importation of vegetable products and other raw materials).
SOAP	. . .	Port Sunlight (importation of vegetable oils and fats, whale oil, etc.), nearness to alkali works.
PAINTS	. . .	The paint industry is not specially localised—proximity to markets is probably the chief factor. Factories are therefore widely distributed in large towns.

- * Group I. Acids, gases, copper and iron compounds, fertilisers.
- " II. Alkalies.
- " III. Fats, greases, waxes, resins, glycerine, soap.
- " IV. Gelatine, glue, varnish, paints, polishes.
- " V. Tar primary products.
- " VI. Fine chemicals, *s.g.*, pharmaceutical, analytical, etc.
- " VII. Phosphorus, manganese, potassium and rarer compounds.
- " VIII. Cellulose products, rubber, etc.
- " IX. Explosives, dyes, etc.
- " X. Glass, porcelain, pottery.
- " XI. Bleachers, dyers, textiles, printers.
- " XII. Distillation of coal, shale oil, alcohol, ammonia, fuels.

- FINE CHEMICALS** . Not highly localised. The largest factory is Boots Ltd., in Nottingham, but the majority of plants are in the London area. As these products are small in bulk, compared with their value, proximity to markets does not matter, and as the value of the raw materials of which they are made is relatively small, nearness to ports is not of vital importance. The chief factor is a supply of skilled labour.
- ARTIFICIAL SILK** . There is no localisation of this industry. In Coventry is located Courtaulds' factory; in Derby, the British Celanese Co.; in Lancaster, the Cellulose Acetate Silk Co., etc. There are smaller factories for the manufacture of artificial silk products scattered widely throughout the country.

It would appear that only Groups III., IV. and VI. are represented in the London area on a large scale, *i.e.*, the manufacture of chemicals such as paint, soap, glue, pharmaceutical products, etc. The heavier chemicals are all manufactured in other parts of the country, and there is no evidence to indicate any movement of the industry from the older centres to the south of England. All those chemical industries which are purely scientific in character, such as the manufacture of research chemicals, tend to become centred in the capital of a country because of access to scientific libraries, learned societies, etc., but the number of workers engaged in such industries is negligible. Again, those chemical industries connected with food supply, such as confectionery, colours and water purification, those connected with clothing, *e.g.*, dry cleaning and dyeing, together with a miscellaneous collection of smaller chemical industries such as the making of fireworks, neon advertising signs, printers' ink, electric plating, wireless battery acid and aeroplane dopes—all these tend to migrate to large towns.

There is no evidence of the migration of chemical firms to London from the provinces, or *vice versa*.* The chemical

* In this industry, as in others, there has, of course, been some movement of the central controlling offices.

industries situated in the northern and western sectors of Greater London are either entirely new types of industry or are migrations from Central London.

Some indication of the geographical distribution of the chemical industry is indicated by the following figures giving the number of insured persons engaged in the main branches of the industry :—

A. Heavy Chemicals, i.e., Alkaloids, Acids, Tar and Wood Distillation, Dyes, Fertilisers, etc.

District.	Estimated Number of Insured Persons at July.				
	Aged 16 and over.			Aged 16 to 64 inclusive.	
	1923.	1925.	1927.	1929.	1931.
London . . .	24,690	23,120	22,640	23,670	21,980
Midlands . . .	9,790	8,720	8,740	8,970	9,480
North-Western . . .	33,020	30,770	29,140	29,980	29,060
Scotland . . .	8,950	9,060	8,760	8,140	8,220
Great Britain . . .	103,290	95,700	94,900	105,340	98,460

B. Oil, Glue, Soap, Ink, Matches, etc.

London . . .	17,410	18,750	21,390	20,830	22,690
Midlands . . .	2,040	2,220	2,160	2,110	2,230
North-Western . . .	27,300	26,940	25,630	24,000	24,120
Scotland . . .	7,220	7,780	7,710	6,000	6,360
Great Britain . . .	77,130	79,500	79,780	74,880	77,200

C. Paint, Varnish, Red and White Leads.

London . . .	5,320	6,730	7,960	7,990	8,560
Midlands . . .	1,350	1,860	2,090	2,270	2,470
North-Western . . .	2,400	2,250	2,820	2,860	3,010
Scotland . . .	1,000	1,050	960	1,020	1,160
Great Britain . . .	13,560	16,520	18,720	18,900	20,500

From information obtained direct from the factories it is estimated that there are approximately 10,000 engaged in

chemical industries in the northern and western sectors of Greater London. (This figure includes the larger dyers and cleaners but excludes gas works.) These sectors therefore contain nearly half the total number of workers engaged in the industry in Greater London.

It should be noted that the number of workers in Class *B*. has been steadily increasing in the London area, but declining in other areas.

FOODSTUFFS

The manufacture of foodstuffs covers a very extensive range of articles, and is widely distributed throughout Great Britain. There is no localisation of this industry; factories are generally established in or near the larger towns or cities, as nearness to a large labour pool, and to the consuming classes, are the chief economic factors which affect the situation of factories.

The following figures, showing the number of insured persons engaged in the main branches of the industry, include those working in small local bakeries and similar establishments which do not come within the range of this thesis. Only those factories have been included in this survey which manufacture such products as Nevill's bread or McVitie's biscuits for a national market. The actual number, therefore, engaged in the production of food products which have a national or international market would be much smaller than the figures given on p. 145.

The following generalisations can be drawn from an examination of these figures:—

(a) The factories for the manufacture of foodstuffs are widely distributed throughout the country.

(b) London occupies a prominent position in this industry, but the proportion engaged in the London area is perhaps smaller than the number of consumers in the London region would suggest. In the production of the three types of foodstuffs mentioned, *viz.*, Bread, Biscuits, etc., Cocoa, Chocolates, etc., and Food Industries not separately specified, London employs 20 per cent., 23 per cent., and 23 per cent. of the total number respectively.

(c) A comparison of the numbers employed in the northern and western sectors of Greater London (*viz.*, 16,000) with those engaged in food production for the whole of the London area is not possible on the basis of these figures, as the figures quoted for the industries examined in this thesis

Bread, Biscuits, Cakes, etc.

District.	Estimated Number of Insured Persons at July.				
	Aged 16 and over.			Aged 16 to 64.	
	1923.	1925.	1927.	1929.	1931.
London	38,500	30,360	32,060	29,850	29,980
Midlands.	13,860	13,120	13,500	14,030	15,260
North-Western	29,550	26,930	29,360	29,170	32,840
Scotland	29,200	28,570	28,600	29,770	33,020
Great Britain	154,260	136,930	141,610	139,440	150,130

Cocoa, Chocolate and Sugar Confectionery.

London	16,540	19,080	17,860	16,060	16,650
Midlands.	9,980	11,620	12,080	10,190	10,600
North-Western	6,390	7,870	7,860	8,090	7,890
Scotland	7,450	7,630	8,080	6,930	6,950
Great Britain	69,420	76,830	78,410	72,310	71,120

Food Industries not Separately Specified.

London	31,320	34,100	31,620	32,870	32,100
Midlands.	8,760	8,530	7,940	8,450	10,190
North-Western	12,640	17,620	16,500	17,290	18,440
Scotland	16,970	22,020	21,640	18,320	20,630
Great Britain	95,940	112,780	110,270	110,010	118,060

exclude all local industries. It should be noted, however, that three of the large biscuit manufacturers, *viz.*, MacFarlane's, McVitie & Price, and Kemp's, are situated in this area, and collectively employ between them from 3,000 to 4,000 workers. No separate statistics of workers engaged in individual industries are available. The Biscuit

Manufacturers Association only represent five of the large firms, and there are now a large number of smaller producers outside the association.

(d) There is no marked increase in numbers engaged in the production of foodstuffs from 1923 to 1931, neither is there any indication of a movement of industry from one part of the country to the other. The one possible exception to this statement is Scotland. In 1931 the number of workers rose to 33,020 for bread, biscuits, etc., and 20,630 for other food products.

THE FURNITURE MAKING INDUSTRY

The manufacture of furniture, upholstery, etc., is an industry which has been concentrated in London for many years, the centre of the industry being Bethnal Green, Hoxton and other parts of the East End. There is no evidence to show that the industry is migrating to other parts of Great Britain. It has been shown in previous sections of this thesis that there is a tendency for firms to move outwards from Central London to Greater London, but beyond this there is no movement of firms from one part of the country to the other.

The following figures indicate that, whilst furniture manufacture is increasing in all sections of Great Britain, the increase is rather more marked in London than elsewhere:—

District.	Estimated Number of Insured Persons at July.				
	1923.	1925.	1927.	1929.	1931.
London	34,150	37,050	43,490	47,300	50,430
Midlands.	10,290	11,770	13,140	12,710	14,020
North-Western	9,770	10,360	11,230	12,260	13,980
Scotland	10,040	10,240	10,830	10,670	11,090
Great Britain	93,030	100,810	113,190	118,880	130,410

In 1923, approximately 36·5 per cent. of the whole of the workers for Great Britain were employed in the London area; in 1931 this figure had risen to 38 per cent.

The figures include workers engaged in upholstery as well as furniture making. Separate figures are not issued by the Ministry of Labour for persons engaged in the furniture industry. It is probable that only a small percentage of the total of 50,430 are engaged in factories which are exclusively devoted to upholstery. Firms which specialise in upholstery are generally small concerns employing not more than a dozen workers.

THE MANUFACTURE OF MUSICAL INSTRUMENTS

The making of musical instruments is almost essentially a London industry, due firstly to the supply of cabinet makers, who mostly come from the East End, and secondly, to the potential demand arising from the large metropolitan population. The piano industry has always been centred in Kentish Town and Hackney, but there is evidence of a movement of some of these firms outwards into Greater London. The most important contribution to the magnitude of the industry lies in the existence of the Gramophone Company's works at Hayes.

The predominance of London in this industry is indicated by the following numbers of insured persons :—

	1923.	1925.*	1927.	1929.	1931.
London	14,980	17,130	19,950	23,260	19,790
Midlands	780	870	920	910	970
North-Western . .	820	650	720	680	610
Scotland	410	440	350	400	370
Great Britain . .	19,520	21,630	24,700	28,330	24,700

These figures show a fairly constant distribution of factories engaged in this industry from 1923 to 1931. There does not appear to be any appreciable alteration in the geographical distribution of the industry beyond a slight increase in the percentage employed in the London area.

In 1923, 76 per cent. of the workers of Great Britain were engaged in the London area ; in 1931 this figure had risen to nearly 80 per cent. The Midlands show a slight increase in numbers engaged since 1923. Whilst there has been a drop of 3,500 workers in the London area from 1929 to 1931, a similar proportionate falling off is not recorded in the north-western section, while the Midlands show an increase of sixty persons employed.

STATIONERY AND OFFICE REQUISITES

There is some difficulty in obtaining an accurate comparison of the numbers engaged in the northern and western sectors of Greater London with other parts of Great Britain in such industries as office duplicators, stationery, pencils and sundry office requisites. The Ministry of Labour figures analyse the numbers employed into two categories : (a) those engaged in the production of cardboard boxes, paper bags, stationery, etc., and (b) those engaged in stationery and typewriting requisites. These categories differ slightly from those arranged in this thesis. Paper bags, for example, are included under the heading "Paper Products," and not under "Stationery," as in the Ministry of Labour classification. Again, Office Requisites might conceivably include workers under the heading "Stationery," which would be classified under either of the categories of the Ministry of Labour figures.

MINISTRY OF LABOUR FIGURES

A. Cardboard Boxes, Paper Bags and Paper, Stationery.

	1923.	1925.	1927.	1929.	1931.
London	22,170	21,070	20,870	21,650	22,760
Midlands	5,770	6,260	6,620	7,000	7,810
North-Western	6,700	7,430	8,530	7,740	8,600
Scotland	4,340	4,010	3,930	4,100	4,240
Great Britain	54,200	53,940	55,420	57,000	60,900

B. Stationery and Typewriting Materials.

	1923.	1925.	1927.	1929.	1931.
London	2,590	2,850	3,420	3,670	3,780
Midlands.	740	700	920	760	850
North-Western	340	630	770	910	1,010
Scotland	590	150	130	380	410
Great Britain	4,710	4,800	5,770	6,220	6,440

The predominating importance of London in both categories is evident from these figures. In the manufacture of cardboard boxes, paper bags, etc., the number employed in London has remained fairly constant, but has increased from 20 to 25 per cent. in the Midlands and the north-western area. In the manufacture of stationery and typewriting requisites, London and the north-western area show increases of 50 and 200 per cent. respectively.

In the area studied in this thesis, between 7,000 and 8,000 are engaged in the production of cardboard boxes, containers, waxed papers, pencils, duplicators, envelopes, account books, ink, etc. This figure is 11 per cent. of the total number engaged in the production of similar articles in Great Britain.

(B.) INDUSTRIES IN WHICH THE NUMBER OF INSURED PERSONS IS SMALL COMPARED WITH THE NUMBER FOR THE WHOLE OF GREAT BRITAIN

There are a number of manufacturing industries in the region now being studied which belong rather to the older traditional industries of other parts of Great Britain, but in magnitude are so small that they do not suggest the possibility of competition with other industrial regions. Manufactured products which come within this category are pottery, glassware, clothing, machinery and metals, hardware, tools, bolts, nuts, screws, leather goods, etc. Products

of this nature manufactured in the London area are generally of a specialised kind, in which the geographic or economic advantages of the Midlands or the north are of minor importance.

The small pottery industry of Wood Green is localised specially to supply the requirements of the nursery industry of the Lea Valley ; the manufacture of glass bottles by three firms in Middlesex is due to the fact that their largest customers are in London ; the machinery and metal manufactures include such articles as window casements, special thread bolts, food machinery, cinematograph machines, gyroscopes—all of a highly specialised nature, in which probably not more than two or three firms are engaged in production in the whole of the United Kingdom, while in many cases one firm only has the power to manufacture a machine which is a patented article.

In many of these industries it is not easy to obtain any comparative figures indicating production of similar articles in other parts of the country for the reason that no exact classification exists. Some comparative idea of the dimensions of some of the industries in the northern and western sectors of Greater London is suggested by the following figures :—

Product.	Approximate Number of Workers in the N. and W. Sectors of Greater London.	Number of Insured Persons in Great Britain.
Shirts, collars, etc.	2,500	88,320
Hosiery	2,800	112,240
Boots and shoes	2,000	137,840
Scientific instruments	600	26,030
Hand tools, cutlery, etc.	1,000	34,580
Stoves, grates and general iron foundry products	2,500	92,440
Pottery	200	78,710
Bolts, nuts, screws, etc.	600	26,250
Leather goods	1,200	24,250
Glass bottles	1,500	18,940
Products made of rubber	1,600	67,740

It is estimated that between 7,000 and 8,000 are engaged in the manufacture of special machinery in the region covered by this thesis. It is probable that for the manufacture of special machinery London and Greater London occupy a prominent position, but the items are so numerous that comparative figures are difficult to obtain. The Ministry of Labour has grouped together a number of metal industries under the heading "Metal Industries not separately specified," which includes the manufacture of such articles as scale and weighing machines, dies, coins, seals, medals, typefoundry and piercing, drop-forgings, cycle and motor accessories, coach ironwork, bedsteads, wire mattresses, locks, keys, latches, etc. In this group of manufactures there are approximately 205,660 persons engaged throughout the country of which Birmingham and district engage slightly more than half (116,620), and the London area between one-sixth and one-seventh (33,900). London therefore occupies a prominent position in the manufacture of sundry metal products, but it should be noted that the figure of 33,900 includes workers engaged in the manufacture of motor accessories, a figure which, in this thesis, has been included under the heading of the motor industry.

THE BOOT AND SHOE INDUSTRY

In view of the fact that this is a traditional industry of London and that a large number of workers are still engaged in Central London and the East End, some further reference may be appropriate at this point. According to Charles Booth's Survey of London there were 39,000 engaged in the manufacture and repair of boots in London in 1887. In 1930 it was estimated that this figure had declined to approximately 20,000.* In 1923 the number of insured persons in the boot and shoe factories in Greater London

* P. 356, "London Life and Labour," Vol. II. Booth's "London" was a very much smaller area than that now administered by the L.C.C., whereas the London of the later edition extends slightly beyond the L.C.C. boundary in the north and north-west, including such districts as Tottenham, Willesden and Acton, and therefore covers a considerable part of the industrial area considered in this thesis.

numbered 14,400 males and 5,270 females. In 1930 these figures had declined to 11,990 males and 4,630 females. There has, therefore, been a shrinkage in the boot and shoe industry in the London area, judged by numbers engaged.* This decline is due to the mechanisation of the industry replacing hand labour. The industry is still one of the most important features of industrial London and occupies approximately 7 per cent. of the total number of insured persons engaged in the industry throughout Great Britain.†

In the northern and western sectors of Greater London, only those factories have been considered which manufacture boots and shoes (not boot and shoe repairers). The figure of 2,000 employees is not therefore comparable with the figures quoted above, which include all workers in the industry, of which a large percentage are engaged in repairing only.

The industry is still largely centred in the East End, but there is evidence of migration northwards along the Lea Valley.‡ In dealing with the distribution of the industry, Vol. II. of "London Life and Labour" states:—

"As between the different parts of the manufacturing area in East and North-East London, there has been an appreciable shifting of the centre of gravity of the industry during the past six years, the number of insured workers in the Stepney Exchange area having fallen by 10 per cent. between 1923 and 1930, while all the other areas more or less held their own. On the whole, the movement has been northward from inner East London towards Tottenham."

(C.) INDUSTRIES WHICH ARE MISCELLANEOUS IN CHARACTER AND WIDELY DISTRIBUTED THROUGHOUT GREAT BRITAIN

This group of industries comprises all those which are of such a miscellaneous character that comparison with other

* Compare the shrinkage for the whole of the United Kingdom:—

1901	:	:	:	:	:	229,000 workers
1921	:	:	:	:	:	194,000

† P. 357, "London Life and Labour," Vol. II.; p. 41, ditto.

‡ P. 47, "London Life and Labour," Vol. II.

producing centres is impossible for the reason that they do not lend themselves to any simple system of classification. Probably the chief feature of such industries in London and Greater London is their extraordinary diversity. But while the manufacturing establishments themselves are small, judged by numbers engaged, the whole group of these miscellaneous industries makes an important contribution to industrial growth. Moreover, as indicated in other sections of this thesis, while manufactures continue to become more highly specialised, it is probable that in course of time this group will continue to grow with the increasing use of branded goods or proprietary articles. The following products are typical of the variety of such industries in this region :—

Army equipment, surgical instruments, fire extinguishers, gyroscopes, caravans, trams, sporting guns, pipes, billiard cues, films, artificial limbs, figures for corsets, tooth brushes, ivory tablets, air-duct ventilators, telephones, clocks, bottle stoppers.

These miscellaneous industries give employment to 5,000 or 6,000 workers. This figure is, of course, a minimum one, as there are probably a number of small industries employing under fifteen workers which have not been included in this survey.

SUMMARY OF SECTION VII

In this section an attempt has been made to obtain a comparative measurement of the industrial growth of the region under analysis in relation to similar industries in Great Britain by means of an examination of the numbers of insured persons in similar manufacturing establishments in (a) Greater London, (b) Great Britain, (c) the northern and western sectors of the London area. From this examination the following deductions can be made :—

1. The most important industries in this region are those in which the London area as a whole has a considerable proportion of the total number of factories throughout the

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country. By tabulating the results we obtain the following comparisons :—

Product Manufactured.	Percentage of Workers in Great Britain in—	
	(a) The London Area.	(b) N. and W. Sectors.
	Per cent.	Per cent.
(a) Cars and accessories	16	8
(b) Chemicals	25	6
(c) Electrical equipment	33	8
(d) Foodstuffs	23	5
(e) Furniture	38	4
(f) Musical instruments	80	33
(g) Stationery and office requisites	37	12

2. These figures show the nature of the industrial growth to be one of the expansion of London's industries, *i.e.*, a decentralisation of firms from London. The firms manufacturing the above products employ collectively about 80,000 to 90,000 workers in the region under analysis, out of a total of 135,000.

3. In the manufacture of such products as clothing, hardware, hosiery, leather goods, rubber goods, pottery, etc., the proportion of the number of insured persons in the northern and western sectors to the rest of the country is so low as to warrant the assumption that these industries are not competitive with similar industries in other industrial sections of Britain.

SECTION EIGHT
RENTS AND RATES IN RELATION TO
FACTORY GROWTH

SECTION EIGHT

AN EXAMINATION OF RENTS AND RATES IN RELATION TO THE INDUSTRIALISATION OF THE NORTHERN AND WESTERN SECTORS OF GREATER LONDON

In this section it is proposed to make a comparative study of rents and rates in certain selected parts of England in order to illustrate the effect, if any, of the incidence of these two economic factors on the growth of factories in the areas of Greater London now under consideration.

This problem is part of the larger question of the influence of rates and rents in the general movement of industry from one part of the country to the other. It is not proposed to attempt a study of the larger problem; indeed, it would be beyond the scope of this thesis, as it would involve a very complete examination of data relative to every industrial area, and, in fact, to every non-industrial area that was capable of industrial development. Within the compass of this section it is proposed to deal with a limited number of rateable areas in various manufacturing districts of England.

RATES AND RATEABLE VALUES

The rate per pound is not necessarily a reliable index of the influence of local rates on factory localisation, as the rateable values of properties in any district may be high. Neither does the total rateable value of the district offer any indication of the incidence of local rates on factory growth. If the rating district covered a wide area, the total rateable value might be considerable (if the district were largely built over), but the rateable value per pound might be low. Again, where land and property are highly valued, as in the City of London, the rateable values are high and the rate

per pound low. It often happens that an increase in rateable values due to enhanced rents or local developments brings about a decrease in rates per pound. In order, therefore, to judge whether an area will attract or repel industries so far as rates alone are concerned, it is necessary to investigate not only rates per pound but local assessments and local conditions generally. Differences in rates as between rating areas are due to a variety of causes, *e.g.*, some localities are more fully developed than others, and the demand for social services is greater; the amounts received from non-rate sources, *e.g.*, government grants and rents from corporate property, may reduce local rates; profits from municipal trading, the efficiency of administration of certain local areas; the political views of the party in power, the extent of unemployment—these are a few of the contributory causes of differences in local taxation.

But whilst it follows that there may not be any statutory figure which in itself is a reliable guide to local rates as between one district and another, the rates per pound are *approximately* indicative of the incidence of rates on industry, although not necessarily *proportionally* indicative, and an industrialist would, generally speaking, choose a district in which the rates in the pound are low, *i.e.*, in so far as rates formed the immediate criteria of his choice of a factory site.

To facilitate a comparison of districts the following table analyses some of the more important rateable districts into three categories: (a) Low-rated areas, *i.e.*, where the rates are under 12s. in the pound. (b) Medium-rated areas, where rates vary between 12s. and 16s. in the pound. (c) High-rated areas, *i.e.*, all those in which the rates are 16s. in the pound and over.

A. Low-rated Areas. Rates between 7s. and 12s.

Approximate Rate.	Districts.
7s.	Oxford 7s. 6d.
8s.	Finchley 8s. 6d., Brighton 8s. 11d.
9s.	Stoke Newington 9s. 6d., Hendon 9s. 8d., Luton 9s. 9d., Maidstone 9s. 6d.

A. Low rated Areas—continued.

Approximate Rate.	Districts.
10s.	<i>Southall</i> 10s., <i>Islington</i> 10s. 2d., <i>Wandsworth</i> 10s. 4d., <i>Acton</i> 10s. 8d., <i>Staines</i> 10s. 8d., <i>Leamington</i> 10s. 8d., <i>Darlington</i> 10s. 8d., <i>Bath</i> 10s., <i>Canterbury</i> 10s. 8d., <i>Gloucester</i> 10s. 8d., <i>Southampton</i> 10s. 10d., <i>Dartford</i> 10s., <i>Gravesend</i> 10s. 10d.
11s.	<i>Kingsbury</i> 11s. 1d., <i>Brentford</i> 11s., <i>Southwark</i> 11s. 5d., <i>Wolverhampton</i> 11s. 10d., <i>Birkenhead</i> 11s. 2d., <i>Clitheroe</i> 11s. 6d., <i>Stretford</i> 11s. 7d., <i>South Shields</i> 11s. 3d., <i>Huddersfield</i> 11s., <i>Newport</i> 11s. 10d., <i>Folkestone</i> 11s., <i>Watford</i> 11s. 10d.

B. Medium-rated Areas. Rates between 12s. and 16s.

12s.	<i>Enfield</i> 12s., <i>Willesden</i> 12s., <i>Shoreditch</i> 12s. 2d., <i>Stafford</i> 12s. 6d., <i>Coventry</i> 12s. 7d., <i>Haslington</i> 12s., <i>Bolton</i> 12s. 2d., <i>Preston</i> 12s. 6d., <i>Accrington</i> 12s. 6d., <i>Stockport</i> 12s. 6d., <i>Rochdale</i> 12s., <i>Chorley</i> 12s. 10d., <i>Oldham</i> 12s. 6d., <i>Warwick</i> 12s. 6d., <i>West Hartlepool</i> 12s., <i>Newcastle</i> 12s. 6d., <i>Wallsend</i> 12s. 6d., <i>Tynemouth</i> 12s., <i>Cardiff</i> 12s., <i>Bristol</i> 12s. 6d., <i>Erith</i> 12s. 6d., <i>Romford</i> 12s. 9d.
13s.	<i>Woolwich</i> 13s., <i>Edmonton</i> 13s. 2d., <i>Stepney</i> 13s. 8d., <i>Tottenham</i> 13s. 4d., <i>Kidderminster</i> 13s., <i>Burton-on-Trent</i> 13s. 6d., <i>Leicester</i> 13s. 10d., <i>Eccles</i> 13s. 6d., <i>Crewe</i> 13s. 7d., <i>York</i> 13s., <i>Swansea</i> 13s. 6d., <i>Ipswich</i> 13s. 4d.
14s.	<i>Bethnal Green</i> 14s. 4d., <i>Cannock</i> 14s. 2d., <i>Birmingham</i> 14s. 6d., <i>Smethwick</i> 14s. 8d., <i>Barrow</i> 14s., <i>Blackburn</i> 14s., <i>Ashton</i> 14s., <i>Heywood</i> 14s., <i>Colne</i> 14s. 6d., <i>Manchester</i> 14s. 6d., <i>Middlesbrough</i> 14s. 6d., <i>Sunderland</i> 14s. 8d., <i>Dewsbury</i> 14s. 6d., <i>Barking</i> 14s., <i>Nottingham</i> 14s.
15s.	<i>Wednesbury</i> 15s. 2d., <i>Walsall</i> 15s. 6d., <i>Derby</i> 15s. 8d., <i>West Bromwich</i> 15s. 6d., <i>Dudley</i> 15s. 10d., <i>Bilston</i> 15s., <i>Warrington</i> 15s. 7d., <i>Wigan</i> 15s. 6d., <i>Stalybridge</i> 15s. 9d., <i>Stockton</i> 15s. 8d., <i>Bacup</i> 15s., <i>Halifax</i> 15s. 6d., <i>Leeds</i> 15s., <i>Dagenham</i> 15s., <i>Lowestoft</i> 15s.

C. High-rated Areas. Over 16s. in the £.

Approximate rate.	Districts.
16s.	Poplar 16s. 8 <i>d.</i> , Nuneaton 16s., St. Helens 16s. 3 <i>d.</i> , Gateshead 16s., Hartlepool 16s. 2 <i>d.</i> , Bradford 16s. 6 <i>d.</i> , Sheffield 16s. 9 <i>d.</i> , Wakefield 16s. 6 <i>d.</i> , Llanelly 16s. 4 <i>d.</i>
17s.	East Ham 17s., Hull 17s. 2 <i>d.</i> , Batley 17s. 6 <i>d.</i> , Rotherham 17s. 6 <i>d.</i>
18s.	Barry 18s., Port Talbot 18s. 2 <i>d.</i> , Ebbw Vale 17s. 6 <i>d.</i>
19s.	Norwich 19s.
20s. and over	Rhondda 23s., Caerphilly 23s. 6 <i>d.</i> , Merthyr 25s. 4 <i>d.</i>

The districts *in italics* are those which come within the area surveyed in this thesis. The striking similarity between the areas of recent industrial development and low-rated districts is to be noted. One exception is Finchley, where industrialisation has hardly commenced. In this case poor rail services, the distance from the docks, and the absence of a suitable labour pool, have been factors which more than outweigh the relative advantage of low rates. The districts in which rates per pound are generally higher are chiefly in the Midlands, the north of England, and South Wales. The latter area has the highest rated districts, due to the depression in the coal-mining industry.

Movements of Rates during the past Ten Years.—There has been a similar relative movement upwards or downwards in rates in most districts during the past decade. Generally speaking, rates for the year 1931-32 have fallen in most districts, the most marked fall being in Tottenham, Edmonton and Enfield, where they have fallen by 5s. 6*d.* to 6s. in the pound. Exceptions to this general fall are districts in Lancashire such as Manchester, Bolton, Stretford, Irlam, etc., where rates have increased for the last year.

General conclusions on the incidence of rates on the location of factories:—

1. From the figures given on pp. 159 and 160 there is a *prima*

facie case for assuming that the lower rated areas of Greater London have tended to attract the newer industries. But this assumption must not be unduly emphasised, as it is impossible to measure the relative importance of economic advantages which favour the location of new factories.

2. The operation of the de-rating scheme has mitigated the evils of high rates in that factories are now allowed a deduction of 75 per cent. of the standard rate. The difference between a high-rated area, *e.g.*, at 18s. in the pound, and an average-rated district, from 11s. to 13s. in the pound, amounts only to 1s. 6d. in the pound for the industrialist, and in most cases he would prefer to establish his factory near suitable transport termini, suitable labour pools, and the market for his finished goods, and pay slightly higher rates.

3. Of those firms visited, in the northern and western sectors of Greater London, very few stated that high rates had a deleterious effect on the location of factories, and the opinion is reached that in the case of mass production factories, where de-rating operates, rates play a small part in the choice of a factory site.*

RENTS

An examination has been made of rents of buildings and the price of freehold land in various industrial districts of England with a view to obtaining a comparative idea of the effect of rents on the movement of industry. The subject can be viewed from two angles: (a) the rent of leasehold factories; (b) the price of freehold land. It was found in the case of (a) that there is no set of economic characteristics common to all factories to enable one to obtain comparative figures which measure the relative advantages and disadvantages of factories in different parts of the country. The differences in the prices of factory buildings or the rents of buildings are too numerous to enable one to seek for conclu-

* "A recent private inquiry in Manchester shows . . . that local taxation is a microscopic burden on the units of output of firms working on a factory scale. The difference in costs made by rural and city rates can be ignored. . . ." P. 62, "Chamber of Commerce Journal," January, 1932.

sions as to the reasons why a firm would choose a factory in one part of the country in preference to some other part.

The price per foot floor space is no criterion, and does not form a basis of comparison; considerations of design, equipment, adaptability, situation, age of building, etc., all enter into the price of leasehold buildings. From information received direct from manufacturing firms in Greater London, it would appear that firms prefer to buy a piece of land and put up a new factory designed on modern lines rather than occupy an old factory building at a much cheaper price. There have been vast improvements in factory construction in the past decade, and the demand is for one-storey buildings constructed of steel, with ample light and air. The modern type of factory found at Park Royal or Slough costs less to build, and entails much lower working costs than many of the older factory buildings, which have been constructed with thick brick walls in three or four storeys.

It was therefore decided to concentrate on land values or the price of freehold factory sites. A firm desirous of erecting a factory would naturally consider the price of land, and some approach to common characteristics is more possible in the case of freehold land than leasehold buildings. The price of freehold land, can, in a general way be compared for various industrial districts, on a uniform basis of comparison. Although even in this case it is difficult to select freehold sites in different localities which are strictly comparable. Freehold sites, even in the same district, may vary very widely in price, due to such differences as frontage to main road, drainage, lighting facilities, situation, nature of ground, etc.

It is therefore necessary to seek for the price of land for different industrial districts in which the sites chosen possess common economic advantages. This has been possible through the help of an expert in factory site values. Such a person has a sufficiently wide knowledge of prices and the amenities of various localities to enable a comparison to be made of freehold site values in different parts of the country.*

* The information was supplied by Mr. Fuller Hall of the firm of Messrs. Fuller Hall and Foulsham, London.

The following figures represent the prices ruling about the period January-March, 1932, for freehold sites for factories in certain districts, each site possessing similar economic advantages, such as situation, nearness to railway or dock, frontage to main roads, etc.

GREATER LONDON

Acton, Willesden, Cricklewood	£2,500 per acre.
Hayes and Southall	£1,000 ..
Welwyn Garden City	£800 ..
Thames—Purfleet	£1,000 ..
Barking	£1,000 ..
Merton, Mitcham and Croydon	£1,500 ..
Medway district	£500 ..

Generally speaking, a fair average price of land in Greater London can be taken at £1,000 per acre.

THE PROVINCES

On the outskirts of provincial manufacturing districts such as Manchester, Birmingham, Nottingham, Burton, Liverpool, Bristol, Huddersfield, Leeds, etc., a fair average price would be £500 per acre. Special sites, with both rail and water carriage facilities, would fetch as much as £800. On the other hand, it has been recorded that to large consumers of power the land would be sold as low as £100 per acre, or in some cases it would be given away. In some districts freehold sites are not sold, but are only rented, *e.g.*, Slough, Trafford Park Estate, Welwyn, Letchworth. Site values are not therefore strictly comparable with other areas where the land is sold freehold, although some basis of comparison is obtained by calculating the price of such rented land on the basis of twenty years rent. Moreover, in some of these factory trading estates the price paid for rent includes the carriage of raw materials and finished products to railheads or docks (*e.g.*, Trafford Park Estate). These economic facilities still further distort comparative land values.

From the investigations made, certain conclusions can be drawn on the relationship between land values and factory development :—

(a) The price of freehold land is many times higher in the central parts of towns or cities than on the outskirts of such cities (*cf.* £1,000 an acre in Greater London and £45,000 an acre in Lambeth). The increasing land values of towns have therefore promoted decentralisation of factories outwards into surrounding districts.

(b) The price of land (with comparable facilities) around provincial towns can be taken at £500 per acre ; that around London at £1,000 per acre. Rents are therefore definitely higher round London than in the industrial districts of the provinces. But in spite of this fact, factories are being established in larger and larger numbers in the London area.* The deduction can be drawn that the price of land as between one part of the country and another has little influence on the location of a new factory, and that a firm would pay a higher price for factory land provided the factory is located near London. This confirms the statement so often made by manufacturers in Greater London that the dominating factor is nearness to markets and transport facilities.

(c) Manufacturers prefer to occupy a new one-storey building rather than older buildings at considerably lower prices. The owners of factory estates such as Slough, Welwyn, Park Royal, etc., are prepared to erect modern factories to suit the requirements of the manufacturer. It is for this reason that many of the older factories in various parts of the country remain empty while newer factories are continually springing up.†

* The London Chamber of Commerce stated that up to 10th May, 1932, 110 firms had erected factories in England as a result of the new British tariffs, and of these, 75 were in the London area. These are minimum figures : there may be other firms which have not come to the notice of the Chamber of Commerce.

† Vacant factories on the outskirts of London sell for 8s. per foot floor space, including the site ; on the outskirts of provincial cities the price for similar factories is as low as 2s. 6d. per foot.

SUMMARY OF CONCLUSIONS

SECTION NINE

A GENERAL SUMMARY OF THE INDUSTRIAL GROWTH OF THE NORTHERN AND WESTERN SECTORS OF GREATER LONDON

It has been the purpose of this thesis to trace the growth of manufacturing establishments in the northern and western sectors of Greater London, to establish the causes at work leading to an expansion of industries in this area, and to discover the economic influences controlling this type of industrial development. It remains to summarise the data so obtained, and to view the area as a whole in order to estimate the nature of possible changes which may operate in this region in the future. The summary of these conclusions will be presented in a form correlative with the objectives referred to on p. 5, Section I. of this thesis.

THE NATURE AND CONDITIONS OF GROWTH

(a) *Geographical Distribution of Factories.*—The geographical influences which have determined the location of industries in many parts of Great Britain are, to a large extent, absent in the case of the factories in Greater London, and operate in a rather indirect manner. The existence of mineral wealth or other raw material, the close proximity of water or fuel, or the existence of special climatic advantages are of small consideration in the determination of the types of industries evolved during the past thirty years round London. The chief factor which has influenced the location of factory sites has been the existence of waste land unsuitable for residential or other purposes. The distribution of factories has therefore become somewhat sporadic or haphazard in its development rather than followed any pre-determined lines of growth. The map indicates the

positions of factories in this area. Broadly speaking, factory areas alternate with residential settlements and appear to have a radial direction of development from London outwards. The construction of arterial roads and the consequent increase of factories along these roads are influences which will tend to emphasise this direction of growth.

The utilisation of land for industrial purposes in this area can be classified in the following categories :—

(a) The utilisation of stretches of waste land which naturally occur in widely separated localities, often near railways, rivers or canals, but often wedged in between residential or shopping areas.

(b) The adaptation of existing buildings in densely populated districts such as Tottenham, Edmonton, Willesden, etc., for factory or workshop purposes. Such buildings are generally occupied by smaller manufacturing firms.

(c) The utilisation of rural fringes of Greater London by :—

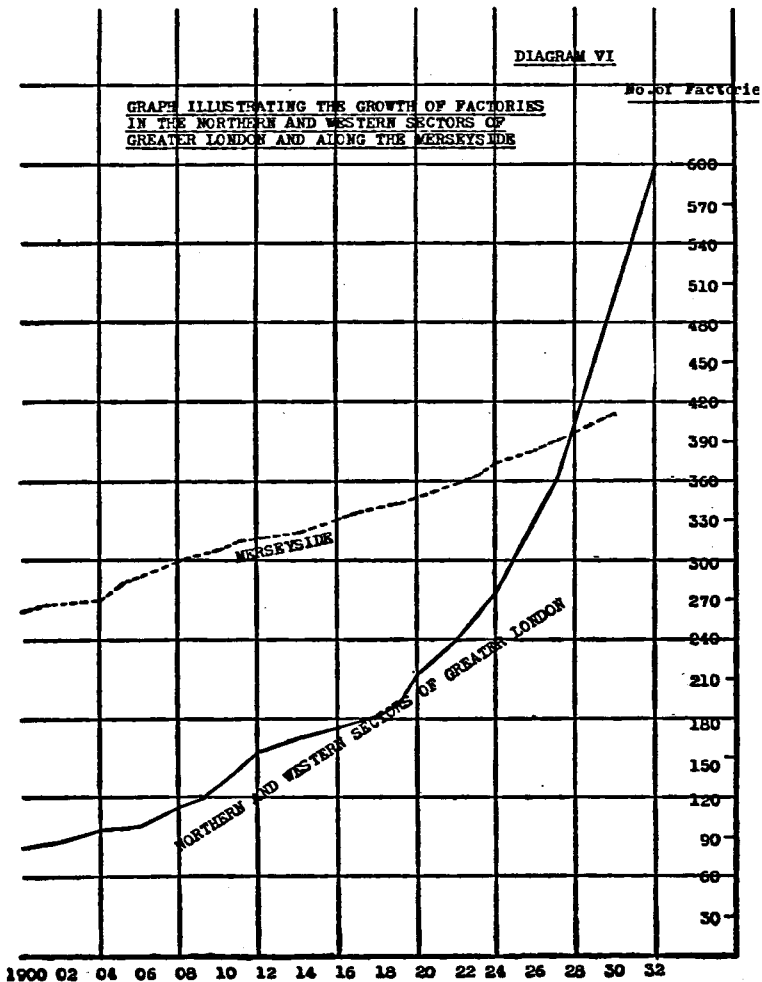
1. The opening up of agricultural land to industrial development, *e.g.*, Park Royal, Greenford and Perivale.
2. The building of factories along arterial roads, *e.g.*, the Great West Road, the Cambridge Road, Western Avenue.

(d) The adaptation of sites or estates for industrial purposes hitherto used for Government services, and the creation therefrom of industrial or trading estates, *e.g.*, Park Royal, Slough, The Hyde (Hendon), Wembley.

(e) Industrialised towns definitely created by Town Planning schemes such as Welwyn and Letchworth.

In the selection of sites or buildings for industrial purposes we see in this analysis a transition from a state of haphazard development to one of ordered growth in the categories (a) to (e).

(b) *The Rate of Growth of Factories.*—The date of establishment of the factories in the area studied has been obtained direct from the firms, and Diagrams I. to V. indicate the growth of factories in some of the more important industrial



districts. These diagrams show that the growth of industry in these sectors of Greater London dates back to the beginning of the twentieth century. The conditions which actuated this growth were operating as far back as 1900, but have been accelerated very considerably by the post-war expansion of industry. Diagram VI. shows the growth of factories engaged in the manufacture of articles of a non-local character for the area as a whole from 1900 onwards. On the same diagram a comparison is also made of the growth of factories along the Merseyside.

Up to 1914 there were approximately 150 factories operating in this region. The growth to that year was steady but considerable. After the war, from 1920 onwards, the curve of growth becomes more marked, the period of greatest development occurring from 1923 onwards. If we assume that at the present time there are in this area approximately 600 factories engaged in production of goods for a national or international market, between 70 and 75 per cent. of these have appeared since the war.

(c) *The Causes of the Growth of Factories.*—The dominating economic factor which has influenced the rise of factories in these sectors of Greater London is the existence of the metropolis with its powerful control over transport, finance and marketing methods, and the demands arising from a population of nine millions which is located within a radius of seven miles of Charing Cross. The overwhelming importance of the markets and shipping facilities of London has been clearly brought out in the recent search for factory sites near London by foreign firms who are erecting their own factories in England, consequent upon the imposition of tariffs by the British Government. Up to May 10th, 1932, it was estimated that 110 foreign firms had erected factories in England as a result of the new British tariffs, and of these seventy-five were in the London area. These are, of course, minimum figures. The decision of these firms to erect their factories in Greater London has been reached in spite of the fact that both freehold and leasehold property are dearer in Greater London than in the environs of the industrial towns of the Midlands or the north of England.

The growth of factories is influenced by the decentralisation of London's manufacturing industries, the creation of new light industries engaged in the manufacture of proprietary articles and the establishment of "assembly" industries for products obtained from other parts of England or from abroad. Of these three determinants, the decentralisation of London's industries is the most important. An examination of the direction of origin of the manufacturing firms studied in this survey gives the following results :—

Migrations from London, 243; from U.S.A., 20; from the Continent, 23; from the provinces, 27. Grown up *in situ*, *i.e.*, old-established firms, 82; new firms (*i.e.*, new companies which have been started within the last decade) 232.

Of the twenty-seven provincial firms which have established factories in this region, fourteen are from the Midlands or the north of England, and thirteen from other counties or from other parts of the London area. Most of the firms which are recorded as coming from the Midlands or the north of England have set up "assembly" factories, or branch service stations in Greater London,* and there is little evidence to support the view (so far as this region is concerned) that there is a southward trend of manufacturing industries from the Midlands or the industrial north. The weight of evidence gathered during the period of research supports the assumption that the manufacturing firms of this region are not encroaching on the industrial activities of other parts of the country so far as the types of industries are concerned.†

TYPES OF INDUSTRIES AND THE NATURE OF THE PRODUCTS MANUFACTURED

A review of the industries enumerated in this thesis reveals the extremely heterogeneous nature of the products manu-

* The motor service and repair depôts are examples of factories in this region the industrial functions of which are not competitive with their manufacturing establishments in other parts of the country.

† The following figures give the increases in the numbers of insured persons in certain industries in the south-eastern section of England; the

factured. There is no evidence to indicate any marked specialisation of industry such as obtains in some of the districts round Manchester, Birmingham, Newcastle, Hull, Leeds. The industries of these sectors of Greater London reflect directly the miscellaneous demands arising from the concentrating of nine million consumers. The industries which are growing up around Greater London are those in which London has always had a large share of the national output, *e.g.*, musical instruments, electrical equipment, foodstuffs, etc. The most important industries, judged by numbers employed, are as follows :—

Product Manufactured.	Approximate Number Employed.
Motor cars and equipment	20,000
Foodstuffs	16,000
Electrical products	15,000
Chemicals	10,000
The nursery industry	8,000
Musical instruments	8,000
Special machinery	8,000
Clothing	8,000
Furniture	5,000
Office equipment	4,000
Metals and metal parts	4,000
Paper products	4,000
Aero engines and aeroplanes	3,000
Dyers and cleaners	3,000
Building materials	2,000
Rubber products	2,000

Apart from the nursery industry, the manufacture of foodstuffs and building materials, these industries are largely

industries are similar to those found in the region surveyed in this article :—

	Southern Section. (Increase from 1927 to 1931).	Northern Section.
Electric cables, lamps, etc.	22,550	2,010
Furniture, upholstery, etc.	14,350	7,310
Printing and bookbinding	18,760	9,490
Motor vehicles	12,800	7,920
Artificial silk	10,260	8,620
Cardboard boxes, bags, etc.	5,020	850

These figures do not necessarily imply that there is a southward trend of factories; they merely indicate, either (a) that as new firms are established they prefer to erect their factories in the metropolitan area rather than the north; or (b) that firms located in the south have increased their output at a greater rate than firms in the north.

assembly industries in which the raw materials, *e.g.*, in the form of metal sheets, cloth, or special castings and fitments, are produced in other parts of the country, or are obtained from abroad.

THE DENSITY OF INDUSTRIALISATION

The following figures indicate the estimated number of workers engaged in the industries examined in the various industrial districts of the region. The figures do not necessarily mean that these workers are resident in the districts in question ; they imply that in these districts there are groups of factories employing these numbers of workers many of whom may live in other parts of London.

District.	Number Employed.
The Lea Valley	37,700
North Middlesex	3,100
West Middlesex :	
Hendon—Edgware	13,500
Wembley—Greenford	
Park Royal—Willesden	28,800
The Vale, Acton	7,500
Southall and Hayes	14,100
Brentford—Chiswick	
Heston and Isleworth	11,100
Slough	8,500
Watford	3,000
St. Albans	2,500
Uxbridge and Yiewsley	1,600
Welwyn	1,500
The Nursery Industries	8,000
	140,000

These figures must necessarily be approximate ; they cannot represent an accurate computation for the following reasons :—

- (a) The *personnel* of factories fluctuates very considerably due to seasonal fluctuations, trade depressions or trade booms, etc.
- (b) Industries are constantly disappearing, while others are growing at a remarkable rate. In the course of visits

made to districts, several firms have been deleted from the list of manufacturing concerns which was originally drawn up when the survey was started.

(c) The information relating to *personnel* supplied by firms was approximate. In many cases the firms were unable to state any definite figure, the pay roll varying considerably from week to week.

Composition of Personnel.—No statistics were obtained of the distribution of employees between the sexes or between adults and juveniles, but from information obtained in the course of visits to firms it would appear that in the majority of factories where the work consists of standardised routine processes requiring unskilled or partly skilled labour, the employees are mostly females or juveniles.* In certain types of factories where the work is highly skilled,† or of an exceptionally heavy nature, the workers are mostly men. Inasmuch as factories tend more and more to produce commodities of a standardised nature, in which light routine work is necessary, there will be an increasing demand for unskilled labour—largely females and juveniles. In factories engaged in the production of such commodities as foodstuffs, leather suit-cases, small electrical equipment, clothing, etc., the labour is almost exclusively female labour. In many districts of West Middlesex the supply of unskilled labour already falls far short of the demand, and this disproportion will be accentuated with every new factory erected, until such time as the increase in residential population has caught up to factory development.

* The following figures giving the numbers of insured persons in industries in Greater London for July, 1931, are indicative of the ratio between males and females in some of the industries:—

	Males.	Females.
Electric cables, lamps, etc.	30,270	23,600
Chemicals	12,910	9,070
Oils, greases, etc.	14,230	8,460
Musical instruments	13,630	6,160
Cardboard boxes, bags, etc.	7,680	15,180
Clothing	2,630	17,070

† "The process of this mechanical evolution . . . is fast making obsolete the old bipartite distinction between skilled and unskilled labour, and a graduated series of specialised process workers are becoming the most characteristic figures in mechanical industry." P. 5. "London Life and Labour," Vol. I.

Size of Manufacturing Establishments.—An analysis has been made of the size of manufacturing firms operating in this region. The following table gives the number of firms arranged according to *personnel* employed :—

Personnel.		Number of Firms.
Between	0 and 50	243
"	50 " 100	124
"	100 " 300	166
"	300 " 500	48
"	500 " 1,000	26
"	1,000 " 2,000	13
Over	2,000	7

From these figures the deduction can be drawn that approximately 84 per cent. of the firms employ under 300 workers, while nearly one-third employ under fifty.* With the exception of one firm which employs 6,000 workers, there is nothing comparable with the large industrial firms of the north of England (*e.g.*, the Metropolitan Vickers Co., which employs approximately 10,000 in Manchester).†

THE MOVEMENT OF INDUSTRY.

Geographical Location of Factories.—The control of new factory sites will be largely determined by economic factors

* But, generally speaking, firms employing less than 15 workers have been disregarded; this proportion would, therefore, be much higher if all firms employing less than 50 were included.

† The magnitude of units of industrial employment in Greater London as estimated on p. 472 of "London Life and Labour," is as follows :—

Under 10 employees	10,859
Between 10 and 25	10,870
" 25 " 50	5,335
" 50 " 100	2,934
" 100 " 200	1,405
" 200 " 500	793
" 500 " 1,000	209
" 1,000 " 2,000	96
" 2,000 " 5,000	27
5,000 and over	7

The average number of employees per unit is 66.

"Small undertakings, though forming a large majority of the whole, only employ a small minority of the total workers. The figures indicate that half the firms employ only one-eighth of the workers, while on the other hand nearly half the workers are employed by about one-twentieth of the firms." P. 4, "London Life and Labour."

rather than geographic. Geographical influences controlling the localisation of industry will be less strong in the case of future industries than they have been in the past. Such influences as soil, climate, mineral wealth, rivers, topography, etc., will give place to financial control, rapid transport, publicity, marketing methods, etc. The character of British industry is changing, due largely to changes of fashion resulting from rapidly altering social standards, influenced by scientific inventions. Not only are the iron and steel industries, shipbuilding, the cotton industry, declining, but smaller trades are disappearing before the onslaught of modern scientific inventions. Thus the brush and broom trade has declined as a result of the growing cleanliness of streets and the use of the vacuum cleaner; wooden bedsteads have taken away the demand for iron bedsteads; alterations in women's wear have dispensed with pins, buttons, jewellery. Many of these industries were centred in the Midlands. Many of these older industries are being replaced by industries manufacturing light engineering equipment, foodstuffs, etc. The motor car, the gramophone, the radio and electrical equipment are characteristic of these newer industries, which are tending to spring up in the south of England.

This statement does not imply that the industries characteristic of the north of England are moving southwards, neither does it imply that new types of industries are not being established in the north.*

It is probable that road transport will dominate very largely the selection of factory sites. Hence the construction of the arterial roads throughout Greater London has created new potential factory areas. The economies resulting from a widely distributed system of electric power will work concurrently with the stimulus resulting from improved road transport in promoting the decentralisation of industry from London. The installation of the "Grid" system of transmission of electric power is a factor of the very greatest

* The Billingham factory of Imperial Chemicals Ltd., for manufacturing sulphate of ammonia and fertilisers, and Courtauld's factory at Coventry, are examples of large newer industries.

importance in the future distribution of factories throughout the country. As a result of this system no place will be too remote for the erection of a factory installed with electric power. Industries need not necessarily be concentrated near sources of power. The grid system will probably prove to be one of the most powerful factors in the decentralisation of industry.*

Allied to the problem of easy road transport and the distribution of cheap electric power in the decentralisation of industry is the economy obtained from lower rents and, therefore, lower rates, arising from the industrial exploitation of rural areas. Cheaper land and more space for expansion has been the main motive actuating the movement of London manufacturing firms outwards, but this desire for cheap land has been conditioned by the necessity of being within easy reach of the metropolis, and for this reason firms are willing to pay twice the price for land in the fringe of Greater London than for land with similar industrial facilities in other parts of England.

Whilst it is true that in some districts of Greater London factories have grown up at points which interfere with the residential or social amenities of the neighbourhood, in many parts, especially the newer industrial districts, *e.g.*, Hayes, Southall and Park Royal, a process of selection of factory sites has operated in the past amounting almost to a geographical control in the utilisation of land for factory development. Land, on account of its proximity to railways, rivers or canals, or because of its low-lying and unhealthy nature has gone over to industrial purposes. But although

* The effect of the more widely distributed system of electric power in the promotion of factory growth is reflected in the following figures, which indicate the percentage increase of factories using electric power in the south-east of England from the year 1921 to 1930.

	Per cent.
1921	100
1922	111·5
1923	122·6
1925	138·4
1927	155·0
1929	175·9
1930	191·6

(From H.M. Chief Inspector of Factories Report, 1930.)

this use of land has operated to the advantage of both social and factory development it has resulted from chance conditions rather than from design. In the future the segregation of factory areas round Greater London will probably be the result of design rather than chance. Two forces will tend to stimulate this policy of segregation: (a) the economic stimulus offered by such facilities as cheaper and better transport services, cheap electric power and the existence of a growing labour pool. The more industry tends to become concentrated into factory estates the greater are the facilities which tend still further to attract factories, as a result of the improved services mentioned; in short, the advantages tend to become cumulative. (b) The general increase in the level of public intelligence towards the appreciation of the efforts of Regional and Town Planning Committees.*

FUTURE TYPES OF INDUSTRIES

1. The forces of scientific progress resulting in increased specialisation will tend to attract particular types of industries towards London, *e.g.*, special machinery, instruments, light engineering, equipment, foodstuffs. The more extensive use of electric power will tend to promote clean industries. Fifteen firms which migrated from Central London to these sectors definitely stated that the desire to obtain clean air was the most important determinant in the choice of a factory site.

In Birmingham and Manchester we see the older industries declining, while the newer industries, such as electrical

* In February, 1930, 327 Local Authorities were designing schemes for Town Planning (see p. 48, "Decentralisation of Population and Industry.")

The West Middlesex Town Planning Committee recommended that certain areas should be allocated for factory development, *e.g.*, part of the Colne Valley, while in other cases the preservation of the country from haphazard factory growth has been protected by the creation of zones or belts which will be used for recreational or social purposes, *e.g.*, the suggested "green girdle" between Ruislip Reservoir in the west and Epping Forest in the east. It is not suggested that this green girdle should consist wholly of public open spaces, but that numerous golf courses and private parks, occasional commons and market garden land should be permanently kept free from building (pp. 18 and 19 of the "North Middlesex Regional Planning Scheme").

engineering, the manufacture of cars, artificial silk, etc., are becoming important. The same varied types of products are characteristic of Greater Birmingham and Greater Manchester as of Greater London. In the Trafford Park Estate, Manchester, which is the largest single industrial area near that city, there are 200 manufacturing firms engaged in the great variety of manufactures such as cork, chemicals, electrical equipment, motors, copper wire, flour, roofing material, abrasives, cables, foodstuffs, cattle food, paper, cash registers, asbestos, etc. In their variety these industries have much in common with those round London.

2. Industries in which the product supplies the immediate needs of the consumer are likely to increase. Such industries are the manufacture of proprietary articles—cars, musical instruments, household requisites, *e.g.*, vacuum cleaners, refrigerators. The facilities available for publicity through floodlighting and other methods of advertising along the main arterial thoroughfares of Greater London are strong inducements which lead firms manufacturing consumers' products to erect their factory around London.

3. Reference has already been made to the importance of "assembly" industries in this area. These will probably tend to increase as industry as a whole becomes more highly nationalised or specialised. Small parts will be manufactured in certain districts and will be despatched to consuming areas for assembly. It is probable that the majority of the manufacturing processes of the future which supply the immediate needs of the public will become more or less assembly industries.

4. There will be a tendency for the main branches of industry to attract to them allied manufacturing processes in the same way that the subsidiary manufactures of non-splinterable glass, chromium plating, motor pumps, tyres, etc., have been drawn to the motor industry of London.

5. Luxury industries will be drawn more and more towards Greater London in view of the demand arising from the large population of the metropolis. Moreover, as long as London and the south of England remain the centre of gravity for the monied classes and the entrepreneurs of industry (either for

residential or leisure purposes) there will be a tendency for the proprietors of businesses to establish factories near London. Again, where firms have a considerable export trade there is an advantage in being near London on account of the ease with which foreign buyers, remaining in England for a short stay, can get into touch with factories which are within half an hour's run from the West End of London.

MIGRATION OF INDUSTRIES AND PEOPLE

The geographical and economic advantages which were originally responsible for the location of such industries as heavy chemicals, textiles, iron and steel goods, pottery, etc., will continue to keep those industries in the places in which they were originally established, but as already indicated, such industries are declining, and may continue to do so in the future, while newer, highly specialised manufactures may take their place. These newer manufacturing processes will spring up at places which are unrelated to the original geographical forces which influenced the distribution of British industries, and for the reasons given the south of England may obtain an increasing share of such industries.

Inasmuch as manufacturing processes are becoming more standardised, there will be an increasing demand for fluctuating supplies of semi-skilled or unskilled labour, both female and juveniles. The nearness to a large labour pool, as in the case of London, will tend to attract new industries to Greater London. Moreover, with increasing mobility of people by improved transport facilities, a radius of fifteen to twenty miles from London will not prove impracticable for the establishment of factories which can draw on the labour pool which is becoming established on the outer fringe of the London area. The growth of satellite towns, fostered by regional planning schemes, will tend to create labour pools and local centres of industry within twenty to twenty-five miles of London, *e.g.*, Slough, Welwyn, Watford, Dagenham.

The effect of a growth of industries of a varied character renders an area immune from periods of cyclical unemployment, as, owing to the varied demands for the products manufactured it is unlikely that all industries will experience bad trade at the same time. Mobility of labour between depressed and progressive industries is more possible than is the case with districts which produce one, or possibly at most, only two types of products. A slump in districts with specialised manufactures may cause much suffering.*

The Census Returns for 1931 reveal some interesting facts relative to the movements of population. The county of Middlesex has experienced the greatest increase of population of any county during the period 1921-31. The population of Middlesex was 1,253,002 in 1921 and has increased by 385,579 in 1931, *i.e.*, an increase of 30 per cent. (cf. the increase in population for Great Britain as a whole during this period, *viz.*, 5.5 per cent.)

There has been a decrease in the population of the northern and western districts of England, and an increase in the home counties; South Wales has lost 242,000 people (*i.e.*, 12.3 per cent. of the population of 1921); Durham and Northumberland have lost 207,000, *i.e.*, 9.3 per cent. of the population for 1921; Cheshire and Lancashire have lost 154,000; the Midlands 81,000, and the Eastern Counties 41,000. Generally speaking, the counties in the north of England have lost nearly half a million people, while the Home Counties have gained 615,000. The County of London has lost 87,702 during this period. It is not possible to estimate how many of these have moved outwards to Middlesex, but judging by the increase of population at such

* Speaking of the unemployment figures of the Birmingham District, G. C. Allen in his book on the "Industrial Development of Birmingham and the Black Country," stated: ". . . the figures reveal that the three largest centres of industry (Oldbury, Darlaston, Smethwick) within the area have been less depressed—a fact which is to be attributed to the localisation of new industries such as the chemical trades, motors and accessories, and partly to the mobility of labour in places which possess a great diversity of industrial pursuits. The places which have most severely suffered have been Wednesbury, Brierley Hill, Bilston, Tipton, Cradley and Dudley. . . . These all have a comparatively specialised industrial life and have been mainly concerned with the heavy iron and steel trades" (pp. 392, 383).

places as Hendon, in which housing estates have been responsible for the transfer of 20,000 people from the L.C.C. area, it is probable that at least 50 per cent. of 87,702 have migrated to Middlesex. But, in order to estimate the actual number of people who migrated from London, allowance must be made for the normal increase in London's population. A rough estimate of the increase due to migration into Middlesex can be reached by the following deductions:—

London County decrease since 1921	87,702
Add: normal increase which should have taken place, i.e., 5.5 per cent. on 4,484,523	246,648
Population to be accounted for by migration or by excess of births over deaths	334,350
Population of Middlesex (increase)	385,519
Less: normal increase, i.e., 5.5 per cent. on 1,253,002	68,915
Actual increase due to migration of people into Middlesex.	<u>316,604</u>

These figures would indicate that London has lost approximately slightly more than the number Middlesex gained, viz., 334,350. It is not possible to ascertain how many of the gains in Middlesex are due to migrations from London, but it is unlikely that the whole of the 334,350 from London would have migrated to Middlesex. It is probable, therefore, that a considerable number have migrated to Middlesex from other counties.

The boroughs within the county of Middlesex, showing the largest increases are as follows:—

	Per cent.	
Kingsbury	796 (increase)	14,780
Wembley	200	32,359
Hayes	144	13,941
Hendon	101	58,153
Wealdstone	101	13,563
Ruislip	76	6,926
Heston	62	28,782
Uxbridge	34	11,240

It will be observed that the population has increased

air, health are concomitants of the rapid industrialisation which is proceeding to-day in the northern and western sectors of Greater London ; and, provided this extending growth is tempered with ordered control, the continued outward spread of factories from the metropolis must work ultimately for the social and economic welfare of the community.

introduction of machinery and labour-saving devices.* It is probable that the introduction of specialised machinery during the past decade, coupled with the economies resulting from rationalisation, is largely responsible for unemployment in certain branches of industry. (b) In many of these newer industries using highly specialised machinery and semi-skilled labour there appears to be fewer and fewer opportunities for promotion for those in the lower ranks of work. In so many of the firms employing from 200 to 500 workers there appears to be only one or, at most two, responsible persons who are capable of controlling policy and initiating changes, with the result that there is little outlet for initiative or promotion on the part of the employees. This is not necessarily a new evil of modern production ; it is inherent in the factory system, but it is probably being accentuated by the changes already referred to through the operation of rationalisation and specialised production.

Socially, the spread of industry into Greater London points all to the good. With the decentralisation of factories from London outwards, favoured by cheap electric power, and the construction of arterial roads, there will continue to be a decentralisation of population. The work of the builder, the town planner and the local authority will be correlated with this phase of urban development. A process of specialisation will be adopted in the exploitation of land for factory and residential uses respectively. The rapid growth of modern hygienic factories in Greater London, with the possibility of improvements in the social amenities of life of the workers through housing estates, the equipment of sports grounds attached to the factories,† are forces which herald the abandonment of slum life in London and the sordid environment in which so many have been condemned to spend their lives where crowded dwellings have been wedged in between tall unhealthy factories. Space,

* " We are," wrote Chaptal in 1828, after more than a decade of peace, " far from having that profusion of machines which one sees in England—it is because labour is cheaper with us." " *De l'industrie française*," II., 28.

† Fourteen of the firms examined have sports grounds and canteens attached to their factories.

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