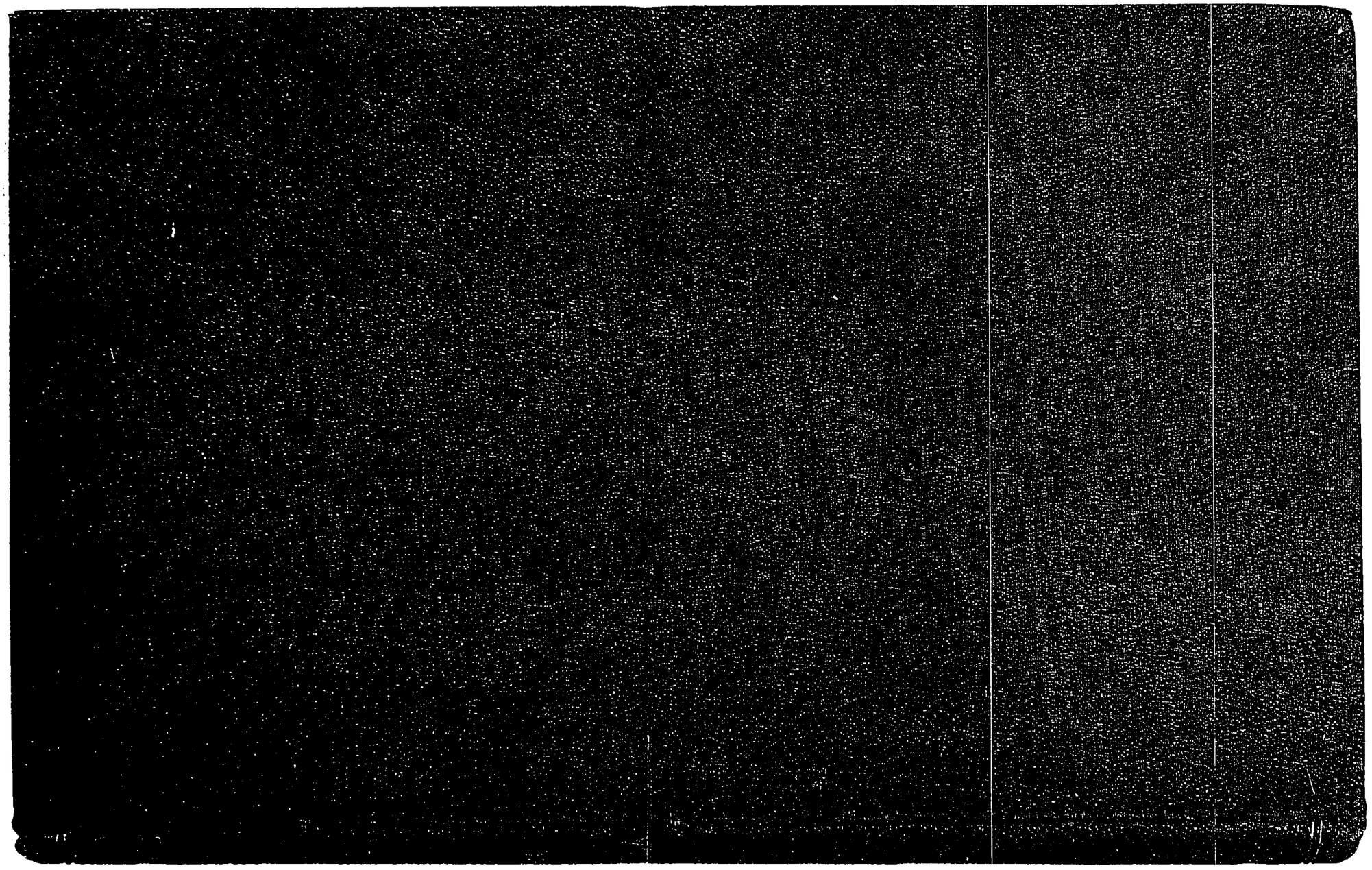

TRANSACTIONS

OF THE

Seventh International Congress of Hygiene and Demography.

LONDON, AUGUST 10TH–17TH, 1891.

Patron:—HER MAJESTY THE QUEEN.

President:—H.R.H. THE PRINCE OF WALES, K.G.

VOLUME XII.

MUNICIPAL HYGIENE AND DEMOGRAPHY.

EDITED BY C. E. SHELLY, M.A., M.D.

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1892.

To the Corporation of Dundee is due the credit of originating a suggestion made during the earlier part of the year, in response to which a number of Municipal bodies supplied the Honorary Secretary General of the Congress with brief reports relating to their vital statistics and corporate history, and embodying the results of local sanitation. These communications*—which were obviously unsuited, and were not intended, to form a subject of discussion by the Congress—are collected in the present volume, and, in order to facilitate reference, have been arranged in alphabetical order under the names of the cities and towns to which they severally refer. They thus present, in a compact and accessible form, a considerable mass of information, which can scarcely fail to prove valuable as well as interesting. For—dealing, as they do, more or less fully with all the great questions of modern sanitation—they indicate some of the many ways in which these problems have arisen, the causes which have operated to make them urgent, and the methods by which they are being successfully solved by communities varying within wide limits of population and of very different rates of growth, existing under a diversity of social conditions, and occupying areas that differ greatly in extent, in configuration, and in climate.

G. V. Poore,
Honorary Secretary General.

* Including those furnished by the Municipalities of Ahmedabad, Bombay, Calcutta, and Rangoon, which also appear in Vol. XI., *Indian Hygiene and Demography*.

TABLE OF CONTENTS.

	Page.
Aberdeen	7
Andover	14
Belfast	15
Birmingham	19
Blackpool	28
Bournemouth	32
Brighton	38
Cardiff	41
Croydon	49
Dundee	53
Ealing	58
Edinburgh	63
Glasgow	69
Gloucester	82
Hanley	84
Huddersfield	86
Lancaster	91
Leeds	94
Liverpool	101
Morecambe	113
Newcastle-upon-Tyne	115
Paignton	121
Preston	122
Richmond, Surrey	124
Ryde	128
St. Helens, Lancashire	133
Salford	136
Wallingford	142
Wolverhampton	146
Ahmedabad	151
Bombay	155
Calcutta	159
Rangoon	164
City of Auckland, N.Z.	169
Colony of South Australia	171

MUNICIPAL HYGIENE AND DEMOGRAPHY.

The City of Aberdeen.

Delegates to the Congress.

Lord Provost DAVID STEWART.
Councillor GEORGE MACONNACHIE.
Professor MATTHEW HAY, M.D.

The city of Aberdeen is, with the exception of a small part south of the River Dee, wholly situated on a gently rising ground between the Rivers Dee and Don, and extends downwards along the Dee to the shore of the North Sea. Its elevation above sea-level varies from a few feet to 300 feet, the mass of the city being under 100 feet. Its position is, therefore, on the whole, favourable to good drainage.

The population, as estimated to the middle of the present year, is, within the recently extended boundary of the city, 125,560; and the area amounts to 6,602 acres, or nearly 10 square miles. In spite of several natural disadvantages, such as distance from coal and iron markets, the population has increased with remarkable rapidity in recent decades, the percentage of increase at the recent census being over 16, and at each of the previous censuses of 1871 and 1881 over 19. Aberdeen is, therefore, one of the most rapidly growing of the larger towns in Scotland. Its area is now the largest of the Scottish towns, but much of the portion recently added is unbuilt upon.

For the ten years ending 1890 the following are the averages of the meteorological observations during the four quarters of the year:—

1881-90.	Mean Barometric Pressure (at Sea-level and 32° F.).	Temperature.		Mean Humidity. Sat. = 100.	Rain.		Average Number of Hours of Bright Sunshine daily.	Rain.	
		Mean.	Daily Range.		No. of Days it fell.	Amount.		Prevailing Directions.	Mean Pressure on sq. foot.
	Ins.	°F.	°F.			Ins.			lbs.
1st Quarter -	29·747	38·7	10·4	82	56	7·2	3·0	S.W., N., & N.W.	1·2
2nd Quarter -	29·903	48·6	13·4	76	48	5·9	6·1	S., N., & S.E.	0·8
3rd Quarter -	29·842	55·1	13·0	79	55	8·2	5·2	S.W., N.W., & N.	0·7
4th Quarter -	29·792	41·5	10·1	82	59	9·1	2·2	S.W., W., & N.W.	1·1
Whole Year -	29·822	45·9	11·7	80	218	30·4	4·1	S.W., N., & N.W.	0·9

The climate is somewhat colder but less wet than the average of Great Britain, and is distinctly bracing, even to occasional harshness, especially in early spring.

Housing.—As in other towns of ancient origin, the streets were all at one time narrow and ill-conditioned. But within the present century great improvements have been carried out which have completely altered the character of the town. In the first place, at the beginning of the century, two streets of splendid proportions were projected at right angles to each other from the old market-place in the centre of the town, and along these are now reared the chief buildings of the city, and they form the great avenues of the city's traffic. By a scheme, only just completed, and costing 125,000*l.*, further improvements of a similar kind have been effected, which add greatly to the beauty of the town. The total number of streets and roads in the city now amount to 530, and

their total length to 110 miles. The houses are mostly three to four, and occasionally five storeys in height, and are, almost without exception, built of impervious granite. The houses in the centre of the older parts of the town are still in many cases deficient when judged by modern standards; but comparatively few houses remain which are unalterably bad. The working classes live almost wholly in so-called tenement-houses, four, six, or eight families entering their houses from a common staircase. This mode of housing is still being adhered to in the most recently built houses. The wealthier classes are largely housed in terraces or detached villas, and many of the better off artizans and middle classes (relatively

speaking) are showing a preference for houses with a separate entrance, and with a modicum of garden. Neither the local authority nor any other public body has undertaken the erection of houses for the working classes. By a local Police Act of 1862 considerable powers were granted to the Corporation for the regulation of new buildings, and these powers are now being very fully exercised. It is questionable if there exist in any other city more advanced regulations for the plans and for the drainage and ventilation of new houses; and they are rigorously enforced. Very active attention has also been given in recent years by the sanitary officials to the drainage and ventilation of old houses, with the result that annually many hundreds of such houses have their drainage and general sanitary arrangements remodelled and brought into conformity with the most modern requirements. Under the Aberdeen Corporation Act of 1881 the Town Council acquired power, without opportunity of appeal by owner, to close any house which is certified by their medical officer of health or sanitary inspector, or by any two medical practitioners, to be unfit for human habitation. This somewhat arbitrary power has been judiciously utilised by the Council for the closure of several hundreds of the worst houses without serious protest on the part of owners.

Only one scheme has as yet been carried out under the Housing of the Working Classes Acts, viz., that for the demolition in 1884, at a cost of nearly 16,000*l.*, of an area of old, low-lying, and highly insanitary property, in which repeated outbreaks of typhus fever had occurred. Similar schemes for other areas in the city are likely to be under the consideration of the Council very soon.

Water-Supply.—Previous to 1866 the city obtained its water-supply from the River Dee, at a point about a mile above the city. The water was pumped by an engine to a large water-tank in a building in the upper part of the city. In 1866 this supply was discontinued, and a fresh and much more abundant supply was introduced from a point in the Dee more than 20 miles from Aberdeen, and filter beds and storage reservoirs were at the same time constructed. The water thus obtained is sufficient for the supply of the greater part of the town by natural gravitation; but the higher parts are supplied from separate reservoirs to which the water is raised by steam-pumping. The Corporation obtained parliamentary power to take 8,000,000 gallons daily from the Dee. The consumption for 1890 was 6,500,000 gallons daily, or about 60 gallons per head of population. The waterworks have cost up to the present time 255,000*l.* Except for slight sewage pollution from the two or three villages on its banks—and steps are being taken to prevent this—the Dee affords a water of great natural purity, containing, on an average, about 3½ grains of total solids, ½ grain of chlorine, ·01 part (per mill.) of free ammonia, and ·04 part (per mill.) of albuminoid ammonia, and scarcely more than 1° of hardness. It is, therefore, a water which is eminently suitable for both domestic and manufacturing purposes. It is almost unnecessary to add that the supply is constant, and that house-cisterns for water for potable purposes are not permitted in new houses, and have been largely extirpated from older houses.

Sewerage.—Owing to the abundance of the water-supply, the wet system for the disposal of sewage is employed, and waterclosets are, almost without exception, in universal use. In 1864 a thorough system of drainage works was commenced at a total cost up to the present time of about 120,000*l.* The total number of main sewers is now 450, and they measure 68 miles in length. With the exception of a small portion which is used for irrigation purposes, the whole of the sewage is discharged unpurified into the Dee, the greater part at the extreme mouth of the Dee, but within the breakwaters, and the remainder at a point opposite the middle of the town. It is proposed to remove the latter outfall further down the river. The outfall of the sewage within the mouth of a tidal river is undesirable, and proposals have recently been made to have it transferred to some point on the coast line, but, as yet, no plan has been adopted. The small part of the sewage used for irrigation is conveyed to a farm of about 50 acres, close to the sea, and the owner pays a rent of 100*l.* annually for the use of the sewage. The farm, though not far removed from dwelling-houses, has not been found to be injurious to health.

Disposal of Refuse.—The refuse of the City is collected by means of carts and is removed to a railway depôt, about half a mile outside the town, from which it is sold and distributed to farmers for manurial purposes at a price varying from 1*s.* 3*d.* to 2*s.* per ton. No destructor is in use in Aberdeen for the treatment of refuse. The cleansing or scavenging staff consists of an Inspector and 124 men, and requires the services of 50 horses.

Common Lodging-Houses; public Wash-Houses; public Baths; Slaughter-Houses.—None of these have been as yet erected by the municipality, although proposals to do so have frequently been discussed. The lodging-houses are privately owned, and are almost wholly located in the older and more overcrowded parts of the city, in very old buildings originally erected for other purposes. The minimum amount of cubic space now allowed to each adult lodger is 400 cubic feet; before the year 1891 it was 300 cubic feet. Although there are no public baths owned by the Corporation, a private company erected a handsome and well-equipped building for baths, in the east end of the city, a few years ago, and their baths are extensively patronised by all classes. The sea itself, being close at hand, is largely used for bathing in summer. The city is greatly in need of a general and municipal slaughter-house; but although plans of such a slaughter-house were at one time before the Council, the slaughter-houses are still privately owned, the work being, however, concentrated mainly in two large buildings.

Hospitals, &c.—The city is well provided with hospitals and other means for treating the sick. The principal hospital is the Royal Infirmary (founded 1739), with accommodation for 200 patients (and, after reconstruction, for 250). It is at present undergoing complete reconstruction on the most advanced principles, at a cost of 40,000*l.* to 50,000*l.* It is to be lighted by electricity, and will probably be in part ventilated by Key's mechanical method. There is also a recently erected hospital for

sick children, accommodating about 80 patients; and a commodious and elegant hospital for incurables. The City (Fever) Hospital accommodates fully 100 patients, and was erected and is maintained by the municipality. It is situated on the outskirt of the east end of the town, and consists of an administration block, five one-storey pavilions of wards, and a reception house—all distinctly separated. Excepting one pavilion, which is of wood, it is built of concrete, and cost over 16,000*l.* It is utilised for the treatment of all the ordinary infectious diseases or fevers, except typhoid fever, cases of which are still treated in the general hospitals. Scarlet fever cases constitute the bulk of those treated in the Fever Hospital, but recently large numbers of measles cases have also been admitted. During the five years ending 1890, the average number of patients (exclusive of quarantines) admitted in each year to the hospital was 403·6, out of an average city population of 105,000. The average number of scarlet fever patients was 259; of measles, 103; of typhus, 11; of small-pox, 9; and of diphtheria, 5. In 1890, of all the zymotic cases known to have occurred in the city, 70 per cent. were removed to the hospital; in 1889, 51 per cent.; in 1888, 65 per cent.; in 1887, 46 per cent.; and in 1886, 50 per cent. The percentage of deaths among the cases treated in the hospital was in each year considerably less than in cases treated outside. The Fever Hospital is therefore performing a double service to the public health, firstly, in restricting the spread of infectious disease, and, secondly, in lessening the mortality among infected cases. Besides the hospitals enumerated, there is also a large and well-managed dispensary for the out-door relief of the indigent sick.

Public Disinfector.—A disinfecting station and wash-house have been erected in the grounds of the Fever Hospital, and are used for the treatment of all infected clothing and bedding. The form of disinfector employed is a Washington-Lyon's hot steam apparatus. It has been found to work well.

Notification of Infectious Diseases.—Notification by the medical attendant was made compulsory by a local Act in 1881. This year the Infectious Disease (Notification) Act, 1889, has been adopted in order to obtain the advantages of dual notification; and measles and whooping cough have been added to the list of diseases named in the Act. These diseases were in the local Act. Notification is carried out very faithfully on the whole, and has been of great service to the Sanitary Department.

Educational Institutions.—Aberdeen, until about thirty years ago, was the seat of two Universities, one founded in 1494, and the other in 1593. These are now incorporated into one University, with a staff of 22 professors, besides lecturers, and an annual attendance of between 900 and 1,000 students, endowed with bursaries to the annual value of 7,400*l.* With the exception of about 60 to 70 in attendance in the Faculties of Law and Divinity, the students are nearly equally divided between the Faculties of Arts and Medicine. At present a large scheme of extension of the University buildings, to accommodate the increasing number of students, and to meet the growing demands of science teaching, is under consideration.

Aberdeen also possesses an excellent Grammar or High School, founded in the thirteenth century, which has within recent years been re-housed in new and stately buildings. The City also contains an institution known as Robert Gordon's College, which, though originally intended by the founder for the education and upbringing of the sons of the poor, has, without detriment to the purpose of the founder, become an important secondary school, and especially has provided a large amount of technical education for the youth of all classes, having indeed been in this respect one of the pioneers of technical education in Great Britain. Much attention has in recent years been given to the proper warming and ventilation of the public schools of the city, with the result that many of them are now ventilated by mechanical (propulsion) means; and Aberdeen is probably more advanced in this respect than any other town in the kingdom.

Public Parks.—The city would be well supplied with public parks, provided some of them were more centrally situated. Between the city and the sea is a large area (300 acres) of common ground, the Links, which is largely used by the working classes for recreation purposes. Near the centre of the town are the Union Terrace Gardens (3¼ acres), and at the west and south margins of the town are the Victoria Park (14½ acres, and costing 5,200*l.*), and the Duthie Park (44½ acres, valued at 40,000*l.*), the latter of which was presented to the city in 1881 by Miss Duthie, of Ruthrieston, and is one of the most beautiful municipal parks in the kingdom.

Public Gymnasium.—An excellent gymnasium has recently been established through the energy and liberality of some public-spirited citizens, and is doing good work both within its own walls and by encouraging the teaching of gymnastics in many of the schools.

Public Libraries and Art Gallery.—The Public Libraries Act was adopted by the city in 1884, and a handsome new edifice for the accommodation of the library, costing about 9,000*l.*, is nearly completed. The library at present consists of about 32,000 volumes. There is also a large and very valuable library connected with the University, and containing upwards of 100,000 volumes. An Art Gallery was erected a few years ago at a cost of 6,300*l.*, and it already contains some excellent examples of the painter's art, which will be greatly added to when the Macdonald collection of paintings—of unique character in some respects—comes to be transferred to the Gallery. An excellent Art School was at the same time erected in contiguity to the Gallery, the school being the gift of Mr. John Gray.

Industries, &c.—The city has no chief and outstanding industry. Exclusive of those connected with the extensive agricultural operations of the surrounding district the most characteristic industry is, perhaps, granite-polishing. But there are also extensive works for paper-making; flax, cotton, wool and jute spinning and weaving; comb-making, soap-making, and shipbuilding. With the introduction of trawling, fishing has sprung into increasing importance, and is now a very considerable source of employment and wealth. The total value of the fish brought into the port during the year 1890 was 243,630*l.*

Aberdeen has an excellent harbour, on which very large sums of money have been spent, and it enjoys a considerable position as a shipping port. The city has also a well-developed tramway system, there being 9 miles of lines, which were constructed at a cost of 39,200*l.*

Vital Statistics.—The average annual birth-rate for the five years ending 1890 was 32·8 per 1,000 of the population. In the five years ending 1870 it was 36·3, since which time it has gradually fallen. Aberdeen enjoys, along with Dundee, among Scottish towns, the unenviable position of having a high proportion of illegitimate births. The average proportion in 1886–90 was 10·4 per cent. of the total births. In 1866–70 it was 12·9 per cent., and it fell to its present proportion about five years later.

The average annual marriage-rate for 1886–90 was 7·7 per 1,000 of population. In 1866–70 it was 8·2. It fell soon afterwards to nearly its present rate.

The average annual death-rate per 1,000 for each of the successive quinquennial periods from 1855 to 1890 has been 23·8, 24·8, 23·54, 22·48, 20·96, 19·74, and 19·84. A very heavy epidemic of measles in 1887, and a visitation of influenza in 1890 have helped to considerably raise the average of the last quinquennium. The lowest rate in any individual year was in 1885, when it was 17·9. The average annual death-rate among persons under 5 years of age during the past 10 years was 51·3 per 1,000; among persons of 5 to 60 years, 9·1; and among persons over 60 years, 68·6. The mortality from tubercular and from zymotic diseases has very considerably and steadily declined during the last 20 years.

Sanitary Administration.—The sewerage and water-supply are entirely under the management of the burgh engineer and surveyor and his staff, subject to the direction of the Town Council. The sanitary arrangements of all new buildings, at the time of their erection, are subject to his control and inspection. The inspection of the sanitary arrangements of the city otherwise is in the hands of the sanitary officials. Until less than ten years ago the sanitary staff consisted only of the medical officer of health and the sanitary inspector. At present it comprises, in addition to these officials, six assistant inspectors, one of whom is specially charged with the examination of food, a second with the inspection of dairies, and a third with the visitation of cases of infectious disease. Other assistants are also employed for the removal of infected clothing, etc.

The Borough of Andover.

Delegates to the Congress:

Councillor W. Bracher (Mayor).
Alderman H. P. Moore.

Andover is one of the most ancient boroughs in England. Nearly 900 years ago the then king of Norway, "Aulif," was confirmed by King Ethelred in the Saxon church at Andover. The church was given by William the Conqueror to the abbey at Saumur, in Anjou, and was attached to it until dissolved by Henry V., who gave it to Winchester College. The borough possesses several charters in a beautiful state of preservation, one of which was granted by Henry 1st, another by King John.

The manufacture of shalloons was formerly extensively carried on here. The town is now a purely agricultural one.

The country around abounds with ancient entrenchments, of which the most noticeable are Danebury and Quarley, and also Bury Hill, a very fine entrenchment.

There is a beautiful semi-circular walk called "The Ladies Walk," which commands the town, forming a turf promenade 20 feet wide, and more than a mile-and-a-half in length, from which the two adjoining counties of Berks and Wilts are distinctly visible.

The town possesses a recreation ground of upwards of seven acres, which was acquired in the Jubilee year.

The town has recently acquired the control of the waterworks formerly belonging to a private company, the water of which has proved on analysis to be of the purest description.

Notwithstanding the agricultural depression, the borough has slightly increased during the last decade, during which period a great many new buildings have been erected. Owing to its capital railway accommodation and the very salubrious air, it is reasonable to believe that it will continue to increase.

The death-rate is low, not exceeding an average of 18 per 1,000.

The population of Andover Parish, including the hamlets, is 5,852.

The City of Belfast.

Delegates to the Congress.

C. C. Connor, Mayor.
Alderman Graham, M.D.
Henry Whitaker, M.D., Medical Superintendent Officer of Health.
Conway Scott, C.E., Executive Sanitary Officer.

The city of Belfast, the capital of Ulster, is situated chiefly in the county of Antrim; but includes in its boundaries the large and increasing district of Ballymacarrett in the county of Down, from which it is separated by the River Lagan, which here empties itself into the Belfast Lough about ten miles from the Irish Channel. Its present municipal boundary comprises 4,322 acres in county Antrim and 1,668 in county Down. There is also an additional area of 814 acres of tideway included in the city boundary; while for Parliamentary purposes a further area of 3,766 acres of suburbs in both counties has been added. In the year 1841 Belfast became a corporate town; and very shortly afterwards the town council took steps to carry out great and much needed improvements, especially in the centre of the city; they swept away many of the narrow and unhealthy lanes and alleys—which, built in earlier times, abutted upon the main thoroughfares—made new streets and widened old ones, established new markets; and in conjunction with the Harbour Commissioners, who at the same time carried out great improvements in filling up old and insanitary docks and making new lines of quay frontage to the river, commenced an era of improvement which though not yet completed, has made the leading streets and thoroughfares a credit to the community and second to few in the Empire.

The population of Belfast in 1782 was 13,105; in 1831, 48,224; in 1861, 120,777; in 1881, 208,122; and in 1891, 255,896; being now at the rate of 39·2 persons to each acre. Its rateable valuation was in 1871, 460,802*l.*; in 1881, 603,732*l.*; and in 1891, 711,406*l.* Few cities (if any) in the United Kingdom can point to the same steady and unvarying rate of progress, as testified by increase in population and in rateable value; while at the same time its material prosperity and success is amply shown by the many and varied industries which within the last half century have risen and thriven in its midst.

Belfast Lough is a wide expanse of comparatively shallow water, with picturesque hills on either side, by which vessels within it are protected from gales blowing from almost any direction. Hence it is largely used by shipping as a harbour of refuge, and the new channels made in it (upwards of four miles in length) by the Harbour Commissioners, enable vessels of large draught to come up to the quays,—where the river unfortunately receives the greater part of the sewerage of the city; this, however, is being remedied by a system of intercepting sewers which are now being constructed by the Corporation. The amount expended by the Harbour Commissioners on harbour improvement

and quayage since 1846 amounts to 1,400,000*l.*, and their revenue for the year 1890 was 121,500*l.*

The streets, lanes, and alleys in the old parts of the city were close and narrow, with high houses and little sanitary accommodation; they, however, are few in number and are rapidly disappearing. The lanes and alleys are being closed, the houses pulled down, new and spacious thoroughfares opened, old and narrow streets widened, open spaces secured, and the means of sanitation amply provided for. At the present time the Corporation have applied for powers under "The Housing of the Working Classes Act" to clear away a large district of unhealthy houses with a view to its proper re-arrangement. The artizans in general are well housed; miles of two-storied houses, each with some four rooms and a small backyard, are found in every district of the city; so that each family can have the great privilege of having a separate house, for the cleanliness of which they alone are accountable and with the privacy of which their neighbours cannot interfere. In the event of an epidemic of infectious disease occurring, the advantage of the small and self-contained separate houses as compared with the tenement house is very obvious.

The parks belonging to the city are well kept and pleasantly situated. The principal one is Ormeau Park, formerly the demesne of the Marquis of Donegall, containing about 175 acres of well wooded and beautifully planted grounds rising almost abruptly from the bed of the River Lagan. It is to be regretted that the greater part of the river adjoining is formed of slob land which, lying exposed except at high tide, gives forth a most unpleasant smell, especially in warm weather. The Corporation hope by their present sewerage scheme, which will remove the sewage from the river, greatly to mitigate if not altogether to do away with this undoubted nuisance. Another park containing 44 acres, adjoining the City Cemetery, is pleasantly situated at the foot of the hills overlooking the valley of the Lagan, for the Falls Road district; and another smaller one, the "Alexandra," for the shore and Antrim Road districts. Woodvale Park, containing 24 acres, in the neighbourhood of the important and densely populated district of Shankhill; and the Dunville Park, recently presented by Mr. Robert G. Dunville, D.L., to the city, and more immediately convenient to the dwellings of the working people, complete the list of the parks now open to the public; whilst the Victoria Park near Ballymacarrett, adjoining the seaside, and containing about 60 acres, is about to be made available for the inhabitants of that neighbourhood.

The water-supply to the city is under the control of a body of commissioners, 15 in number, chosen by the ratepayers, and elected in a somewhat similar manner to the members of the town council. These gentlemen have shown a wise foresight and discernment in the management of this important trust. The rapid increase of the city, and the demand for sufficient water, not only for household and sanitary but also for business and manufacturing purposes, called for considerable efforts, and necessitated a large outlay. Within the last 50 years the water commissioners have had, on three occasions, to erect new and more

extensive works for the supply and storage of water. First in 1840, about a mile from the centre of the city on the Antrim Road, where basins were placed capable of holding about 180 million gallons; secondly about the year 1865, at Woodburn and Lough Mourne district, reservoirs which, with subsequent extensions, now possess a storage capacity of upwards of 1,500 million gallons; and latterly, at Stonyford, about 8 miles from Belfast, where a reservoir has been erected, the area of which is about 160 acres, and its capacity about 700 million gallons. The quality of the water is very fair; it is principally obtained from upland pasture, and has a moderate degree of hardness. Filtration beds on an extensive scale, and on the most improved principle are at present being erected in connexion with the works, so that both for quantity and quality the water furnished to the city will bear favourable comparison with that supplied to other large centres of industry. The expense has been comparatively great; the rapid growth of the city and great demand for water could scarcely have been foreseen, and hence the extra expense necessarily incurred by the execution of new works from time to time to meet the increasing demand. The total amount expended on the waterworks (capital account) since 1840, amounts to 655,511*l.* The daily quantity of water at present delivered into the city is 9¼ million gallons, equal to a supply of 34 gallons per head per day of the population supplied.

In the year 1879, the first public baths were established in Belfast, at a cost of 6,500*l.*, and were so much appreciated that the Corporation, when making a new street in the centre of the city, Ormeau Avenue, set apart a portion of ground therein upon which to erect new baths; this they did in 1888, at a cost of 10,500*l.*; these have proved very successful, and are often inconveniently overcrowded. To remedy this, and in compliance with the wishes of those living on the county Down side of the river, the Public Health Committee are at present erecting new baths in Ballymacarrett.

When the Corporation took over the charge of the streets of Belfast, they were merely macadamized, and in few, if any of the streets were the footpaths flagged. It was not until the year 1874 that powers were obtained from Parliament by which the paving of the city in a permanent and substantial manner could be attempted. Since that date 45,000*l.* has been expended on square setting some of the principal streets; and a loan of 50,000*l.* has just been obtained for a similar purpose. The footpaths were in general very rudimentary, and only flagged in small patches or in the leading squares. Since 1884, in which year an Act of Parliament was obtained authorizing the expenditure of 50,000*l.* in flagging, great progress has been and still continues to be made, 48,000*l.* having beeu already expended for that purpose. Upwards of one million and a half has been expended since 1846, for all purposes; this sum, however, includes cost of forming markets, and nearly 500,000*l.* expended for the purchase of gas works.

For many years the importance of a proper system of sewerage has pressed itself upon the attention of the Corporation, and so long ago as the year 1866, the late Mr. Montgomery, C.E., borough surveyor,

presented an exhaustive report entering fully into the matter, and showing the difficulties to be encountered in carrying out a good and sufficient plan in the city, the greater part of which was built on marshy and mud land mainly reclaimed from the bed of the river, and so little above high water level that an outfall could hardly be given to the sewers. Sir Joseph Bazalgette was consulted and approved generally of the scheme, although he suggested some alterations therein; as however, a very large sum of money would have had to be raised and an Act of Parliament obtained for this purpose, the matter was allowed to remain in abeyance until 1885. In the meantime, however, district sewers were constructed in different parts of the city, all so arranged as to form part of a grand sewerage scheme to be thereafter carried into effect.

The Belfast Main Drainage Act of 1887 empowers the Corporation to carry out a scheme of intercepting sewerage for the entire city somewhat on the lines of the Main Drainage of London. The works comprised by this scheme are the construction of trunk or intercepting high-level and low-level sewers together with an outfall sewer and covered storage reservoir, 5,000,000 gals. in capacity, erected in a new enclosure reclaimed from the tide by embankments; also a covered timber outlet sewer one mile in length along the tidal lands of Belfast Lough, through which the sewage flowing from the reservoir will be discharged into the deep water of Whitehouse Roads. The scheme also embraces a pumping-station to lift the low-level sewage into the outfall sewer, and an auxiliary pumping-station near the storage reservoir to raise sewage into the latter at certain times when the flow cannot be properly obtained by gravitation. The construction of the timber outlet sewer has proved to be a difficult work, the sewer being below ordinary low-water level. However it is now practically completed, and the embankments reclaiming some 25 acres for the purpose of providing a site for the storage reservoir, auxiliary pumping-station and accessories, are now just being finished. The outfall sewer and first sections of the high-level and low-level trunk sewers have already been constructed, having a temporary outlet into the tidal Milewater River pending the completion of the outlet works. The buildings of the pumping-station are rapidly nearing completion; and a contract has been recently let comprising the construction of the storage reservoir and buildings of the auxiliary pumping-station.

The works yet requiring to be undertaken are the extensions of the high-level and low-level trunk sewers, and the continuation of the latter work under the tidal River Lagan in order to intercept the sewage of that portion of the city on the eastern side of the river.

Before the full advantage of the scheme can be obtained, many subsidiary sewers and works will have to be carried out in order that the sewage now flowing into and polluting the River Lagan may be collected and diverted into the new system. The discharge of the sewage into the sea by means of the new works will only take place during the first portion of the ebb tide, so that advantage may be taken of the currents setting out towards the open sea.

The City of Birmingham.

Delegates to the Congress:

Councillor R. F. Martineau.
Alfred Hill, M.D., Med. Off. Health.

Birmingham is a parliamentary and municipal city and borough and county borough under the Local Government Act, 1888. The parliamentary borough includes the districts of Balsall Heath, Harborne, Saltley, and Little Bromwich, and returns seven Members to Parliament. The population of the city in 1881 was 400,774, and in 1891 it was 429,171.

The area of city is 8,420 acres. There are 205 miles of streets, 32 of which are paved, the remainder are macadamised.

The rateable value in 1890 was 1,817,638*l.*

The number of voters on the Burgess Roll, 1890–91, was 78,510, and the number of voters on the Parliamentary Register for 1891 was 76,157. The city is divided into 16 wards, each of which is represented by three councillors; an alderman is allotted to each ward to act as returning officer at municipal elections.

The city was incorporated in 1838; but not until the passing of the Birmingham Improvement Act, 1851, did the council obtain entire control of the borough, the formation and maintenance of streets, lighting, draining, &c., having until that time been in the hands of several bodies of commissioners. Birmingham was created a city in 1888.

A grant of assizes was made in 1884, and in 1887 the foundation stone of the courts was laid by Her Majesty the Queen.

The city is of considerable antiquity. The name first appears in history in Domesday Book (1083–1086), and it was then a place of some importance. Its great growth has, however, been recent, for the population in 1801 was but 73,670. The manufacturing industries of Birmingham are very varied, and are mainly connected with the hardware trades, of which the city is the chief seat.

The city is situated on the north-west of Warwickshire, at an elevation of 291 to 616 feet above sea level. The soil is of a porous and gravelly nature, and in parts sandstone rock. Its elevation and the nature of the soil have a beneficial effect on the public health. The general sanitary condition of the city is now good, and the powers of the council with respect to public health are vigorously administered. Owing in a great measure to this fact, the death-rate declined from 26·8 per 1,000 in 1874 to 17·5 in 1888, and the zymotic death-rate from an average of 5·3 per 1,000 during the five years 1873 to 1877 to 2·7 during the five years 1886–1890. The death-rate for last year shows an increase, being 22 per 1,000 on the estimated population. This increase is not, however, confined to Birmingham, the death-rate for the whole of England and Wales having risen to quite as great an extent, while that for the 28 large towns given in the returns of the

Registrar-General shows a larger increase than has occurred in Birmingham. The zymotic death-rate for 1890 was 2·8 per 1,000, and the birth-rate for 1890 was 29·9 per 1,000.

The Infectious Disease (Notification) Act, 1889, the Infectious Disease (Prevention) Act, 1890, and Part III. of the Housing of the Working Classes Act, 1890, have been adopted. The Corporation have a hospital for the treatment of small-pox and scarlet fever, with accommodation for about 400 patients. The sanitary department proper includes, in addition to the medical officer of health and the inspector of nuisances, 22 assistant inspectors. There are also two meat inspectors under the markets superintendent, and a special drain inspector and a building surveyor under the city surveyor. During the year 1890 22,727 notices were issued for the abatement of nuisances, 21,342 nuisances were abated, and in 57 cases only were proceedings taken against defaulters. There were 87 common lodging-houses on the register at the end of the year, registered for 1,959 lodgers, besides 128 houses registered as "houses let in lodgings" for 725 lodgers. Nine hundred and twenty-six samples were purchased under the Food and Drugs Acts, 123 articles were more or less adulterated, 29 persons were cautioned, and 16 summoned.

Sewerage.—There are 206 miles of sewers. The sewage is discharged at Saltley, and is dealt with on a farm of over 1,200 acres by a system of treatment with lime, of precipitation in tanks, and of filtration of the sewage through the land. The effluent water is afterwards discharged into the Cole and Tame. The farm is the property of the Birmingham, Tame, and Rea District Drainage Board, a body composed partly of representatives elected by the city council and partly of representatives of adjoining authorities. There are in all 22 members, of which the mayor of Birmingham and the chairman of the Aston Local Board are *ex officio;* of the others 11 are elected by Birmingham. The total area of these districts, the sewage from all of which is treated, is 45,000 acres.

Improvement Scheme.—Immediately upon the passing of the Artizans' and Labourers' Dwellings Improvement Act, 1875, the Corporation took steps to put it in operation. The area acquired under the Act (including a site for the erection of artizans' dwellings) was 218,099 square yards; this area has up to the present time been dealt with as follows:—Let on building lease to 31st March 1891, 48,076 square yards; sold or exchanged, 17,237 square yards; site of Victoria Courts, 5,600 square yards; site of 22 artizans' dwellings in Ryder Street, 2,100 square yards; site of 82 artizans' dwellings about to be erected, 6,783 square yards; required for new streets and widening old ones, 39,810 square yards; still occupied by rent-producing property, 84,152 square yards; cleared for letting, 14,341 square yards.

The annual rental receivable from the 48,076 yards let on building lease amounts to 36,021*l.* 10*s.* 3*d.*, and the property left standing produces about 20,000*l.* per annum.

About 1,867 houses and 814 other buildings have been acquired; of these, 890 houses and 353 other buildings have been taken down,

and the remainder repaired and put into a sanitary condition by removing buildings where too crowded, rebuilding the out-offices, paving the yards, providing a proper system of drainage, laying on the Corporation water supply, &c. Fifty-seven licensed premises were included in the above, and up to the present time these have been treated as follows:—Premises taken down and licenses abandoned, 19; premises taken down and licenses transferred to new buildings, 11; premises still standing and licenses continued, 27.

The total capital expenditure in respect of this scheme up to the 31st March 1891 amounts to 1,666,398*l.* 7*s.* 11*d.*; but by deducting the sum of 115,588*l.* 16*s.* 7*d.* paid to the sinking fund out of income, the actual liability is reduced to 1,550,809*l.* 11*s.* 4*d.* It is estimated that the outlay still to be incurred will entail the expenditure of a further sum of 50,000*l.* The actual cost to the ratepayers, being the annual instalments voted from the rates in aid of the scheme up to the present time, is as follows:—In 1876, 460*l.*; 1877, 6,147*l.*; 1878, 15,000*l.*; 1879 to 1886, 20,000*l.* per annum; 1887 to 1890, 25,000*l.*; and it is estimated that the scheme will entail a charge on the rates of 20,000*l.* per annum until the loans are paid off at the expiration of 60 years from the date of borrowing.

The Corporation have recently erected 22 artizans' dwellings at a cost of 4,000*l.*, and the houses are let at a rental of 5*s.* 6*d.* per week each. Eighty-two additional dwellings are now being erected, the estimated cost being 14,000*l.*, and it is intended to let these at the same rental.

Parks.—Birmingham possesses several public parks and recreation grounds, of which five have been presented to the Corporation.

The following is a list with particulars:—

Name of Park.	Date of Acquisition.	Area.	Gift or Purchase.
		a. r. p.	
Adderley Park - - -	1856	10 0 22	Gift of Mr. C. B. Adderley (now Lord Norton).
Calthorpe Park - -	1857	21 1 13	Leased to Corporation by Lord Calthorpe at nominal rent.
Aston Park and Hall - -	1864	43 0 0	Purchased for 26,000*l.*, 7,000*l.* of which was raised by subscription.
„ addition to - -	1873	6 2 8	Purchased for 4,750*l.*
Cannon Hill Park - -	1873	57 1 9	Gift by Miss Ryland.
Highgate Park - -	1876	8 0 28	Land purchased for 8,000*l.*, and 7,000*l.* expended in laying out.
Summerfield Park* - -	1876	12 0 20	Land purchased for 8,000*l.*, and 3,857*l.* expended for laying out.
Barbury Street Recreation Ground.	1877	4 1 3	Gift by Mr. Wm. Middlemore.
Victoria Park - -	1879	41 3 34	Gift by Miss Ryland.
Park Street Gardens - -	1880	4 1 35	Disused burial grounds; laid out at cost of 12,099*l.*
St. Mary's Gardens - -	1882	2 2 0	

* This park will shortly be increased by about 16 acres.

In addition to the foregoing, the Corporation are the possessors of a Hill (Rednal Hill, 32 acres), part of the Lickey Hills, a low range of about 900 feet in height, situated about eight miles from the City on the south-west. This hill was about to be let in lots on building leases when the Society for the Preservation of Open Spaces (T. Grosvenor Lee, Hon. Sec.), stepped in, and through its efforts sufficient subscriptions were raised for the purchase of nearly the whole Hill which has since been transferred to the Corporation. Another hill in the same range, Bilberry Hill (36a. 3r. 3p.), has been leased to the Corporation by Lord Windsor for a period of 21 years at a nominal rent. Both hills will be preserved in their natural state.

Baths.—There are four sets of baths belonging to the Corporation, the first of which was opened in 1851. Each suite consists of first and second class baths and private baths. There is also an open-air bath, and two sets of Turkish baths. The total number of persons using the swimming baths last year was 318,955, and of persons using the Turkish baths, 7,992.

Markets.—The markets consist of a market hall, fish market, dead meat market, covered vegetable market, cattle, sheep, pig, and horse markets, hay and straw markets, and several open-air vegetable and general markets. Their total cost (including 12,500*l.* purchase of market rights from the lord of the manor) was 235,000*l.* A further expenditure of about 60,000*l.* is contemplated in providing a new dead meat market and public slaughter-houses, and 12,500*l.* for the erection of a new pig market.

The total income for the year ending 31st March 1891, was 20,854*l.* 17*s.* 6*d.*; and the total expenditure 15,125*l.* 10*s.* 7*d.*; yielding a net income of 5,729*l.* 6*s.* 11*d.*

Education.—By the Corporation (Consolidation) Act, 1883, the limit of the Free Library Rate was removed, and power was given to the Corporation to establish a Municipal School of Art and to provide funds for the maintenance of the Art Gallery. Towards the erection of a School of Art. Miss Ryland gave 10,000*l.*, Messrs. Richard and George Tangye 10,000*l.*, and Mr. Cregoe Colmore gave the land worth 14,000*l.* The school was opened in 1885. In connexion with it there are 11 branch schools in various parts of the town. The total number of students on the books at end of 1890 was 2,456.

The Birmingham Museum and Art Gallery was opened in 1885. There is on view here a collection of oil paintings, water colour drawings, sketches, &c., as well as a large collection of iron and other metal work, stone, ivory, and wood carvings, tapestry, textiles, jewellery, &c. An Art and Natural History Collection is also open to the public at Aston Hall. The total number of visitors at both these places was 825,601 during the year 1890. The Art Gallery and Museum are open on Sunday afternoons.

A Technical School has been established by the Corporation under the Technical Instruction Act, 1889.

Other educational institutions in the City are the Birmingham and Midland Institute, Mason Science College, Queen's College, and the Grammar School.

The Birmingham and Midland Institute was established in 1854, for the diffusion and advancement of science, literature, and art, and lectures are delivered to the members by the best lecturers of the day, and popular classes are held in science, languages, commercial subjects, music, &c., open to persons of both sexes.

The Mason College was opened in 1880. In addition to the higher branches of collegiate learning, education adapted to the scientific requirements of the manufactures and industrial pursuits of the Midland District is given, also regular systematic instruction for the B.Sc. and D.Sc. of the University of London, and popular instruction by evening lectures, &c., for artizans and others.

Queen's College is devoted chiefly to medical and surgical study. It is about to be amalgamated with Mason College, except as regards its theological faculty.

At the Grammar School of King Edward VI., which has several branches, higher education is given to boys and girls.

There are few towns where the educational ladder is so complete. In the 52 board schools the curriculum includes, besides the usual subjects, science, cookery, carpentry, and manual training. From the board schools there are scholarships to the Grammar School and Mason College.

Free Libraries.—The Corporation maintain a central free lending library, reference library, and news room. There are also four branch libraries, each with a news room, and two other branches are in course of erection. The first library was opened in 1861. In the lending libraries there are upwards of 60,000 vols., and in the reference library there are more than 106,000 books. The number issued during the year from the reference library was 343,116, and from the lending libraries 504,575. The reference library is opened on Sunday afternoons and evenings.

Cemetery.—In 1860 the Corporation purchased 105 acres of land, of a light nature, at Witton, about three miles outside the City, for use as a cemetery.

The Gas Department.—The Corporation of Birmingham acquired by purchase in 1875 the Undertakings of the Birmingham and Staffordshire Gas Light Company and the Birmingham Gas Light and Coke Company. The area of supply includes, besides the city of Birmingham, the parishes of Edgbaston, Harborne, Northfield, King's Norton, Yardley, Sutton Coldfield, Handsworth, Aston, Darlaston, and Wednesbury, and portions of the parishes of Halesowen and Bickenhill. The area, at the time of the transfer to the Corporation, also included the

parishes of Smethwick, Oldbury, Rowley Regis, Tipton, West Bromwich, and Walsall, but in each of these districts the rights of supply have since been sold by the Corporation to the local authorities. The present area is about 18 miles from north to south and 12 miles from east to west. Within this district, 536 miles of mains have been laid, covering an area of about 12 by 10 miles, and supplying over 55,000 consumers and 12,200 public lamps.

At the time of the purchase the prices charged for gas were as follows:—

	s.	d.	
Under 10,000 cubic feet per quarter,	3	6	per 1,000 cubic feet.
10,000 to 25,000 „ „	3	4	„ „
25,000 to 100,000 „ „	3	2	„ „
Over 100,000 „ „	3	0	„ „
Public lamps - -	3	0	„ „

All subject to 5 per cent. discount for prompt payment.

The prices now are as follows:—

	s.	d.	
Under 25,000 cubic feet per quarter,	2	7	per 1,000 cubic feet.
25,000 to 50,000 „ „	2	5	„ „
50,000 and upwards „	2	3	„ „
Public lamps -	1	1	„ „

All subject to 5 per cent. discount for prompt payment.

The gas works supplying this area are situated at Windsor Street and Adderley Street within the city, at Saltley within the district of the Saltley Local Board (about to be brought within the city boundaries), and at Swan Village in the parish of West Bromwich. The area of land occupied by and used in connexion with these works is about 96½ acres. The accompanying tables show the growth of the Undertaking and the application of its profits from the year 1875:—

Year.	Capital Expenditure to 31st December.	Coal Carbonised.	Gas sold and used on Works.	Gas Rental.	Price of Gas less 5% discount for Prompt Payment.	Average Net Price of Gas.	Residuals sold.				Amount of Reduction, Public Lighting.	Surplus Profit.
							Coke and Breeze.	Tar.	Ammoniacal Liquor.			
	£	Tons.	Cubic Feet.	£	s. d.	d.	£	£	£		£	£
1875	2,000,931	296,000	2,327,596,800*	—	3/ to 3/6	About 3·14	—	—	—		—	25,339
1876	2,084,530	299,396	2,386,595,800	344,144	2/9 „ 3/3	2·10·69	70,790	31,165	16,271		—	34,122
1877	2,133,731	287,849	2,280,217,800	342,614	2/9 „ 3/3	2·10·54	55,968	33,205	16,884		—	36,685
1878	2,131,442	297,884	2,494,495,900	357,678	2/9 „ 3/3	2·10·41	39,907	31,279	28,547		—	54,832
1879	2,153,336	318,083	2,645,396,200	346,709	2/8 „ 3/	2·7·45	41,359	33,196	38,199		—	51,166
1880	2,142,262	307,232	2,675,755,400	349,551	2/6 „ 3/	2·7·85	47,549	30,396	30,374		—	57,009
1881	2,096,110	309,134	2,747,865,400	325,008	2/3 „ 2/9	2·4·38	49,861	33,830	47,339		—	52,853
1882	2,127,726	301,491	2,710,598,100	319,639	2/3 „ 2/9	2·4·24	48,085	32,083	51,294		—	50,946
1883	2,190,875	311,886	2,861,072,000	336,275	2/3 „ 2/9	2·4·21	49,634	32,705	42,706		—	55,389
1884	2,274,095	323,050	2,953,697,800	327,982	2/1 „ 2/5	2·2·65	44,486	31,918	33,564		—	28,465
1885	2,313,222	343,156	3,151,878,000	332,145	2/1 „ 2/5	2·1·29	39,286	22,665	28,002		7,294	25,000
1886	2,328,014	350,734	3,208,740,000	344,211	2/1 „ 2/5	2·1·04	34,356	18,899	30,089		8,353	19,227
1887	2,294,340	359,415	3,378,555,000	377,778	2/3 „ 2/7	2·2·93	34,835	16,886	27,561		9,078	25,773
1888	2,241,271	372,605	3,482,923,800	387,842	2/3 „ 2/7	2·2·73	43,959	21,781	29,588		10,280	40,016
1889	2,211,060	390,128	3,618,777,800	401,696	2/3 „ 2/7	2·2·64	60,384	29,102	32,430		10,912	70,357
3 months ended 31 Mar. 1890	2,209,158 To 31st March.	129,808	1,255,637,400	138,273	2/3 „ 2/7	2·2·43	29,804	10,059	10,586		3,352	38,471
Year ended 31 Mar. 1891	2,178,407	421,710	3,810,418,300	423,059	2/3 „ 2/7	2·2·04	91,401	33,157	30,241		11,139	36,785

* About.

Year.	Appropriation of Net Profit.*				Amount of Reserve Fund at 31st December.	Amount of Sinking Fund at 31st December.
	Improvement Rate.	New Offices Account and other Public Purposes.	Reserve Fund.	Extra Contribution to Sinking Fund.		
	£	£	£	£	£	£
1875	—	950	24,389	—	—	—
1876	30,000	—	4,122	—	24,389	3,832
1877	25,000	—	11,685	—	29,499	7,924
1878	25,000	—	7,152	22,680	42,848	12,349
1879	25,000	—	—	26,166	50,000	40,519
1880	25,000	6,000	—	28,009	50,000	73,486
1881	27,500	—	—	25,353	50,000	107,670
1882	25,000	—	—	25,946	50,000	142,359
1883	25,000	—	5,000	25,389	50,000	179,241
1884	28,465	—	—	—	57,222	217,214
1885	25,000	—	—	—	59,534	227,144
1886	19,227	—	—	—	61,939	240,726
1887	25,773	—	—	—	64,441	254,868
1888	25,000	—	15,916	—	67,045	269,384
1889	41,649	—	13,688	15,000	86,312	284,494

* Exclusive of 31,072*l.* appropriated to New Offices Account from Gross Profit.

Water.—The Corporation acquired the Water Undertaking in 1875 at an estimated cost of 1,350,000*l.* The area of supply includes, besides the city, the parishes of Handsworth, Aston, Edgbaston, Harborne, Northfield, King's Norton, Yardley, Curdworth, Coleshill, Sheldon, Bickenhill, Elmdon, Solihull. This area is about 12 miles from north to south and 15 miles from east to west; within it there are 579 miles of mains supplying about 600,000 consumers. The average daily supply at time of purchase was 8·46 million gallons. It is now 15·73 million.

The supply is derived from the rivers Blythe and Bourne, Plant's Brook, Perry and Witton Brooks, and from six wells in the Sandstone rock. The area of the reservoirs is as follows:—

Reservoirs.	Water Area.	Contents.
	A. R. P.	Gallons.
SHUSTOKE:—		
Large Pool	89 1 33	421,601,176
Small „	9 0 14	20,286,505
Whitacre (Blythe Pool)	10 2 30	32,303,491
PLANT'S BROOK:—		
Large Pool	10 2 35	27,153,219
Middle „	2 2 9	3,795,387
Small „	1 1 36	2,133,632

Reservoirs.	Water Area.	Contents.
	A. R. P.	Gallons.
WITTON:—		
Upper Pool	6 0 30	10,958,283
Middle „	12 3 2	25,124,559
Lower „	17 1 12	29,697,850
Erdington	2 0 26	11,564,542
Perry	7 1 18	8,764,568
ASTON:—		
East Pool	2 0 20	7,071,014
West „	2 1 9	6,657,131
EDGBASTON:—		
Upper Pool	2 1 1	6,505,742
Lower „	1 1 34	4,147,814

Note.—By the City of Birmingham Order, 1891, confirmed by the Local Government Board's Provisional Order Confirmation (No. 13) Act, 1891, the boundaries of the City of Birmingham were, on November 9th, 1891, extended so as to include therein the Local Board Districts of Balsall Heath, Harborne and Saltley, and the Hamlet of Little Bromwich. These districts were previously included in the Parliamentary Borough of Birmingham. By this extension the population of the City has been increased from 429,171 to 478,116, and the area from 8,420 acres to 12,365 acres.

The Borough of Blackpool.

Blackpool is situated on the north-west coast of the county of Lancaster, about 18 miles from Preston and 49 from Manchester. It has been built on an exposed part of the coast, and receives the winds from all the westerly points of the compass in their full force. It is a place of most recent and rapid growth: some 75 years ago it was little more than a fishing hamlet, though even then well known for the healthful character of its situation and climate. Since that date it has greatly grown both in size and importance. During the last decade the population has increased by 67 per cent., and the rateable value by 70 per cent.

The town is now served by two railway companies, the Lancashire and Yorkshire, and the London and North-Western; a third line is projected, and it is hoped that in a few months the process of construction will have started. The busiest season of the year is comprised in the three months of July, August, and September, and during this period the town is so well patronised that at times the population is estimated to be over 70,000, exclusive of the excursionists who on Saturdays and Mondays flock into the town in great numbers. Though the "season" in Blackpool is so limited, the weather during the earlier months of the year is most delightful, and for certain diseases very beneficial. Thus in June the total hours of bright sunshine recorded on the average for the six years, 1885 1890, were 199·2 hours. This is the highest average for any month, whilst July comes next with an average of 181 hours. The average annual rainfall for the six years is $32\frac{1}{4}$ inches, but it is exceptional for rain to fall for a long period during any one day, and the ground dries rapidly. The driest months are April and June, with a rainfall of 1·57 inches each, and February comes next with a fall of 1·68 inches. The velocity of the wind has been recorded for the two years 1889–90 only, but from those observations it would seem that the winds are strongest in January, with a daily velocity of 490·7 miles, and least in May with a velocity of 317 miles per diem.

In 1851 the Layton-with-Warbrick Local Board was constituted, comprising by far the greater portion of the district now known as the Borough of Blackpool. In 1868 the name was altered to the Blackpool Local Board of Health district. In 1876 a Charter of Incorporation was granted, and the town divided into six wards, represented by six aldermen and 18 councillors. Under the Blackpool Improvement Act, 1879, the borough was extended so that its area, inclusive of the foreshore, is 4,243 acres, and exclusive of that portion, 3,495 acres.

In 1890 there were 5,044 inhabited houses within the borough. Whereas the resident population in 1881 was 14,229, it had risen to 23,846 in 1891. It is estimated that the resident population of the present borough at the census of 1861 was 3,907, and at that of 1871, 7,092. The rateable value in 1891 was 175,883*l.*

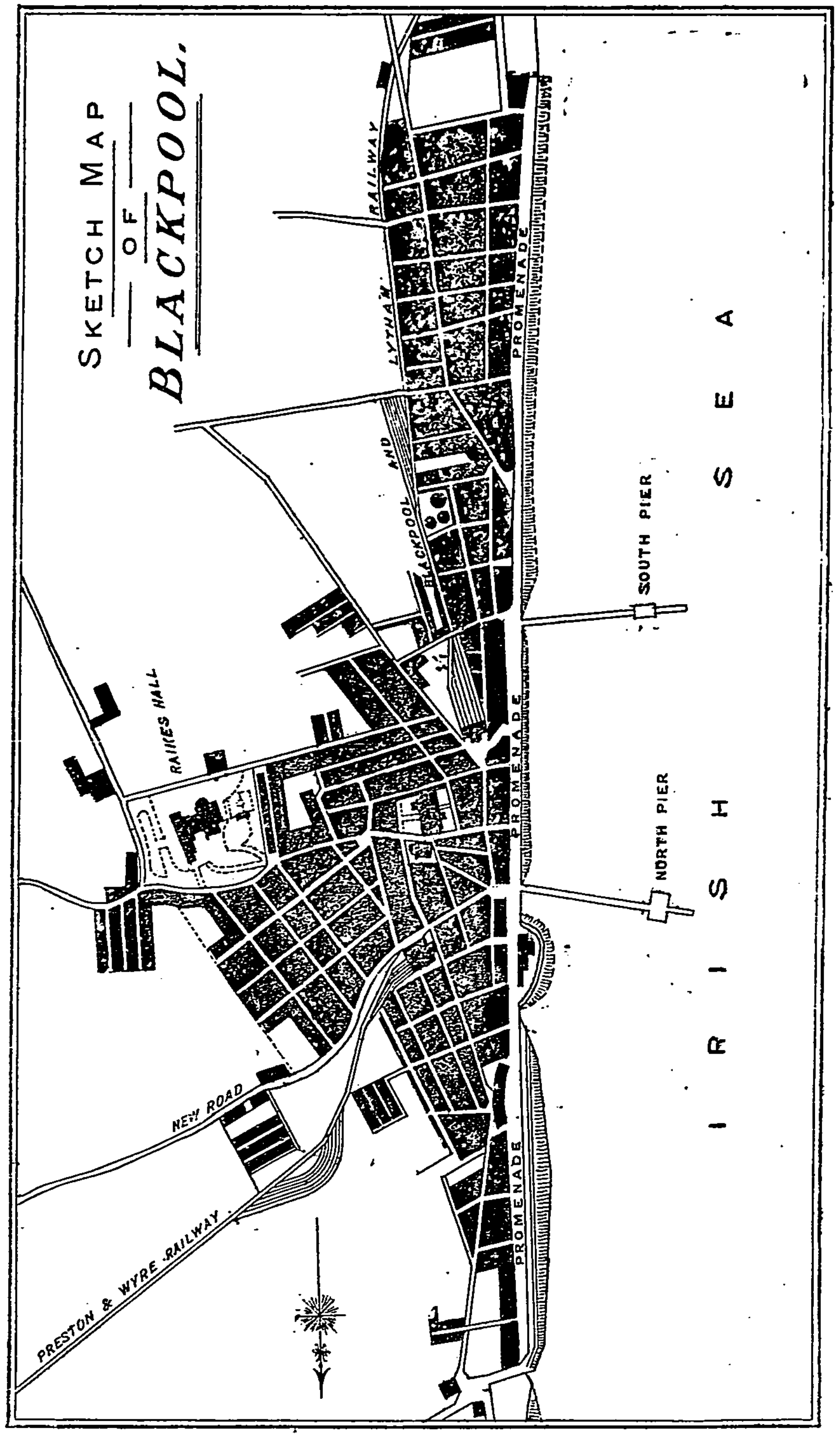
Main drainage works were first commenced in the borough in the year 1866, and have been added to and improved upon from time to time,

especially by the diversion of a stream called Spen Dyke into the sewage outfall. These works up to the present time have cost 45,709*l.* The length of main sewers within the borough is 10 miles. The sewage is discharged into the sea by one main outfall which is carried out to sea as far as possible beyond the influence of the tide, and also by a smaller one at the most northern part of the borough. During the last few years great exertions have been made to place the town in a thorough sanitary condition by the employment of experienced drain-testers, who are making a house-to-house survey of the town in order to discover any sanitary defects, and who submit the drains of each house to the trial of a smoke-testing machine. This is in addition to the examination of any house of which complaint is made, or where infectious disease breaks out. The borough surveyor does not now give a certificate to the effect that a new house is habitable until the drains have satisfactorily withstood the smoke-test, as testified by the medical officer of health.

Along the sea front a wide and beautiful promenade has been constructed, 3,440 yards in length, at a cost of 79,013*l.*; its seaward slope is faced with large blocks of stone, and is known as the hulking. During the season this has been found too narrow in its central portion for the large amount of vehicular and pedestrian traffic between the two piers, so that it is now contemplated to widen it. Besides the two large piers, north and south, just mentioned, a third at South Shore is to be constructed during the coming winter. Over about 2 miles of the promenade electric tramcars run throughout the day, the current generated at the central depôt being conducted by an insulated copper bar contained in a channel in the centre of the track, and being picked up thence by a tongue of metal attached to the car and passing through the slot in the roof of the channel. This tramway has been working since 1885. Further, during the season the promenade and the two piers are lighted by the electric light from 11 Siemen's burners placed at a height of 50 feet. These were first installed in 1879, and have cost 3,570*l.* Under the Blackpool Electric Lighting Order, 1890, the Corporation have secured powers to adopt electricity in the lighting of the streets of the town generally, and for domestic and business purposes. The Corporation, except as to a small portion of the town, are the gas undertakers, and supply that illuminant at 2*s.* 6*d.* per 1,000 cubic feet.

The streets of the town are kept in good order. The promenade is paved with large "setts," the only pavement which has up to the present been found to withstand the sea at Blackpool. In the other streets macadam, asphalt-macadam, and stone setts are used. An experiment has lately been made in one part with wood pavement. There are in the borough about 13 miles of county roads and 17 of public streets, besides 8 miles of private streets not yet taken over by the Corporation.

The borough and surrounding districts are supplied by the Fylde Waterworks Company. This water comes fully up to the standard of an upland peaty water, and is collected from the moorland around Grisedale. At times, however, the water has a deep-brown hue, and may even be turbid. This is not believed to be deleterious to health,



and can be easily rectified by proper filtration of the water at the collecting grounds. Owing to a very active opposition made by the Blackpool Corporation and the neighbouring urban authorities of Fleetwood, Lytham, and St. Anne's-on-the-Sea to a private Bill promoted by the Water Company in the last session of Parliament, the filtration of water must in future be efficiently carried out by the Company. By the same Bill the gathering ground has been increased, and by next season it is hoped there will be an ample water-supply against which no objections can be legitimately made.

A suitable site, with land for a railway siding, has been purchased, and the sanction of the Local Government Board to a loan of 4,000*l.* for the erection of public slaughter-houses has been granted.

For the decade 1881–1890 the birth-rate is 27·4 and the death-rate 16·2 per annum for every 1,000 persons living. (The death-rate is corrected by the subtraction of all cases of death occurring amongst visitors to the town.) The deaths from the seven principal zymotic diseases average 1·9 per 1,000, and during 1890 these deaths were chiefly due to diarrhœa. Taking into account the character of the residents and the healthiness of the district the infant mortality is high, being 181 per 1,000 births registered during 1890, and 155·7 for the years 1881–1890.

The infectious diseases (small-pox, infectious cholera, measles, typhus, typhoid, scarlet, relapsing, and puerperal fevers, and diphtheria) have been notified since 1879. Power to make this notification compulsory both on the householder and the medical attendant was given by the Blackpool Improvement Act, 1879. The results attained have been excellent, and the authorities have found very little difficulty in its administration even in the early days of its inception. The recently erected hospital for the isolation and treatment of infectious disease is admirably equipped and arranged for its purpose. There is a large house for the matron, containing doctor's consulting room and accommodation for a few cases whose exact diagnosis is doubtful or in which the patient's friends refuse to have the patient placed in a ward along with others. There are two blocks; one block being divided so as to preclude direct communication between its two portions. Each of these portions, like the second block, consists of two wards with a nurses' kitchen between; thus there are altogether six wards, so that, if necessary, three separate diseases in each sex could be treated and isolated at the same time. The grounds around the building are ample and very tastefully laid out. Twenty-six patients can be accommodated in the hospital at one time. A hospital for accident cases and for non-infectious diseases is about to be erected on a convenient site by means of voluntary subscriptions.

There is a well-managed Free Library in the town, supported by less than the 1*d.* rate under the Free Libraries Act. The Corporation also intend to put into operation within the borough the power and benefit of the Technical Instruction Act, 1889.

The Borough of Bournemouth.

Delegates to the Congress.

T. J. Hankinson, Mayor.
F. W. Lacey, A.M.I.C.E., Borough Surveyor.
Philip W. G. Nunn, L.R.C.P., Lond., M.R.C.S., M.O.H.

The municipal borough of Bournemouth is situate on the south coast, at the western extremity of the county of Hants, midway between the towns of Poole and Christchurch. It is included in the parliamentary borough of Christchurch. The town is divided into two portions by a small rivulet, called the Bourne, which rises in the parish of Kinson, between six and seven miles distant from the sea.

The pine trees are a great feature in the town. They are more numerous on the East Cliff, but on all sides of the town there are extensive pine woods. These contribute, in a great measure, to its reputation as a health resort. For many years past the governing authorities have endeavoured to make the town perfect in its general sanitary arrangements, and it is now generally admitted that it deserves a high character for its sanitary condition.

Climate.—With regard to the climate of Bournemouth, whilst the value of its winter season has an established world-wide reputation, the advantages of the summer season are still much less widely known than they ought to be. It is commonly inferred by strangers that inasmuch as Bournemouth is an excellent winter health resort, it must be a very hot place in summer, whereas the coolness of the summer here is certainly a very remarkable and interesting fact.

With reference to extremes of heat in summer, it appears from a series of observations taken continuously for the past 24 years in the district by Dr. T. A. Compton, of Southbourne, that a temperature of 80° Fahr. in the shade has never been recorded in May or September, whilst it has only been reached in three Junes, in eight Julys, and in eight Augusts out of the 24. A temperature in excess of 83° Fahr. was recorded in three months only in the 24 years, viz., in July and August 1876, and in July 1886; the actual maximum, 87½°, of the 24 years having been attained in July 1886. These temperatures being from 10° to 15° below the corresponding ones at Greenwich, the summer coolness of Bournemouth cannot be denied. This coolness of air in summer has not been due to prevalence of cloud, for the average number of hours of bright sunshine registered by "Campbell's Sun Recorder" in the past 11 years (since the instrument was set up) has been as follows in the three hottest summer months of June, July, and August: June, 195 hours; July, 204 hours; August, 196 hours. Whilst bright sunshine* has occurred, on an average, on 27 out of 30 days of June; 29 out of 31 days of July; 29 out of 31 days of August.

* The term "bright sunshine" is used on account of the fact that Campbell's Sun Recorder does not register the total amount of sunshine, such, for instance, as the majority of that which passes through visible cloud. Generally speaking, the instrument registers sunshine whenever a person with ordinary eyesight cannot look at the sun.

No doubt, the coolness of the bright summer days is greatly due to the prevalence of the local sea breezes, which, in fine weather, generally set in about 10 a.m., and continue until late in the afternoon.

The average annual rainfall of the past 24 years has been 28·73 inches, falling on an average of 162 days. The average annual amount of bright sunshine has been 1,550 hours in the 11 years since the introduction of the recording instruments; the average number of days on which bright sunshine has occurred having been 290.

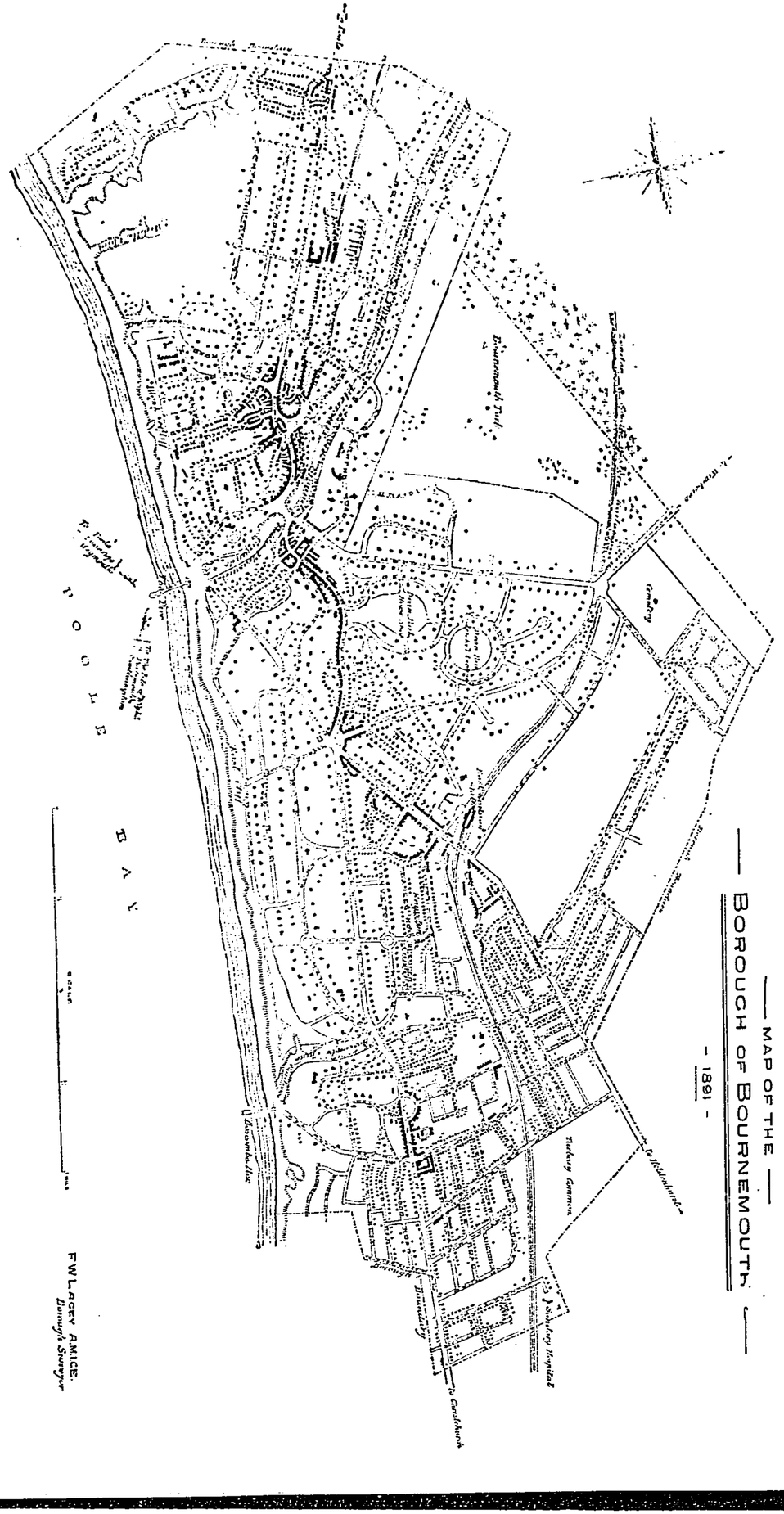
Local Government.—In 1856 the Bournemouth Improvement Act was passed, which vested the government of the district in a board of commissioners, who continued to conduct its affairs until 1890, when they were superseded on the grant of a charter of incorporation, which constituted the district a municipal borough. The borough is divided into six wards, each of which is represented by three councillors; in addition to the 18 councillors there are six aldermen. The area of the urban sanitary district of Bournemouth in 1856 was 1,139 acres, 2 roods, 8 poles, comprised within the radius of one mile from a centre in the Pier Approach. This area was increased in 1876, and again in 1884, so that the present area of the borough amounts to 2,660 acres, 1 rood, 20 poles.

Population, &c.—Since 1861 there has been a continuously rapid increase of population, as the following table will show:—

—	Population.	Area.	Rateable Value.
		Acres.	£
1861 - - -	1,707	1,391	4,923
1871 - - -	7,027	1,391	30,306
1881 - - -	18,533	1,671	117,341
1891 - - -	37,650	2,660	268,865

It is difficult to estimate the death-rate of a district in which the population is subject to such varying influences, but it may be taken at about 10 to 12 per thousand of those properly belonging to the district, and inclusive of visitors (many of whom arrive with their fatal illnesses upon them). The rates during the past three years are as follows: 1888, 14·0; 1889, 12·7; and 1890, 15·5 per thousand.

Of the foregoing area of 2,660 acres, no less than 240 acres are included in public pleasure grounds, parks, commons, and open spaces. There are public tennis courts, 10 in number, in the Central, Boscombe, and Knyveton Gardens, with lavatories, dressing-rooms, &c., to each. The Durrant Estate Gardens are kept up by Miss Durrant, who gives the public the free use of them. Besides the above public pleasure grounds the Corporation has secured the Durley Chine by gift from Mr. Cooper Dean, comprising about seven-and-a-half acres; and negotiations are now pending for the acquisition of the Alum Chine, comprising about 22 acres.



Roads.—The public roads and streets are about 52 miles in length, and the private roads or highways, not repairable by the inhabitants at large, about 12 miles; of the former, $3\frac{3}{4}$ miles are main roads, and were maintained during the year ending March 1891 at a cost of 4,709*l.* 16*s.* 11*d.*, exclusive of footpaths, or at the rate of 1,305*l.* 6*s.* 8*d.* per mile. The metalling used on this road is picked flints and Mendip lime-stone. The other roads are metalled with gravel dug from the pits in the neighbourhood. The paths through the principal streets are paved with Limmer asphalte, and the majority of other paths within the district with lime-stone tar paving. The total length of paved paths in the district is as follows: Limmer asphalte, two miles; tar paving, 29 miles.

Water Supply.—The water supply is derived from the water-bearing strata in the valley of the River Stour, and collected by means of brickwork culverts. From the sump in connexion with these culverts, two 100-h.p. Worthington pumps, each capable of pumping about 1,836,000 gallons per day, and one Turbine, capable of lifting about 576,000 gallons per day, are used as required in forcing the water through an 18 in. rising main to the aerating works and filtering beds at Alderney Manor; from thence the water flows to Bournemouth by gravitation. In connexion with these works there is a reservoir 203 ft. above ordnance datum, the capacity of which is 3,000,000 gallons. The level of the town varies from about 20 ft. to 130 ft. above ordnance datum.

Sea-Water Scheme.—A system of sea-water mains, consisting of about 11 miles of cast iron distributing mains from 3 in. to 6 in. diameter, and supplied by means of two 9-h.p. Nom. gas engines, pumps water from the sea through water towers 170 ft. above ordnance datum for road watering and sewer flushing purposes. This system, adopted in 1888, is now being considerably extended, with a view to a perfect system of sewer flushing referred to hereafter, necessitating the laying of an additional nine miles of mains and increased steam pumping plant.

Lighting.—The public streets are lighted by means of 940 public gas lamps, of an average of 12 candle power each, and 23 large public lamps, of an average 84 candle power each; the former are paid for according to the average meter system, and the larger ones according to the actual gas consumed. The total gas consumed in the year ending March 25th 1891 was 9,558,078 cubic feet, at a cost of 1,505*l.* 1*s.* 9*d.*, exclusive of lighting, extinguishing, cleaning, and maintenance, which cost 1,092*l.* 4*s.* 1*d.*, making a total of 2,597*l.* 5*s.* 10*d.*, or an average for each lamp of 2*l.* 12*s.* 11*d.*

The Brush Electrical Engineering Company, Limited, established the electric light in Bournemouth, and at the present time no less than 3,300 lamps of eight candle power are connected with the system. The electric supply is on the alternate current transformer system. The cables are partly over-head at present, but are being gradually placed underground.

Hospitals, &c.—The district is well provided with hospitals of all kinds, the following being a list of the principal institutions: A National Sanatorium for the reception of consumptive cases and diseases of the chest from all parts of the United Kingdom; the Royal Victoria Hospital, on the West Cliffe, and the Boscombe Hospital, at the eastern end of the town, affording the needed help to the local population; the Firs Home for incurable consumptives; an Invalid Ladies' Home for ladies in reduced circumstances; the Hip Hospital for Children (a branch of that in Great Ormond Street); the Herbert Home for Convalescents; the Hahnemann Convalescent Home and Homœopathic Dispensary.

There are two well conducted institutes for trained nurses.

The above hospitals are kept up by public subscriptions, and in part by small endowment funds.

A hospital for the proper isolation of cases of infectious disease was erected by the urban authority in 1887, on a site known as the Shaftesbury Estate, admirably isolated. The soil is of a dry gravelly character, 130 feet above ordnance datum; the grounds are about three-and-a-half acres in extent. The buildings consist of an administrative block (containing accommodation for a surgeon and matron), ward pavillion (containing two large and two small wards with accommodation for 10 beds, and quarters for two nurses), mortuary, ambulance shed, laundry, disinfecting room, and stable.

The dimensions of the smaller wards are 18 ft. by 18 ft., with a cubic space of 2,187 ft. for each patient. The dimensions of the larger wards are 18 ft. by 30 ft., with a cubic space of 2,340 ft. for each patient. In all parts of the building everything has been constructed on the best sanitary principles, and the ventilation is of the most approved description. At the head of each drain is placed one of Field's Patent Automatic Flushing Tanks. A Washington Lyons Patent High Pressure Steam Disinfector has been erected in connexion with the hospital, and as a means of preventing the spread of infectious disease it has been found most useful.

Drainage.—For drainage purposes the borough is much favoured by its natural formation, the district consisting for the most part of a table land about 130 ft. above ordnance datum, divided by three distinct valleys, forming three drainage areas or systems as follows:—Alum Chine at the western end, the Bourne Valley in the centre, and Boscombe Chine at the eastern end of the borough.

The sewers are constructed of glazed stoneware pipes, from 9 in. to 18 in., for the collateral and branch sewers, and of brick and iron for the main lines. Each of the three drainage systems discharges its contents into the sea by means of iron outfalls, the total discharging capacity of which in 24 hours is 45,820,455 gallons. Plans have been adopted by the Corporation for providing additional storm outfalls with a further capacity of 87,517,368 gallons per 24 hours.

The estimated total flow through the sewers at present is as follows:—Dry weather flow about 1,200,000 gallons. During storm, allowing 1½-in. rainfall, half to fall in six hours, about 40,500,000 gallons per 24 hours.

The ventilation of the sewers is effected by means of 6-in. wrought iron galvanized pipes carried up trees and walls of houses, and 6-in. wrought iron standard ventilators fixed in the kerb or other suitable positions throughout the district.

The flushing of the sewers is receiving the greatest possible attention from the Corporation, and the 20 miles of sea water main before referred to are at present used for this and road watering purposes only. In connexion with these mains there are 45 automatic flushing tanks at the dead ends of sewers, with a discharging capacity of 600 gallons in from 1¼ to 3 minutes after starting. In addition to these automatic flushing tanks, the dead end of every sewer in the district (104 in number) is being connected with the salt water mains, and fitted with a 3-in. sluice valve, by means of which every sewer can be flushed daily, as desired, by simply turning a handle. The discharging capacity of these 3-in. valves varies from 200 to 600 gallons per minute. This complete system of flushing the sewers also enables the Corporation to thoroughly and effectually disinfect the sewers by mixing appropriate disinfectants whenever required. The borough is provided with 14 public urinals, fitted with w.c.'s, &c. Four of these are constructed underground on the most approved principles in glazed bricks. There are also ladies' w.c.'s. fitted with lavatories, &c.

Destructor.—The house refuse from the principal streets and thickly populated parts is collected daily, and from the outlying districts once or twice a week, as experience has proved necessary. It is carted in closed carts and vans to the destructor, situate on the verge of the borough, where it is cremated, leaving 25 per cent. of the original matter as a residue consisting of hard clinker, suitable for making roads, concrete, etc. The total number of loads consumed in 1890 was 6,068. The destructor consists of six cells with "fume" cremator attached.

Pier.—The present Pier, constructed by the Bournemouth Commissioners from designs of the late Mr. Eugenius Birch, C.E. and completed in August 1880, has cost 28,300*l.*

Bathing Stations.—The Bournemouth shore consists of extensive sands, clean and dry, and eminently suited for bathing (the slope being so gradual that the most inexperienced may bathe with safety), along which the Corporation have nine public bathing stations, including two for females. There are also bathing-machines provided by private enterprise at convenient places on the beach.

The borough is otherwise well provided with bathing establishments of all descriptions, amongst which may be mentioned the Mont Dore and Messrs. Roberts and Co.'s Baths, including Swimming, Turkish, Electric, Sea Water, Pine Baths, &c.

Amongst the important Public Works in contemplation at the present time besides the Central Rendezvous and the extension of the Pier, are the Undercliff Drive and Promenade at an estimated probable cost of about 40,000*l.*; New Municipal Buildings; Electric Lighting of Pier and Pleasure Grounds, from power derived from the engines in connexion with the Sea-Water Scheme.

The Borough of Brighton.

Delegates to the Congress.

Alderman S. H. Soper (Mayor).
Alderman Ewart, J.P.
Councillor Blaker.
Arthur Newsholme, M.D., Medical Officer of Health.

Brighton lies on the east side of a shallow bay, with a south-south-west aspect towards the sea, and protected behind in a large measure by the South Downs. Two ranges of hills lie behind the town, and on the gradual slopes of these towards the sea, Brighton is chiefly built.

The Dyke district is situate on the summit of one of these hills, and is thus more fully exposed to the prevalent winds than other parts of the town. These two ranges of hills are separated by valleys leading from the Old Steine at its junction with the sea, in the shape of a Y, to Preston and Lewes respectively, and a considerable portion of the town is built in these more sheltered valleys.

The chalk cliffs at the Kemp Town end of Brighton reach from 60 to 80 feet above the beach, and the Madeira Road below these forms one of the most sheltered and sunny parts of Brighton. Its attractions for invalids are now still further enhanced by the covered esplanade, shelter hall, lift, &c., which have been erected. The hills behind the town reach in some parts to a height of 460 feet, the west range sloping more gradually to the sea beach than the eastern range.

There is no river within six miles of Brighton; and this fact, conjoined with the fact that in the greater part of its area the subsoil is a porous chalk, and everywhere slopes towards the sea, explains the great dryness of the Brighton soil and air, its comparative freedom from fog, and the fact that even after a heavy rainfall, its roads are rapidly dry and clean.

The chalk gradually thins out to the westward of Brighton, and when we get further west than a line from the sea to Montpelier Road, patches of clay appear. Still further west, brick-earth forms the entire superficial stratum of soil, but the gradual slope of the soil and the thorough character of the drainage prevent any accumulation of moisture.

Next to exposure and soil meteorological factors require consideration, and the following, stretching over a series of years, are of importance. Taking an average of 21 years, the highest mean daily maximum temperature in any month has been 70·5°, and is attained in July; the lowest mean minimum, 34·9°, in January. The mean daily range of temperature was only 11·8°, the lowest mean range being 7·7° in January, and the highest, 15·9° in June. The mean maximum

temperature for the whole year was 55·7°, the mean minimum 43·9°. The month of least humidity is May, when the mean humidity of the air is 72 per cent.; the highest is 91 per cent. in January and February. The most rainy month is November, with a mean rainfall of 3·40 inches; the driest month March, with 1·67 inches. The average annual rainfall is about 28 inches. The annual number of days on which rain fell averaged (in 20 years) 163 days; May and June are the two months in which the least rainfall occurs. The prevalent winds are westerly. Thus during 1890, on 14 days the winds was north, on eight days east, on 27 days south-east, on 12 days south, on 101 days south-west, on 27 days west, on 70 days north-west, and on 40 days a calm. The number of days on which rain fell in 1890 was 142, and the amount collected 23·6 inches. The duration of bright sunshine has probably a greater influence in determining the desirability of a given place for wintering than minor differences in extreme or mean temperatures.

Brighton shares, with other places on the south coast, a considerably longer duration of bright sunshine than other parts of England, and this preponderance is more marked during the winter than during the summer months. Thus during 1889, the Campbell Stokes sunshine recorder gave a record of 1,709 hours of bright sunshine; and of 1,700 hours during 1890.

The area of the Municipal Borough of Brighton is 2,620 acres. The population in 1801 was 7,339, in 1811 it was 12,012, in 1821 it was 24,229, at the present time (June 1891) it is 115,606. The death-rate in 1882 was 21·8, and in 1889 it had fallen to 16·1 per 1,000 inhabitants. The death-rate has been lower than any of the other 28 great towns for the last seven years. The death-rate from enteric fever has steadily declined from 0·21 per 1,000 inhabitants in 1882 to 0·10 in 1890. The death-rate from scarlet fever and from diphtheria is also extremely low.

The sanatorium or fever hospital is situated on an isolated portion of the Downs, and the majority of the infectious cases occurring in the town are isolated here. There is accommodation for over 100 patients. The hospital is built upon land embracing altogether 10 acres. The land cost the Corporation 5,000*l.*, the buildings, 13,193*l.*

The Infectious Diseases (Notification) Act came into operation in the present year; certain clauses of the Infectious Disease Prevention Act, and of the Public Health Amendment Act have also been adopted. The Brighton Local Improvement Act of 1884, incorporated a number of powers beyond these contained in the Public Health Act of 1875, which have been of the greatest service in bringing the sanitary administration of the town to its present high standard of efficiency.

The general sewerage system of Brighton was planned by Mr. P. C. Lockwood, C.E., for many years the borough surveyor. By means of an intercepting sewer, planned by the late Sir John Hawkshaw, and running directly east and west, the sewage is carried under the main road facing the sea to Portobello, its outfall being four miles distant from the most easterly point of the borough. Every sewer in the side streets is flushed in a most efficient manner weekly, and by this means

and by free ventilation of the sewers, freedom from nuisance is secured. House to house inspection is systematically carried out in every part of the borough, in order to ensure compliance with all sanitary requirements, and a staff of eight sanitary inspectors is constantly engaged in this and allied work.

The water supply of Brighton is unlimited in quantity, being derived from borings and tunnellings from the bottom of wells sunk in the chalk to the level of the subterranean water which is finding its way in the chalk towards the sea. At the Goldstone Bottom Waterworks, the shaft is about 150 feet deep, and lateral tunnels run from this to a length of 2,600 feet, tapping the fissures in the chalk through which the water runs. Like all waters filtered through chalk, the Brighton water is slightly hard. In 100,000 parts of water temporary hardness is represented by 12·1 parts, and permanent hardness by 7·3. In a manufacturing town this amount of hardness would be unfortunate, but in a health resort it is rather advantageous than otherwise. The water is palatable and agreeable to drink, very fully aerated, and free from traces of organic matter.

Two large public baths have been provided by the Corporation at the expense of 12,200*l.*, and other baths have been opened for the public on the cottage system.

Two parks are devoted to the use of the public, Preston Park with an area of about 62 acreas, which was acquired at a cost of 50,000*l.*; and Queen's Park with an area of 17½ acres, which has been given to the town by the trustees of the Race Stand. There are other recreation grounds including the Race Ground, which has an area of 105 acres, the Level Enclosure 10½ acres, and the Old Steine Enclosures, about 2 acres.

The Royal Pavilion and Dome were acquired by the town commissioners, the predecessors of the corporation, from the Commissioners of Woods and Forests, at a cost of 53,000*l.*, and are used for official receptions, concerts, balls, &c. The public library, to which is attached a free lending library, the art gallery, and museum are situated on the same premises.

The "Booth" Museum of birds in the Dyke Road has been recently bequeathed to the town. It is a very fine collection, embracing the whole of the British birds.

The sea front and marine drive is about four miles in length.

The County Borough of Cardiff.

BY

W. Harpur, M. Inst. C.E., Borough Engineer.

Delegates to the Congress.

Alderman T. W. Jacobs, J.P.
Councillor J. Ramsdale.
Edward Walford, M.D., Medical Officer of Health.
Wm. Harpur, Borough Engineer.

The county borough of Cardiff is situated on the banks of the River Taff, in the county of Glamorgan, and is bounded on the south by the Bristol Channel, on the east by the River Rumney, and on the west by the River Ely.

Cardiff, as its name indicates, is a town of great antiquity. Its existence can be traced back to the time of Aulus Didius, who in the first century established a Roman station at the mouth of the River Taff. That station was maintained until the withdrawal of the Romans from Britain three centuries later. Amongst the invaders the place was known as Castra Didii (*Anglice*, Didius' Camp); but the natives called it Caer Didii, which name, slightly modified by the natural mutations of the Celtic tongue, it bears to the present day; for though corrupted by the English residents into Cardiff the name is still pronounced Caerdydd (kairdeedh) by the descendants of those patriotic Cymru who waged war against Didius and his Roman legionaries 1800 years ago. Of its pre-Roman history nothing definite is known; but the commanding position which it occupies, and the fact that some of the earthworks of the castle are of British construction, strongly favour the presumption that Cardiff was an important and fortified place before the Romans landed on British shores.

From the withdrawal of the Roman troops down to within very recent times, the history of Cardiff is comprised in the story of the castle and its successive owners. For 600 years, from the end of the fifth to the end of the eleventh century, a succession of Welsh princes held sway in Cardiff, fiercely contesting the incursions of the Saxons and the Danes, as their fathers had resisted the invasion of the Romans.

In 1080, Jestyn ap Gwrgan, the last of the lords of Morganwg, is said to have built largely at Cardiff. It was in consequence of his ill-advised alliance with the Norman invaders of England that the lordship of Morganwg finally passed out of native hands in the year 1090.

The town has received many important charters; the oldest extant is one of Hugh le Despenser, in the reign of Edward III., dated 14th October 1388.

The central portion of the town was originally enclosed by a substantial wall, but with the exception of one or two small sections, nothing of it now remains, while the castle has been restored greatly extended and altered by the owner, the Marquis of Bute, now (1891) Mayor of Cardiff. One of the most important historical incidents in connexion with the castle is the reported confinement of Robert, Duke of Normandy, who was deprived of his sight and confined for 26 years in a small room at the base of the entrance tower.

One of the principal subjects deserving attention is the astonishing progress which has of recent years taken place in the commerce and population of the town, a progress which the recent census returns show has been unexampled in Great Britain, and one which has rendered Cardiff the metropolis of Wales.

In 1811 the population of Cardiff was only 2,577 ; but from that time it went on steadily increasing until in 1871 it had reached 39,536. During this time the area of the municipal borough was 2,791 acres, but under the powers of the Cardiff Improvement Act of 1875, the districts of Canton, Roath, and Grangetown were added to the borough, and the area thereby was increased to 8,409 acres, its present dimensions.

Owing to the foregoing extensions of the borough boundaries in 1875, as well as to an increased prosperity in the commerce of the town, it was found, when the census was taken in 1881, that the population had increased to 82,761, or an addition in 10 years of 43,225 ; but this great increase in population, largely due to the extension of the borough boundaries, has been continued during the past 10 years without any extension of the borough boundaries, for the returns of this year's census shows the population to have increased by 46,088, the last returns being 128,849, or an increase in the 10 years of 55·7 per cent. upon the population of 1881.

The coal and iron trades are the mainspring of the commercial prosperity and rapid growth of Cardiff, large docks having been constructed by the Marquess of Bute and his late father for the export of the immense quantities of coal raised and iron and steel manufactured in the valleys of the "Taff" and "Rumney."

The Glamorganshire Canal leading down the valley of the Taff to the "Sea Lock," was opened in 1798, and no further accommodation for shipping was provided until 1839, when the West Bute Dock, which has a water-surface of about 18 acres, and 8,800 feet run of quays, was opened for traffic, and was the first great undertaking which stimulated the rise of Cardiff. In 1859, the completion of the East Bute Dock added a further dock area of 46½ acres, and an additional 9,360 feet run of quays. Subsequently, the Roath Basin was constructed, with an area of 12 acres and 2,700 lineal feet of quayage; and in 1887, the Roath Dock, having an area of 33 acres and 7,520 feet run of quays was opened for traffic, and already the merchants are pointing out the immediate necessity for, and urging the construction of, further docks.

The port of Cardiff has now achieved the distinction of being the first port in the world for the volume of its foreign exports.

In addition to the docks mentioned, there are several large graving docks, engineering and ship repairing works, paper mills, copper works, and numerous other smaller industries, principally of a mechanical character; and the Dowlais Iron and Steel Company are now establishing large works for the manufacture of steel. The first portion of these works was opened in January 1891.

Upon the adoption by the town council in 1849 of the Local Government Act of 1848, Cardiff started upon a period of public improvement, which has gone on ever since, and is still going on, and is telling greatly to the health, comfort, and enjoyment of the people.

Extensive drainage works were commenced in 1853, and from that time until the present have been continued and extended as time and necessity required. The amount expended by the corporation for sewerage works upon capital account has been 135,611*l.*, and this sum has been very largely added to by the landowners, who in laying out their lands for building purposes are by a local Act required to sewer all new streets at their own cost.

The configuration of the site upon which the town lies is almost flat, and consequently the question of sewerage has been a difficult one. A large portion of the town is built upon a level with high-water mark of ordinary spring tides, and the sewers (which discharge into the Bristol Channel) are of necessity some depth below the surface of the ground, and, consequently, all the sewers are tide locked for some time before and after high-water of all ordinary and spring tides; and in order to store the sewage when the tide-valves are closed, large sewers are provided which act as storage reservoirs until the tide recedes, when the contents are discharged.

The evenness of the surface of the ground has also rendered the question of obtaining suitable gradients for the sewers a difficult one, some of the gradients being as slight as 1 in 2,000. Notwithstanding these difficulties, however, Cardiff is well and efficiently sewered, and few towns can boast of as good a system of sewerage. The smallest sewers are egg-shaped, built in brickwork, and the internal dimensions are 3 feet by 2 feet, and the total length of sewers in the borough at the present time is about 75 miles.

Up to the year 1850 the town was dependent for its water upon various private and public wells. In that year an Act was obtained by the Cardiff Waterworks Company, empowering them to construct works near the River Ely, about three miles from the town. The water is derived from the dolomite formation of the old red sandstone taken into culverts running alongside the River Ely, and then pumped into service reservoirs for the supply of the town and district.

In 1860 the company obtained further powers, enabling them to take the waters of various streams on the limestone gathering grounds at Lisvane, three to four miles from Cardiff, and to construct at

Lisvane a storage reservoir holding 80,000,000 gallons of water, together with filter-beds, the town being supplied from this source by gravitation.

In the year 1879 the Cardiff Corporation obtained an Act of Parliament empowering them to purchase the whole of the existing water undertaking from the company, and the purchase of the works was shortly afterwards completed, the amount paid to the company being 320,000*l.*

It was found that the existing works would soon prove inadequate to meet the increasing consumption of water, owing to the very rapid growth of the town and district; and after an exhaustive inquiry into the merits of several sources for future supply, it was decided to promote a Bill in Parliament to obtain water from the Taff Fawr Valley in Brecknockshire, situate on the old red sandstone formation about 30 miles from Cardiff.

In order to meet the pressing needs of the town, another large storage reservoir was commenced at Llanishen in 1884 and completed in 1886, adjoining the existing Lisvane Reservoir, capable of holding 300,000,000 gallons of water.

New filter beds for efficiently filtering 3,000,000 to 4,000,000 gallons per day on the most approved principles, with land for future extensions, were built near the "Heath," a mile and a half from Cardiff, at the same time as the storage reservoir at Llainshen.

In the meantime, the Act authorising the works in the Taff Fawr Valley was obtained, and contracts for the work let in the year 1886, since which time over 300,000*l.* has been expended thereon. Owing to unforeseen circumstances in connexion with the first storage reservoir, and to difficulties with the contractors, the town has not yet had the Taff Fawr water supplied, but it is confidently expected that the reservoir will be so far advanced by next summer as to admit of the compensation water to millowners being stored therein, and the water sent down to Cardiff; the whole of the pipe line, with balancing reservoirs, &c. *en route*, being complete and in working order.

In the Taff Fawr Valley the Corporation have one of the finest watersheds in the kingdom, with an almost inexhaustible supply of pure soft water, eminently suitable for all domestic and manufacturing purposes.

Since the Corporation have had the water supply in their own hands there has been a full and *constant* service to all parts of the district, excepting for a short time in the summer of 1887, when the water was turned off for a few hours in each day so that the available water in store should be conserved as far as possible for any contingencies which might arise.

The total cost of the waterworks undertaking to the Corporation has been over 800,000*l.*, and the annual revenue from all sources has increased from 18,000*l.* in 1880 to 35,000*l.* in 1890.

The effect produced on the public health of the district by the various public works which have been constructed may be seen in the

reduction of the death-rate which has taken place during the past 40 years.

The average annual death-rate, which in the 10 years ending 1854 was 327, was reduced in the 10 years ending 1889 to 197 per 10,000 of the population, and the death-rate from the chief infectious diseases was reduced from 98 to 31 per 10,000 during the same period. A most marked reduction has taken place in the death-rate from typhoid fever, which fell from 19 per 10,000 in the 10 years ending 1854 to 3 per 10,000 in the 10 years ending 1889.

The streets of the town are wide, well kept, and exceedingly well lighted. The main business thoroughfares, known as St. Mary Street and Queen Street, are unusually wide for a provincial town, and the lighting of those thoroughfares is not surpassed in any provincial town in England.

The total length of highways in the borough is now 81 miles; while in 1875, including the districts then annexed to the borough, the total length of highways was only 32 miles. The carriage ways are mostly macadamised, and the footways are well flagged with local flagging, which is of excellent quality. About seven miles of street tramways, the property of private companies, traverse the main thoroughfares.

In 1875 a Bill was promoted in Parliament for annexing the adjoining districts and for carrying out a number of street improvements and widenings whereby a large number of disreputable cottages were swept away, and some of the most important thoroughfares reconstructed, widened, or improved, about 250,000*l.* being spent in this work.

A further Bill was promoted in Parliament in 1887 whereby power was obtained for constructing a new means of communication between the commercial parts of the town in the neighbourhood of the docks and the districts of Grangetown and Canton, on the western side of the River Taff. These works comprised about a mile of fine roads, a bridge over the River Taff, 464 feet long, and another bridge over the Glamorganshire canal, 104 feet long, the whole work costing about 52,000*l.* The principal feature of these works is the bridge over the River Taff, which, by permission, has been called "Clarence Bridge," in honour of His Royal Highness the Duke of Clarence and Avondale, who performed the opening ceremony September 17, 1890. It consists of a central swinging span of 190 feet 8 inches, providing two openings each of a clear width of 72 feet for the passage of vessels navigating the river, and two end-fixed spans each 132 feet. It is 40 feet wide, and consists of a carriage way, 24 feet wide, and two footways, supported on cantilevers on the outside of the main girders, each 8 feet wide. The main girders are pin-connected trusses with single intersection quadrangular web bracing; those for the fixed spans are of a uniform height of 17 feet, while those for the swinging span are 17 feet high at their extreme ends rising by an upward curve to 25 feet over the central pier. They are braced together overhead, giving a clear

headway for carriage traffic of 16 feet. The whole of the weight of the swinging span, which is upwards of 500 tons, rests entirely upon the central pier, not only when the bridge is swinging but also when closed and ready to receive the road traffic. It is believed that this is the first swing bridge constructed upon this principle in the United Kingdom. It is also believed that up to date it is the largest swinging road bridge erected in the country.

The Corporation some years ago purchased baths from a private company. They consist of swimming, Turkish, and slipper baths, and are still carried on by the Corporation for the benefit and comfort of the public.

Two separate and complete sets of new slaughter-houses, with appliances on the most approved principles, have been erected by the Corporation, one at either side of the town, and upon this department the sum of 18,500*l.* has been expended, exclusive of the cost of the land, and the whole of the slaughtering of the borough is now confined to these premises with the exception of imported foreign cattle which are slaughtered at the docks. There is a cattle market adjoining each of the two public slaughter-houses where most of the cattle, &c., slaughtered in the borough are purchased. Cattle markets are held twice weekly.

The Corporation erected a market hall in the year 1835, but this becoming inadequate for present requirements, besides being badly ventilated and lighted, was last year taken down and a new market erected upon the same site, at a cost of about 17,000*l.*, additional accommodation being provided by means of a gallery running round the main building. A retail fish market has been provided at one end of the site.

The new building is one of the most attractive, handsome, and convenient markets in the kingdom, being provided with all the latest and most approved appliances. This building was opened for public business by the Mayoress of Cardiff, the most honourable the Marchioness of Bute, on the 8th May 1891.

The public authorities have not yet completed any large park or pleasure grounds, but there is every reason to expect that in a few years' time in this respect also Cardiff will be better provided than most towns similar in size and population. For many years the public has had to be content with the pleasure grounds so generously provided and maintained by and at the expense of the present Mayor of Cardiff, the most noble the Marquess of Bute, comprising the Sophia Gardens and "Cardiff Arms" Park, both very centrally situated, and to which the public has free admittance.

Within the past two or three years, however, the Corporation has obtained by gift from Lord Bute ten, and from Lord Tredegar three small open spaces in various parts of the town, varying from a quarter of an acre to about two acres in extent each, and these are now being attended to and considerably improved by the public authorities. The Corporation has recently acquired, by compulsory powers, two pieces of

common land on the western side of the town, the one comprising about 40 acres, and the other 30 acres, and has obtained powers to expend the sum of 10,000*l.* in laying out these lands as public parks and recreation grounds. On the eastern side of the town the Corporation has recently secured by deeds of gift about 125 acres of land for the purpose of a public park or parks and recreation grounds; of this land about 100 acres was contributed by Lord Bute, the remainder being given by Lord Tredegar and by Messrs. Clark and Jackson.

This park is now being laid out at an estimated cost of 54,000*l.*, and when complete it will be unique, and will form one of the most attractive and handsome parks in the provinces.

The land lies in the bottom of a valley, with rising ground on either side; a pellucid brook of no mean dimensions winds through the entire length of the land from end to end, a distance of $1\frac{2}{3}$ miles; a handsome road, 40 feet wide, is being formed round the entire site, which will provide a carriage drive of $3\frac{1}{4}$ miles; and another of the main features in the scheme is the formation of a lake half a mile long, with an average width of 200 yards, for boating and other aquatic purposes.

Up to the present time there has been no proper accommodation for the treatment of infectious diseases, but plans have been prepared upon the pavilion principle by the borough engineer, and approved by the council, for the erection of an infectious diseases hospital suitable to accommodate 50 patients at the present time, but capable of being extended ultimately to accommodate 166 patients, upon a site 12 acres in extent, recently purchased for the purpose at a cost of 1,800*l.*; and application has already been made to the Local Government Board for their sanction to borrow the sum of 25,000*l.*, the estimated cost of erecting and furnishing the first portion of these buildings, in order that the work may proceed at once, and it is hoped and expected that when this institution is completed its operations will result in a still further decrease in the number of deaths arising from zymotic diseases.

In educational matters, Cardiff may fairly claim to rank with the great towns, and so far as Wales is concerned, is acknowledged to be the leader in all that pertains to education.

Efforts are now being made to formulate a system of education of the most complete and efficient character, which, commencing with the elementary schools, shall be continued through the higher grade school, intermediate school, technical school, and culminate in the University College. The elementary education is provided in 19 voluntary and 13 board schools. The higher grade school, opened in 1885, is under the school board, and was the first school of its kind established in Wales. The technical school is a development under the provisions of the Technical Instruction Act, 1889, of the science and art schools established by the Free Library and Museum Committee in 1865. An arrangement has been made with the Council of the University College to provide accommodation and teaching staff. The scheme for intermediate schools under the Welsh Intermediate Education Act, 1889, has just been submitted to the Education Department. As the result of

an inquiry commenced in 1880, on the state of higher education in Wales, the Government agreed to the establishment and endowment of university colleges for North and South Wales respectively. Cardiff was chosen as the site for South Wales after a keen competition with Swansea. The college was opened in 1883, and a day training college for elementary teachers under the new code was added in 1890. The Welsh Intermediate Education Act was passed on the recommendation of the same Committee of Inquiry. By means of scholarships and exhibitions it is hoped that the educational chain between all these institutions will be completed, so that the poorest boy or girl may receive the advantage of a complete course of education.

The free library was established under the Public Libraries Acts in 1862, and the museum in 1867. These two institutions are located in buildings erected in 1881–2, at a cost of 10,000*l.*, to which extensive additions are about to be made at an estimated cost of 16,000*l.* exclusive of the site. The library (lending and reference) contains about 43,000 volumes, including a magnificient collection of books and manuscripts in Welsh or relating to Wales. The museum is mainly natural history, the local geology being well represented. There is the nucleus of a good art gallery (which will be provided when the buildings are extended) in a choice collection of modern paintings of the value of 10,000*l.* presented by one donor, the late William Menelaus, Esq., of Dowlais, and many important paintings have been given by other gentlemen.

The County Borough of Croydon.

Delegates to the Congress.

Alfred Carpenter, M.D., J.P.
C. Coleby Morland, J.P.

The county borough of Croydon is about 10 miles from the Royal Exchange, London; it adjoins the metropolis on the south side, and is within the district of the Metropolitan Police.

The town lies in a valley at the head of the River Wandle.

The area of the borough is 9,014 statute acres. The population in 1851 was 20,548, and at the recent census (1891) it was 102,697, having increased at the rate of 30·33 per cent. since 1881.

The residence of the Archbishops of Canterbury formerly adjoined the parish church, but in 1809 an Act of Parliament was passed enabling the Archbishop to alienate the site of the Palace, and in pursuance thereof the Addington Estate was purchased.

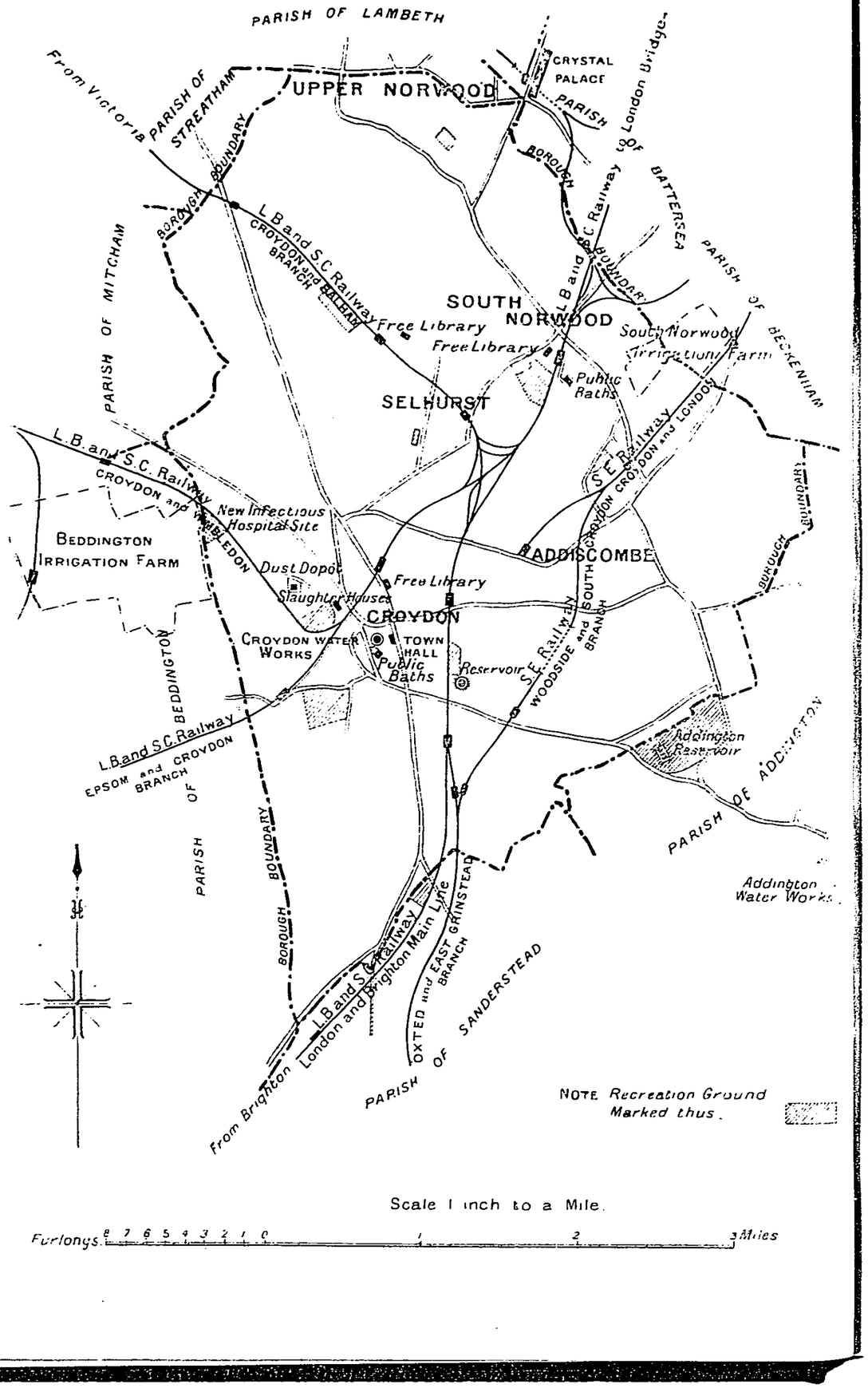
Croydon was one of the 15 towns included in the first Provisional Order for the adoption of the Public Health Act. Prior to the adoption of the Public Health Act a series of ponds and milldams, into which the drainage of the place was discharged, rendered the subsoil very damp, and in consequence the death-rate was very high.

When the Public Health Act was adopted the town was devoid of any system of sewerage, the houses being drained into cesspools, the overflow of which discharged into the watercourses and ponds; and in consequence of the superficial character of the drainage very few of the wells in the town were free from contamination. The state of the courts, lanes, byeways, &c. is described as having been in a deplorable condition and unfit for ordinary traffic.

The Provisional Order for the adoption of the Public Health Act was obtained on the 1st August 1849, and the local board at once commenced to sewer the town and to give it an abundant supply of water. By the end of the year 1867 112,000*l.* had been expended upon drainage, but earthenware drain pipes were then first being introduced and were of inferior quality, and many of the sewers were too small and were without ventilation. In consequence of this a serious outbreak of typhoid fever occurred in the town. The improvement of the sewers was then vigorously taken in hand. A thorough system of ventilation was introduced; many of the sewers were enlarged and extended; the total amount thus spent upon them being 161,967*l.*

There was great difficulty in dealing with the sewage; it was chemically treated in every way then known, but the River Wandle was fouled, and a perpetual injunction was obtained restraining the board from further polluting it. Just at this time the local board obtained power to take land for irrigation purposes outside the borough, which they at once did at Beddington, where they established an irrigation farm, which has been increased from time to time as the quantity of

CROYDON.



sewage has necessitated. It now consists of 525 acres of freehold land, 420 of which are under irrigation. The Board also established an irrigation farm at South Norwood, upon which another outfall sewer discharges. There are 79 acres of freehold and 32 acres of leasehold land in use at South Norwood.

Broad or surface irrigation only is adopted; or in other words, the sewage flows slowly over the surface of the land in a thin film amongst the root of rye grass or other crops; these take up the impurities in the sewage, and after a flow of about 500 yards it is bright and clear. The sewage is applied to about three plots in succession before it leaves the farms, when the effluent is found to be bright and well cleansed.

From careful gaugings, the effluent leaving the farms has been found to be about 70 per cent. of the sewage coming on the farms, but this varies with the season of the year. Seven crops of rye grass from the same plot have been cut during a season, but the average is about five crops and there is often a difficulty in getting rid of the produce.

The sewage is purified without cost except for the purchase money or rent of necessary land. This involves a payment of about 4½*d.* in the pound on the rateable value of the districts draining to the farms. This expense will continue for about 35 years longer, by which time the whole purchase money (about 227,712*l.*) will have been paid off.

In 1850 the local board established waterworks by sinking a well in the chalk in the valley of the Wandle, close by the town, which gave an abundant supply of water. Duplicate pumping engines were erected on the site for raising the water into a covered reservoir on Park Hill, 74 feet in diameter and 35 feet deep. Since then two other wells and two larger pumping engines have been placed on the same site, and about two million gallons are now usually pumped every day from it. In 1887 a new well was sunk in the valley south of Addington village, also in the chalk, an engine erected, and the water forced into a covered reservoir erected on the top of Addington Hills at sufficient altitude to supply the whole of the borough; about three-quarter million gallons per day are now supplied from this reservoir. The total amount thus spent on the waterworks up to the present time is 153,963*l.*

Public baths have been erected in Croydon and in South Norwood, both establishments having covered and open swimming baths, private baths, &c., at a cost of 16,341*l.*

The public slaughter-houses, costing 4,232*l.*, are near to the Town hall, and afford ample accommodation. Thirty private slaughter-houses still exist in various parts of the borough.

The length of public highways in the borough is 90 miles. The roads have been much improved by curbing, asphalting, or paving the footpaths, upon which 69,973*l.* have been expended.

The borough being a very large one, it has been thought better to have a number of recreation grounds in various parts of it rather than one or two large ones only. Eleven have been provided with an aggregate area of 204 statute acres, at an expenditure of 48,069*l.* Most

of these have recently been opened, and the burgesses are much pleased with this provision.

The Corporation has just purchased eight acres of land in a suitable position for the erection of an infectious hospital. The land is being fenced in and buildings will shortly be erected.

The Libraries Acts have been adopted in Croydon, and the Corporation have established a central and two branch libraries, and also have opened four evening reading-rooms with small circulating libraries attached, in various parts of the borough The Corporation are, moreover, erecting a Polytechnic building for technical instruction, which is intended to accommodate 320 students at one time.

The ratepayers have recently sanctioned some considerable town improvements, for carrying out which an Act of Parliament has been obtained. They will comprise the abolition of a nest of rookery dwellings, the improvement of the high street of Croydon, and an increase of its width, from about 24 feet in its narrowest portion to a uniform width of 54 feet throughout. In connection with these improvements the old Town hall, which has been in existence since the beginning of this century, has to be demolished, and the Corporation have purchased the site of a former railway station, upon which they are about to erect a block of municipal buildings, courts, and library, the whole involving an expenditure of between 150,000*l.* and 200,000*l.*

As a result of the sanitary measures taken for the improvement of Croydon, the death-rate has been brought to a very low figure, the following being the rates of the last five years:—1886, 14·47; 1887, 14·65; 1888, 13·11; 1889, 13·82; and 1890, 16·61.

The rateable value of the borough to the poor-rate is 583,929*l.* The debt is 557,554*l.* and the capital expenditure on various works has been as follows:—Waterworks, 153,963*l.*; sewers and surface drainage, 150,781*l.*; purchase of land for sewage irrigation (Beddington farm, &c., and South Norwood farm), 227,712*l.*; purchase of land for recreation grounds and laying out, 48,069*l.*; baths (Croydon and South Norwood), 16,341*l.*; slaughter-houses, 4,232*l.*; kerbing and paving, 69,973*l.*; widening bridges, 9,711*l.*; flushing tanks, &c. 11,186*l.*; High Street improvement, 2,580*l.*; purchase of Central Croydon Railway Station and improvement of Park Lane, 11,903*l.*; on account of new municipal buildings, 72*l.*; libraries (Central and South Norwood), 640*l.*; total, 707,163*l.*

Many of the loans contracted for the above expenditure have been paid off.

It may not be uninteresting to note that the rates levied for all purposes in the borough, including poor, police, school board, general district and borough rates, have been in the pound as follows, during the last ten years:—1882, 5*s.* 11*d.*; 1883, 6*s.* 3*d.*; 1884, 6*s.* 4*d.*; 1885, 5*s.* 3*d.*; 1886, 5*s* 5*d.*; 1887, 5*s.* 1*d.*; 1888, 5*s.* 3*d.*; 1889, 5*s.* 1*d.*; 1890, 4*s.* 9*d.*

The City of Dundee.

Delegates to the Congress.

Lord Provost Mathewson.
Bailie Wm. McDougall Ogilvie.
Councillor R. D. B. Ritchie.

The city of Dundee is situated on the north bank of the River Tay in the county of Forfar, and, as in all the ancient royal burghs of Scotland, the inhabitants were formerly huddled together in houses built in narrow closes and pends, and no provision made for street accommodation or even necessary means of ventilation. Large sums have therefore been expended in the public improvements necessary to meet the increased population, and to accommodate the great expanding trade and manufactures of the city. While the area of the ancient royalty was 194 acres, the present area of the city extends to 3,863 acres, to low-water mark. The population in 1821 was 30,575, and at the present time it is 155,433.

By the adoption of the General Police Act of 1850, Dundee entered upon a period of improvement, which has gone on at a progressive rate, and has told favourably upon the health and comfort of the community.

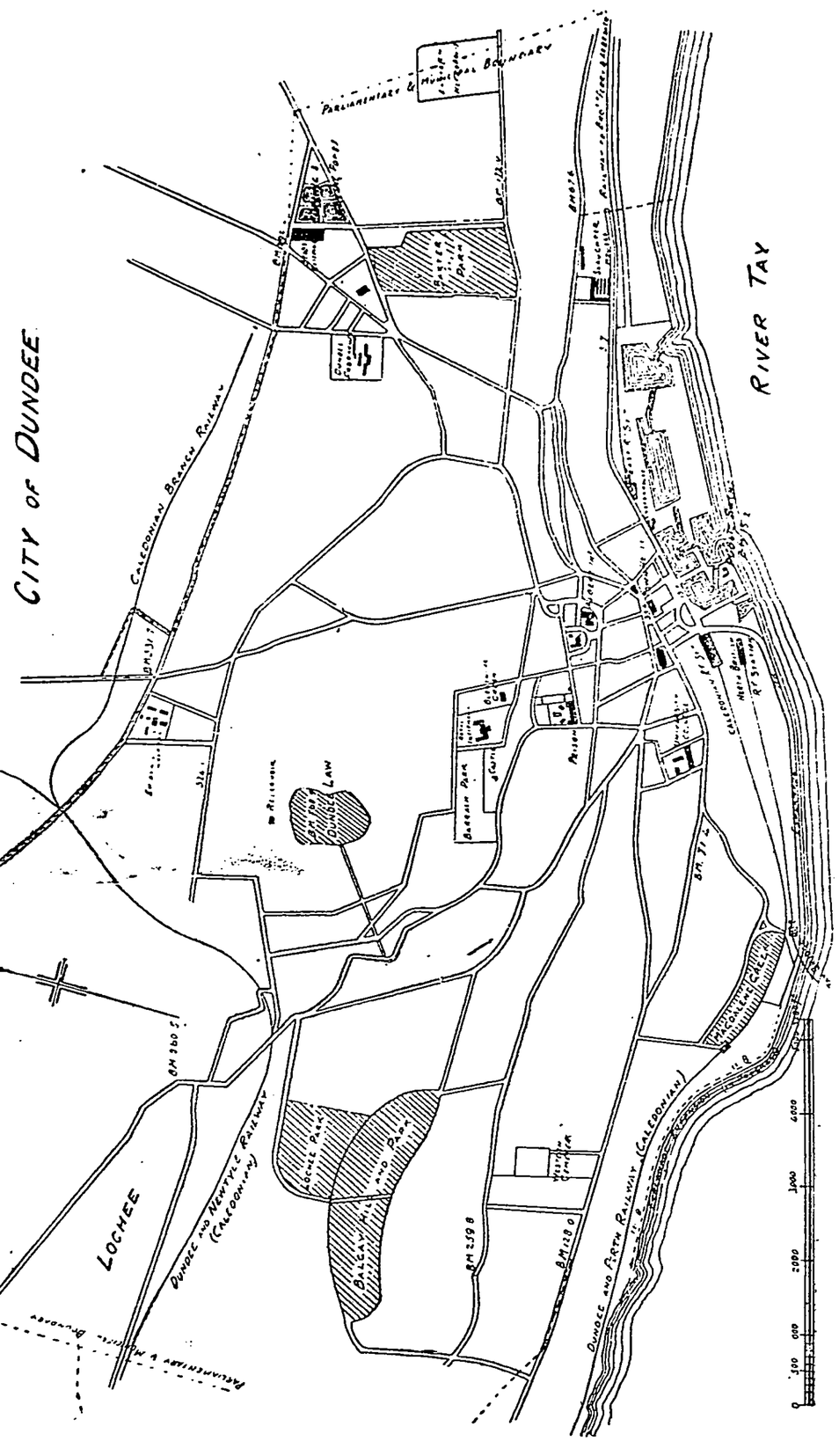
Extensive drainage works were commenced shortly after that date, and from an expenditure in 1857 of 7,912*l.* 11*s.* 5*d.*, it increased to 152,493*l.* 3*s.* by 15th May 1890. Prior to this there was no real drainage in the burgh.

Obnoxious cesspools also existed in various parts, and polluted water was freely discharged on to the surface of the streets, back courts, closes, and passages. At present the main drains are constructed on the most approved principles. The total number of main sewers within the city is 478, and the total length of sewers 66·68 miles.

On account of the ground rising in all directions from the centre of the town near the riverside, the surface water and drainage discharge ran towards the centre, and in order to prevent flooding the Corporation promoted a large intercepting main sewer, running eastwards towards the river, at a cost of 20,000*l.*

The streets in the city, especially in wet weather, were most unserviceable, and even dangerous; the Police Commissioners, under their statutory powers, gave special attention to this matter, and at the present day Dundee is considered to be one of the best paved and flagged cities in the country.

In 1870 a Local Bill was promoted for reconstructing parts of the burgh, for opening up new streets, and executing other necessary works, in order to improve the sanitary condition of the town. The total number of streets and roads is now 527, and their total length is 71·5 miles, and since the passing of the Improvement Act, 1871, no less than 185 new streets have been sanctioned by the Commissioners of Police.



Prior to this time, many of the streets were very narrow, and traffic was carried on with great difficulty and danger in leading thoroughfares. There was much overcrowding in the central, oldest, and most insalubrious parts of the town, which in its turn resulted in immorality, degradation, and crime.

The Improvement Scheme, for which an Act was obtained in 1871, consisted of 20 important works and many valuable provisions for the control of buildings and sanitary requirements. Numerous areas of the town were scheduled, and the clearing of the buildings from these areas resulted not only in the removal of narrow streets and thoroughfares, but of a great number of narrow closes with high buildings on either side, some of which were also covered with houses of the worst kind, and which were styled "Nurseries of disease, immorality, and crime." The demolition and removal of these and other old buildings made way for the new improved and wide streets which have since been constructed, and for the most part built upon to the height of from four to five storeys, the buildings being of substantial and elegant construction and style, giving character and dignity to the city, and, indeed, changing the face of the town.

In the purchase of properties and in the construction of the burgh under the Improvement Scheme, the Commissioners have expended 504,335*l.* 15*s.* 6½*d.*, of which sum a considerable amount remains on loan, to be gradually liquidated from the feuing of the side building ground along the streets.

The spaces thus cleared contained an excess of population, one of them containing a population of 855, or 724 persons per acre, and had a death-rate of 58·4 per 1,000. The rate of population at that time for the whole burgh was 33¾ per acre. Moreover, 1,352 feet of closes, the average width of which was 5½ feet, and of which 328 feet were covered or built over, were demolished.

By these important works, by the operations of the sanitary provisions and powers in the Acts, and by the ventilation and the drainage system, with a most abundant supply of water for sanitary purposes, the death-rate has been much reduced. In 1871 the death-rate was 29·38 per 1,000; in 1889 it was 18·30; and last year, with an epidemic of scarlet fever, it was 21·20. But by the official report of the Registrar-General it is now at 19 per 1,000.

The Corporation, by great efforts, and at an expenditure of 839,544*l.*, have provided an abundant supply of water. They first acquired a supply from reservoirs constructed at Monikie, about 11 miles from Dundee; but by the great increase of population and of trade and manufacture in the City they were obliged largely to supplement the supply, and in 1871 acquired a large source of supply from the Loch of Lintrathen in the Grampians. The Loch extended to an area of 101 acres, with a right of watershed from 30 square miles or 19,000 acres of gathering ground. The Commissioners raised the Loch by 20 feet and increased its area to 405 acres, giving a storage of 1,601,000,000 gallons of water. The water is conveyed to Dundee, a distance of 23 miles, by two lines of cast-iron pipes (27-inch diameter)

now delivering in the place of supply in and around the City of between nine to ten million gallons of water daily.

The abundant water-supply for domestic use and public and sanitary purposes, while enabling the Commissioners to give water for all sanitary purposes, at the same time enables them to assist to a considerable extent the manufacturing industries.

The Police Commissioners have erected and carry on swimming baths and public baths of all kinds for the public, and have expended in this department a sum of 14,096*l.*

A large and beautiful Esplanade has been constructed along the margin of the river from the centre of the city westward, communicating with the Magdalen Green, a place of public resort for healthy recreation. This Esplanade, originally about one mile in extent, is in course of further extension for the accommodation of the public, and fully 60,000*l.* have been expended on these works. Tramways extending to upwards of five miles have also been constructed in the city at a cost of 49,000*l.*

New slaughter-houses and appliances on the most approved principles have been erected, which, with the land and amenities, raise the outlay to a cost of 66,744*l.* 19*s.* 3*d.* In this way the Commissioners were enabled not only to shut up private killing-houses within the burgh (which were then kept in a most insanitary condition), but also to provide most convenient accommodation and appliances for the butcher trade and for the sale of live stock and dead meat.

As to pleasure grounds, considerable expense has been incurred. The ancient Magdalen Green, extending to about 17 acres; Balgay Park, extending to 36 acres; Law Hill, extending to 17 acres, have been supplemented by the gifts—first, by the late Sir David and Misses Baxter, of a park extending to 36 acres, all well ornamented and laid out; of the Fairmuir, the gift of Sir John Ogilvy, extending to 20 acres; and of the Lochee Park, the gift of Messrs. Cox Brothers, extending to 25 acres. These afford full and healthful recreation for the people.

The Commissioners have erected a hospital for the treatment of infectious diseases, suitable for accommodating 40 patients, each having a cubic space of fully 2,000 feet. The cost of these permanent works has been about 22,000*l.* There is space in the grounds for such additional accommodation as may be found necessary; and, on the whole, great time, consideration, and cost have been expended by the Corporation and Public Boards towards the improvement of the city and for the preservation of the public health.

Besides the sanitary and other public improvements thus briefly noticed, extensive facilities have been provided for the mental culture and information of the inhabitants. A large and extensive building was, by the liberality of the merchants and inhabitants, built at a cost, with subsequent additions, of fully 40,000*l.*, and dedicated to the memory of the late lamented Prince Consort, with the view of carrying out his enlightened views for the elevation of the people and their instruction in art and science.

In this Albert Institute are included an extensive free library, containing upwards of 50,000 works on history and all departments of literature and science, and having a reference department as well as one for the lending out of books. It contains also museums and art galleries, largely taken advantage of by the public. Its utility may be evidenced by upwards of 200,000 volumes being taken out yearly by the people. To this spacious institute there have been added last year, and dedicated as a Jubilee gift to Her Majesty the Queen, extensive ranges as picture galleries, the cost of which was also contributed by the voluntary offerings of the public, aided by the Corporation. These extensive buildings now constitute the Victoria and Albert Institute, and contain, besides the library and museums, many valuable works of art, affording the community advantages for the study of arts, science, and literature probably not exceeded in any city of the empire.

The Burgh of Dundee was raised to dignity of a City of the Empire by Royal Charter granted by Her Majesty Queen Victoria on 2nd February 1889.

The District of Ealing, Middlesex.

BY

CHARLES JONES, A.M. Inst. C.E., F.S.I., Engineer and Surveyor to the Board.

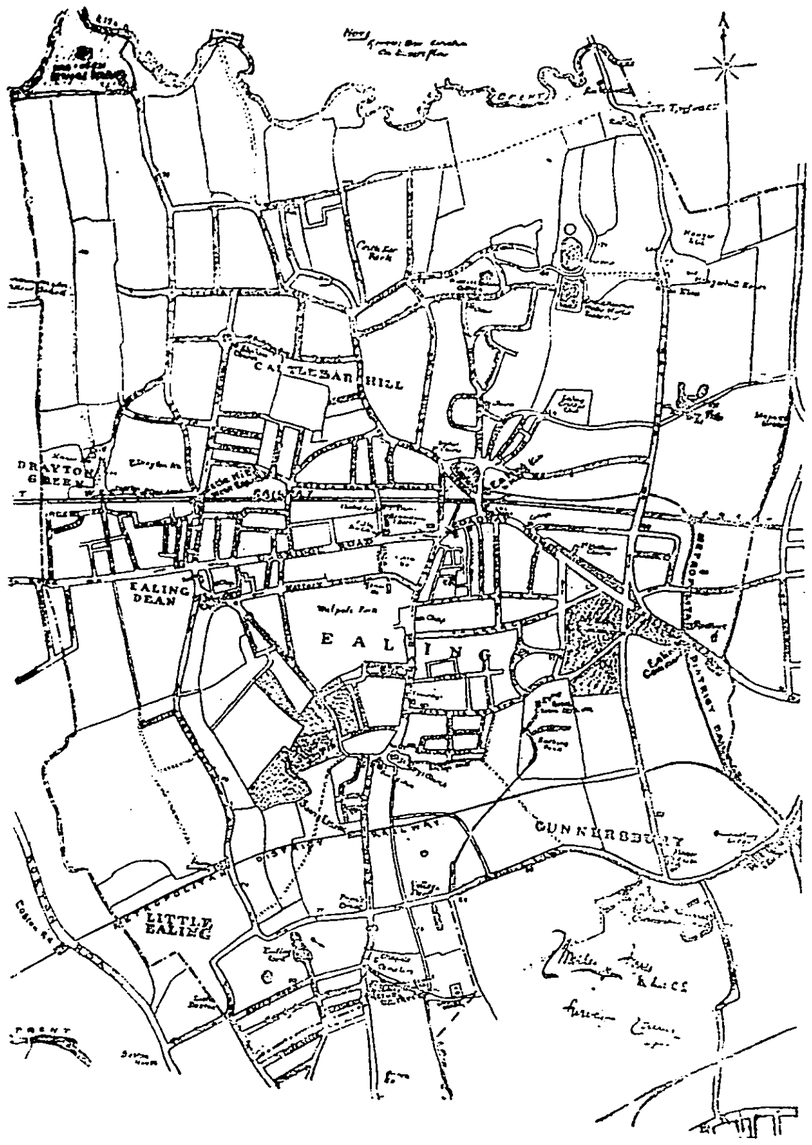
The district of Ealing is situated some six miles from the Marble Arch westward, in the valley of the Thames, and lies about one mile northward from that river. It was formerly called Yealing or Zealing, of the hundred of Ousselton, in the county of Middlesex, and was principally known as a favourite residential suburb, where many men whose names have become household words in the history of England resided. Amongst these may be mentioned the Earl of Rochford, the Dukes of Marlborough and Argyll, Sir Francis Dashwood, the Percivals, Lord Brooke, and Lord Manners. John Horne Tooke, and the great political writer of the last century John Oldmixon, were buried here. Sir William Lawrence, the eminent surgeon, died here, and was buried in the old parish churchyard. The great Lord Heathfield dwelt in the village, and at Fordhook, Henry Fielding the novelist, and subsequently Lady Byron. In the drawing-room of Fordhook, "Ada, sole daughter of my home and heart," was married to Lord King, afterwards Earl of Lovelace. The Duke of Kent lived at Castle Bar Park, and the late Home Secretary, the Right Hon. Spencer Horatio Walpole, has been for many years and is still a resident amongst us. Professor Huxley was also born in Ealing.

One speciality was the large private scholastic establishments; the largest private school in England, Great Ealing School, was kept for many years by the Drs. Nicholas. Probably not many private tutors could show a longer list of scholars who became men of note than could the Nicholas family,—amongst others, Sir Henry Lawrence, Bishop Selwyn, Charles Knight, Sir Henry Rawlinson, Cardinal Newman, Captain Marryatt, Lord Truro, and many more.

The district of Ealing consists of about 3,225 acres; the main road from Uxbridge to London passes through it, and is slightly over two miles in length. The 200 feet O.D. contour line runs through the district from east to west, and the ground falls from 200 feet to about 37·0 O.D. at the southern, and 50·0 O.D. at the northern outfall, giving a fall of about 150 feet to each set of sewage works: a fact which has considerable bearing upon its healthiness, and makes it a first class drainage district.

The district of Ealing over which the Board have supervision, is not co-extensive with the parish of Ealing, which includes Brentford, the county town of Middlesex, a county which contains within its boundaries the city of London, the city of Westminster and its palaces, and the fountain head of the government of a large portion of the whole world. Some 30 years since it became apparent that the time had come when steps should be taken towards developing its qualities as a

residential place, and an endeavour was made to induce the town of Brentford to co-operate in the formation of a governing body which should exercise the jurisdiction of the Public Health Act, 1847, and under the powers of that Act bring about a change for the better. At this tim Ealing had a population of about 5,200. It was governed by what was known as a highway board, the members being elected for life. The town of Brentford not being disposed to fall in with the above proposal, and having succeeded in defeating by vote the formation of a local board for the parish, a district was formed under the powers of the Act within the parish of Ealing, and on May 25th, in the year



1863, the first meeting of the Ealing Local Board was held, when they at once instructed their surveyor to prepare a scheme for the drainage of that part of the district which lies south of the Great Western Railway. Land was procured in the southern extremity of the district for the erection of precipitating works, and at an early date contracts were issued for the construction of the necessary lines of sewers and works connected with the same.

In the year 1873, the northern portion of Ealing applied to be taken into the district, and this having been brought about, a scheme for the draining of this portion of Ealing was prepared and carried out, a plot of land in the north-east corner, some 22 acress in extent, being purchased to be formed into a sewage farm.

At the time of the formation of the board in 1863, the roads and streets were in a most unsatisfactory condition. Curbing and channelling were unknown. There was no public gas lighting, and a large number of houses were supplied with water from surface wells. This state of things continued up to the year 1869, when the old highway board was done away with by Act of Parliament, and the local board at once determined to reconstruct the roads and paths. A sum of 10,000*l.* being expended in the course of 12 or 18 months in this work.

It would be impossible in this short space to go into the details of these several works. The entire length of the first contract being somewhat over eight miles, the length of sewer now in use in the district is about 30 miles, exclusive of surface drains. The rateable value of the district in the year 1863 was 18,396*l.*, and when it became known that a sum of 21,500*l.* was to be expended in the construction of tanks and sewers, and the purchase of the land, not a few of those who may be called the old residents of the place looked forward with a feeling of dread, and prophesied that the board and their officer would ruin the village. The 28 years that have passed since that time can best give the answers to the doubts then raised. The rateable value in 1863, was 18,396*l.*, and now in 1891, it has reached 162,029*l.*, or an increase since the first rate was made of 143,633*l.* The rateable increase per head of the population from 1863 will be seen from the following table:—In 1863, 3*l.* 9*s.* 2¾*d.*; 1871, 4*l.* 15*s.* 6*d.*; 1881, 6*l.* 7*s.* 10*d.*; and 1891, 6*l.* 15*s.* 0¼*d.* This table shows that the class of property has in no way deteriorated, the rateable value per head having increased in excess of the rate of increase of population.

Shortly after the formation of the board, the Metropolitan Railway was opened, and exercised a considerable influence in the further development of the district.

Much public attention was directed to the Ealing Sewage Works by those who were interested in the subject, and it may be recorded that Ealing was the first place in the valley of the Thames where a thorough and efficient mode of treatment and purification of sewage was tried; and it is worthy of remark in connexion with this matter that Ealing by its energy in dealing with the subject has had its reward, for while the towns along the banks of the Thames have been engaged year after year in litigation, vexatious inquiries, and the expenditure

of thousands of pounds in fruitless endeavours to carry some grand and imposing scheme into effect, Ealing has gone on its way without litigation, and up to the present moment prosperously, in all sanitary matters.

During the past five years the local board has become the owner of the various public greens and commons in the district, and in the year 1883, they purchased the freehold of the lammas lands (some 30 acres) as recreation grounds for the people, making now rather over 100 acres of open grounds, divided between five different portions of the district, in addition to some 20 acres of ground which is laid out in allotments for the poor. These large open spaces, together with the care taken in all sanitary matters, have doubtless much to do with the exceedingly low death-rate at present recorded. At the time of the formation of the board it was some 18 per 1,000, in the year 1888 it was 10 per 1,000, and the average of the past five years is 11·52 per 1,000, a record probably hardly equalled by any inland town in England with the same number of inhabitants, viz., 24,000.

During the past seven years much has been done in the way of planting, the principal roads and thoroughfares being lined with avenues of trees in order to preserve as much as possible the rural character of the district, and enhance its value as a residential suburb. The district is supplied with water by the Grand Junction Water Company, and with gas by the Brentford Gas Company. It is intended, however, at an early period, to introduce the electric light, a Provisional Order having been obtained for this purpose.

In the year 1884 the board erected public baths, consisting of first class bath, third class, and ladies', together with slipper baths and various conveniences appertaining thereto. During the winter months the large bath is used as a gymnasium, only one bath being retained for the public use. A sum of 10,500*l.* has been expended in connexion with this matter, and the taking is about 900*l.* per annum.

In the year 1884, an isolation hospital was erected, an acre and a half of land having been purchased for that purpose. The scheme provides for three separate blocks, together with the necessary administrative block, laundry, &c. Only one block has been at present erected. In addition to the necessary offices the grounds are laid out as a garden, and arrangements have been made by which, in case of emergency, hospital tents may be erected on a concrete floor, which occupies the site of one of the blocks. The entire cost of these works was 6,500*l.*, including the purchase of the land.

The growth of the neighbourhood having necessitated additional office accommodation, as well as enlarged stable buildings, &c., it was decided to erect the present offices, and at the same time to commemorate Her Majesty's Jubilee by the erection, by public subscription, of the Victoria Hall, and to arrange a building for the free library, so that the whole scheme might be brought within one general design.

At the rear of these buildings are the baths, and at the rear of the baths the stabling with all the necessary departments connected with

municipal work, including carpenters' and painters' shops, forge, cart-sheds, mortuary, &c., &c. The entire outlay upon the public buildings (including free library) amounted to 16,000*l.*, of which 7,000*l.* was received from the sale of the old offices; the Victoria Hall, erected by public contributions, cost 4,500*l.*, and stables and fire station 4,000*l.*; or a total of 24,500*l.*

On the road fronting the stables was erected a fire brigade station, capable of containing three engines, with residence for the permanent engineer, and sleeping rooms for men on night duty.

The whole of these buildings are contiguous, and form a block of altogether some two acres of ground.

During the past four years the whole of the bridges across the Great Western Railway connecting the northern and southern districts have been widened and a new one has been erected.

A feature of great interest has been the destructor and fume cremator, erected in the year 1883, at the southern sewage works. In this destructor not only is house refuse from the district destroyed, but the residuum from the sewage, there being no means of dealing with this for agricultural purposes. The steam power created is used in the works for pumping, electric light, &c.

This work, although in close proximity to houses in the district, is carried out with no inconvenience or nuisance in any way.

The Victoria Hall already referred to was opened by his Royal Highness the Prince of Wales, December 15th, 1888.

The free library (lending department) has some 7,500 volumes, including works in all departments of literature and science, and a reference library of nearly 1,000 volumes. The value set upon the library may be estimated by the fact that in the year 1891, the total circulation was 113,949, and the attendance in the reading rooms nearly a quarter of a million.

In addition there are provided science and art classes, and a large studio used as an art school.

The loan indebtedness of the board is only one-half of the rateable value of the district, and the rate has not exceeded for the last 11 years the sum of 1*s.* 6*d.* in the £ half-yearly, with ½*d.* in the £ for the free library.

The City of Edinburgh.

Delegates to the Congress.

Lord Provost Rt. Hon. John Boyd.
Bailie James Alexander Russell.
Henry D. Littlejohn, M.D., Medical Officer of Health.

The area of the city within the municipal boundaries is 6,166½ acres. This area includes 1,171 acres of public parks and recreation grounds, consisting of the Queen's Park, the property of the Crown, but open for public use (614 acres), The Meadows (63 acres), Bruntsfield Links (35 acres), Blackford Hill (95 acres), Braid Hills (156 acres), Calton Hill, (23 acres), Princes Street Gardens and Castle Terrace Gardens (38½ acres), Inverleith Park (61 acres), and—closely adjoining—the Arboretum and Royal Botanic Gardens, also Crown property but open for public use (58 acres), Harrison Park (14 acres), Regent Road Gardens (3⅔ acres), and Montgomery Street Gardens (3 acres), besides several small plots used as public bowling greens and children's play-grounds.

In 1871 the population of the city amounted to 197,581, in 1881 to 236,000, and in 1891 to 261,261. The average rate of density of population, exclusive of public parks and recreation grounds, is 52 persons per acre. The maximum rate of density of population is 900 persons per acre, which is to be found in a small area of the Cowgate; this has long been one of the most wretched districts of Edinburgh, but is now rapidly undergoing improvement.

Edinburgh probably has a more difficult problem in the condition and improvement of its "slums" than any other city of its size. This is largely due to the fact that for purposes of mutual protection and defence in warlike times, its inhabitants crowded their habitations closely together so as to be under the protection of the castle and within walls of defence which were erected from time to time. The effect of this is seen in the numerous excessively high tenements or blocks of dwelling-houses in close proximity to each other with only narrow closes between. Formerly inhabited by the better classes, these tenements have become sub-divided in modern times into single-roomed houses for the abodes of the very poorest classes, giving rise through overcrowding to insanitary and disease-producing conditions.

In the year 1867 a scheme of city improvement was carried out whereby new streets forming avenues of light and air-space were opened up through some of the worst of these over-congested districts. In order to overtake the congestion of the adjoining or intervening districts which remained unaffected by this scheme of city improvement, powers were obtained in 1879, in the same Act which provided for the compulsory notification of infectious diseases, for dealing summarily with insanitary dwelling-houses. This latter question has been diligently prosecuted by the Public Health Committee of the Town Council

as is shown by the following figures:—(1) Uninhabitable houses dealt with during the last 6 years, 2,163; (2) Houses closed as being uninhabitable, 1,077; (3) Condemned houses improved and reoccupied, 744.

The whole sewerage of Edinburgh is disposed of on the water carriage system. With a few exceptions in the poorer quarters of the city, every dwelling-house is supplied with water, water-closets, and sinks. In the course of the last six years under compulsory orders more than 1,100 water-closets and 635 sinks with water service have been introduced into the poorer class of dwelling-houses. The Public Health Committee is careful in insisting that all such sanitary appliances shall be placed next the outer wall so as to be well lighted and properly ventilated.

The question of providing model housing for the working classes has from time to time during the last 30 to 40 years been taken up and treated in a very practical and satisfactory manner by several prominent citizens, and some admirable schemes of well-planned houses of this class have been provided. Some of these schemes are on the self-contained cottage principle, having separate accesses and small plots of garden ground attached. Others are on the "flat" system with external staircases and balconies leading to the houses, each house having thus a separate door of its own entering from the open air. Housing accommodation of the kinds mentioned has thus been provided for 4,000 to 5,000 persons of the working classes. Housing of a class within the reach of the very poor has not yet been provided, although the question has recently been under the consideration of the Town Council.

The matter of public baths has received the special attention of the Corporation. One establishment of this kind, consisting of one men's and one women's swimming pond, and 48 private baths—12 of which have shower-bath arrangements—has been erected. During the summer months there is a weekly average of 4,000 to 6,000 persons availing themselves of the baths. Steps have been taken for acquiring sites for similar premises in other parts of the city.

Public washing-house and laundry premises for the poorer classes, consisting of 26 tubs, hydros, drying chambers, &c. are in course of being arranged for.

In the more densely occupied districts the Corporation have in several cases acquired the sites of condemned and dilapidated houses, and have formed the same into children's playgrounds with see-saws and seats, which are largely used.

A new method has been adopted in providing public conveniences, which are being placed underground, fitted up with all modern appliances, and placed under the charge of an attendant. Five of these have been, or are being provided, at a cost of 3,000*l.*

With reference to the condition of the drainage arrangements and internal sanitary appliances of dwelling-houses throughout the city generally, the authorities have instituted and maintained for several years a thorough-going investigation, with the object of having every house examined and put into thorough order. This is not intended to

supersede but to assist voluntary effort in the same direction. As in the case of new houses, all such work is certified; the reconstruction of the drainage of existing houses is also certified when properly executed. This work has proceeded for the last eight or nine years at the rate of nearly 1,000 houses per annum, at an estimated cost to the owners of 10,000*l.* to 12,000*l.* In cases of infectious disease, wherever the Medical Officer of Health considers it to be desirable, investigation is made as to the sanitary condition of the house where such disease occurs.

All plans of new houses and buildings and of alterations on existing buildings must receive the sanction of the Dean of Guild Court, which sits weekly for this purpose. As the building proceeds, periodical inspection is made, from the laying of the foundations to the completion of the building, special attention being given to the drainage and sanitary appliances; and on completion a certificate is granted that the whole work has been satisfactorily executed. In order to the better supervision of this work, and as the result of recent experience, further powers have been obtained during the present session of Parliament with reference to a higher standard of width of streets and height of houses, extent of open ground in rear of same, the sub-division of houses, and the enactment of the Code of Building Regulations.

As regards the disposal of its sewage, Edinburgh is fortunate in being near the sea (Firth of Forth), and in having good gradients; its sewage is therefore carried swiftly to the sea, and is discharged at, or slightly beyond, low-water mark. The city is naturally divided into three large drainage districts, with three separate outfalls. With the exception of what is used for irrigation on Craigmillar, Lochend, and Craigentinny Meadows, the sewage of Edinburgh, to the amount of nearly 3,000,000 cubic feet per day, is thus discharged directly into the sea. In view of the enormous trouble and outlay in which many cities and towns are involved in order to get rid of their sewage, Edinburgh may be regarded as fortunate in having such facilities within easy reach.

A large sewerage scheme for the purification of the water of Leith, estimated to cost, along with the acquisition of certain mill-lades, nearly 200,000*l.*, is now being carried out, at the instance of the authorities of Edinburgh and Leith, and of the parishes of Corstorphine, Colinton, St. Cuthbert's, and Currie, and several paper-mill owners. The principal part of the works consists of the construction of a large intercepting sewer, seven miles in length, with the necessary branch drains. It is proposed to intercept all sewage and other offensive matter, which at present discharges into the river; and by means of large compensation reservoirs on the upper reaches of the river, to replenish the same with a reasonable supply of pure water. This is an important sanitary measure, intended at once to purify the river, and to prevent the pollution of the harbour of Leith.

For the last 20 years Edinburgh has possessed a horse tramway system which traverses the leading lines of thoroughfare, and for the last two or three years two separate systems of cable tramways have been at work on the northern slopes, affording a pleasant and convenient means of communication. At the present time the alternative questions

of the Corporation undertaking the management of the horse tramway system, or granting a new lease under new conditions to the Edinburgh Street Tramways Company, who have worked the system for the last 20 years, are under consideration.

During the year 1891 an Electric Lighting Provisional Order was obtained, empowering the Magistrates and Council, under certain prescribed conditions to supply electrical energy for public and private purposes.

Edinburgh enjoyed for many years the unenviable notoriety of being subject to periodical outbursts of fever. These assumed in all cases the epidemic form and entailed a large mortality among the citizens. It was observed that the first to suffer were the Irish, then the poorer Scotch, but ultimately all classes of the community were affected, including among the medical profession the physicians and resident officials of the Royal Infirmary, and, lastly, the medical students, who caught the infection in their dispensary practice. There can be little doubt that one main cause of these repeated outbreaks was the manner of housing of the inhabitants which, copied from the French, consisted of piling tenement above tenement until a large over-crowded population was confined in a limited space, and could only communicate with the outer world by a narrow stair which was aptly described by the late Sir Edwin Chadwick as an upright street. Many of these blocks of buildings contained upwards of 200 inhabitants. When infectious disease of any kind broke out in such circumstances it spread with great rapidity and quickly assumed the epidemic form. The hospital accommodation at the disposal of the authorities being limited, the disease was practically allowed to continue its ravages among the population unchecked, until it gradually wore itself out for want of material. Meanwhile the reputation of Edinburgh as a residential city and as the great educational centre of Scotland suffered. The Corporation in 1863 appointed a medical officer of health, who reported on the sanitary requirements of the city, more especially of its poorer districts, which were the hot-beds of infectious disease. Lord Provost Chambers in 1867 inaugurated a comprehensive scheme, whereby the insanitary areas in the old town were satisfactorily dealt with under a special Act of Parliament. This scheme came to an end in 1889, and during its continuance 600,000*l.* has been expended with the following results as regards the general mortality of the city:—

From 1865 to 1874 the death-rate was 26·26 per 1,000;
from 1875 to 1884 it was 19·94 per 1,000; and
from 1885 to 1890 it was 17·51 per 1,000.

Another step in advance was the adoption by the Corporation in 1879 of a clause in a local Act enforcing the notification of infectious diseases by medical practitioners. This has been loyally carried out by the profession, and thus for the first time the authorities became aware of the amount of preventible disease in the metropolis of Scotland. Up to 1891 upwards of 60,000 intimations were reported; the fees payable to medical men amounting to nearly 7,500*l.* One immediate

benefit of the system of notification was the discovery of the necessity of greatly increased hospital accommodation for these diseases.

The Corporation at an expense of 30,000*l.* have provided a hospital with 250 beds, together with a reception house with 70 beds for infected families. In addition, a convalescent hospital with 30 beds has been established at the seaside in the immediate neighbourhood of the city, for the special benefit of patients recovering from infectious diseases.

Meanwhile the Corporation has continued to deal, not with insanitary areas, but with individual houses throughout the city. This they do with marked success and with little friction, owing to a special plan which has been adopted and which has received the sanction of Parliament. In the first instance reports are obtained from the Medical Officer of Health and from the Borough Surveyor as to the sanitary state of the dwelling; these reports are submitted to the Health Committee of the Town Council, and, after approval, notice is served on the proprietors of the dwelling in question to appear before the Health Committee (as representing the Town Council) and show cause why the recommendations of the sanitary officials should not be carried out. Before this informal court there is a free interchange of opinions, and the citizens are satisfied that their objections have been listened to and their proposals met in a conciliatory spirit. The number of insanitary houses dealt with in this way during the last six years is 1,968, of which number 892 have been closed as uninhabitable, the remainder having been improved and reoccupied or otherwise disposed of.

There are 125 miles of roads or streets in Edinburgh, of which 68 are causewayed, 55 macadamised, and 2 laid with wood. On account chiefly of their durability and resistance to the wear and tear of traffic, whinstone and granite setts have been most extensively used. Wood paving has not found favour hitherto. As in other cities, however, the noise of the stone paved streets is much complained of, and the desire is becoming general for smooth paving. For the paving of footpaths "granolithic" cement is at present more in use than any other, especially for suburban roads.

The cleansing of the city is not the work of private contract, but is performed by the Corporation. The workers or employés in the cleansing department number 390; and 120 horses are employed, with occasional hiring as circumstances may require.

The main features of the cleansing system may be read in the fact that the watercloset is universal throughout the city, and there are *no ashpits or refuse receptacles of any kind.* All house refuse is removed daily between the hours of 6 and 8.30 a.m. during the week; and in the poorer districts special provision is made to ensure cleanliness by taking away refuse accumulations on Sunday. The annual collections represent 110,000 tons, 90,000 of which consist of house refuse and street sweepings, the remaining 20,000 tons being mud and road scrapings.

The cleansing of the city costs about 30,000*l.* per annum. This is equivalent to 3½*d.* per £ of the assessable rental, or about 2*s.* 2*d.* per head of the population.

The one great and still growing difficulty in connexion with the cleansing of Edinburgh is the want of suitable outlets for the dry refuse. This difficulty points to the probability of the city being compelled to burn its refuse collections; and the erection of one or more destructors is at present in contemplation.

Through the munificence of private individuals within the last three years Edinburgh has been furnished with a free public library, which cost upwards of 50,000*l.*, the annual expenditure being provided by the rates; a national portrait gallery costing upwards of 50,000*l.*, besides an endowment of 20,000*l.* for future art purchases; and a new academic hall for the University, which will cost 70,000*l.*

The City of Glasgow.

Delegates to the Congress.

Lord Provost The Hon. John Muir.
Lord Dean of Guild, John Ure.
Councillor Robert Crawford.
Councillor Hugh Steel Thomson.
James Burn Russell, M.D., LL.D., &c., Medical Officer of Health.

The City of Glasgow is the commercial capital of Scotland, in population the second city in Great Britain, and placed by the registered tonnage of its shipping it ranks as a port next to London and Liverpool. It is situated in lat. 55° 51′ 32″ N., and long. 4° 17′ 54″ W., on both banks of the Clyde, 14 miles above the point where that river begins to open out into the Firth.

From the earliest period of its history Glasgow has been a "city" by virtue of being the seat of a bishop. The existing cathedral was founded in 1197, and the university in 1450.

The present area of the city is 6,111 acres, and the population at the census taken on the 5th April 1891 was 565,714. A Municipal Extension Act has been obtained this Session, to take effect on 1st November, which includes 6 police burghs and other populous districts, thus raising the area to 11,861 acres and the population to some 660,000 souls. This gathers together the whole overflow of population since the last great Extension Act of 1846, with the important exceptions of 3 police burghs, the population of which is about 112,000.

The Municipal Government is vested in a town council, 77 in number, of whom 75 are elected by householders. The two *ex-officio* members sit in virtue of their office as "Dean of Guild" of the Merchants House and "Deacon-Convener" of the incorporated trades. The various departments of municipal business are all controlled by the town council either by committees or acting as a whole as trusts constituted by Acts of Parliament for special purposes.

Sanitary History of Glasgow.—Glasgow affords no exception to the rule that the lessons of sanitation are learned in the school of suffering. The only praise due to her is that she has been an apt pupil. Her progress is chiefly recorded in her successive Police Acts, which began in 1800 and close for the present with the "Glasgow Police (Amendment) Act, 1890," which is a purely sanitary measure.

The health of the City was first recognised as a department of municipal duty worthy of the attention of a distinct committee of the Police Board (town council sitting for police purposes) in 1857, by the appointment under the Nuisance Removal (Scotland) Act, passed in the previous year, of a "Committee on Nuisances." One of its first works was to send a deputation through the large towns of England and Scotland to study their sanitary systems. The outcome of their report was the eighth Police Act of 1862, renewed and amended in 1866. A "Sanitary Committee" under the 1862 Act was at once substituted for the Nuisance Committee. The first medical officer of health was appointed in 1863. The first washing and disinfecting establishment was established in 1864. The first epidemic hospital was opened in 1865. The cleansing of the City was taken from contractors and recognised as a department of municipal service in 1868. In 1870 the cleansing and sanitary committees were united under the designation of "Committee on Health," forming a body of 21 members to which henceforth the whole duties of local authority were entrusted. Its first work was to appoint a chief sanitary inspector (an office hitherto held by the chief constable) and to commission him to organise the sanitary administration of the City. Taking the 5 police sub-divisions as his territorial basis, each was treated as a separate sanitary district under a district inspector with an adequate staff of inspectors of nuisances, of epidemics, of lodging-houses, &c., &c., making up a total staff for the city, including clerks, &c. at the headquarters, of 47 persons. Since 1870 the sanitary department has, as regards details, been adapted from time to time to the wants of the City in accordance with the lessons of experience, but it works to this day essentially on the old administrative lines. The greatest advance has been in the material equipment.

The Sanitary Department is administered from the Sanitary Office, 1, Montrose Street, which, besides being on the public telephone system, is connected by private telephone with all the police stations and sub-stations, and with the hospitals and washing-house. The City is for statistical purposes divided into 24 "statistical sub-divisions." These have been grouped into five administrative sub-divisions, as nearly as possible equal in population or sanitary necessity. The vital statistics and administrative statistics of work done are in this way built on one basis.

The Sanitary Staff consists of medical officer of health, chief sanitary inspector, 5 district or superintending inspectors, 16 nuisance inspectors, 9 epidemic inspectors, 5 female inspectors (women who carry on house inspection in the poorer districts to enforce domestic cleanliness); a staff of 5 smoke-testors who apply the smoke-test to the private drains of dwelling-houses, offices, &c. in the City, and especially to all new buildings before occupation. Other departments of sanitary work are carried on without respect to the districts, *e.g.*, night visitation for the prevention of overcrowding. Under the 1862 Police Act all houses consisting of not more than 3 apartments and having an aggregate cubic space not exceeding 2,000 cubic feet may be measured, and the total contents with the number of inmates allowed at the rate of 1 adult or 2 children under 10 years for every 400 cubic feet (300 until the Police (Amendment) Act of 1890) marked on a tinplate ticket which is affixed to the outer door. All houses so "ticketed" may be visited at night, the inmates counted, and householders, where a number in excess is found, summoned before a magistrate and fined. There are also 4 food and dairy inspectors, 1 inspector of common lodging-houses, and a medical vaccinator who attends at the vaccination hall twice a week. The object is to maintain a large stock of lymph for use in revaccination when small-pox appears.* For statistical and general clerical work there is a large staff of clerks in the office, also a draughtsman.

Epidemic Hospitals.—The estate of Belvidere extending to 32 acres was acquired on the eastern confines of the town in 1870 for hospital purposes. A fever hospital has been erected there containing 390 beds with 2,000 cubit feet of space to each adult; also a small-pox hospital, separate and complete in itself, containing 150 beds. These beds are all arranged in isolated brick pavilions, each containing 30 beds, divided between two wards. The wards are all on the ground floor with open roofs. There are ample grounds laid out for convalescents, with well-grown trees and flower plots. A part of the original fever hospital, built in 1865 of wood on brick basements in the north quarter of the town, is retained as a reserve hospital; it has 120 beds. To meet the necessities of the enlarged City, a site has just been secured in the north-western outskirts, where it is proposed to erect a duplicate of Belvidere. The old reserve hospital will then be abolished.

Washing and Disinfecting Establishment.—This occupies an area of 2,500 square yards of the estate of Belvidere. It is essentially a washing-house fitted up with the best mechanical contrivances, to which infected articles to be treated are driven by a service of vans from all parts of the city, and in the case of the poor returned the same day. It has also a Lyon's disinfector; a cremator for burning straw, chaff, and other material which can only be burned, and a steam carpet-beating machine. On an average 1,000 articles per day are treated.

House Disinfection and Limewashing.—An adequate staff of men is attached to the washing-house to fumigate infected houses with sulphur and to limewash or size-colour the internal surfaces in the poorer class of houses.

The Reception House is a self-contained house with a small piece of exercising ground attached, under the charge of a matron with the necessary servants. It contains 24 beds, and is used to receive the healthy members of families infected with typhus, who generally are very poor and very dirty. They are divested of their clothing and provided with clean suits until it is washed. They are boarded and lodged for from 14 to 17 days, and watched for development of illness; in which case the sick person is at once sent to hospital. In special circumstances this house is used to quarantine people who have been

* In Scotland primary vaccination is carried out under parochial supervision.

exposed to other infectious diseases, but it is useful more particularly in stamping out typhus. Another reception house, with accommodation for 40 persons, has just been acquired, on the opposite, or south, side of the river.

The Infectious Diseases (Notification) Act, 1889, was adopted on 1st January 1890. The following statement shows the current expenditure of the sanitary department under various heads for the year 1st June 1890 to 31st May 1891: hospitals and reception house, 23,364*l.*; disinfection, 2,613*l.*; interest and repayment of principal, &c., 7,991*l.*; miscellaneous charges, 2,033*l.*; general sanitary operations, 9,720*l.*; total, 45,721*l.* During the year, 4,018 patients were treated in the fever hospitals; 338,000 domiciliary visits with reference to nuisances and infectious diseases were made, and 21,000 nuisances and 11,300 cases of infectious disease dealt with; the night inspectors made 45,000 inspections of "ticketed houses"; the female inspectors 47,000 household inspections; about 11,000 apartments were fumigated or limewashed; 561,500 infected articles were washed; 1,000 carpets beaten; 11,600 beds, pillows, &c. were steamed under pressure; 2,000 straw or chaff beds were burned, and fresh material issued.*

The Cleansing Department.—This is conducted by a chief "inspector of cleansing" under a sub-committee of the committee on health. The work of the department embraces (1) the scavenging of all courts and backyards forming a common access to lands and heritages separately occupied. These are mostly attached to tenement houses (dwellings arranged in flats). They are cleaned on a sectional system, each section being divided into beats, to each of which a man is assigned. The courts are thus scavenged once, twice, or even thrice a day, according to locality. (2.) The scavenging and watering of all streets and roads. (3.) The collection, removal, and disposal of all night-soil, general domestic refuse, and detritus. This last is the most difficult, and from a health aspect, the most important section of the cleansing work. The old privy and ashpit system of excrement-disposal is being gradually displaced by the introduction of waterclosets, but is still sufficiently prevalent to require special arrangements. The object is to prepare a manure which will be purchased by farmers. This is done at three refuse despatch works erected (1881–90) in different parts of the City.† Thither the ashpit refuse, night-soil, and street sweepings are carted nightly. The refuse and dry sweepings are screened and sorted in revolving screens. The cinders are sufficient to raise all the steam required to drive the machinery. The rougher rubbish is partly cremated and partly sorted out for economic use, *e.g.*, meat tins for the recovery of the solder; old iron, glass, and anything saleable for sale. The fine ash and dry sweepings are mixed with night-soil to form

* N.B.—All the resources of the sanitary department are placed at the service of the ratepayer without charge incidental to their use. This has been done for many years *ex gratiâ*, but by the Police (Amendment) Act of 1890, the Commissioners bound themselves to do so. Even paupers and prisoners affected with infectious disease are removed from the poorhouses and prisons and treated without charge.

† A fourth is still required to complete the scheme.

manure. The sloppy sweepings are added after draining off the water. The macadamized road sweepings are trucked out to Fulwood Moss, a farm of 125 acres about 10 miles from the City on the Greenock line. When leased 12 years ago it was a useless bog, but it is now reclaimed, and from the road sweepings yields magnificent crops of hay, potatoes, &c. In these various ways the refuse of the City is removed nightly and disposed of by 10 o'clock next morning. Up to 1st June 1891, the capital outlay of the cleansing department for works and plant was 173,000*l.* In the year ending at that date the ordinary expenditure, including interest, was 80,200*l.*; the ordinary revenue was 19,610*l.* The number of men employed was 844: of horses 180. The ashpit refuse, sweepings, &c. removed amounted to 779 tons per working day and 16,263,000 gallons of water were sprinkled over the streets during the year.

City Improvement Trust.—The wynds of Glasgow were a byeword among strangers and a scandal in the eyes of all thoughtful citizens for generations. The evil had grown to such gigantic proportions through long neglect that no common measures could suffice to remove it. One of the first acts of the town council after the extension of 1846 was to set aside 30,000*l.* for the purchase of property in those wynds, and when this sum was exhausted, private philanthropy continued the work. But it soon became evident that some extended, definite, and coherent scheme was necessary, and this was produced in 1865 in the City Improvement Act, the preamble of which sets forth that: "Whereas various portions of the City of Glasgow are so built, "and the buildings thereon are so densely inhabited as to be highly "injurious to the moral and physical welfare of the inhabitants, and "many of the thoroughfares are narrow, circuitous, and inconvenient, "and it would be of public and local advantage if various houses and "buildings were taken down, and those portions of the city recon-"stituted, and new streets were constructed in and through various "parts of the said city, etc."

The improvement scheme embraced about 88 acres, distributed over the old centres of growth of the now continuously built area. On this area a population of 51,294 was housed. The average rate of mortality was 39 per 1,000, and 36 per cent. of all the deaths was caused by epidemic diseases. The Act was passed in 1866 and amended in 1871 and 1880. The magnitude of the operations contemplated is sufficiently shown by the borrowing powers conferred by the 1866 Act to the extent of 1,250,000*l.*, which were raised by the 1880 Act to 1,500,000*l.* The work of demolition began in 1870 and was carried out at intervals until 1877. The first effect of these operations, which coincided with extensive railway clearances, was to stimulate a building "boom." Of the houses in existence in Glasgow in 1881 it is calculated that 28 per cent. had been built within the preceding 10 years. The Improvement Trust were required by their Act to dispose of their ground by public sale. The bidding frequently ran high, and the consequences in some cases were so disastrous to the purchasers that the land came back to the Trust. In 1878 the failure of the City of Glasgow

Bank gave local intensity to the general depression of trade. The Trust was caught not only holding large areas of cleared land, but a large amount of the worst property in the City bought for demolition. There followed, therefore, 10 years of inactivity during which the Trust acted simply as landlords of this property, hove to and waited for a change of wind. This change came two years ago and now demolition and reconstruction are again in progress.

In the earlier history of the Trust the provision of accommodation for the displaced inhabitants was left almost entirely to private enterprise. In addition to the land cleared and laid out or feuing within the scheduled area, the Trust purchased two estates on the southern and western outskirts of the City and feued them, at a cost of 42,000*l.* and 43,000*l.* They built two small "model tenements" at a cost of 3,426*l.* as an example to private builders, but did nothing more for householders. For the lodgers who pervaded the localities which were cleared, living not only in low lodging-houses, but forming a most unwholesome element in the small houses of the poor, they made ample provision in seven "model lodging-houses" erected in various quarters of the City, of which a special account will be found further on. It had been hoped that private enterprise would supply houses suited for the poorer householders, but the cost of the land made that impossible. The Trust was, therefore, compelled to begin to cover its own ground. In Saltmarket they have already erected on the east side tenements in four flats, the street flats being shops, containing 24 houses of one apartment, 58 of two apartments, and 8 of three apartments, and on the west side behind the street building line, a brick tenement of three flats containing 36 houses of one apartment, in each case with all conveniences in the shape of watercloset, washing-houses, etc. These are fully occupied. But as the rent of the single apartment houses on the street line is 13*s.* 4*d.* per month, and in the brick tenement 12*s.*, it is evident that the poorest householder is still unprovided for. Two efforts are being made to do this; by the Trust in altering the most substantial of the old tenements held by them, putting them under resident caretakers, introducing waterclosets and otherwise making them wholesome and cheap dwellings, and by a private company with a limited dividend. The company has only recently secured its first site, but the Trust, aided by certain extensive railway operations, is rapidly reconstructing and rebuilding. In this way the whole original scheduled area will in a few years be reformed. Supplementary to the Improvement Act of 1866, Street Improvement Acts were obtained in 1873 and 1877, with borrowing powers to 370,000*l.*, which have been all but exhausted in the purchase of property in different parts of the City, and the improvement of streets, etc., etc. The Streets Improvement Committee also hold a considerable amount of poor property with regard to which they are now following the same intelligent policy as the Trust. An interesting result of these circumstances, which are so much of the nature of accidents, is that the ratepayers of Glasgow through their representatives, not only purvey their own water, gas, electricity, and street locomotion, but under the force of circumstances

are becoming holders and purveyors of house accommodation. The Improvement Trust and Streets Improvement Committee own 1,202 houses, of which 551 are one-room and 486 two-room houses. These accommodate 5,300 persons. To these must be added the model lodging-houses with their 2,000 inmates.

Model Lodging-houses.—Between 1871 and 1879 the Improvement Trust erected at a cost of over 87,000*l.* seven model lodging-houses in as many industrial centres of the City. They contain 2,092 beds, for the most part arranged in private compartments with an average of 400 cubic feet of space per bed. One of these houses containing 125 beds is reserved for females. Attached to them are dining halls, reading-rooms, facilities for cooking and washing, and shops for the sale of food stuffs of good quality in small quantities. The males pay 3½*d.* and 4½*d.* per night, the females 3*d.* They are nearly always fully occupied, and yield a net return of fully five per cent. on their original cost. They have acted as "models" in the fullest sense. The old low class houses have been almost extinguished. Private enterprise has established larger lodging-houses which rival the "model" both in size and equipment. The lodgers who used to frequent the small houses of the poor have been to a great extent attracted to these institutions, thereby diminishing the occasion of indecency and immorality, and raising the tone of domestic life.

Public Baths and Wash-houses.—The Police Commissioners erected, between 1878 and 1884, five sets of public baths and wash-houses in the industrial quarters of the City at a cost of 123,500*l.* There are separate swimming ponds for males and females, also private plunge and shower baths. The charge for the ponds is 2*d.* for adults, 1*d.* for boys and girls under 13; for hot plunge baths 4*d.* and 6*d.* The washing-houses are fitted up with every mechanical convenience. For 2*d.* per hour, a woman has a separate washing stall with boiler, washing tub, a compartment in a drying stove, and the use of a hydro-extractor. Those who wish merely to dry clothes washed at home may have a drying compartment at 1*d.* per half-hour. The number of bathers in 1890–91 was about 454,000, the number of washings 155,000. The ordinary expenditure including interest was 12,000*l.*, the ordinary revenue 9,100*l.*

Public Parks, Gardens, and Playgrounds.—The extended City will have over 500 acres of park and garden ground, distributed conveniently to the population of each district within its area, besides a park of 49 acres on the top of a range of hills some distance outside the southern boundary.

Public Markets and Slaughter-houses.—There are no private slaughter-houses in Glasgow. The cattle market, dead meat market, and principal slaughter-house cover together an area of over 11 acres in the eastern part of the City. There are two smaller slaughter-houses in the northern and southern districts. The town council, as local authority under the Contagious Diseases (Animals) Acts, has provided for foreign

animals wharves with lairs and slaughtering sheds on the Clyde at Yorkhill (within the bounds) and at Shieldhall (without the bounds). The former is used for States cattle which must be slaughtered on debarkation, the latter for Canadian cattle, which are removed alive. Each can accommodate 2,000 head at one time. Their joint cost was 62,000*l.* The central fish market is situated near the harbour. "The Bazaar" is the central fruit and vegetable market. The dog and bird market and the old clothes market are illustrations of the public advantage of trades and businesses which tend to fall into the hands of small dealers without capital and become nuisances, being centralized and housed in public premises. This remark applies especially to the old clothes market in Greendyke Street, where lofty and salubrious buildings have been erected at a cost of 20,000*l.* They are leased at a profitable rent to a person of substance who sublets to stallholders and is responsible for their good management. To all interested in the domestic economics of the poor, "Paddies Market" presents a fine field of observation.

Public Provision for Instruction and Amusement.

The Mitchell Library.—In 1874 Mr. Stephen Mitchell bequeathed to the town council as trustees the sum of 67,000*l.* for the institution of a free public library. It was opened in temporary premises in 1877, but is now installed in commodious buildings, 23, Miller Street, purchased from the Water Commissioners and—until the erection of the new municipal buildings in George Square—used at their head offices. They have been entirely reconstructed internally. It contains nearly 90,000 volumes, and is a reading or consulting library only. Several attempts have been made to get the ratepayers to adopt the Free Libraries Act, but hitherto without success, although the number of readers shows the existence of a necessity which a central library cannot satisfy. The available annual income of the Trust is insufficient to adequately maintain this library, and it depends on subventions voted by the town council.

Picture Galleries and Museums.—The Corporation galleries in Sauchiehall Street were erected in 1854 by Mr. Archibald M'Lellan to receive his valuable collection of pictures which he proposed to bequeath to the citizens. He died before his design had been carried out, and the building and collection were purchased by the Corporation in 1856. The collection has been supplemented by gift and purchase, and is rich in specimens both of ancient and modern art.

The Industrial Museum in Kelvingrove Park is a building for the exhibition of the processes and products of the chief industries of the district.

New Art Galleries are about to be built on a portion of the site occupied by the great International Exhibition of 1888, granted by the Corporation. They will ultimately cost 200,000*l.*, the nucleus of which

is the sum of 47,000*l.*, being the surplus of that exhibition. The balance is being raised by private subscription.

The Public Halls belonging to the Corporation are the City hall and the St. Andrew's halls originally erected by a private company at a cost of 62,000*l.*, and recently acquired by the authorities.

Music is provided by the Corporation during the summer in all the parks and in other open spaces in the City. Free concerts are also given during the winter on Saturdays in the halls, which are provided with grand organs.

Water-supply.—The private companies who supplied water to the City were bought up by the Corporation in 1855. The Clyde was abandoned as a source when the Loch Katrine Water was turned on by Her Majesty in October 1859. The Gorbals Waterworks Company obtained their water by gravitation from the hills seven miles to the south of the City. This was continued, and still supplies a large population on the south side of the river. The cost of the new Loch Katrine Works and of the acquisition of the old, including the expenses of the Act of 1855, was 2,100,000*l.* The supply thereby secured was 42 million gallons per day. In 1885 an Act was obtained to extend the Loch Katrine Works at an additional outlay of 1,200,000*l.* which will increase the available supply by 70 million gallons per day, making a possible maximum of 112 million gallons per day. During the year ending 31st May 1891, there was distributed from the Loch Katrine Works 37,192,699 gallons per day, and from the Gorbals Works 4,764,122 gallons, or a total of close on the maximum available until the extension is completed, which will still require two or three years. The population within the area of supply, *which includes extensive suburban districts*, is close upon 840,000 or at the rate of 50 gallons per head per day. Within the City the domestic water-rate per pound of annual value has varied from 1*s.* 4*d.* to 6*d.*, the present rate. Outside the City from 1*s.* 2*d.* to 10*d.* the present rate. There is no charge for baths or waterclosets, and no other restrictions upon the domestic use of the water.

Drainage and Sewerage.—The domestic drains and public sewers of Glasgow are probably as sound and satisfactory as could be desired. No newly built houses or premises are allowed to be occupied or used until the drainage system has been smoke-tested by the Sanitary Department. For many years the house property has been systematically tested in the same way. The occurrence of enteric fever or of diphtheria is always made the occasion of a special examination of drains and soil-pipes. Built drains and cesspools are abolished wherever found. Under the new powers of the Police Amendment Act of 1890 waterclosets are gradually being substituted for privies. There is a complete system of public sewers built on the most approved principles.

All the sewage of Glasgow and its suburbs is discharged into the River Clyde either directly or through its tributaries. The result is that the Clyde is one of the foulest rivers in the kingdom. In the summer,

and especially after long drought, the stench is very great on the river and in its vicinity. The prevailing winds are south-west and west, and bear the effluvia over the whole western districts. It is more than 40 years since the offensive condition of the Clyde began to be talked about. In the interval it has been repeatedly inquired into by local committees and by the foremost engineers. Sir John Hawkshaw reported upon it as a Royal Commissioner in 1876. The chief difficulty has arisen from the number of the polluting authorities, and especially from the number of jurisdictions into which the great central community of Glasgow itself is divided, all of whom must co-operate in any effective sewage scheme. The latter difficulty has in great part been removed by the extension of the boundaries, which takes effect in November, and no doubt the first question to which the enlarged City will apply its united energies is the purification of the Clyde. Meanwhile accident has suggested and given the opportunity for a partial sewage scheme, to carry out which Parliamentary powers have been obtained during the current session. To admit of the construction of an underground railway running below the main streets from east to west, and cutting across the main sewers on their way to the Clyde, it was necessary to intercept and convey the sewage in sections to points of discharge. One of these mains conducts the sewage of about one fourth of the City to Dalmarnock in the east end at a cost to the railway company of between 40,000*l.* and 50,000*l.* The Commissioners have acquired about 30 acres of land there, and have obtained an Act enabling them to borrow 100,000*l.* Plans for sewage precipitation works capable of dealing with 10,000,000 gallons per day are now being matured. Upon the results thus obtained the nature of the measures for the entire purification of the Clyde will depend.

Gas: Electric Lighting: Tramways.—Although not directly hygienic, no statement of what Glasgow has done for itself through its municipal representatives would be complete without noting the fact that gas supply, electric lighting, and tramways are also in the hands of the authorities. Since 1869 gas has been manufactured and sold to the community and suburbs by the Corporation with great financial success. Arrangements are now being made under newly acquired powers to provide electricity also. About the same time the Corporation was successful in opposing a private enterprise to lay down tramway lines in the city, and in obtaining power to own and construct and lease to a private company tramways in the City and suburbs. The first instalment of these lines was opened in 1872. The system now extends to 31½ miles, of which seven are beyond the present boundaries. The lease expires in 1894, and there is every likelihood that the Corporation will then assume the management. Meanwhile the public enjoy an admirable service at a fixed charge of one penny per mile, with a further stipulation that on certain routes, most convenient for the working classes, morning and evening workmen's cars shall be run at half-price. The sanitary advantages of such cheap locomotion in distributing the population over a wider area are obvious.

Sanitary History and Results.

Sanitation.	Health.
1800. First Police Act.	1818. Typhus appeared.
1807. Second do.	1832. Typhus epidemic.
1821. Third do.	„ First cholera epidemic—3,166 deaths: death-rate, 46.
1830. Fourth do.	1837. Typhus epidemic — 2,180 deaths: death-rate, 41.
1837. Fifth do.	1843. Relapsing fever — 1,398 deaths: death-rate, 32.
1843. Sixth do.	1847. Typhus epidemic: death-rate, 53.
1846. Seventh Police and Extension Act.	1848–9. Second cholera epidemic—3,923 deaths: death-rate, 35.
„ Scotch Nuisance Removal Act.	1853–4. Third cholera epidemic—3,885 deaths: death-rate, 42.
1855. Scotch Registration Act.	6 years, 1855–60.
„ Waterworks Act.	
1856. Amended Scotch Nuisance Removal Act.	Death-rate, chief zymotic diseases, 6·1.
1858. "Nuisance Committee."	Total death-rate, 30·0.
1859. (October) Loch Katrine water turned on.	
1862. Eighth Police Act.	10 years, 1861–70.
1863. First medical officer of health.	
1864. First municipal disinfection and washing-house.	Death-rate, chief zymotic diseases, 6·5.
1865. First municipal fever hospital.	Total death-rate, 30·4.
1865. Market and Slaughter Houses Act.	1864–5. Last typhus epidemic—2,200 deaths.
1866. Ninth Police Act.	1866. Fourth and last cholera epidemic—only 53 deaths.
„ Improvements Act.	
1867. Public Health (Scotland) Act.	
1870. "Committee on Health."	
„ First sanitary inspector.	
„ Sanitary department organized.	
„ Cleansing do. do.	
„ Estate of Belvidere acquired.	

Sanitation.	Health.
1870–77. Improvement Trust demolitions and reconstructions. 1872. Reception House opened. 1873–77. Streets Improvement Acts passed. 1871–79. Model lodging-houses erected. 1877. Small-pox hospital, Belvidere, opened. 1878. Public Parks Act. 1878–84. Public baths and wash-houses erected.	10 years, 1871–80. Death-rate, chief zymotic diseases, 4·3. Total death-rate, 28·6.
1881. First refuse despatch work opened. 1883. New municipal washing and disinfecting establishment opened at Belvidere. 1884. Second refuse despatch work opened. 1887. Belvidere Fever Hospital completed. 1889. Improvement Trust resumes reconstruction. 1890. Police (Amendment) Act. 1890. Infectious Disease (Notification) Act adopted 1st January. „ Third refuse despatch work opened.	10 years, 1881–90. Death-rate, chief zymotic diseases, 3·1. Total death-rate, 24·4.

The following table gives fuller mortality statistics for each of these periods of sanitary development since registration was instituted in Scotland in 1855. The figures are the annual mean for the period specified:—

—	Mean Population.	Mean Annual Deaths, all Causes.	Typhus and Enteric.		Small-pox.	Scarlet Fever.	Measles.	Hooping Cough.	Diphtheria.
6 years, 1855-60	373,133	11,176	457		232	462	366	618	152
10 „ 1861-70	430,082	13,226	872		100	567	341	647	285
10 „ 1871-80	519,680	14,425	94	215	81	510	365	649	297
10 „ 1881-90	539,588	13,132	25	124	2·6*	264	367	609	287

* 26 deaths in 10 years.

A special word on the influence of the substitution (October 1859) of the pure water from Loch Katrine for the polluted water of the Clyde is necessary. In 1832, 1848, and 1853 there were very fatal outbreaks of cholera. In 1866 the disease was again imported, but it caused only 53 deaths, and has never returned. But the effect on the local diarrhœa was remarkable, as the following table shows:—

—	Mean Diarrhœal Deaths.	Mean Death-rate.	Proportion per cent.	
			Under 5 years.	5 years and upwards.
6 years, 1855–60 -	500	1·34	59·5	40·5
10 „ 1861–70 -	350	0·81	70·0	30·0
10 „ 1871–80 -	410	0·79	75·0	25·0
10 „ 1881–90 -	319	0·59	75·5	24·5

Emphasis must be laid upon the fact that these statistics refer only to the population within the boundaries, beyond which there has been a constant overflow of the cream of the inhabitants, leaving still to the parent city the burden of those classes who always keep close to the heart of cities. The following statement of the proportion of the inhabitants occupying houses of various sizes, as ascertained at the last three enumerations of the people, shows (1) the diminishing proportion of those who dwell in houses of five apartments and upwards; (2) the diminishing proportion of those who dwell in houses of one room; (3) the gradual increase in the proportion of those who dwell in houses of two, three, and four rooms. While, therefore, the "Glasgow," to which these statistics refer, is probably a larger collection of dwellers in small houses than exists anywhere else, the standard of house accommodation has been steadily raised.

Proportion of Inhabitants of Glasgow living in Houses of various Sizes.

—	1861.	1871.	1881.	1891.
1 room - - -	27·0	30·4	24·7	18·0
2 rooms - - -	40·7	41·5	44·7	47·5
3 „ - - -	14·0	13·2	16·0	19·7
4 „ - - -	7·4	5·8	6·1	7·2
5 „ and upwards -	10·9	9·1	8·5	7·6

The City of Gloucester.

Delegates to the Congress.

Joseph J. Seekings, Mayor.
A. M. Sydney Turner, M.R.C.S., Chairman Sanitary Committee.
John Campbell, M.D., Medical Officer of Health.
Richard Read, A.M.I.C.E., City Surveyor.

The city of Gloucester, situated on the east bank of the River Severn, was garrisoned and fortified by the Romans about A.D. 43, and formed one of their most important stations in the West of England. The centre of the city is on high ground sloping towards the river on the west and south, and rising on the north and east. Of the many Royal Charters granted to the city the earliest now in the possession of the Corporation is that of King Henry II. (about 1160), granting to the burgesses the same customs and liberties throughout all his land of toll and of all other things as the better citizens of London and those of Winchester had at anytime in the time of King Henry, his grandfather. King Richard III., by Charter dated 2nd September 1483, incorporated the town and made it a county of itself, provided for the election of a mayor and sheriffs, and authorised the carrying of a sword before the mayor, and of a mace before the mayor and sheriffs. King Henry VIII., by Charter dated 3rd September 1541, founded the Bishoprick of Gloucester and made Gloucester a city. King Charles II. granted to the city a very lengthy Charter, dated 8th April 1672, embodying the privileges granted by earlier Charters, and this remained the ruling Charter of the city until the passing of the Municipal Corporations Act, 1835. The boundaries of the city were extended in 1848, and again in 1874; and the city now has an area of 1,666 acres, and a population of 40,022, the latter having increased from 36,521 since 1881.

The old city was sewered in 1855 at a cost of 16,000*l.*, and the added districts in 1875–6 at a cost of 15,000*l.* In 1885 some old sewers in the added districts were abolished, and the sewerage of the city was generally improved and ventilated at a cost of about 7,000*l.*

Gloucester has for centuries been supplied with water from reservoirs at Robin's Wood Hill, about two miles from the city. Under the Gloucester Waterworks Act, 1885, these works were purchased by the Council for 18,000*l.*, and new works were constructed at Witcombe, on an escarpment of the Cotswold Hills, about five miles from the city, at a cost of about 100,000*l.*; further schemes for an additional supply are now under consideration..

The Council own a large and very important cattle market, a general market, corn exchange, and the quay on the bank of the river Severn, which together bring in a revenue of about 1,400*l.* per annum, in addition to the rents arising from the lands and other property of the Corporation, amounting to about 3,000*l.* a year.

Gloucester is the most inland port in the kingdom. The Gloucester Docks, which belong to the Sharpness New Docks and Gloucester and Birmingham Navigation Company, are connected with the River Severn at Gloucester and at Sharpness by a ship canal, 16 miles in length, free from locks, except at each end, and capable of passing ships of nearly 1,000 tons (registered) burden.

The Park and Spa pleasure grounds contain an area of about 21 acres, and the Spa has long been noted for its valuable wells of saline and chalybeate waters, which are highly prized for their medicinal qualities.

The county museum and the schools of science and art constitute the chief centre for art, scientific and technical instruction, both for the county and city of Gloucester.

The principal schools of the city are, for boys, the Crypt Grammar School, the Kings or College Schools, Sir Thomas Rich's Schools, and the County School at Hempsted, near Gloucester; for girls, the Endowed School, and the County School at the Spa. There is also a Theological College in connection with the Cathedral.

The Gloucester General Infirmary, the Children's Hospital, and the Dispensary, are large and important institutions.

New public baths of a very complete character, including Turkish baths, two large swimming baths, and first and second-class private baths for both sexes, have just been provided and opened, at a cost of about 12,000*l.*

New municipal buildings are now being completed, at a cost of about 25,000*l.*

During the last 15 years many public improvements have been carried out, and the sanitary condition of the city is, generally speaking, very good. The death-rate, which in 1875 was 24·6 per 1,000, has been steadily reduced, and in 1890 was only 15·2. The zymotic death rate has been reduced from 3·5 per 1,000 in 1875, to 1·5 in 1890.

The County Borough of Hanley.

Delegates to the Congress.

Councillor M. Huntbach, Mayor.
Major H. Palmer.
Alderman E. J. Hammersley.
John Clare, L.R.C.S. (Ed.), L.S.A. (Lond.), Medical Officer of Health.
Joseph Lobley, M. Inst. C.E., Borough Surveyor.

The county borough of Hanley is situate in the northern part of the county of Stafford on the north bank of the River Trent, and is about 147 miles distant from London. The county borough is immediately surrounded by four municipal boroughs and a local board district; it contains the largest population of the pottery towns, of which it is the most central and important, and is styled "the metropolis of the potteries." A hundred years ago Hanley presented only a humble collection of dwellings chiefly confined to two small villages half a mile apart. In 1801 it contained a population of 7,940 inhabitants; in 1821, 12,956; in 1841, 20,781; in 1861, 33,009; in 1871, 41,976; in 1881, 48,361; and at the last census in 1891, 54,846. The Borough has an area of 1,768 acres, and was incorporated in the year 1857; prior to which, from the year 1825, it was watched and lighted under a local Act of Parliament which appointed Commissioners and empowered those Commissioners to appoint a chief bailiff who was to be sworn as a constable, also a head and deputy constable and watchman for the preservation of the peace in the town. The Act further empowered the Commissioners to light the streets and to levy rates. Hanley, in addition to being a municipal borough, is also, with the adjoining borough of Burslem, a parliamentary borough, and was formed into a county borough by the Local Government Act of 1888. It is a market town, and situate within the parish of Stoke-upon-Trent, the hundred of North Pirehill, the deanery of Newcastle and Stone, the archdeaconry of Stafford, and the diocese of Lichfield; and has a separate Commission of the Peace and Court of Quarter Sessions, as well as its own Police force.

The chief productions of the borough are earthenware and china, some of the largest manufactories in the district being established in the town. Coal and iron are also extensively produced within the municipal boundary. The history of Hanley is almost confined to its rapid rise and development which is owing to its being the chief seat of the china and earthenware manufacture, for it formerly ranked only as one of the numerous villages of the potteries district. From its topographical situation on the summit and sides of a considerable elevation it is, for a manufacturing town, very healthy.

Extensive drainage works have been carried out at a cost of 70,000*l.*, the sewage being treated by precipitation in tanks followed by filtration through land. Extensive parks are about to be provided; and

the sanction to purchase 105 acres as a site for one of these has lately been obtained from the Local Government Board.

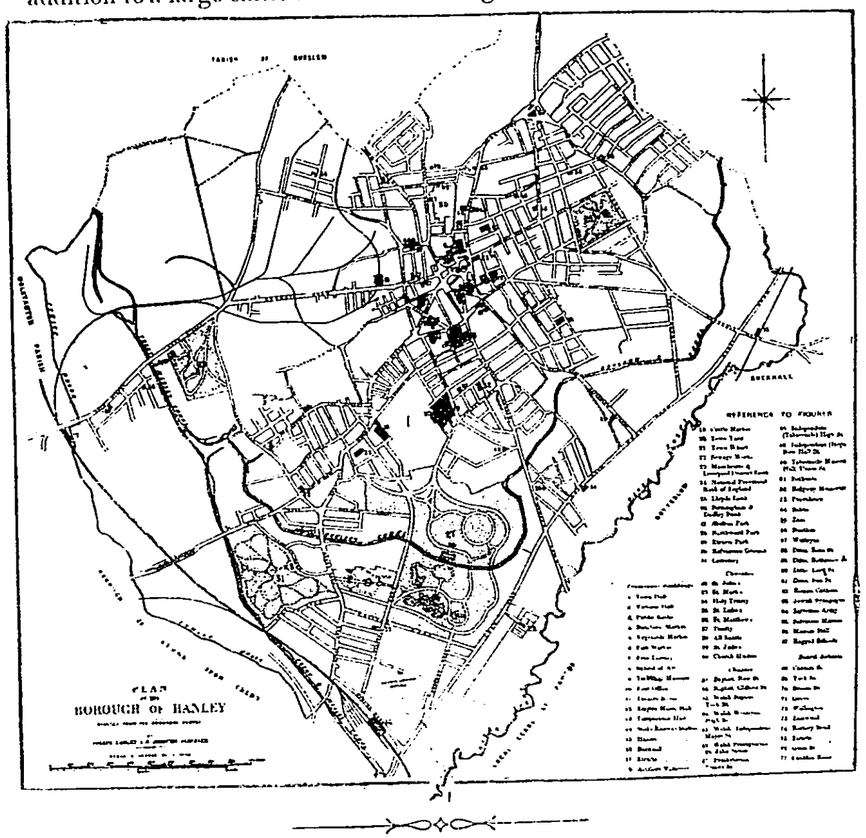
A recreation ground has been in existence for many years; a school of art was formed more than 30 years ago, and it now accommodates 200 students. A Mechanics' Institution, opened in 1861, has been connected with the Free Library which was provided under the Public Libraries Acts in April 1887; and a large and comprehensive Museum has lately been established.

The Town Hall, which was purchased a few years ago, and to which has been added quarter and petty sessions courts, and a large hall which accommodates about 3,000 persons seated, altogether cost 26,750*l.* Public swimming baths, Turkish and other baths have also been provided by the Corporation at an outlay of 10,000*l.*

Public abattoirs on the most approved principles have been erected in the borough, and the water-carriage system of night soil has been adopted.

The gas and water supplies are in the hands of private companies. A hospital for the treatment of infectious diseases has been erected by the council of the borough, in connexion with the adjoining towns of Stoke and Fenton, under the title of the Hanley, Stoke, and Fenton Joint Hospital at a cost of 7,525*l.*, and the cost of patients sent thither from Hanley is defrayed by the Corporation.

Hanley possesses three large covered markets (vegetable, fish, and butchers'), the largest of which is 126 feet long by 120 feet broad, in addition to a large cattle market containing an area of 8,000 square yards.



The County Borough of Huddersfield.

Delegates to the Congress.

Health Committee.	Sanitary Committee.
Councillor Jessop.	Alderman Hirst.
Councillor Brierley.	Councillor Jordan.
	R. S. Dugdale, C.E., Borough Surveyor.

Dr. J. R. Kaye, Medical Officer of Health.

The town of Huddersfield is situate in the West Riding of Yorkshire, 15 miles south of Bradford, and 16½ miles from Leeds. It stands on the slope of a hillside, at heights varying from 250 to 500 feet above sea level. The houses are nearly all built of stone, which abounds in the district, and the new streets are wide, airy, and spacious; but in the older parts of the town they are narrow. Great improvement has been effected by paving the streets with setts.

Two streams, the Colne and Holme, both in a filthy state of pollution, enter the borough separately, and join in the Lockwood district. They occupy the Valley of the Colne, and run first in an easterly direction, and then to the north to join the River Calder just outside the borough.

Huddersfield is considered one of the centres of the fancy woollen trade. Silk and cotton spinning is also carried on. Huddersfield is justly proud of its cleanliness as a manufacturing town, but a great improvement would be accomplished if manufacturers would employ better means for the consumption of smoke.

In 1837 Huddersfield was constituted a parliamentary borough, and the charter of incorporation was granted in July 1868.

The municipal and parliamentary boundaries of the borough are not co-extensive. The limits of the borough comprises the townships of Huddersfield (Central Huddersfield, Marsh, Fartown, Deighton, and Bradley), Dalton, Almondbury, Lockwood, and Lindley-cum-Quarmby. The incorporated area contains 10,518 acres, and the density of population, according to the Registrar-General's estimate, is nine persons per acre; in other words, if the population was evenly distributed over the whole borough, there would be nine persons living upon each acre of ground. This statement is, however, misleading, for whilst some parts of the borough are more sparsely or scarcely at all built upon, others like the central are almost entirely covered with buildings. In the month of November, 1890, the district of Longwood, containing an area of 1,270 acres, and a population of 5,406, with a rateable value of 17,486*l.*, was annexed, but this district has not been taken into consideration in the statistics of 1890.

The subjoined table shows the population and rateable value of the municipal borough for the two decennial periods, and at the present time, viz.:—

Year.	Population.	Rateable Value.
		£
1871 - - - - -	72,253	227,961
1881 - - - - -	81,841	285,847
1890 - - - - -	94,253	362,504

The Public Health Act, 1875, is applicable to the borough, and the Corporation, by the council, is the urban sanitary authority of the district of the borough under that Act.

The following local Acts are now in force within the borough, and show the progress of administration:—Huddersfield Burial Ground Act, 1852; Huddersfield Burial Ground Amendment Act, 1855; Huddersfield Gas Act, 1861; Huddersfield Water Act, 1869; Local Government Supplemental Act, 1869; Huddersfield Waterworks Act, 1871; Huddersfield Improvement Act, 1871; Huddersfield Waterworks and Improvement Act, 1876; Huddersfield Improvement Act, 1880; Huddersfield Corporation Act, 1882.

The following undertakings and works (in addition to the Town Hall), have been acquired or instituted, and are now the property, and under the control of the Corporation:—

1. *Waterworks.*—In 1869 the Corporation acquired the Waterworks Undertaking of the Huddersfield Waterworks Commissioners. The limits of the supply have been extended by the Huddersfield Water Act, 1869, the Huddersfield Waterworks and Improvement Act, 1876, and the Huddersfield Corporation Act, 1880. The waterworks derive their supply from three sources, namely:—

I. The Longwood Reservoirs, capable of storing 70 million gallons of water; II. The Blackmoorfoot and Deerhill Reservoirs, capable of storing 860 million gallons of water; III. Wessenden Reservoirs, capable of storing 189 million gallons of water. The total area of the present limits of supply is 39,758 acres. The capital expenditure to March 31st, 1891, amounted to 913,480*l.* The annual revenue was 48,494*l.* and the annual expenditure 47,682*l.* The water rights of the Wessenden Commissioners have just been purchased at a cost of 50,000*l.* This additional supply of pure water cannot be too highly estimated.

2. *Gasworks.*—The capital expenditure to March 31st, 1891, amounted to 271,126*l.*; the annual revenue to 74,677*l.*, and expenditure to 67,726*l.* The charges for supply to consumers are (*a*) for lighting purposes, 2*s.* 9*d.* per 1,000 cubic feet, and (*b*) for heating, motive power, and cooking purposes, 2*s.* per 1,000 cubic feet, with a discount of 5 per cent. when paid within a specified time.

3. *Markets.*—On the incorporation of the borough in 1868, the powers exercised by the Commissioners in respect of the markets and fairs were transferred to the Corporation. By the Huddersfield Waterworks and Improvement Act, 1876, the purchase of the markets,

fairs, tolls, and market rights, with certain land sufficient to build a covered market and slaughter-house, at a cost of 38,402*l.*, was confirmed, and full powers were vested in the Corporation to erect and maintain markets and fairs, slaughter-houses, and other works in the borough. In pursuance of the powers granted to them by the last-named Act, the Corporation have constructed a large covered market, and have also constructed a cattle market and slaughter-houses. There are only 17 licensed private slaughter-houses in the borough. The total capital expenditure upon markets up to March 31st, 1891, amounted to the sum of 100,653*l.*, and the expenditure upon the public abattoir to 15,248*l.* The income for the year ending February 1891, was 8,031*l.*, and the expenditure for the same period (including sinking fund and interest to provide for repayment of loans), 7,914*l.*

4. *Cemetery.*—By the Huddersfield Burial Ground Act, 1852, powers were given to the Huddersfield Improvement Commissioners to provide a burial ground for the township of Huddersfield; and by the Huddersfield Improvement Act, 1871, the burial ground provided under the Act of 1852 was transferred to and vested in the Corporation. The cemetery now covers 15 acres of land. The amount of capital expended amounts to the sum of 18,069*l.* The income for the year ended March 31st, 1891, was 1,805*l.*, and the expenditure 1,383*l.*

5. *Tramways.*—By their Improvement Act of 1880, the Corporation obtained powers to construct tramways within the borough, and by the Huddersfield Corporation Act, 1882, these powers were extended and enlarged. By the same Acts power was vested in the Corporation (subject to licence from the Board of Trade) to work the tramways themselves. The total length of tramways constructed by the Corporation and now open for traffic is 12 miles, and extensions are in active progress. The capital expended upon the undertaking amounts to the sum of 89,729*l.* The income for the year ended March 31st, 1891, amounted to the sum of 17,911*l.*; and the expenditure, including making provision for sinking fund, depreciation, and all contingencies, to the sum of 19,520*l.*

6. *Public Parks.*—The Corporation have established two public parks in the borough, namely, "Greenhead" Park and "Beaumont" Park. Greenhead Park is situate in the central district, and contains an area of about 36 acres. Beaumont Park is situate in the Lockwood district, and is distant about 1½ miles from the centre of the town; the area of this park comprises about 25 acres. The capital expenditure in respect of these parks amounted, up to March 31st, 1891, to the sum of 104,199*l.*

7. *Sanitary Depôt.*—The Corporation possess a depôt at Hillhouse in connection with the scavenging of the streets and the collection and disposal of night soil, house refuse, &c., and for the work of the Sanitary Department. The capital expenditure on this account so far is 10,462*l.*, and is a charge on the borough fund.

8. *Sewage Construction and Works.*—Under the powers of the Public Health Act, 1875, and the Huddersfield Improvement Act, 1871, the Corporation have constructed large main intercepting sewers for the main drainage of the borough. Up to 31st March 1891, the capital expenditure on the same has been 41,417*l.*, and further extensions of the sewers are still proceeding.

Sewage Distribution.—Under powers contained in the last-named Act, the Corporation have purchased about 40 acres of land at Deighton adjoining, the capital expenditure, including purchase of land, amounting to 14,096*l.*; and they have commenced the construction of works thereon for the purification, by precipitation, and disposal of the whole of the sewage of the borough. The contract for these works has been let at the sum of 40,196*l.*

9. *Public Baths.*—In 1888 the central wards of the borough acquired the public baths, situate in Ramsden Street, by purchase from a company. The institution comprises all necessary baths and appliances with caretaker's quarters. In addition to the above, public baths are also provided at Lockwood, and are a charge upon that district. A capital expenditure of 6,278*l.* has been incurred up to 31st March 1891. In connection with these baths there is in each case a small deficiency on the revenue account, which is provided for out of the rate in each district.

10. *Hospital for Infectious Diseases.*—A hospital for infectious diseases has been provided by the Corporation under the authority of the Huddersfield Waterworks and Improvement Act, 1876. The present hospital is situate at Birkby on an area of 1½ acres, and is capable of accommodating 72 patients. The Corporation have purchased an additional site of 12 acres, situate at Mill Hill. The total expenditure upon this account up to 31st March 1891 was 7,220*l.*, and is a borough charge. The Corporation obtained powers in their Improvement Acts for the compulsory notification of infectious diseases, and this has proved a most valuable aid in dealing with the suppression and prevention of epidemics.

11. *Model Lodging-house.*—The Model lodging-house for labouring classes was provided by the Huddersfield Improvement Commissioners prior to the incorporation of the borough, under the Labouring Classes Lodging House Act, 1851, and has departments for males, females, and married couples, and a mechanics' home. This establishment has proved itself to be a most useful institution, contributing in no small degree towards the prevention of overcrowding in the common lodging-houses within the borough. The building was extended in the year 1878. The total capital expenditure to the present time is 6,492*l.* The income from this institution, after providing for interest and sinking funds, exceeds the expenditure, and this excess is placed to the credit of the borough fund. The expenditure for the year ended 31st March amounted to 1,072*l.*; but 214*l.* was included for re-drainage and the replacing of the abominable long Hopper closet by the modern water-closets. The income was 979*l.*

12.—*Artizans' Dwellings.*—In the year 1882–3 the Corporation erected 160 dwellings for the labouring classes, under the powers of the Huddersfield Waterworks and Improvement Act, 1876, and the capital expenditure so far amounts to 28,945*l.* These have proved to be of

very great benefit to the working classes in the borough. Since their erection they have been constantly occupied, and this fact leads the council to believe that the dwellings are of a kind which was very much required within the borough. The income for the year 1890 was 1,905*l.* 11*s.* 7*d.*, while the expenditure was only 673*l.* 13*s.* 5*d.* This is an encouragement to extend such dwellings, which are urgently required, because there still exists a fairly large number of cellar dwellings now occupied, although unfit for habitation, and to close them would simply mean overcrowding elsewhere.

If we take the gross annual death-rate as an index of sanitary administration, there has been much improvement. The following was the average death-rate for three periods of five years each:—1876 to 1880, 22·51 per thousand; 1881 to 1885, 20·71 per thousand; and 1886 to 1890, 19·72 per thousand inhabitants. For the three years before and after incorporation in 1868, the death-rate averaged 23 per 1,000 of the population. The population taken at the last census was 94,253, or nearly 5,000 below the population estimated by the Registrar-General.

The Borough of Lancaster.

Delegates to the Congress.

Alderman William Towers, Chairman Sanitary Committee.
Councillor William Gilchrist, Chairman Insanitary Dwellings Committee.
William Oliver Roper, Deputy Town Clerk.

The borough of Lancaster stands on the River Lune, about 5 miles from the junction of that stream with the waters of Morecambe Bay. Roman remains are found in profusion in many parts of the town, but owing to incursions of the Scots, the Wars of the Roses, and the Civil War, little beyond the Castle and Church remain to show the antiquity of the buildings within the boundaries of the borough.

So far back as the thirteenth century the Corporation of Lancaster obtained certain tolls to enable them to pave the town through which ran the great western road to the north. In 1824 a body of Police Commissioners were formed to superintend the watching of the town. It was not, however, until the application of the Public Health Act to the borough that any attempt was made to grapple with its sanitary requirements. In 1852 statutory powers were obtained, and shortly afterwards an extensive scheme of drainage was carried out at a cost of over 10,000*l.* This scheme has been extended from time to time, but the cost of all such extensions has, to a great extent, been defrayed from the rates of the year.

About the year 1852 was initiated the system of water supply which has been of so great advantage to Lancaster and its neighbourhood. The supply is obtained from the Wyresdale Fells, where the springs are tapped before the water rises to the surface, and the water conveyed by pot pipes along the Fells, and by iron pipes along the high roads to the town. The amount of water to be taken was limited by the Act of 1852 to 300,000 gallons, and a compensation reservoir was constructed for the benefit of millowners on the River Wyre to contain 28,500,000 gallons. In 1864 authority was obtained for an additional 400,000 gallons per day; the pipes were extended along the Fells, and the compensation reservoir enlarged so as to contain 76,500,000 gallons.

In 1876 further powers were obtained extending the daily supply to 2,000,000 gallons. A new line of pipes was laid on the Fells and continued to a point on the Tarnbrook Wyre 1,433 feet above the sea level. The compensation reservoir was also enlarged so as to contain 185,000,000 gallons, covering about 60 acres of ground. Under the same Act a storage reservoir was constructed which will hold 30,000,000 gallons, and will be available in dry weather to supplement the supply from the springs. This system of water supply cost about 125,000*l.*, of which nearly one third has been redeemed by the operation

of the sinking funds. The water is unusually soft, having less than one degree of hardness, and supplies a district of some 50,000 inhabitants. In 1863 swimming and other baths were presented to the town. These have been since carried on by the Corporation, and are about to be considerably enlarged.

In 1887 the moor above the town was laid out as a public park by the munificence of a Lancaster manufacturer, by whom and by whose son it was liberally endowed. The views from several points in the park include the majority of the mountains in the Lake District, the whole of Morecambe Bay, the flat country of the Fylde, Ingleborough, and the Yorkshire Fells, and in the west the mountains of the Isle of Man.

Large covered markets were constructed between 1876 and 1880 at a cost of 12,000*l.*, and a cattle market at a cost of over 2,000*l.* In their local Act of 1880 the Corporation obtained powers to construct slaughter-houses and to close private slaughter-houses. Accordingly, after the erection of public slaughter-houses at a cost of over 3,000*l.*, the Corporation compulsorily closed all private slaughter-houses in their district.

The Corporation have also erected an infectious diseases hospital suitable for accommodating 20 patients, and have carried out considerable street improvements in the town.

In 1880 the Corporation purchased the gasworks, then in the hands of a private company, at a cost of 87,000*l.* During the last 10 years the price of gas has been reduced to 2*s.* 3*d.* per 1,000 cubic feet, the capital debt has been reduced by over 5,000*l.*, a reserve fund of 6,800*l.* has been created, and large alterations and improvements in the works have been carried out from revenue.

In 1880 also the Corporation obtained compulsory powers for the notification of infectious disease. The experience of 10 years has shown the great value of these powers now so extensively applied in various parts of the country.

In 1889–90 tramways were constructed by a Company to connect various parts of Lancaster with the seaside resort of Morecambe, some four miles distant.

Besides the sanitary and other improvements carried out by the Corporation, extensive provision has been made from other sources for the poor and the afflicted in mind and in body. The County Lunatic Asylum with its 2,000 patients is situate within the borough. The Ripley Hospital was erected 27 years ago for the benefit of orphan children; and just beyond the boundary of the borough is the Royal Albert Asylum for the idiots and imbeciles of the seven northern counties. A site has been procured for a large infirmary for Lancaster and the district, and the charitable institutions of the town are both large and varied.

The Royal Grammar School, of which the Corporation are the governors, dates back to the fifteenth century; and the erection of large buildings, gymnasium, laboratory, and sanatorium, together with the

donations of valuable scholarships, enable it to hold its own with the great schools of the north.

A large institute has recently been erected by a Lancaster manufacturer, in which are included an art gallery, schools of science and art, a library and museum, reading room, class-rooms, and lecture theatre.

The area of the borough is 1,680 acres, its rateable value 120,000*l.*, and its population, which in 1801 was 9,030, is now 31,034.

The Borough of Leeds.

Delegates to the Congress.

Alderman JOHN WARD.
Alderman F. R. SPARK.
Councillor JOHN ATHA.
Councillor JAMES SCARBOROUGH LOE, M.R.C.S. Eng.
Councillor HANNAM.
Councillor VICKERS.
DAVIDSON HAINSWORTH, Inspector of Buildings.
J. SPOTTISWOODE CAMERON, M.D., B.Sc., Medical Officer of Health.

Leeds is a manufacturing town, and a municipal, parliamentary, and county borough in the West Riding of Yorkshire. Its population is 367,506; and its rateable value 1,279,213*l*. The parliamentary and municipal boundaries are identical. For the former purpose the town is divided into five electorial districts each returning a member to Parliament. For the latter into sixteen wards each returning three councillors. An alderman is appointed by the Council for each ward, and the Council elect one of their number as mayor every year.

Geology, &c.—Leeds is situated geologically entirely upon the carboniferous series, the strata being those of the lower coal measures and upper millstone grit. Numerous faults exist in the district, some of the principal having an east-west direction. Coal is worked at several places within the borough, and also fire-clay, especially that forming the seat of the "better bed" coal. A north-south line through the borough would divide the thin seam coals on the west from the thick seam coals on the east. The magnesian limestone is found about four miles north-east of Leeds, and the Yoredale shales on the north-west commence near Skipton, some 20 miles distant, followed by the mountain limestone at the Craven Fault, most conveniently reached from Leeds at Settle, 15 miles further on the Midland line to Scotland.

The town stands principally on the sandstones and shales, chiefly the latter, of the Elland sandstone of the lower coal measures, through which the River Aire and one or two tributaries have made deep cuttings. No part of the town is of any great altitude, but the declivities towards the river on both sides are at places pretty steep.

Manufactures, &c.—For nearly a thousand years Leeds has had some amount of importance in connexion with the woollen trade; but this importance has been much increased during the present century and since the introduction of steam. Weaving was carried on at first in private houses, but now is almost entirely done by steam power. Of recent years Leeds has not contented itself with sending out cloth in pieces but a large trade has sprung up in the manufacture of ready-made clothing. In addition to its textile manufactures and the collateral industries such as scouring, sorting, combing, spinning, dyeing, and

finishing, &c., Leeds is noted as a centre for the leather industry, including tanning, currying, leather-dressing, as well as the manufacture of the leather into boots and shoes. Situated on the coal fields, Leeds early acquired an importance in the manufacture of iron which it has retained even since the more convenient haematite and sesquioxide ores have been imported. Yorkshire iron is specially valued for its strength and reliability, on which account it is used for the construction of various parts of locomotive and marine engines. Water gas has recently been introduced by one Leeds firm for welding. Tools of various kinds, hydraulic and general machinery, war material, lithographic and printing machines, locomotives and agricultural machinery, nails, flax machinery, &c. are all made in Leeds. The fireclay industry is also an important one. Refractory fire-bricks, used in iron manufacture, fire-clay gas retorts, and sanitary tubes of all kinds are made in this town. Tubes of all kinds from 2 to 36 inches in diameter are now made by machinery, and a porcelain enamel glaze as smooth as earthenware can be given to them. Glazed bricks, terra-cotta articles, and decorative pottery are also largely manufactured. Soap, various chemicals, glass bottles, paper, &c. are all largely made in Leeds. About 1,300 looms and 1,700 people are employed in linen manufacture.

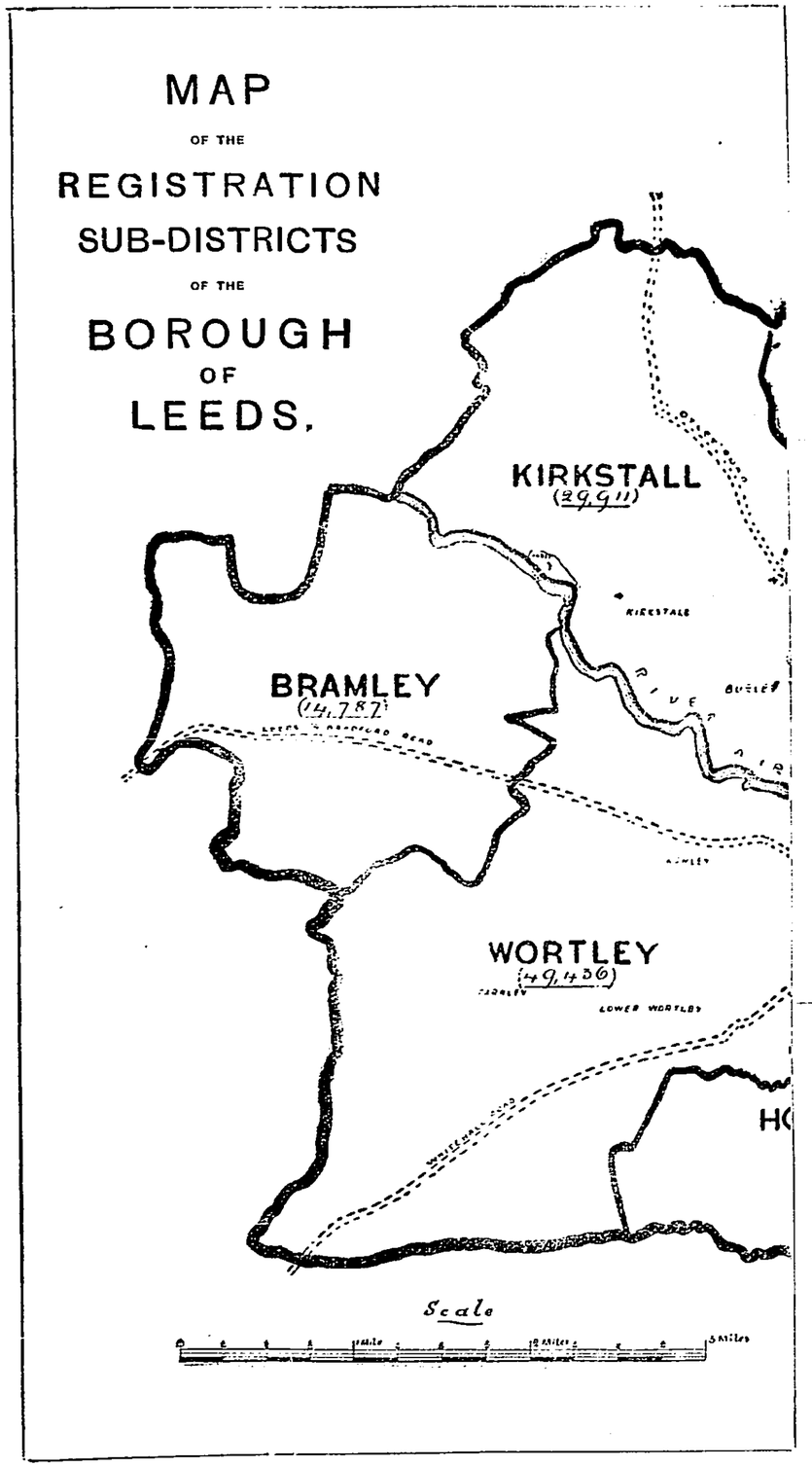
Vital Statistics.—The population of Leeds has increased rapidly during the last 90 years as is shown by the following table:—

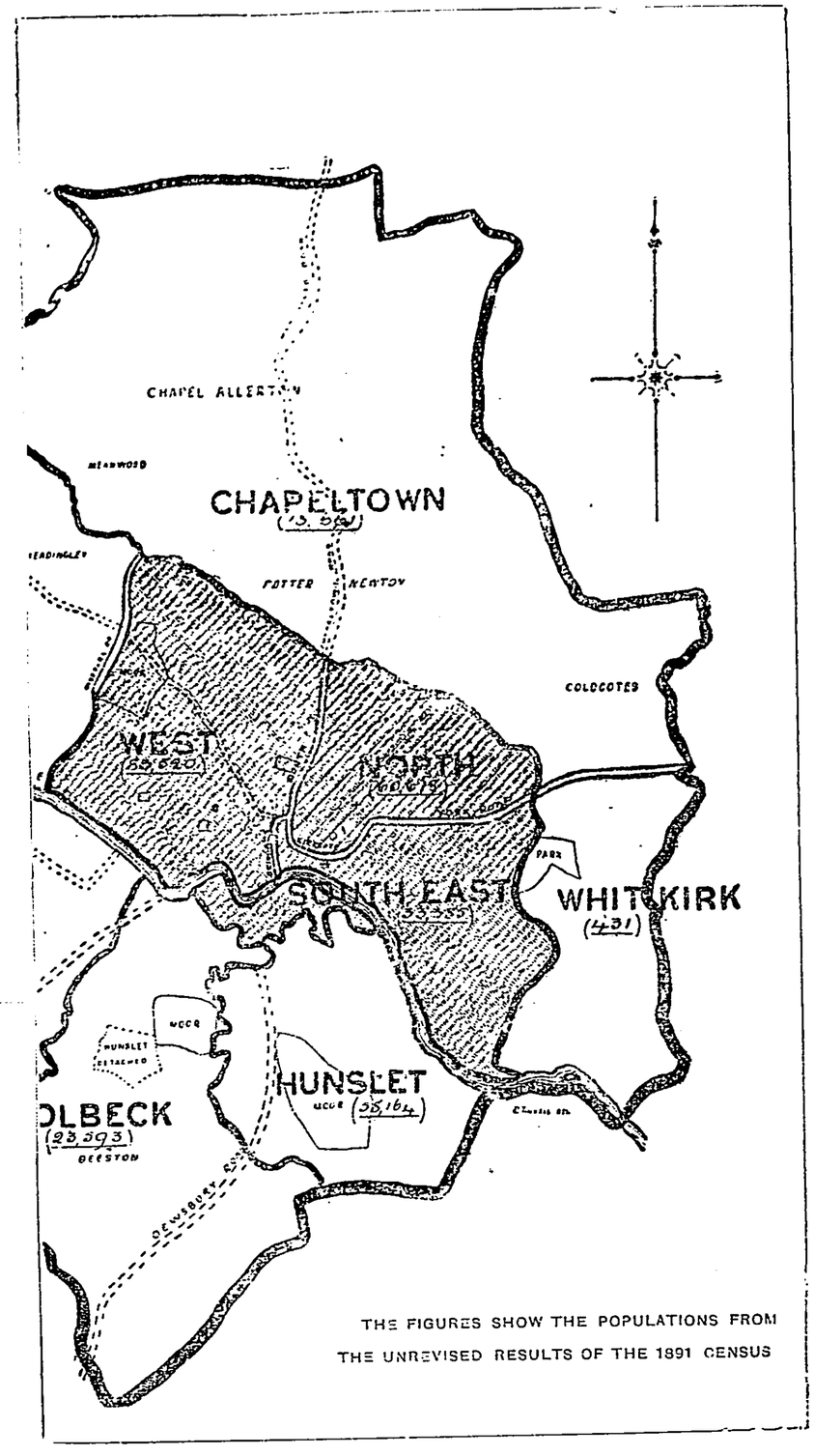
Table showing the enumerated Population at each Census during the Nineteenth Century.

Date of Census.	Population.	Increase per cent. on previous Census
1801 - -	53,162	—
1811 - -	62,534	17·63
1821 - -	83,746	33·92
1831 - -	119,345	42·51
1841 - -	152,054	27·41
1851 - -	172,258	13·29
1861 - -	207,149	20·26
1871 - -	259,212	25·13
1881 - -	309,119	19·25
1891 - -	367,506	18·89

Since the year 1865, when the death-rate was 31 per 1,000, the rate of mortality, notwithstanding the increase of population, has been pretty steadily decreasing, as will be seen from the annexed table:—

Quinquennium.	Death-rate.
1866–70 - -	28·7
1871–75 - -	27·5
1876–80 - -	22·8
1881–85 - -	22·4
1886–90 - -	21·7


MAP
OF THE
REGISTRATION
SUB-DISTRICTS
OF THE
BOROUGH
OF
LEEDS.
KIRKSTALL
(29,911)
KIRKSTALE
BRAMLEY
(14,787)
WORTLEY
(49,436)
LOWER WORTLEY
Scale
1 mile
5 miles


CHAPEL ALLERTON
CHAPELTOWN
(13,050)
POTTER NEWTON
COLDCOTES
WEST
(55,620)
NORTH
(60,613)
SOUTH-EAST
(33,335)
WHITKIRK
(431)
HUNSLET
(58,164)
OLBECK
(23,593)
BEESTON
THE FIGURES SHOW THE POPULATIONS FROM
THE UNREVISED RESULTS OF THE 1891 CENSUS

1 p. 1855.

Sanitary Undertakings of the Corporation.—A constant supply of pure water is collected amongst the hills, 17 miles beyond the town, filtered and supplied to every house in the populous parts of the borough. The catchment area is 20,684 acres (10,327 hectares), and the storage capacity 3,908 million gallons (nearly 18 million cubic metres).

The system of *drainage* has been improved and extended, and various experiments as to the purification of the sewage have been made at the outfall; the A B C process was tried, but eventually abandoned. In the present *sewage works*, which have been in operation for fifteen years, the sewage is treated with milk of lime and run through large settling tanks. An attempt has been made at various places to deal with trade effluents, but at the present time the result in this respect has not been all that could have been desired.

The removal of solid refuse has received a great deal of attention, and two large destructors of twelve and fourteen cells, in Armley Road and Beckett Street, have been for several years in operation. A third of ten cells, recently erected, is now working successfully. Negotiations are at present going on for the erection of a fourth. Ashpit and market refuse, and in some cases the contents of privy middens, are subjected at these places to a destructive heat and reduced to a harmless ash, a part of which is utilised in the manufacture of building mortar.

The Corporation also possess a *fever hospital*. Originally a charitable institution, it was purchased by the Corporation in 1885 and considerably altered. It consists essentially of two wings, entirely separate from one another, each containing two storeys. Each storey of each wing has two wards with 736 and 644 square feet (68·4 and 59·8 square metres) of floor space, and five smaller wards. The nurses' apartments are contained in the centre of the building, between the two wings, but have no internal connection with either. The administration is in a separate building behind, and contains in addition to the resident medical officer's and matron's apartments and those for the domestic staff, the kitchens and a laundry supplied with steam. The boiler also supplies a Washington Lyon's disinfecting apparatus. There is also a wooden hospital consisting of seven separate detached buildings for the reception of cases of small-pox and the necessary administration. The Corporation admit patients without any charge to both hospitals.

Close to the Beckett Street destructor is a modern *disinfecting station*. The infected articles of clothing, &c. are received in an apartment distinct from the rest of the station, and are passed through one of the Goddard and Massey's steam disinfectors, specially designed for the Corporation. In this chamber they are subjected, first, to a current of warm air; afterwards, to steam under pressure; and are then dried by a further current of warm air in the chamber. Two hot-air drying chambers are also provided, to either of which the cradle containing the articles undergoing disinfection can be conveyed on a bogie carriage, to save time in drying in the apparatus itself in case of an epidemic. The steam chamber can be heated either by steam generated in the destructor, or, if the latter is not working, by a fire underneath

the apparatus. In this respect it differs from any previously constructed. There are also two bath-rooms attached to the station for the use of persons coming from infected houses.

The Corporation employ a staff of *seven disinfecters*, who stove infected houses, and remove bedding, clothing, and draperies to the station to be disinfected by steam without charge to the owners.

Other objects of interest from a sanitary point of view are the underground latrine in Briggate, and the abattoirs of the Corporation and of the co-operative society, near the cattle market, Whitehall Road, with which may be contrasted the older slaughter-houses in the yards between Briggate and Vicar Lane. Amongst insanitary conditions, attention may be drawn to the River Aire, the foul condition of which is part of the price at present paid by Leeds for the commercial prosperity of the district. The principal parks are Roundhay Park, just outside the town; the East End Park, near York Road; Hunslet and Holbeck Moors; Wortley Recreation Ground, off Whitehall Road; Recreation Ground, Town Street, Bramley; the grounds of Kirkstall Abbey; Woodhouse Moor, West Registration District; and Woodhouse Ridge, north of the Moor; besides a few smaller open spaces in the heart of the town.

Sanitary Staff.—The Sanitary Department is under the direction of the medical officer of health, who has the assistance of one chief sanitary inspector, two divisional inspectors (who assist the chief inspector in the east and west divisions of the borough respectively), and sixteen district inspectors, each of whom has charge of a municipal ward. There are special inspectors for food, drugs, and dairies (one), meat and slaughter-houses (two), smoke (one), canal boats and lodging houses (one), workshops (one). There is also a removal officer and his assistant and seven disinfecters. Street scavenging and refuse removal form two sub-departments, each having its own superintendent. The trough-closet cleansers work under the direction of the superintendent of the latter, and the three gangs of house-drain flushers under that of the former. The whole department is under the control of the sanitary committee of the Town Council.

Educational Buildings.—The Yorkshire College, attached to the Victoria University, has, in addition to the usual classes in arts and sciences, a medical school in connexion with the Infirmary, and a textile department in which the principles of dyeing, weaving, and engineering are practically taught.

The Grammar School, founded in 1552, is situated on Woodhouse Moor. The present building, erected in 1858, is in the decorated Gothic style. The Mechanics' Institute, to which is attached a modern day-school and a science school for youths, is situated in Cookridge Street. The science laboratories are well fitted up with every requisite for practical teaching.

The Higher Grade School is under the management of the School Board, and is attended by children of both sexes to the number of about 1,500. It has well equipped laboratories and school appliances. There are, in addition, schools in various parts of the borough under

the school board; and schools, also under Government inspection, partially supported by voluntary contributions, besides private schools.

Other Buildings.—The Town Hall, opened by the Queen in 1858, contains a large room—the Victoria Hall—capable of accommodating 2,000 people. The municipal council meet once a month in the council chamber. The mayor's rooms and town clerk's offices are also contained in this building, the rest of which is devoted to law courts, the law library, and the police offices. The latter are in the basement.

The Municipal Offices, opened in 1884, contain, in addition to rooms for committees of the council, the departments of the borough engineer, borough accountant, and medical officer of health, and the officers acting under them. In the same building is the Public Library with its issue and reference department respectively on the first and second storeys; and, entered by a statue gallery on the ground floor, is the Municipal Art Gallery containing a small but valuable collection of paintings. A public news room is in the same building, but reached by a different doorway.

The Parish Church is a fine modern building after the perpendicular Gothic style. The ruins of an old Cistercian abbey at Kirkstall, lately presented to the town, are about two miles from the railway station, and can be reached by tramcar. The village church of Adel, beyond Headingley, an erection of the Norman period, has a fine doorway. Headingley church is a recent building after the early English style, and Mill Hill chapel (Unitarian) after the perpendicular.

The Philosophical Society possesses a museum in Park Row specially valuable for its geological and natural history collections.

The Exchange at the foot of Park Row, below Mill Hill chapel, and the Corn Exchange in Duncan Street, are worthy of observation. The principal street in the town is Briggate, a broad thoroughfare about one-third of a mile long.

The City of Liverpool.

By J. Stopford Taylor, M.D., Med. Off. Health, and H. Percy Bulnois, M. Inst. C.E., City Engineer.

Delegates to the Congress.

James Barkeley Smith, Esq., J.P., Chairman of the Health Committee.

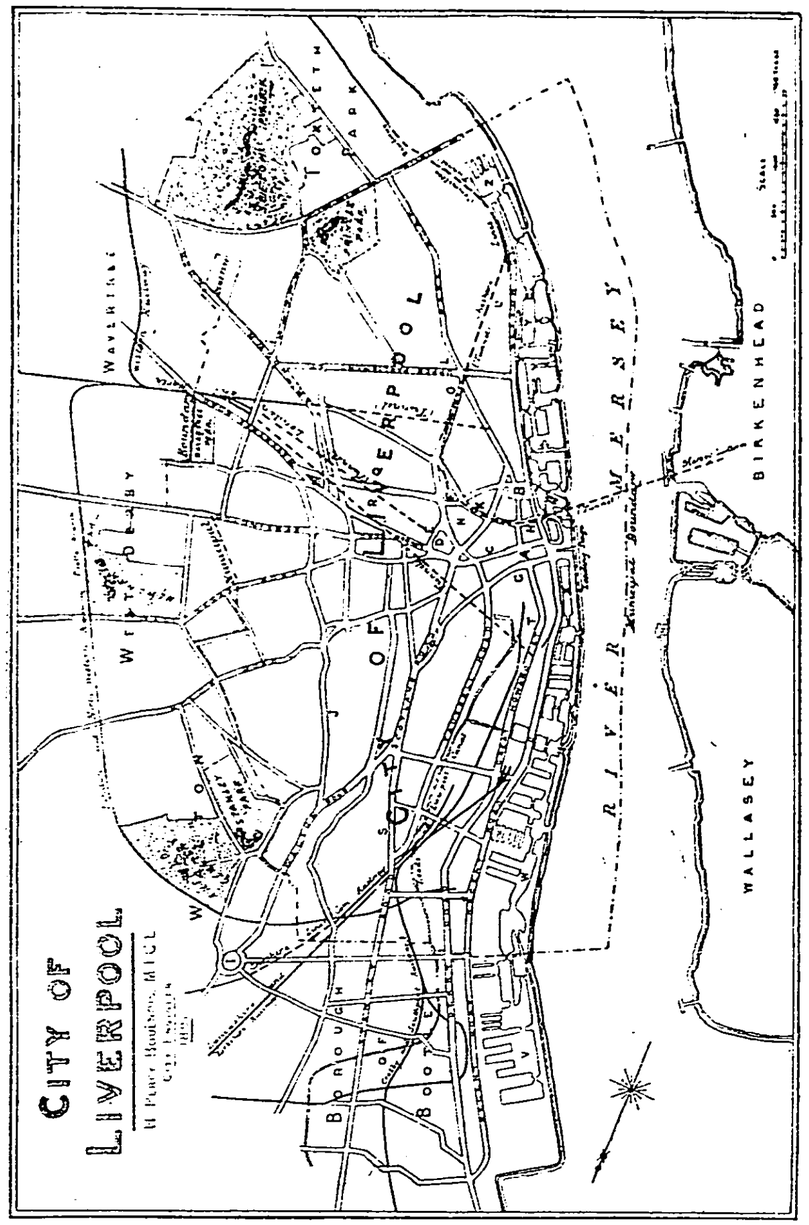
Edward Hatton Cookson, Esq., J.P., Deputy-Chairman of the Health Committee.

The city of Liverpool is situated in lat. 53° 24′ 39″ N., long. 2° 59′ 30″ W. from Greenwich, and occupies the slopes of a series of small hills on the eastern side of the River Mersey. It was created an episcopal city in the year 1880, and is a parliamentary and county borough in the hundred of West Derby and south-west division of the county of Lancaster.

Liverpool was formerly represented in Parliament by three members, each voter having two votes, but under the Redistribution of Seats Act, 1885, the parliamentary boundaries of the borough were extended and the enlarged borough divided into nine sections, each section having accorded to it one member.

The name "Liverpool" has been supposed by some to have owed its origin to the existence some time in the ages past of a pool formed by the overflow of the Mersey which was frequented by a peculiar description of water fowl known as the "Lever" or "Lyver." At the mouth of this pool the first Liverpool Dock was constructed in the year 1715 and was known as the "Old Dock." It contained an approximate area of 3½ acres with a lineal quay space of 600 yards. It was filled up in the year 1826, and the present General Post Office and Custom House were erected on its site. In order to show the immense growth of the docks and shipping trade of Liverpool the following statistics will be of interest:—In the year 1864 the area of the docks and basins was 255 acres, with a quay space of 18 lineal miles; and at the present time the total approximate water area of the docks is 381 acres with a lineal quay space of 25½ miles. This does not include the Birkenhead Docks which have an approximate water are of 164½ acres, with a lineal quay space of 9½ miles. At the beginning of the present century the tonnage of the port was 450,000; and the dock dues, &c., 23,380*l.*; these had increased in 1835 to 1,770,000 tons, and nearly 200,000*l.* respectively. The tonnage at the present time amounts to nearly 10,000,000 tons, and the dues, rates, &c., to 1,110,000*l.*

King John was the first monarch who granted a Charter to Liverpool, viz., in the year 1209; and the silver seal with a bird upon it, somewhat similar to that which is now the crest of the city arms, is still in the custody of the Corporation. In the year 1173 another Charter was granted constituting the town a port, and in the year 1227



INDEX TO MAP.

A. Town Hall.
B. Custom House.
C. Municipal Buildings.
D. Saint George's Hall.
E. Lime Street Station, London and North-Western Railway.
F. Central Station, Cheshire Lines Committee Railways.
G. Exchange Station, Lancashire and Yorkshire Railway.
H. James Street Station, Mersey Railway.
I. Walton Church.
J. Everton Church.
K. Saint Peter's Pro-Cathedral.
L. Saint James's Church.
M. Saint Mary's Church, Edge Hill.
N. Saint John's Market.
O. St. James' Market.
P. Saint Martin's Market.
Q. Workhouse.
R. Royal Infirmary.
S. Stanley Hospital.
T. Northern Hospital.
U. Southern Hospital.
V. Alexandra Dock.
W. Huskisson Dock.
X. Prince's Dock.
Y. Brunswick Dock.
Z. Herculaneum Dock.

it was made a free borough by King Henry III. These Charters were confirmed and others added by subsequent monarchs, among the more important being one granted by King William III., by which the rights of the burgesses were confirmed and the Corporation received powers to make and annul such laws as might be thought conducive to the welfare of the town.

Although in the reign of Edward III. Liverpool could only supply one vessel and six sailors for an expedition to France, and so late as the year 1630 was only rated at 25*l.* ship money, it has now become, from its position on the River Mersey, one of the most important maritime emporiums of the world, and it is one of the greatest, if not the greatest, of the highways for all nations. Travellers of all nationalities and descriptions pass through the city, and an immense and constant stream of emigration flows in and out of the port. Prior to the year 1858 the docks and quays were under the jurisdiction of the Corporation of Liverpool, when their powers were transferred to the then newly constituted and independent body, the Mersey Docks and Harbour Board.

Previous to the year 1832 the parliamentary and municipal boundaries of the town were co-terminous, and comprised what now forms only a district of the city, viz., the parish of Liverpool. It contained an area of 1,860 acres, and a population of 165,000 persons, equal to about 88 persons per acre. Following the passing of the Reform Act of 1832 the Boundaries Act came into operation, and by this Act the parliamentary limits of the town were extended so as to include the whole of the townships of Everton and Kirkdale, and parts of the townships of West Derby and Toxteth Park. By the Municipal Reform Act of 1835 the municipal boundaries of the town were extended so as to be coincident with the parliamentary boundaries, and by this extension an area of 3,350 acres was added, making the total acreage of the borough 5,210 acres. The population of the enlarged borough was 205,000, or equal to about 40 persons per acre. With the exception of an extension of the western boundary of the city in the year 1890 from the river frontage of the docks to the centre line of the river, no extension of the municipal boundary has taken place since the Reform Act of 1835; and the population of the town since the passing of that Act, as will be seen by the following table, has been nearly trebled, with a result that at the present day Liverpool is the most densely populated city in the kingdom.

Year.	Population.	Density of Population per Acre.
1835 - -	205,000	40
1841 - -	286,487	54
1851 - -	376,065	72
1861 - -	437,740	84
1871 - -	493,346	94
1881 - -	552,425	106

From the census returns for 1891 the population of the city would appear to have decreased during the past decade from 552,425 persons to 517,951 persons, equal to a density of 99 persons per acre. It may, however, be pointed out that the population of the area between the municipal boundary and the parliamentary boundary of the borough is 70,000, and in the districts outside and immediately adjoining this area there is a further population of 50,000 persons, and if to these were added the population of the adjoining borough of Bootle, the result would be a total population of 687,000 persons. All these outside districts are the outgrowth of, and dependent upon, the port and trade of Liverpool.

Within the municipal limits of Liverpool there are now practically no available spaces on which new buildings can be erected, the land having been wholly built upon, and consequently for some years past there has been a natural and ever increasing overflow population passing out of the city into these districts just outside and adjoining the municipal boundary, with a result that the city is now closely surrounded by populous districts, which owe their origin solely to the outgrowth and expansion of the city itself. This fact was recognised by Parliament in 1885 when under the Redistribution of Seats Act provision was made for the extension of the parliamentary boundaries so as to include in the parliamentary borough the populous areas thus formed. Several proposals have been put forward from time to time for the extension of the municipal boundaries of the city, but without success. In the year 1867 the Commissioners appointed under the Representation of the Peoples Act, 1867, having regard to the extension of buildings and community of interests, recommended that what is now the adjoining borough of Bootle and parts of the districts of Walton, West Derby, Wavertree, and Toxteth Park, should be included in Liverpool, but owing to opposition these recommendations were not carried out. In the year 1880 the House of Commons rejected a Bill deposited by the Corporation for the extension of the boundaries, and in the session of 1890 the Corporation again approached Parliament and promoted a Bill for the extension of the municipal boundaries so as to make them coincident with the parliamentary boundaries (following the precedent set in the year 1835), but the Committee of the House of Commons before whom the Corporation appeared refused to grant the extension, a refusal which, besides being a serious drawback to the efficient sanitation of the city, leaves under the control of several local sanitary authorities (with differing powers and regulations) populous areas now forming parts of the northern, southern, and eastern divisions of the parliamentary borough of Liverpool.

The sanitary history of Liverpool has been that of rapid progress and development during a comparatively recent period. In the year 1840, in a report of the late Dr. Duncan on the sanitary condition of Liverpool, it is stated that in connexion with the great majority of the dwellings of the working classes in front streets there was no provision made for getting rid of their filth, except by carrying it into some of the adjoining courts and depositing it in the ashpits there; and with regard

to the courts themselves, that in general at the further end of the court two privies were provided with an ashpit between them, which, becoming speedily filled, and it being no one's business to see it emptied, would not infrequently continue full to overflowing for weeks together; in the meantime the ashes, &c. were deposited in the corners and other spaces in the courts, with the result that the atmosphere became impregnated with all sorts of nauseous effluvia. It is also stated that at that time many of the main streets were unsewered, as well as the great majority of the minor streets; and that even where sewers did exist in the latter streets they were imperfect and that, except where a natural inclination in the street existed, the surface water and fluid refuse of all descriptions stagnated on the street surfaces. The courts had no underground drains, but in some courts a narrow, open, shallow gutter existed, which was generally choked up with stagnant filth.

The scavenging and cleansing were most imperfect, the bye streets were not visited more than once a week, and no cognizance whatever was taken of the courts; and sometimes when the water pipes got out of order a court would be without water supply for weeks together.

In this report a case is cited of a whole court being inundated with fluid which had oozed through the walls from two adjoining ashpits or cesspools, and which could not escape owing to the court being below the street level and having no drain, and in this condition it remained for two or three years. In the case of another court, owing to defective privies a stratum of semi-fluid abomination covered the whole surface of the court.

Two cases also are cited in connexion with the occupation of cellars, one in which the filthy water from an adjoining court privy had oozed through the walls and collected in the cellar to a depth of two feet, while in the case of another cellar a well four feet deep into which this kind of fluid had been allowed to drain, was discovered below the bed where the family slept.

Such were some of the insanitary conditions under which people existed in the year 1840, and at that time there were no parliamentary powers to enforce the observance of sanitary regulations.

When, however, attention was drawn to these defects the Corporation did not allow a long period to elapse before taking action to remedy some of these matters, and in the year 1842 they obtained an Act entitled "An Act to provide for the health of the inhabitants of the "borough of Liverpool and for the better regulation of buildings "within the said borough," which Act empowered the Council to appoint a health committee to see that the provisions of that Act were complied with. This is believed to have been the first Act ever obtained which conferred powers to enforce sanitary regulations. It contained important provisions as to the size of rooms in houses, the width, flagging, and draining of courts, the description of cellars to be used for habitation, removal of nuisances, appointment of building surveyors, regulation of buildings, &c. In the year that this Act was passed, a Royal Commission "was appointed to inquire into and report upon the state of large towns "and populous districts with reference to the causes of disease among the

" inhabitants, and the best means of promoting and securing public health " under existing laws, the usage prevailing with regard to drainage of " lands, the erection, drainage, and ventilation of buildings, the supply of " water, whether for the purposes of health or protection from fire, and " the amendment of existing laws in these respects."

The Commissioners presented their first report in June 1844, and their second report in June 1845, and, among others, one of the principal recommendations they made was, "that the several duties of " paving, sewering, supplying of water, &c., should be combined under " one management, subject to the supervision of officers appointed " by the Crown." In the year 1845 a Bill was introduced into Parliament by a member of the Commission, (Lord Lincoln, Chief Commissioner of Woods) to carry into effect the recommendation of the Commission.

At that period there were several governing bodies controlling the sanitary operations of the city of Liverpool, viz.:—(1.) The Town Council, who exercised certain limited powers over the whole borough. (2.) The Commissioners for the parish of Liverpool, who had the control of the paving, sewering, and watering of the streets in that district of the city known as the parish of Liverpool. (3.) The Commissioners for the township of Toxteth Park who possessed similar powers over their district.

The townships of Everton and Kirkdale and West Derby were regulated by a General Highway Act, but these townships were without any statutory provisions as regards sewerage. The water supply of the town was in the hands of two private companies.

In the year 1846 the Corporation obtained an Act of Parliament, known as the Liverpool Sanitary Act, 1846, by which the Town Council became the sole governing sanitary authority over the whole borough. By this Act the Corporation had conferred upon them full powers for the paving, sewering, and drainage of the town, together with many other important powers for its sanitary improvement. This Act also empowered the Council to appoint " subject to approval by one of Her " Majesty's Principal Secretaries of State, a person duly qualified as a " civil engineer to act as a local surveyor," and by the Liverpool Sanitary Amendment Act, 1854, it is is also enacted that he shall be called and known as "the borough engineer." Liverpool is the only town where the appointment of the borough engineer must receive the approval of one of Her Majesty's Principal Secretaries of State, and where the title "borough engineer" is conferred upon him by parliamentary enactment.

The Liverpool Sanitary Act, 1846, also provides for the appointment of "a legally qualified medical practitioner of skill and experience" as medical officer of health, his appointment being subject to approval by one of Her Majesty's Principal Secretaries of State. This is believed to have been the first mention of such an officer in any sanitary or other Act of Parliament. For many years Liverpool was the pioneer in sanitary legislation, and the Liverpool Sanitary Act, 1846, was practically the precursor of the Towns Improvement Clauses Act, 1847. This

was followed by the Liverpool Sanitary Amendment Acts of 1854 and 1864, the Liverpool Improvement Act, 1867, and the Liverpool Improvement and Waterworks Act, 1871, which in their turn practically formed the basis of the Public Health Act of England, passed in the year 1875.

In the year 1847, during one of the Irish famines and the consequent influx into Liverpool of an immense number of Irish people, the death rate rose to 63·5 per 1,000, due principally to fever. Owing, however, to the energetic way in which the Corporation after this warning set to work, and have since continuously carried out every sanitary measure calculated to promote the health of the inhabitants of the city, the death rate of 63·5 has been gradually reduced as follows:—from 63·5 in 1847, to 32·5 in 1861–70, 28·4 in 1871–80, and 25·1* in 1881–90.

In the year 1848 the then borough engineer (the late Mr. James Newlands, M. Inst. C.E.) prepared a comprehensive report on the sanitary requirements of the borough, embracing a complete scheme of sewerage and drainage, besides other sanitary and improvement works and sanitary regulations so as to raise the borough to a proper sanitary standard. This report was approved by the Town Council on the 4th July in that year, and generally speaking the whole of the recommendations contained in that report were subsequently carried out and acted upon.

Among other important sanitary improvements the substitution of waterclosets for privies has for many years past been systematically and continuously carried out, until at the present time few, if any, privies exist in the city. By the Liverpool Building Act, 1842, owners were required to provide sufficient privy and ashpit accommodation to their property; but previous to the passing of that Act, the mode of construction, &c. of such privies appears to have been left entirely to the discretion of each individual owner of property, and up to the year 1846, connexions between the privies and public sewers were prohibited. Under the provisions of the Liverpool Sanitary Act of that year the sewers, which had hitherto vested in the Highway Board, were vested in the Corporation, and owners of property were encouraged and even compelled to connect such privies with the public sewers.

From a report of the health committee, made in the year 1849, it appears that the conversion of privies into waterclosets was then anticipated; but, probably owing to difficulties in connexion with the water supply, little or no action was taken by the Corporation until the year 1860, when they began to withhold their approval of plans which did not provide for ample watercloset accommodation. In the year 1863 the medical officer of health certified periodically such privies and cesspools as required converting into waterclosets, the property owners paying the cost of conversion, and the Corporation providing the requisite drainage. This practice was continued, and up to the year 1876, 16,176 privies had been so converted. The present medical officer of health (J. Stopford Taylor, M.D.) was appointed in 1876, and from

* Based on the census return for 1891.

that year to the year 1885 no less than 18,000 privies were converted into watercloseets, until, as has already been stated, very few, if any, privies now exist in the city.

The whole of the sewage of Liverpool is discharged into the tidal River Mersey, by ten outfall sewers of large capacity, having a drainage area of 6,359 acres. At the present time there exist in the city 555 miles of sewers, consisting of 258 miles of brick and pipe sewers; 267 miles of passage sewers; and 30 miles of main outfalls, ranging from 5 feet × 3 feet to 9 feet in diameter. All the old sewers are being systematically repaired, and up to last year 107 miles of such sewers had been dealt with. Generally speaking all the main sewers are constructed so as to be self-cleansing; but the few that are not self-cleansing are flushed periodically by large movable tanks placed over a manhole on the sewer. Each tank contains 1,800 gallons of water, and discharges its contents into the sewer through a valve at the bottom in 28 seconds.

All passage sewers are flushed periodically four times a year, and the whole of the private drains are regularly and periodically flushed twice a year, by and at the cost of the Corporation, involving an expenditure of approximately 3,000*l.* per annum. Hospitals, and other similar public institutions, have their drains flushed, free of charge, at intervals varying from a fortnight to three months.

Prior to the year 1879 sewerage works were executed by contract, but since that year the whole of the works have been executed by the Corporation staff.

The length of roads (exclusive of back passages, which may be taken as about the same length as the roads) is 276 miles, of which length 18 miles are unadopted. Formerly the carriageways were macadamised, or paved with boulders, and later on with large size setts, with wide joints grouted with gravel. In the year 1871 impervious pavements were introduced, consisting of granite or syenite setts of suitable dimensions (regulated by the traffic or other local circumstances), with close joints, grouted with hot asphalte and creosote oil, and laid on a Portland cement concrete foundation, 6 inches deep.

Of the 258 miles of adopted streets, about 101 miles (embracing an area of 1,702,814 square yards) have been constructed with impervious pavements, as follows: Granite or syenite sett pavement, 1,651,000 square yards; natural compressed asphalte, 27,000 square yards; wood, 18,000 square yards; and granolithic, 6,800 square yards. With the exception of such pavements as compressed asphalte and granolithic, all works in connexion with the construction of pavements in public streets are executed by Corporation workmen.

A complete system of tramways has been laid, branching out into every part of the city and the adjoining districts. The length of lines within the city is 47½ miles. The whole of the tramways in the city were constructed by the staff of the Corporation, and are maintained by the Council, the lines being leased to a private company for a term of years at a fixed rental per annum.

Prior to the year 1867 the removal and disposal of nightsoil, mixed with cinder ash and domestic refuse, were executed by contract; but

since that year the Corporation have executed with their own staff the whole of the scavenging, cleansing, and disposal of town refuse. They have erected large stables and workshops in different parts of the city, and keep a large stud of horses in each of these stables. Two wharves have also been constructed on the banks of the Leeds and Liverpool Canal and adjoining the Lancashire and Yorkshire Railway, and in addition five other wharves are rented, where the refuse is collected with a view to its disposal to farmers and others.

Up to the year 1870 little or no difficulty was experienced in the disposal of dry ashpit refuse in many available disused stone quarries and excavated lands; but owing to extension of buildings this mode of disposal became objectionable, and the Corporation acquired a farm (known as the Carr Hall Farm), 17 miles distant from the city, and containing an area of 70 to 80 acres; and, between the years 1871 and 1874, 90,000 tons of refuse from the northern portion of the city were deposited on this farm. Owing to objections having been raised to this mode of disposal of the refuse it was discontinued, and arrangements were then made with farmers and others who had land on the banks of the Leeds and Liverpool Canal, distant within 10 miles from Liverpool, to take refuse unsuitable for manure, the Corporation paying them from 8½*d.* to 10½*d.* per ton and defraying the cost of transport along the canal and discharging. Between the years 1874 and 1885 upwards of 700,000 tons were thus disposed of.

For the disposal of refuse from the southern portion of the city the Corporation rented several acres of marsh land abutting upon the margin of Bromborough Pool in Cheshire, the level of which it was proposed to raise 20 feet, and cover over with soil in sections for purposes of cultivation. Up to January 1878, 100,000 tons of refuse were deposited, when it had to be discontinued in consequence of objections being raised by the rural sanitary authorities. During the following two years refuse from this end of the city was used for filling up low-lying land on the margin of the upper reaches of the Mersey, and the Lancashire Canal, and nearly 17,000 tons of refuse were disposed of in this way. Meanwhile the Corporation had under consideration a number of schemes with a view to the permanent solution of the question, and amongst others were the following:—(*a.*) Destruction by burning. (*b.*) Reclamation of land from the sea, near the mouth of the River Dee. (*c.*) Depositing on the fore-shore near Ainsdale and Formby. (*d.*) Depositing over the entire area of Carr Hall Farm.

There being at the time more or less objections to these respective proposals, it was ultimately decided to convey the refuse to sea by steam hopper barges to a point outside the bar of the River Mersey about 22 miles distant from the Liverpool Landing Stage. Two steam hopper barges have been built, one in 1880 and the other in 1884. The first one, designed to carry 380 cubic yards of refuse, conveys to sea the refuse from the southern portion of the city; and the second barge, constructed to carry 530 cubic yards of refuse, takes to sea refuse from the northern portion of the city.

Since the appointment of the present city engineer (H. Percy Boulnois, M. Inst. C.E., F.S.I.) it has been decided to erect a 12 cell refuse destructor with Jones' cremator and all the most recent improvements, and the work is now drawing to completion. It is expected that this destructor will destroy about 600 tons of refuse per week, leaving a residuum of clinker and ash of 120 tons, which will probably be utilized for road-making purposes.

The Corporation have from time to time promoted important Improvement Acts for the widening, &c. of existing streets and the carrying through of new streets. Since 1858 no less than eleven such Acts or Provisional Orders have been obtained authorising an approximate expenditure of about two and a quarter million pounds sterling. Large amounts have also been expended in providing parks and recreation grounds for public use, as follows:—Shiel Park, containing 15 acres, and costing 9,000*l.*; Newsham Park, 160 acres, cost 93,471*l.*; Stanley Park, 100 acres, cost 164,188*l.*; Sefton Park, 382 acres, cost 410,266; Wavertree Park and Botanic Gardens, containing 34 acres, cost 29,455*l.*; Mount Gardens and Walk, costing 10,920*l.*; Kensington Gardens, costing 34,995*l.*; Kensington Reservoir, costing 556*l.*; Aubrey Street Reservoir, costing 300*l.*; Browside Recreation Ground, costing 440*l.*; Shaw Street Recreation Ground, costing 9,227*l.*; Prince's Boulevard, costing 12,000*l.*; and five churchyards laid out as gardens at a cost of 6,065*l.*; making a total of 781,183*l.*

Under the provisions of the Liverpool Sanitary Amendment Act, 1864, and other local Acts, approximately 3,700 houses have been Presented, or reported to the Council by the medical officer of health with a view to their demolition; and the sites of the houses thus cleared have either been filled up and levelled and left as open spaces, or houses for the labouring class, in full accordance with the existing building regulations, have been erected thereon. The property dealt with has been principally confined to courts, back-to-back houses, or such houses as were without the means of proper ventilation. It is estimated that the expenditure incurred by the Corporation in acquiring insanitary property has been 226,000*l.*

In addition to the foregoing most important improvements carried out under local Acts, the Corporation availed themselves of the powers conferred by the Artizans and Labourers Dwellings Act, 1875, and cleared an "unhealthy area" known as Nash Grove. This area contained 22,487 superficial yards of land, of which 3,717 yards consisted of public streets, and the balance was occupied by low class unhealthy dwellings, buildings, and yards used for trade purposes. The population displaced was 1,310, of which number 1,100 belonged to the poorer classes. The density of the population on this area was 282 persons per acre. On a portion of the site thus cleared the Corporation have erected blocks of artizans' dwellings, known as Victoria Square, occupying an area of 9,195 superficial yards, including an open quadrangle of 5,271 superficial yards, the cost for land and buildings being 68,148*l.*

These dwellings contain 271 tenements and a superintendent's house, including 86 3-roomed tenements at a rental of 5*s.* to 5*s.* 6*d.* per week; 164 2-roomed tenements at a rental of 3*s.* 6*d.* to 4*s.* 3*d.* per week; 21 1-roomed tenements at a rental of 2*s.* per week. On other portions of Nash Grove four blocks of labourers' dwellings have been erected at a cost of 16,000*l.* including land.

The approximate total cost of these artizans' and labourers' dwellings was 142,000*l.*

The city is amply lighted with 545 special lamps having an illuminating power varying from 50 candles to 64 candles, consuming 16 cubic feet of gas per hour; and 10,743 ordinary lamps of 16-candle power, burning 4 cubic feet per hour; the average distance apart of the lamps being 52 yards.

In the year 1873 it was felt that the supply of water to Liverpoool should be extended, with the result that after many schemes had been discussed it was decided to construct an artificial lake in the valley of the Vyrnwy in Wales, and to bring the water from thence by aqueducts to Liverpool. It would occupy too much space to describe in detail the engineering grandeur of this undertaking; the following particulars will, however, be of interest:—

General Dimensions of the Lake.—When the lake is full to the overflow, the surface of the water is 825 feet above the sea (Ordnance datum), and the principal dimensions are:—Superficial area, 1,121 acres; length, 4¾ miles; average width, ½ mile; greatest depth, 84 feet; contents in gallons, 13,125,000,000; in cubic feet, 2,103,000,000; in tons of water, 58,000,000. The length of the road around the margin of the lake is 11¾ miles, exclusive of the road over the dam.

Gathering Ground and Yield.—The area of the gathering ground from which water is collected is 18,000 acres, but the Corporation have power to divert two neighbouring streams, the Cowny and the Marchnant, with a gathering ground of 5,200 acres, so that when all the works contemplated by the Act of 1880 have been carried out, the lake will have a total watershed of 23,200 acres; and it is estimated that the rainfall on this area will yield an average daily supply of about 53,000,000 gallons of which 40,000,000 gallons will be available for Liverpool, after delivering compensation water to the river, as provided by Act of Parliament.

The Dam.—The dimensions of the wall are as follows:—

Total length along the top, 1,165 feet; height from lowest part of foundation to parapet of carriageway, 161 feet; height from river bed to sill of overflow (under the roadway), 84 feet; greatest thickness at base, 120 feet; width of roadway over top of dam (between the parapets), 19 feet 10 inches; the batter or slope of the wall on the front or water side is 1 horizontal in 7¼ vertical; the slope of the back wall is 1 horizontal in 1½ vertical; the total quantity of masonry in the dam is 260,975 cubic yards; the total weight of the masonry is 510,000 tons; the quantity of earth and stones that had to be excavated for the foundations was 220,890 cubic yards; and the refilling at the front and back of the wall amounted to 79,501 cubic yards.

The following few leading facts with reference to the Liverpool water supply will also be of interest:—By an Act of Parliament passed

in the year 1847, the Corporation of Liverpool obtained power to purchase the undertaking of two private water companies, who then supplied the town with water. Both of these companies derived their supplies exclusively from wells in the new red sandstone, and they distributed water to their customers only twice or three times in a week, and for not more than two or three hours at one time. By the same Act of Parliament (1847) the Corporation were authorised to carry out what was known as the "Rivington Pike" scheme, designed by Mr. Hawksley. This was a project for impounding the head waters of the Rivers Douglas, Yarrow, and Roddlesworth, by the construction of large reservoirs in a hilly and sparsely populated district between Bolton and Blackburn in Lancashire. These works were commenced in the year 1852, and were finished in 1857. There are six reservoirs, with a total surface area of about 600 acres. The total length of the reservoirs is 5½ miles. Their total contents, when full, is 4,200,000,000 gallons. The area of the gathering ground is 10,000 acres. The elevation of the watershed ranges from 425 to 1,500 feet above the sea level. All the water is filtered. There are altogether eight filter beds, with a total filtering area of 6¼ acres. The aqueduct from Rivington to Prescot, near Liverpool, is 25 miles in length, and with the exception of one mile of tunnel at Hilton House, it consists of a cast-iron pipe of an uniform internal diameter of 3 feet 8 inches. The quantity of water thus available for Liverpool, after delivery of compensation water to the rivers, is about 12,000,000 gallons per day.

Several of the wells acquired by the Corporation in 1847 have been abandoned, but new wells in the same new red sandstone formation have been sunk as the requirements of the district have increased. At the present time water is pumped from four deep wells; one in Bootle, one in Ledge Lane, Windsor, near the Edgehill Station of the London and North-Western Company, one at Green Lane, Old Swan, and one at Dudlow Lane, on the road between Wavertree and Woolton. The total yield of these wells is about 6½ million gallons per day.

In addition to the foregoing important sanitary works and measures carried out by the Corporation with a view to the promotion of the health and well-being of the inhabitants of the city, they have erected and maintain large public baths and washhouses, wholesale and retail markets, disinfecting apparatuses in different parts of the city, hospitals for infectious diseases, and other large public buildings for the administration of justice and public entertainments, reading rooms, libraries, museums, &c.

It is satisfactory to know that the large expenditure on public works incurred by the Corporation has transformed Liverpool from what it was described in the year 1847 "as the most unhealthy town in the United Kingdom" with a death rate of 63·5 to one of the healthiest of the large cities of the Empire with an average death rate for the past ten years of 26·1 per 1,000.

Morecambe.

Morecambe—formerly a small fishing village known as Poulton-le-Sands—is situate on the south shore of Morecambe Bay in 54° 4′ 30″ N. lat. and 2° 51′ 30″ W. long., in the county of Lancaster. The district consists of three hamlets, viz.:—Poulton, Bare, and Torrisholme, the total area being 1,725 acres. In 1811 the population of the whole district was 277. In 1852 a local board was established,—The "Poulton, Bare, and Torrisholme Local Board," the population at that time being 1,301; in 1889 the name was changed to "Morecambe Local Board." By the census of 1891, the resident population had increased to 6,476, having nearly doubled itself during the past 10 years; the rateable value for 1890 was 36,056*l.*

At the time of the formation of the local board there were no sewers in the district; sanitation being practically unknown, the streets and roads were used as the natural sites for storing manure, &c. Since the formation of the local board (and especially during the last 20 years) the town has been efficiently sewered; through the unremitting vigilance of the board in sanitary matters, it now enjoys a singular immunity from disease, and has become a very popular seaside resort, 10 to 15 thousand persons visiting it daily in the season.

The water-supply, unlimited in quantity and excellent in quality,—is obtained by gravitation; the following is Dr. Wigner's analysis and report:—

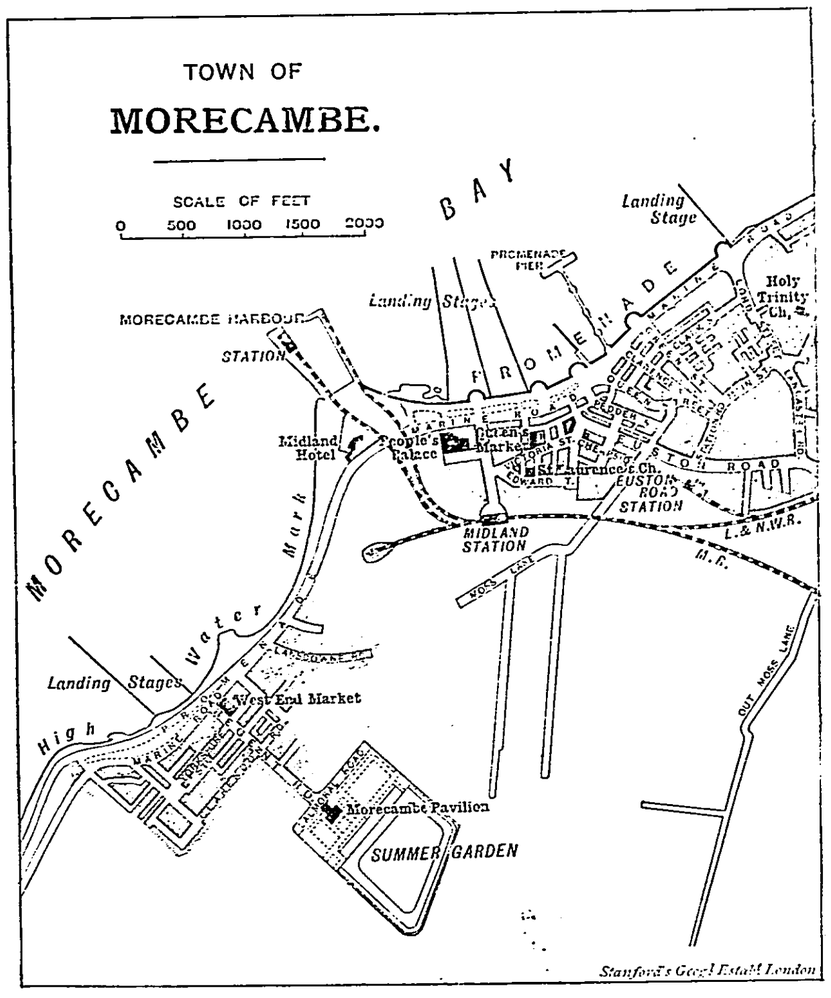
"Total solid matter - -	3·00 grains per gallon.
Loss on ignition after deducting combined carbonic acid - -	1·30 „
Lead and copper - -	none.
Iron, - - -	very slight traces.
Chlorine, calculated as chloride of sodium - - - -	1·17
Hardness before boiling - -	1·5° (Clark's scale)
„ after „ - -	1·5° „
Nitrogen, as ammonia - -	0·0019
„ albuminoid ammonia -	0·0027
„ nitrates - -	0·0280
„ nitrites - -	none.
Total nitrogen in these four parts	0·0326
Oxygen absorbed by organic matter	0·0780

As regards mineral constituents, this is an extremely good water, and as regards nitrogenous compounds it is satisfactory. It must be summed up as an excellent water-supply."

The town is situated at a point commanding a splendid and uninterrupted view of the Lake Mountains, and boasts of a pleasure pier and a harbour pier, winter gardens and summer gardens, Midland, and London and North-Western railway stations. It is a convenient centre for excursions to Windermere, Blackpool, Furness Abbey, Barrow

Grange, Limesdale, and other places of interest. The boating and fishing are excellent. There are two tramway companies; and powers have been obtained for lighting the town by electricity.

The local board have expended the sum of £14,900*l.* in building seawalls and in providing a promenade nearly two miles in length, one of the finest in England.



The City and County of Newcastle-upon-Tyne.

Delegates to the Congress.

Councillor Joseph Baxter Ellis (Mayor).
Councillor Stephen Quin (Sheriff).
Alderman Thomas Burgess Winter.
Councillor Thomas Barkas Sanderson.
Councillor Hugh Morton.
Hill Motum (Town Clerk).
William George Laws (City Engineer).
Henry Edward Armstrong, D.Hy. (Medical Officer of Health).

The general aspect of the city is toward the south. The altitude above sea level (high-water mark) toward the north-west ranges from 12 feet at the quay to 355 feet at a distance of about 1½ miles; the rise from the riverside in an easterly direction is 180 feet in about three quarters of a mile. The facilities for drainage are therefore good.

The slope from the quay to the north-west is intersected by five ancient watercourses along which in former times the domestic refuse was discharged. Four of these are now covered in and converted into sewers, which consequently are well and continuously flushed.

Newcastle was originally founded by the Romans for the purpose of war, and since then has undergone many changes of fortune and of structure.

The area of the city is now 5,371 acres, or 8½ square miles; its buildings cover 2,600 acres, or four square miles; the number of houses is 25,700, equal to 10 per acre. There are 15 banks, 60 churches, and 30 chapels in the city.

The population was in 1801, 33,000; in 1821, 42,000; in 1841, 70,500; in 1861, 109,000; in 1881; 145,400; and in 1891, 186,400, or at the rate of 34·7 persons per acre; the increase in last decade amounts to 41,000 or 28¼ per cent.

There are 159 miles of streets and roads in the city, of which 34 miles are macadamized, 113 paved and 12 unpaved. The total length of the sewers is 149 miles, and the sewer ventilators are 4,500 in number.

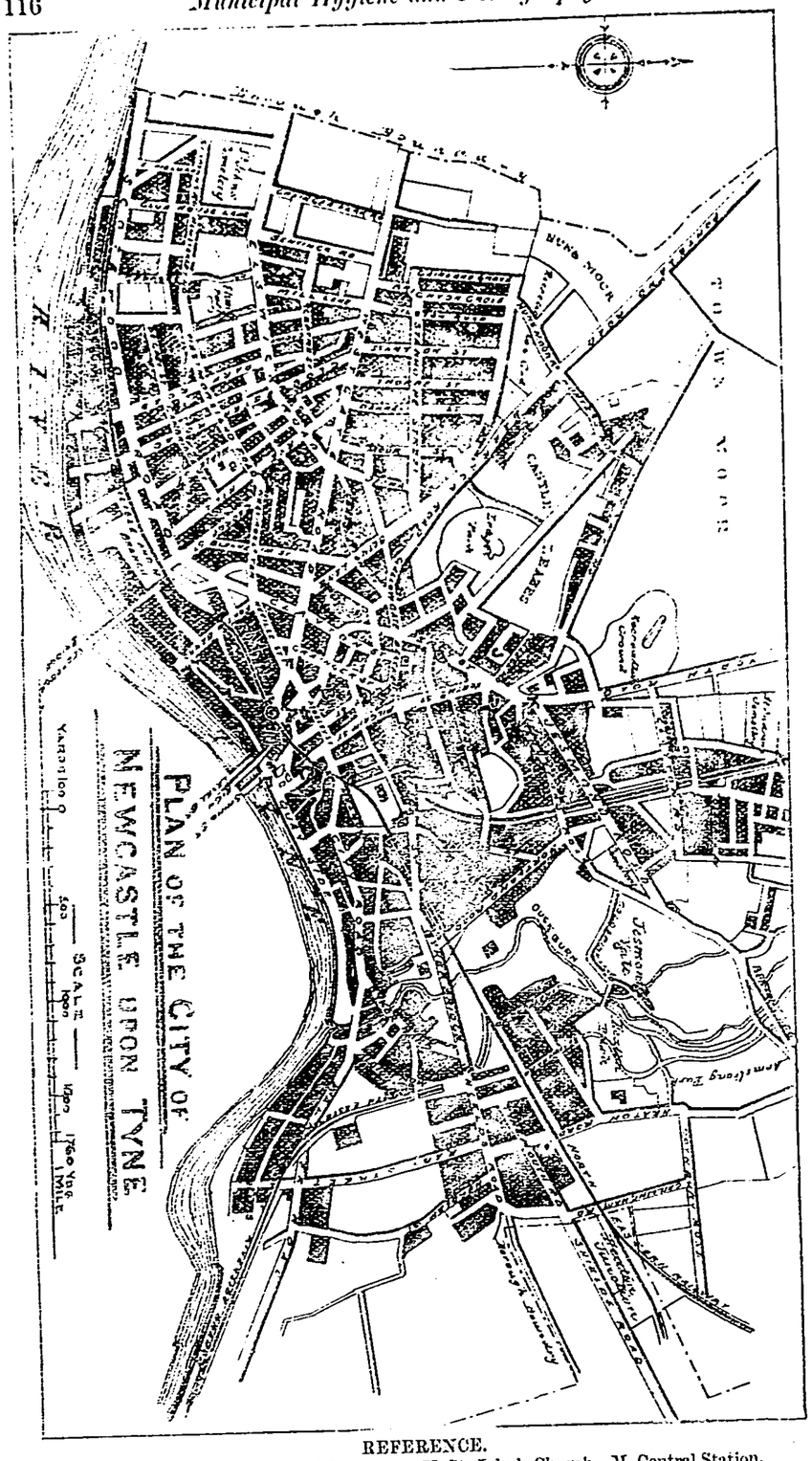
Since 1860 the following sums have been expended on sanitary improvements:—

On sewers, 164,500*l.*; on paving, 320,000*l.*; on roads and scavenging, 414,500*l.*; making a total of 899,000*l.*

There are three old established and three modern public baths and wash-houses, which cost 50,000*l.*

The public library contains over 70,000 volumes, and cost 23,000*l.* The Literary and Philosophical Society's library contains 45,000 volumes.

The town wall, which is said to have been first built by William Rufus and was afterwards extended about the middle of last century, enclosed



REFERENCE.

A. Cathedral.
B. Town Hall.
C. All Saints Church.
D. Moot Hall.
E. Guild Hall.
F. Stephenson's Monument.
G. Grey's Monument.
H. St. John's Church.
J. College of Science.
K. Museum.
L. St. Thomas's Church.
M. Central Station.
N. Infirmary.
O. Old Castle.

an area of 164 acres. This led to the formation of numerous narrow streets and lanes crowded together, and having very little light or ventilation. Most of these, known locally as "Chares" or "Entries," have disappeared; others remain to this day and interfere with sanitation.

Of the present area of the city, no less than 1,373 acres consist of public parks or recreation grounds in various parts of the city, including the Town Moor (1,031 acres); the beautiful and romantic Jesmond Dene, the gift of Lord Armstrong; the Cruddas Recreation Grounds, the gift of W. D. Cruddas, Esq.; the Leazes, and five other ornamental parks in various parts of the city provided by the Corporation.

The water of the city is supplied by the Newcastle and Gateshead Water Company, whose collecting grounds lie in the County of Northumberland, at a distance of about 30 miles to the west of the city. In that neighbourhood are several of the reservoirs; others fed by these and otherwise, are situated about 12 miles from Newcastle; and still nearer the city are the filter beds, service reservoirs, &c. The water is good in quality and is supplied under constant pressure. The reservoirs have a total capacity of 3,040 million gallons. The population supplied in and round Newcastle numbers 370,000, and the daily consumption is 40 gallons per head, or $14\frac{3}{4}$ million gallons per day.

In 1865 the Corporation obtained extensive powers under a local Act, for improving the sanitary condition of the city. Soon after this a large number of streets, previously defective, were put into good order; the sanitary staff was increased; a house-to-house inspection was carried out; upwards of 500 unhealthy dwellings were closed in less than two years, and of these a large number were pulled down. Rooms for many of the displaced persons were temporarily provided elsewhere; and active steps were at the same time taken to abate the overcrowding, which was great. Many other sanitary improvements were also effected. Under the Artizans and Labourers Dwellings Act, 1875, the old dilapidated property known as the New Pandon group, consisting of the dwellings of 958 persons was acquired by the Corporation and demolished in 1878. The hollow in which these houses stood was filled up and is now crossed by two large thoroughfares. Adjoining this area was another, the Old Pandon group, consisting of similar dwellings occupied in 1875 by 943 persons. Most of these houses were pulled down. The total expenditure out of the Corporate funds on these areas was 63,800*l*. In 1883–84 a house-to-house inspection of the city was carried out by the Health Department, the staff of which was strengthened for the purpose by the addition of a dozen inspectors. This inquiry led to the disclosure, and subsequently to the remedy, of a very large number of defects, as also to the formation of a useful sanitary register of the dwellings in the city. At the present time action is being taken under the Housing of the Working Classes Act, 1890, for the closure of many of the old and dilapidated dwellings still remaining. The Corporation have resolved to erect a common lodging-house for males and another for females, capable of accommodating 400 persons, and also a block of 50 single-room tenement dwellings to be let at low rentals.

In 1882 the Corporation erected on the Town Moor a new hospital of 21 beds for the treatment of small-pox, in place of the then existing small-pox wards in the ground of the old fever hospital at Bath Lane. In 1888 they also opened a new hospital for infectious diseases other than small-pox. This is built on part of their estate at Walker, about 3 miles from the centre of the city. This hospital consists of five ward pavilions (105 beds), administrative block, laundries, disinfecting station, lodge, stabling, &c., &c., according to the most modern and improved principles. The area of the site is upwards of 11 acres, thus allowing space for future extension. Admission to the general wards is free. The cost of the building was 23,176*l.*, and that of furniture and fittings, 3,186*l.* The notification of infectious diseases has been in operation under a local Act since 1882. On the receipt of every notification of a case of infectious disease, the action taken by the Health Department is as follows:—1. A special inspector attends at the infected house, without delay, and makes a careful and exhaustive inquiry into the circumstances, filling up on a printed form details relating to all the probable channels by which infection may have been received or is likely to be propagated, the sanitary condition of the premises, water and milk supplies, &c.: all defects noted receive attention as soon as practicable. 2. The removal to hospital of all suitable cases is recommended, and, wherever possible, effected. 3. Printed advice and instructions as to the best means of preventing the spread of infection are left at the house in every instance, and, where requisite, disinfectants are supplied gratis. 4. The attendance at school of children from infected houses is prohibited. The principals of schools attended by children in whose houses there is infectious disease are informed by circular, and cautioned not to allow any such child to attend school until they have received a certificate from the Medical Officer of Health as to the final disinfection of the house. 5. A printed form of certificate stating that the infected premises and articles are ready for final disinfection is also left with the householder for the signature of the medical attendant on the termination of the case. This certificate when duly signed is forwarded to the medical officer of health, after which the special inspector sees to the final disinfection. 6. The bedding, &c., are removed to the steam disinfection station, where it is fumigated and returned without charge to the owner. The infected premises are also fumigated by the inspector.

The Health Department of the Corporation is placed by the city council under the entire control of the medical officer of health. It comprises the following divisions—(*a*) The department proper of the medical officer of health with the special inspectors for infectious diseases, clerks, &c. (*b*) The hospitals for infectious diseases and the requisite staffs. (*c*) The work of the inspector of nuisances, and the inspectors of dairies, slaughter-houses, food of all kinds, and adulterations, with the requisite staffs. The inspectorial staff includes an inspector of nuisances and eight assistant inspectors, two special inspectors for infectious diseases, an inspector of provisions, slaughter-houses, dairies, &c., and his assistant; and two subordinate officers.

The general death-rate of the City, which for the 10 years 1871–80 was 25·8 per 1,000 population, fell during the succeeding decade to 23·8, as calculated on a population which last Census has proved to have been greatly under-estimated. The death-rate from the "Chief Zymotic Diseases," * which for the former of these decades was 4·6, fell during the latter to 3·0 per 1,000, having been 3·6 for the quinquennial 1881–85, and 2·5 for that of 1886–90. The rate for the year 1890, if calculated on the population enumerated in April, 1891, is 1·8 per 1,000.

Among the older charitable medical institutions of Newcastle may be mentioned, the Royal Infirmary (270 beds), and the Newcastle Dispensary. Among those more recently erected may be named (1) the Fleming Memorial Hospital for Sick Children, erected by the late John Fleming, Esq., and opened in 1888; (2) the Home for Incurables, provided by the Corporation out of the funds of the Mary Magdalene Hospital, (No. of beds, 30; cost of buildings, 5,886*l.*; and that of furnishings, 1,165*l.*).

Two new College Buildings have lately been added to the city, viz., those of the College of Medicine and the College of Science of the University of Durham. These have each taken the place of less commodious structures, previously occupied by the respective colleges in a more central situation. The cost of the new premises of the College of Medicine up to date is 30,000*l.*, and that of the College of Science 25,000*l.* Large extensions are contemplated for each of these colleges.

The Tyne has during late years been immensely improved as a port by the River Commissioners. Since the formation of that body in 1850 about 100 millions of tons of material have been removed by dredging from the river and docks; 5,000,000*l.* have been spent in widening and deepening the river, and in other improvements, including the removal of shoals and dangerous projections of land, the making of piers, embankments, docks, quays, warehouses, a swing-bridge 559½ feet in length, including two opening spans of 104 feet each. The piers at the mouth of the Tyne were begun in 1856, and are still in progress. When completed the North Pier will be 2,472 feet, and the South Pier 4,670 feet in length. The amount of sea water now coming up the Tyne to Newcastle and above it has been much increased by the deepening of the river, to the sanitary and general benefit of the inhabitants and the great development of commerce. Upwards of 14,000 ships now annually arrive in the Tyne. Shipbuilding is one of the principal works of the port. The Tyne is the principal coal port in the kingdom.

The sanitary administration of the port is in the hands of the River Tyne Port Sanitary Authority, a body formed of representatives from the councils of Newcastle, Gateshead, Tynemouth, South Shields, and Jarrow, and the Local Boards of Walker, Wallsend, Willington Quay, Felling, and Hebburn. The staff of the Health Department of the authority comprises a medical officer of health, assistant medical officer of health, inspector of nuisances, two assistant inspectors, &c. The

* Small-pox, scarlet fever, typhus, enteric and continued fevers, measles, diphtheria, whooping cough, and diarrhœa.

authority has a floating hospital of 30 beds, in three blocks, erected on a deck 140 feet in length by 80 feet in width. This deck rests on 10 pontoons. The cost of this hospital, which was launched in 1886, was 5,000*l.* Adjoining the hospital, to which it is moored, is the Dutch Galleot "Alliance," on the deck of which is erected a house for the resident staff and administrative department generally. The Health Department is provided with a steam launch, the forecabin of which is fitted up for the removal of patients. The offices of the authority are in the Town Hall, Newcastle. The inspector's station, where the inspector of nuisances resides, is at South Shields, overlooking the Port. The number of vessels annually inspected is over 12,000.

Paignton.

The town of Paignton is pleasantly situated on the western shore of Torbay. Its extensive frontage to this magnificient bay is protected by a sea-wall, and provided with an excellent marine drive. The houses on the Esplanade, which face the sea, are set back from the shore a considerable distance, and in the intervening space are many acres of green sward secured for ever as a public recreation ground. The beach is nearly a mile in length; and, consisting almost entirely of sand sloping very gradually seawards, affords ample facilities for bathing with perfect safety at all periods of the tide.

During the past 10 years Paignton has rapidly become popular, not only as a place of health and summer resort, but also as a place for permanent residence, the population having increased from 4,610 in 1881 to 6,785 in 1891, a gain of over 47 per cent. The rateable value of the property included within its area has risen from 11,000*l.* in 1863 to 36,890*l.* 10*s.* in 1890. The town, with its surrounding district, comprising altogether an area of 5,092 acres, forms the Urban Sanitary District of Paignton, with the Local Board of Health as the Urban Sanitary Authority.

Drainage.—In 1867 a thorough system of drainage was undertaken and carried out under the direction of R. P. Brereton, Esquire, of Westminster. By this means the whole of the sewage is discharged into the sea, at a point sufficiently remote to prevent its being washed back on to the shore. The work was completed in 1887 at a cost of about 12,000*l.*

Water Supply.—The reservoir situated at Blagdon, about three miles from the town of Paignton, and the rest of the waterworks, originally the property of a company was purchased by the local board on behalf of the public in the year 1888, at a cost of 10,500*l.*; and a large additional sum has since been expended in extensions and improvements, so as to secure a continuous supply of pure water.

Infectious Diseases Notification.—The Infectious Diseases Notification Act was adopted and came into force throughout the town and district on January 1st, 1890. It has been found a useful measure, though the amount of such disease is usually very slight in the locality, only one case having been notified during the first half of 1891.

Sanitation of New Buildings.—Great care is taken to ensure the perfection of the sanitary arrangements in all new buildings, each drain being submitted to the "smoke test."

Its natural advantages, good drainage, and water supply, together with the constant care shown by the local sanitary authorities in all matters pertaining to sanitation, combine to render Paignton a very healthy town. The annual amount of sickness is slight, and the yearly death-rate a very low one. During the years 1885 to 1890 inclusive, the average annual rate of mortality from all causes was 12·6 per 1,000, and in 1890 it was only 11·2 per 1,000.

The County Borough of Preston.

Delegates to the Congress.

Councillor Holden, J.P.
Councillor J. E. Dunn.
H. O. Pilkington, M.R.C.S., Medical Officer of Health.

Preston is one of the oldest and most important of the manufacturing towns of Lancashire. It is picturesquely situated on the northern bank of the valley of the Ribble, the centre of the town rising to an elevation of 150 feet above sea level; and it is distant some 15 miles from the Irish Sea. It has an area of 3,721 acres, and, according to the recent census, a population of 107,864.

Many historical associations are connected with it, dating back to the time of the Roman occupation, and it was when the neighbouring town of Ribchester began to decline in importance as a Roman station that Preston is first heard of. In 1648 it formed the battle ground between Cromwell and the Royalist forces, and it played an important part in the Jacobite risings of 1715 and 1745. The town was occupied by Prince Charles Edward in the course of his march to, and retreat from, Derby; while Hoghton Tower in the immediate neighbourhood is celebrated in connexion with the memorable visit of King James I., and the elevation of the loin of beef to the honours of knighthood.

By Royal Charter the town enjoys the right to hold a Guild Merchant, a period of public celebration and rejoicing, first commenced about the 12th century, and regularly held every 20 years since 1512. The last guild was held in 1882, when Mr. Alderman Edmund Birley filled the honoured rôle of Guild Mayor.

The town possesses many fine buildings, and is especially remarkable for its handsome churches; chief amongst these is the Roman Catholic Church of St. Walburgh's, the graceful spire of which, with its surmounting vane, rises to a height of 333 feet, the highest erected since the period of the Reformation.

The town hall is a handsome Gothic structure built in 1862–67 by Sir G. G. Scott, the clock tower and spire being 197 feet in height. Adjoining it, and now rapidly approaching completion, is the Free Public Library and Museum, taking its name from the late E. R. Harris, Esq., the munificent donor of this and other gifts to his native town. To this building will shortly be transferred a very choice collection of pictures valued at 60,000*l.*, left to the town by the late Richard Newsham, Esq., and at present occupying a portion of the Guild Hall. The reference library, bequeathed and endowed by Dr. Shepherd in 1759, and the collection of valuable and interesting objects forming the museum, at present temporarily located in Cross Street, will also find a suitable location in this magnificent building.

Preston is an important centre of railway traffic, and possesses a handsome station, one of the finest to be found in provincial towns,

erected at a cost of 250,000*l.*, and opened in 1880. It is also a large and increasing centre of postal communication, occupying, as it does, a position on the main artery between the north and the south, and being in direct communication with the whole of East Lancashire, and the important district known as the Fylde on the West. It has an efficient system of tramways, leading to the suburbs of Ashton and Ribbleton, and to the adjoining township of Fulwood. These were commenced in 1879, and enlarged in 1882.

The Ribble Navigation scheme, commenced by the Corporation in 1883, is now rapidly approaching completion.

For recreation purposes the people of Preston have the advantage of several handsome parks. Of these, two—the Avenham and Miller Parks—extend along the banks of the River Ribble; the third, named the Moor Park, is of considerable extent, and is situated towards the northern side of the town.

The Miller Park is about 11 acres in extent, and the land was a gift to the town by the late Alderman T. Miller, "subject to the payment "by the Corporation of the sum of 40*l.* a year, to be applied for a "University Exhibition in connexion with Preston Grammar School." It contains a handsome statue to the late Lord Derby, erected by public subscription at a cost of 2,500*l.*

The water supply is abundant and of good quality, and is derived from moorland gathering grounds, distant about 20 miles from the town. The waterworks were first established in 1832, and came into the hands of the Corporation about the year 1853. Since then extensions and improvements have been carried out, both as regards the area of collection and the facilities for storage, and still further ones are contemplated.

Following upon the formation of a sanitary committee and the appointment of a medical officer of health in 1874, much has been done to improve the public health and the sanitary condition of the town. In the first place steps were directed towards the closing of a number of unhealthy houses and cellar dwellings, and to the opening out of others built on the back-to-back system. Latterly the attention of the authority has been mainly directed towards improving the closet accommodation, and in a large number of cases the watercloset and movable ashpail has been substituted for the previously existing privy and large offensive ashpit. Additional powers in this direction were obtained by the Improvement Act of 1880, in which also was inserted a clause requiring the compulsory notification of infectious disease. At the present time large works are in progress by which the sewage of the town, instead of being discharged, as now, into the river, will be conveyed in iron pipes to Freckleton, distant about six miles in the seaward direction, where a farm of some 600 acres, recently purchased by the Corporation, will be available for dealing with it. Another destructor, for treating the dry ashes and other refuse, is also being erected at the pumping station to supplement that which has been for many years in use at the other end of the town.

The Borough of Richmond.

BY

Councillor T. F. Wakefield.

Delegates to the Congress.

Jno. T. Rowland, M.D., &c., Medical Officer of Health of the Richmond Urban Sanitary Authority.
Councillor T. F. Wakefield, Chairman of Health Committee.

Richmond is beautifully situated on the banks of the Thames, and is surrounded by parks and open spaces. On the high ground on the south side of the town is Richmond Park, eight miles in circumference, and comprising 2,253 acres; whilst on the slope of the hill is Petersham Park; and in the vale below Sudbrook Park. Towards the north are the Old Deer Park, and the Royal Gardens at Kew. On the South-west is the famous view from the terrace on Richmond Hill unsurpassed in the world for its sylvan beauty. The view, with the river in the immediate foreground, extends to Windsor Castle which can be plainly seen in the distance on the one side, and to Hind Head near the village of Haslemere, Surrey, 35 miles distant, on the other.

The attractiveness of the Terrace has been greatly enhanced by the purchase of the gardens on the slope of the hill (formerly belonging to the Duke of Buccleuch) at a cost to the town of 15,000*l.* The cost of maintenance is about 700*l.* a year.

Richmond was governed by a vestry under a special Act of Parliament passed in the year 1785 until the town was incorporated by Royal Charter in 1890. Sir J. Whittaker Ellis, Bart., M.P., a former Lord Mayor of London, and a native of the town, was the first Mayor.

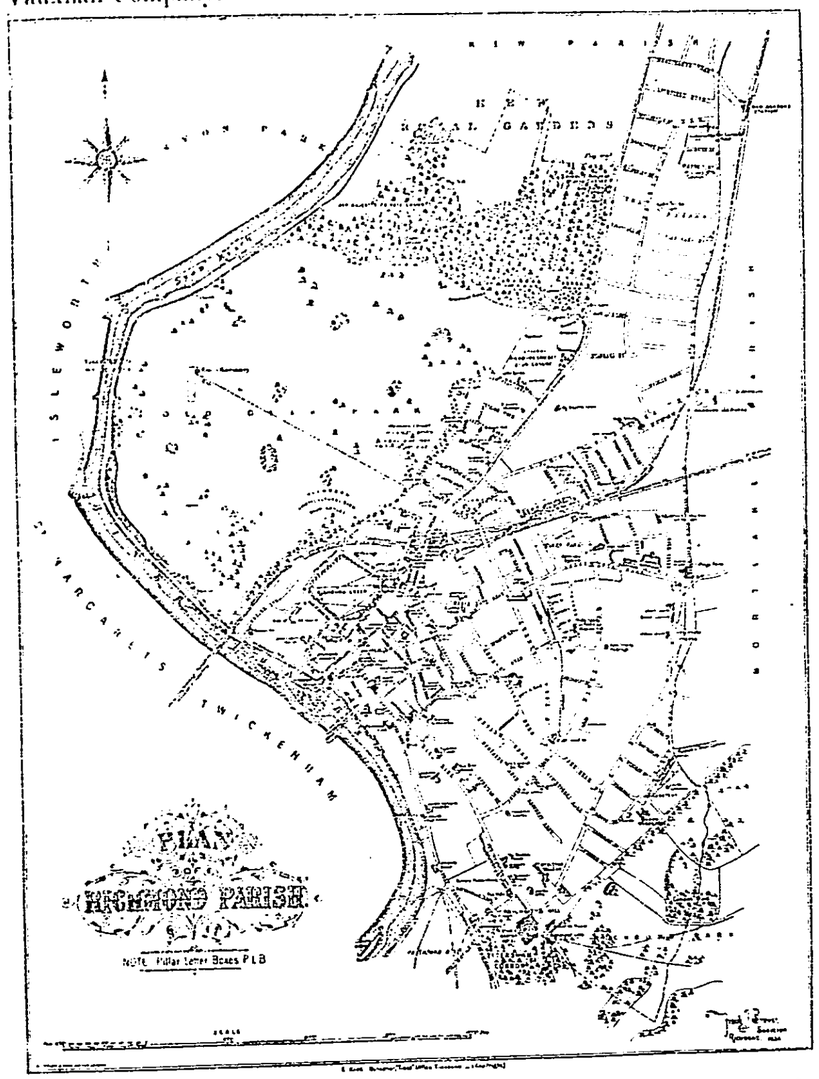
The area of the borough is 1,256 acres, of which 557 is Crown land, viz., part of Richmond Park, 67 acres, the Old Deer Park, 353 acres, and part of Kew Gardens, 137 acres. Application has been made for an extension of the boundaries, which will double the area of the Borough.

The population according to the last census in 1891 was 22,684 as compared with 19,066 in 1881. In 1801 when the first census was taken the numbers were 4,628. The increase at the close of each decennium has been as follows: 1811—591; 1821—775; 1831—1,249; 1841—509; 1851—1,503; 1861—1,666; 1871—4,187; 1881—3,956; 1891—3,618.

The rateable value of the borough is now (1891) 180,000*l.*, and the number of inhabited houses 4,300. The number of burgesses on the roll is 3,397.

The total income of the borough in 1890 was 57,400*l.*, and the loan indebtedness 136,386*l.*

The water supply, at one time taken from the river Thames, afterwards from the Southwark and Vauxhall Water Company, whose mains run through Richmond, is now derived from: 1. An artesian well, near the river, 1,146 feet deep. 2. A well in the Terrace Gardens down to the chalk, 470 feet deep. 3. A well in the Petersham Meadows, supplied by springs. The supply from the wells is as yet insufficient, and is supplemented by water drawn from the mains of the Southwark and Vauxhall Company.



The supply is about 477,700 gallons per diem, which, for a population of 23,000, gives less than 21 gallons per head for all purposes. The average supply by the Metropolitan Water Companies for 1889 was for domestic purposes 23·93 gallons per head per day, and for all purposes 29·91 gallons.

An adit is now being driven through the water-bearing chalk from well No. 2 to join well No. 1, and it is hoped that eventually an adequate

supply will thus be obtained. The cost of the plant, &c., has been 77,000*l.* The annual income is 10,000*l.*, of which 5,000*l.* goes to pay off the loan (originally) of 75,000*l.* and 5,000*l.* to pay annual expenses. The water rate is 1*s.* 4*d.* in the £.

Richmond has hitherto been drained into the Thames, but a system of drainage works for the town and adjoining districts has just been completed at a cost of 100,000*l.*, by which the sewage is conveyed to filtering tanks located by the banks of the Thames below Kew Bridge, about two miles distant from the town. The effluent passes into the river. The sewers are well ventilated, and the Holman-Keeling Sewer Gas Destructors are used. It is expected that Richmond will shortly become one of the best drained towns in the kingdom. Typhoid fever and diphtheria are practically extinct in the district.

The River Thames is at once a source of recreation and of health to the inhabitants and visitors to Richmond; but since the embankment of the Thames, the rebuilding of the bridges below with greater waterway, and the dredging away of shoals, combined with the increased intake of the water companies above Teddington Lock for the supply of London, the level of low water in the Thames at Richmond has been gradually falling; the low-water level at Richmond Bridge has fallen 4 feet since the bridge was built in 1774.

In accordance with an Act of Parliament obtained in 1890, a footbridge, lock, and weir are now being constructed below Richmond, which will hold up the water at ebb tide and thus ensure above this point a reasonable depth of water. The shallows will thus be covered, and boating will be possible at all times of the tide. The cost is estimated at 45,000*l.* or more, of which Richmond is to pay 25,000*l.*

The Thames Conservators have contributed to the cost, and are now building the lock and bridge which will be of peculiar construction with sluices (Stoney's) worked on steel rollers, placed in recesses in the piers of the bridge; these, although of enormous weight, can be lifted and lowered with the greatest facility, and when raised can even be canted up under the footway of the bridge so as to be out of sight.

Public baths were erected in 1882 at a cost of 10,000*l.*; and a free public library, partly supported by a voluntary rate. Much attention is paid to sanitation, and the death-rate in 1889 was as low as 13·0 per 1,000 against 17·5 for London. In 1890 (an exceptional year) it was 14·6 against 20·3 for London.

Richmond is practically a suburb of London; the rateable value is high in proportion to the population, and the inhabitants are of a class who interest themselves in sanitary matters.

As an urban sanitary authority Richmond has a medical officer of health, and an inspector of nuisances with an assistant inspector. There is also a sanitary association composed of medical men and others who make it their business to see that the Public Health Act and Sanitary Acts are enforced. Richmond has a hospital, but no separate hospital as yet for the isolation of infectious diseases. The Surrey County Council propose to deal with the county as a whole in this matter.

The Terrace Gardens, the Grove Road Pleasure Ground, the Lower Mortlake Road Recreation Ground, and the Green, a large space of ground on which cricket is played, furnish to the inhabitants extensive areas for recreation; and the riverside footpaths provide delightful walks.

Richmond Green belongs to the Crown and was formerly the Tilting Yard of the Old Palace, portions of which are still remaining. There still exists an old Tudor gateway with a room above in which Queen Elizabeth is said to have died.

Cholmondeley Walk by the riverside is under the control of the Corporation and is a favourite resort of the inhabitants.

Richmond is distant from London Bridge, by the river, 26 miles; from Lincoln's Inn Hall, by road, 11 miles; and by rail from Waterloo Station, 9¾ miles.

The Borough of Ryde.

Delegate to the Congress.

FRANCIS NEWMAN, Borough Engineer and Surveyor.

The borough of Ryde is situate on the south shore of the Solent Sea, and on the north side of the Isle of Wight. The Isle of Wight, although an administrative county under the Local Government Act of 1888, is part of the county commonly known as "Hampshire," but in legal language as the "County of Southampton."

The pier head at Ryde is five miles from the Portsmouth Harbour Pier of the London and South-Western and London Brighton and South Coast Railway Companies; and 2¾ miles from the Stokes Bay Pier of the London and South-Western Railway Company. The area comprised within the boundaries of the borough, exclusive of foreshore covered at high water, is 801 acres.

The geological character of the Isle of Wight is very varied; a ridge of chalk extends from east to west through the centre of the Island, with its dip-slope to the northward; north of this the soil consists of the clays and other beds of the tertiary system, and southward of chalk and greensand. Ryde is, therefore, situate on the tertiary beds, but being on a hill with bold slopes to the north and east, water is not retained on its surface.

At the commencement of the present century Ryde consisted of two villages called Upper and Lower Ryde; very early in the century they were united by the formation of the present principal business street, called Union Street. The foreshore at Ryde, uncovered at low water, is about three-eighths of a mile in breadth, and consists of clay now wholly covered by a deposit of sand; formerly it was covered for only about 100 yards from high-water mark outwards with sand and gravel. It thus formed an obstacle to communication by sea, excepting at high water, and to remedy this a company was formed which obtained parliamentary powers in 1813 for the construction and maintenance of a pier, and for supplying water for shipping. The construction of the pier was at once proceeded with; it has been subsequently widened and extended to about half a mile in length, and the head increased in size.

From this period the population rapidly increased, and towards the close of the third decade of the century had so grown as to induce the inhabitants to seek the powers of local government then only granted to towns by special Acts of Parliament, but now happily more perfectly and inexpensively obtained, by the adoption of the Public Health Act. Accordingly, in 1829 was passed "An Act for paving, watching, lighting, "cleansing, and otherwise improving the Town of Ryde, in the Isle of "Wight, in the County of Southampton, and for establishing a market "within the said town." This Act gave power for paving footways in the streets, for watering the carriageways, and for scavenging the

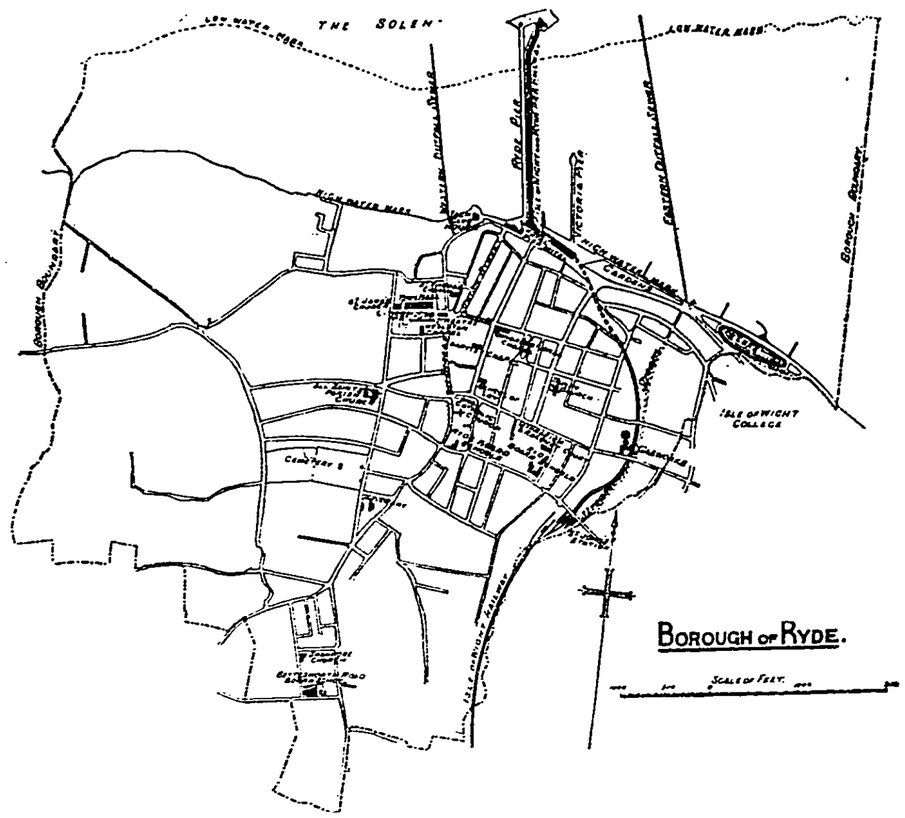
streets; but left the repair of highways, that is the carriageways of the streets, in the hands of the Commissioners of Highways for the Isle of Wight. In 1847 an Act was obtained vesting the repair of the highways in the town in the Ryde Commissioners. By the Act of 1829 the Commissioners appointed were the Governor and Captain-General of the Isle of Wight, and every person who should be possessed in his own right, or in the right of his wife, of real or personal estate in a messuage or tenement, messuages or tenements, land, tithes, or hereditaments in the town, which should be of the value, above all charges, of 1,000*l.* and who should make an oath or affirmation to that effect. The Commissioners erected a town hall and market house, and caused the footways to be paved, and other improvements to be made; they also caused the footways and streets to be properly cleansed and watered. But until 1847 no sewerage work of a systematic character were executed. At that time, although Ryde was to some extent a water-closeted town, the waterclosets all drained into cesspools, the overflow drains from which passed into drains carried under the streets by different owners. The owners abutting on the shore, or on the watercourse in the valley, on the eastern side of the town, having taken their drains to the shore, or to the watercourse, the owners immediately above them drained into the upper ends of these drains; and the next owners joined the upper ends of the last; while in parts of the town situated on beds of sand or gravel, very little drainage had been attempted; but about 1847, some brick sewers were put into the streets by the Commissioners.

In 1849, during the visitation of cholera, Ryde suffered severely. Between 1849 and 1852 other sewers were laid down in a fragmentary way; and an important intercepting sewer was laid to take the drainage discharging on the shore and convey it by means of an elm trunk across the foreshore, to a distance of 700 feet below high-water mark.

Still no systematic scheme of sewerage had been attempted, and the sewage, discharging on the foreshore, was partly returned at flood tide. At that time the public supply of water was limited to three or four public wells and the waterworks constructed by the Pier Company for the supply of shipping. These had been leased to a private individual, and were used by him to supply houses, for which purpose mains had been laid in many of the streets, but the supply available for this purpose was very insufficient.

To meet these defects, in the year 1852 a movement was made for the adoption of the "Public Health Act, 1848," the promoters seeking amongst other improvements, a complete system of sewerage; an improved water supply; an extended boundary; the construction of an esplanade next the sea; and an elected board.

The opposition to the adoption of the Act was, however, so strenuous that the General Board of Health did not proceed with the Order. In 1853, the promoters of the adoption of the Public Health Act; and many of the leading opponents of that step, came to an understanding to promote a local Act having the above-named objects in view; which Act, after somer some opposition, and some concession to those outside



the former boundary but included in the proposed boundary, was passed in 1854. The Act vested the government of the town in 27 commissioners, one-third of which were to be elected annually.

In 1868 a Charter of Incorporation was obtained, the number of aldermen being fixed at six, and that of the councillors at 18; and shortly afterwards the commissioners transferred their powers and liabilities to the town council. A separate commission of the peace was shortly after granted, and at the same time a separate police force was established for the borough.

The Local Government and Public Health Acts having been adopted, the administration of the Borough is now in harmony with the great majority of the urban districts of England.

Since 1854 the sewerage of the town has been rendered complete, the sewers generally being of stoneware pipes, the main trunk sewers of brick; two iron outfall sewers have been carried across the foreshore, discharging at points where there is a depth of six feet of water at low spring tides. The sewers are efficiently ventilated, and provided with inspection chambers. All cesspools have been abolished, the house drains have been connected with the sewers, and in nearly the whole of the town defective or obsolete private sanitary arrangements have given place to the most modern appliances.

The old waterworks were acquired by the commissioners; a pumping station and reservoir erected on the north slope of Ashey Down, three miles to the southward of the town, with the view of supplying water from the chalk; and a complete system of mains laid down. The supply at Ashey not being sufficient, another pumping station was erected at Knighton to the southward of Ashey Down, from which water is now obtained from the chalk and upper and lower greensands, of the greatest purity and in ample quantity, and a constant supply is given to all consumers.

An esplanade has been formed along the whole of the front of the town eastward of the pier, with gardens 15 acres in extent abutting on the sea, including a lake, three acres in extent, for canoes, small pleasure boats for children and model yacht races.

Large additions have been made to the town hall, which now contains a room seating 800 persons, a second room communicating therewith which will seat nearly half that number, a justice room, council chamber, committee rooms, public offices, and several smaller rooms with good approaches and other conveniences.

In 1872 a wooden Isolation Hospital for infectious diseases was built; this has since been removed to a more eligible site and improved. The accommodation provided in this building has been found greatly in excess of the requirements on each of the few occasions on which this hospital has been needed, during the 19 years of its existence.

The Burial Acts were adopted by the Commissioners in 1861, and a cemetery constructed; this has since been extended and now contains an area of 9 acres.

The population of the old town in 1831, two years after the passing of the first Improvement Act, was 3,396, and in 1881, 50 years later, 11,461.

The length of streets and roads being carriageways in the borough is $16\frac{7}{8}$ miles; the length of flagged footways at the sides of such streets is $17\frac{1}{2}$ miles, and the length of curbed, channelled, and gravelled footways is $5\frac{1}{8}$ miles. The length of sewers is $15\frac{1}{2}$ miles.

Excepting in the business streets there are very few houses in the borough built in rows; they are for the most part detached or semi-detached with gardens. Even the great majority of the houses of the working classes built during the last 40 years are in pairs, with side entrances and small gardens back and front.

The borough supplies water and provides outfall drainage for the suburbs of St. John's and Haylands, situate outside the boundary and containing a population of upwards of 3,000.

The amount of outstanding debts of the Corporation secured by mortgages on the rates is 96,000*l*., of which 42,500*l*. is in respect of the waterworks.

The rate of mortality in the borough for the year 1890, which was in excess of some recent years, was 15·27 per thousand.

In the preceding paragraphs the leading improvements effected by the governing body of the town are enumerated; but public and private

enterprise in other directions, have contributed to make the town a pleasant health resort and a desirable residential locality.

The Royal Isle of Wight Infirmary and County Hospital, which is available as a medical and surgical hospital for the whole of the inhabitants of the island, was erected in 1849, and has since been considerably enlarged.

Handsome churches and chapels have been built as well as good elementary schools, voluntary or controlled by the school board. There are also good private schools for the children of those of larger means, which with the Isle of Wight College, founded in the immediate neighbourhood in 1880, the Ryde Young Men's Christian Association, and the Literary and Scientific Institute, and the Ryde School of Science and Art give to the town exceptional educational advantages.

Gasworks were established by a company in 1839. Railway communication has been made with other parts of the island, and connected with the sea by a railway pier, adjacent to the old Ryde Pier, at the side of which an electric railway runs for local traffic.

Excellent sea bathing is provided at the Victoria Pier, with medicated and other sea baths. There is also a public bathing stage available for men and boys at a charge of a halfpenny each, which is extensively used.

The exceptional advantages of the Solent for yachting, which have always been recognised, led to the formation at Ryde in 1845 of the Royal Victoria Yacht Club, and in 1846 a large and well appointed club house was built, and for many years Ryde has been one of the principal English yachting stations.

The Borough of St. Helens, Lancashire.

The County Borough of St. Helens (Lancashire) is situate 11 miles east of Liverpool and 21 west of Manchester. It is a rapidly increasing and important manufacturing town of comparatively recent date, having received its charter of incorporation in 1868. Depending as the borough does for its importance on its various manufactures, it may be said to date from the establishment in 1773 of the Ravenhead Plate Glass Works, which are historically interesting by reason of their being the first of the kind established in Britain, the manufacture having been introduced by La Bruyere from Picardy.

The present area of the borough is 6,558 acres, and its rateable value is 273,621*l.*

The borough comprises the whole of the Townships of Sutton and Parr, and portions of the Townships of Windle and Eccleston; those portions of the two townships outside the borough being mainly of a rural character.

The population of the whole of the four townships was in 1801, 7,573; in 1811, 9,397; in 1821, 10,603; in 1831, 14,194; in 1841, 21,450; in 1851, 28,042; in 1861, 41,345; in 1871, 49,034; in 1881, 61,472; and in 1891, 77,076; while the population of the borough in the censuses taken since its incorporation was ascertained to be in 1871, 45,134; in 1881, 57,403; and in 1891, 71,288.

The great factors in the production of its commercial prosperity are its geological formation and its railway and canal accommodation. By its situation on the southernmost limit of the Lancashire Coal Measures, its manufacturers have secured an abundant supply of good coal. Ample railway and canal accommodation were provided at an early period, and such accommodation now forms part of the L. & N.W. Railway Company's system. The Sankey Canal running from St. Helens to the River Mersey,—the oldest canal in the British Isles, dating from 1755,—connects St. Helens with the sea.

St. Helens is the chief seat of the manufacture of plate and crown glass in Great Britain, if not in the world; one firm alone employing over 4,000 men in its manufacture. Along with the neighbouring town of Widnes, it is also the principal seat of the chemical trade in England; the combined towns manufacturing three fourths of the heavy chemicals made in Great Britain. The more important substances made are caustic soda and potash, carbonate of soda and potash, hydrochloric and sulphuric acids, sulphate of magnesia soda and ammonium, chlorate of potash, and soda. There are several very extensive copper works and glass bottle works, also potteries, chemical manure works, lead, silver, and nickel works, besides numerous collieries.

Owing to its rapidly increasing population, and the extensive area covered by the town, it has been found necessary from time to time to apply to Parliament for powers for dealing with sanitary and other requirements. The first Act, incorporating the St. Helens Improvement

Commissioners and giving them power over parts of the Townships of Windle, Eccleston, and Parr, was passed in 1845. By a subsequent Act passed in 1851 the limits under the jurisdiction of the Commissioners were extended, and in 1863 and 1865 local government boards were established for the Township of Sutton and for the part of Parr not within the Commissioners' limits. In 1868 the whole of these districts with some additions were incorporated as the Borough of St. Helen's, and ample powers for the government of the whole borough were conferred by the St. Helen's Improvement Act, 1869.

Since that time, new streets and passages have been laid out at an expense of 120,000*l*. All the streets, with the exception of a few of those made before 1845, are laid out with "back passages" of 4 or 9 feet wide for the convenience of sanitary measures.

Extensive sewerage operations have been undertaken at a cost of 45,000*l*. to convey the sewage rapidly from the precincts of the town, instead of allowing it to flow into a small and sluggish stream which meanders through the town, and which acts at present as the main sewer and drain from the various works; and large sums of money are now being spent on the completion of these operations. The removal of excreta is carried out on the dry system. Many of the old privy-ashpits still exist, but are being converted, as they fall into disrepair, into tub and pail closets. All the most approved methods of working the tub and pail system have been here adopted.

Two well laid out public parks, with areas of 36 and 12 acres respectively, have been established. Two sets of public baths are maintained by the Corporation, the more recent of the two having been lately erected at a cost of 10,083*l*., and provided with all the latest improvements as to structure, size, and management. This set of baths contains a men's swimming bath of 101 feet by 30 feet, a ladies' bath, 40 feet by 25 feet, two vapour baths, and 39 private baths.

Two general medical and surgical hospitals, each doing good work, exist; the one being supported by voluntary subscription and endowment, the other mainly supported on the penny-a-week system from the employées of works—a system which is found to supply ample means for its maintenance. The Corporation have also provided a free isolation hospital for infectious diseases, in which good and useful work is being done.

A small gravitation waterworks existed at the time of the passing of the first St. Helens Improvement Act in 1845; the Commissioners arranged for the transfer to them of the powers possessed by the company owning these works, and under Acts passed in 1851 and 1855 made large additions to the water supply, which was further increased by the Corporation under their Acts of 1869 and 1882; so that there is now a supply of 3,000,000 gallons a day, or about 40 gallons per head of the population supplied, half of this probably being used for manufacturing purposes. The total cost of the works has been over 171,000*l*., and the water rate at present is $4\frac{3}{8}$ per cent. on the gross rental of the house for domestic purposes, and 5*d*. per 1,000 gallons per meter for manufacturing purposes.

The gasworks were purchased by the Corporation in 1879 at a cost of 140,000*l*. At that time 111,800,000 cubic feet of gas were manufactured per annum. At the present time the works stand in the books at 172,000*l*., and are sending out annually 203,503,400 cubic feet of $18\frac{1}{2}$ candle power gas at the price (subject to discounts for quantities of over 20,000 cubic feet) of 2*s*. 9*d*. within the borough and of 3*s*. 3*d*. without the borough; the area of supply being considerably larger than that of the borough itself. Meters are supplied to consumers without charge.

The foundation stone of very handsome new municipal buildings was laid in 1873, and the work was completed in 1876. The buildings comprise a large and well-decorated assembly room, a fine council chamber, committee rooms, extensive municipal offices, a free public library, police station and offices, and a court-room.

The free public library, which was established and is maintained under the local Act, is not dependent on the penny in the pound rate of the Free Libraries Act, although the expense has, as a matter of fact, been kept within that limit; it contains 18,000 volumes in its lending and reference departments. There are well-appointed separate reading rooms for general readers, for ladies, and for boys. As compared with similar institutions in neighbouring towns, there is an exceptionally good use made of the books in all departments of literature. There are also two branch libraries in the outlying districts of the borough in connexion with this central one.

The County Borough of Salford.

BY

CHARLES E. PAGET, Medical Officer of Health.

Delegates to the Congress.

Alderman B. ROBINSON, Mayor.
Alderman A. L. DICKINS, J.P.
C. E. PAGET, M.R.C.S., L.R.C.P., D.P.H.

The county borough of Salford is a large town lying N.N.W. to, in part adjoining, and in part separated by the River Irwell from, the city of Manchester. The borough comprises three principal townships, viz., Salford, Pendleton, and Broughton. The former of these townships is the most important commercially, and certainly contains the most ancient property of the borough; a large portion of the Pendleton and Broughton townships is residential, though both townships also contain large mills and manufactories.

The total area of the borough is 5,170 acres, and is made up in the following township proportions: Salford, 1,329 acres; Pendleton, 2,415 acres; and Broughton, 1,426 acres.

The borough of Salford received its Charter of Incorporation in the year 1844, but before that time it was a free borough under a Charter of Ranulph, Earl of Chester and Lincoln, apparently in or about the year 1231. The Council at the present time consists of 64 members, of whom 16 are aldermen and 48 are councillors.

The population in the year 1831 was 52,366, and is now estimated to be 198,717. The rateable value of the borough is 782,158*l.*

An Act passed in 1862 extended the powers of the corporation.

An Act was obtained in 1857 for burial purposes, and in that year the cemetery was opened. In 1888 it was extended to double its original size.

Under the Salford Improvement Act of 1871 the corporation has carried out an extensive scheme for the disposal of the sewage and for its purification.

The intercepting sewer provides for carrying the whole of the sewage of the borough to the sewage works. It varies in size from 2 feet 6 inches by 2 feet 6 inches at the commencement to 8 feet by 7 feet at the outfall, It is over 8 miles in length, and cost upwards of 115,000*l.* The sewage works were opened in 1882. There is a pumping plant for raising the sewage to the level of the precipitation tanks, and the purified sewage then runs into the River Irwell. At present the sewage is being treated with lime, but, in view of the approaching completion of the Manchester Ship Canal, the corporation intend to abandon this process, and are experimenting to discover some process which will fulfil the requirements of the Rivers Pollution Prevention Act. The cost of the sewage works, including land, tanks, and machinery, was upwards of 84,000*l.*

The length of main sewers in the borough is over 160 miles, in addition to the main intercepting sewer.

The streets of the borough are paved and sewered, and the passages drained and flagged.

The total length of streets declared highways is over 120 miles.

The water supply is from the reservoirs of the Manchester Corporation.

The gas works are vested in the Corporation. In 1890 the Corporation obtained a Provisional Order for supplying the borough with the electric light.

In 1875 the Corporation obtained powers under which they have laid an extensive system of tramways, and, in 1885, powers to lay further new lines, as well as to authorise the use on the lines of steam, electric, or other motive power. There are 6¼ miles of double lines, and 8½ miles of single lines.

Extensive street improvements have been carried out from time to time. The Blackfriars Street Improvement, begun in 1871, was the means of demolishing a large number of small houses and cellar dwellings in the district of Greengate.

A large block of property, consisting of very insanitary dwellings, called Birtle's Square, was demolished in 1881, and the site has since been sold for warehouses.

A Local Government Board inquiry was held in March 1891 with reference to certain blocks of property, on which representations had been officially made by the medical officer of health under the Housing of the Working Classes Act, 1890, and negotiations for dealing with the premises are now in progress.

The area of these blocks is about 21,447 square yards, and the population to be displaced is about 1,450. The death-rates of these areas varied from 40·8 to 78·2 per 1,000 of the persons living in them. The Corporation is taking steps for the provision of a model common lodging house for the accommodation of a portion of the population which will be displaced by the demolition of the insanitary property.

The borough is well supplied with pleasure grounds. There are four parks, namely Peel Park, Seedley Park, Albert Park, Ordsall Park, comprising altogether about 100 acres. There are besides seven recreation grounds containing a total area of about 26 acres.

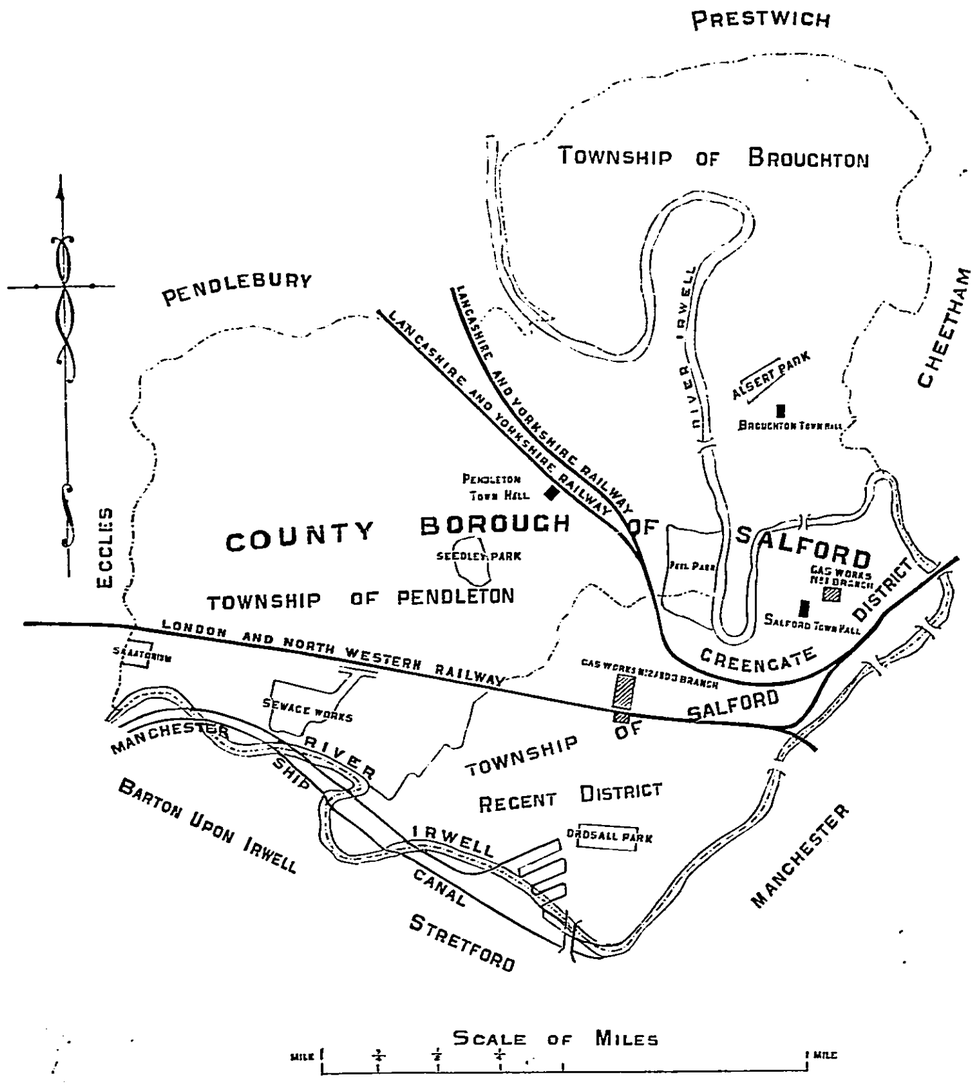
There are five public Free Libraries in the borough.

Two public baths have been established at a cost of 21,514*l.*, and two others of equal size are now in course of erection.

A hospital for infectious diseases was opened in 1876. A new hospital, to accommodate 184 beds, with 2,000 cubic feet of space per bed, is approaching completion. The land for this new hospital cost 13,101*l.*, and the buildings are estimated to cost 32,170*l.*

There is a large general hospital and dispensary, called the Salford Royal Hospital, in the Salford township, with a branch dispensary in the Pendleton township.

COUNTY BOROUGH OF SALFORD



The Notification of infectious diseases has been in force in the borough since the year 1883, under a local Act passed in 1882, but the general Act of 1889 is now in operation.

There are several charities in Salford, the principal one being the "Booth's Charity" for old people who have lived in the Salford township. Humphrey Booth the elder's Charity, was founded in 1630, and Humphrey Booth the grandson's Charity in 1695.

The income is derived from chief rent of land in Manchester and Salford, and from Government stock, and exceeds 9,600*l.* per annum. It is disposed of to about 550 recipients in sums varying from 5*s.* to 10*s.* weekly.

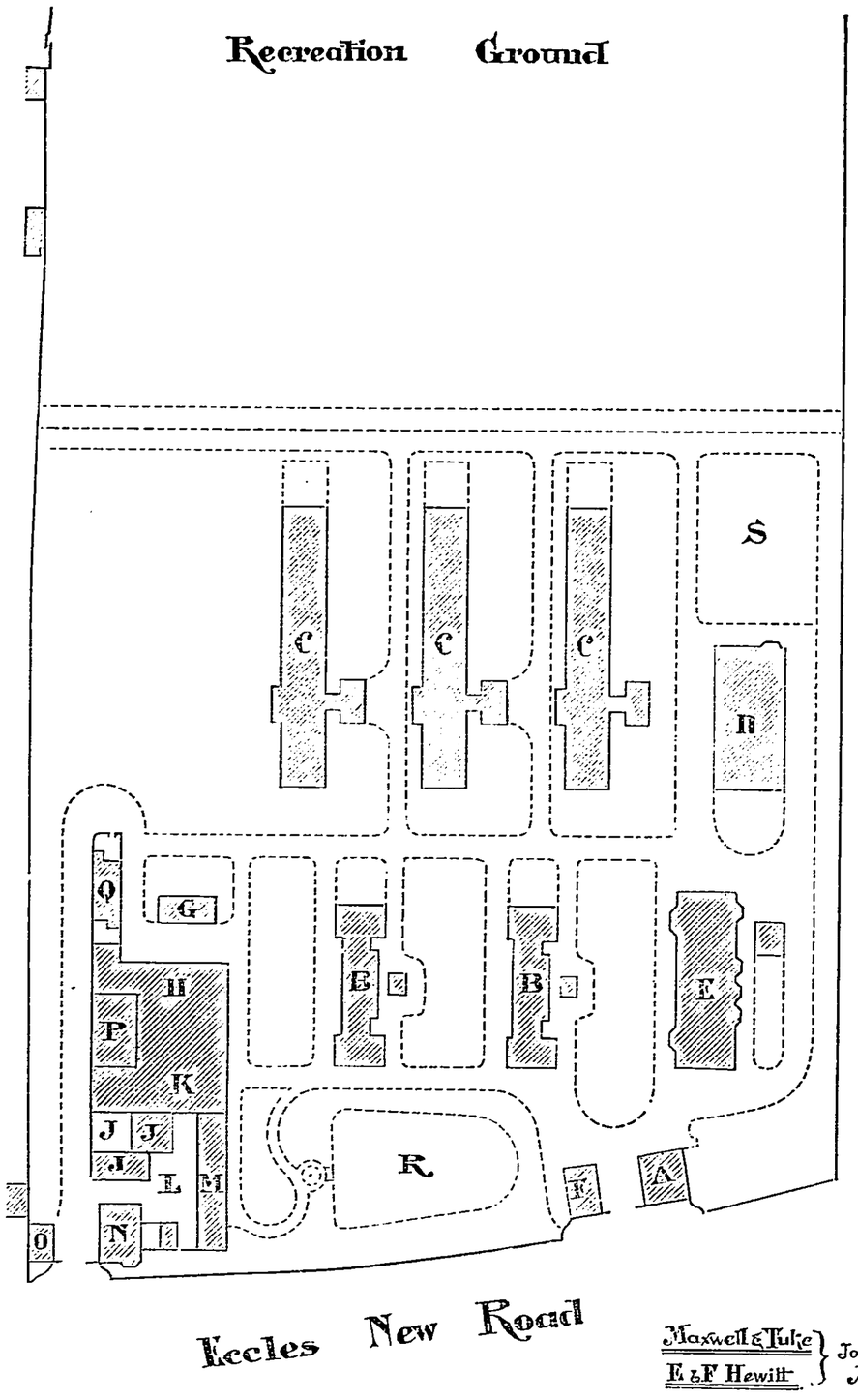
During the year ending March 25, 1891, 906 blankets, 100 counterpanes, 723 pairs of sheets, 1,322 yards of calico, 20 pieces of flannel, 365 yards of Melton cloth, 247 yards of Wincey, 53 shawls, and 16 pairs of shoes were distributed amongst the poor.

The blankets, &c., are stamped to prevent their being pawned, and special notices are sent to pawnbrokers at the time of each distribution.

In 1845 the Police force numbered 45 men; there is now a force of 330, including a chief constable, a deputy chief constable, one superintendent, and 13 inspectors.

A separate court of Quarter Sessions was granted to the borough in 1889.

SALFORD SANATORIUM.



Salford Sanatorium.

Reference to Plan.

A.—Lodge and office, and single men-servants' lodgings.
BB.—16 isolation wards to accommodate 40 patients.
CCC.—Pavilions. Total accommodation for 144 patients, with nurses' day-rooms, and offices.
D.—Kitchens, stores, and servants' residence.
E.—Residence of medical superintendent, matron, and nurses
F.—Discharging rooms, with bath room, and waiting rooms for parents or friends.
G.—Fuel.
H.—Patients' and staff laundries.
J.—Yard, van sheds, hearse, and ambulance.
K.—Disinfecting station for the borough.
L.—Yard.
M.—Stable, carriage-house, and harness-room.
N.—Lodge office for sanitary station.
O.—Mourners' room.
P.—Boiler-house.
Q.—Post-mortem room and mortuary.
R.—Nurses' recreation ground.
S.—Servants' recreation ground.

The Borough of Wallingford, Berks.

Delegates to the Congress.

HENRY HAWKINS, Mayor.
FRANCIS E. HEDGES, Town Clerk.

Wallingford, with a present population of 2,989, is an ancient fortified town on the banks of the Thames, surrounded by the river and a moat and earthworks; the greater part of the latter are still in existence. It was created a borough in the time of Edward the Confessor, and received Charters from Henry I. and Charles II. It formerly returned two members to Parliament until the Reform Act, 1832; and afterwards one, until its disenfranchisement in 1885. It is now included in the parliamentary division of North Berks.

The Corporation secured in 1884 an unfailing supply of excellent water which may be used free of cost for domestic purposes. The water is pumped by Otto gas engines from a deep tube well to a tower 60 feet in height. The water is of great purity, and remarkably free from hardness.

Drainage works are upon the point of being finished. Wallingford being flat and undrainable by gravitation only, the Shone hydro-pneumatic system has been adopted. By this system, ordinary gravitation drainage is taken advantage of as far as possible; but where, owing to the flatness of the district to be drained, ordinary gravitation cannot be resorted to without laying the sewers at great depths, recourse is had to mechanical power. The Shone system of distributing compressed-air power, from one air-compressing station, to as many ejector stations (which are the equivalents of so many pumping stations) as are required, to secure effective gravitation drainage to each station, meets the case at Wallingford admirably.

The municipal area of Wallingford is 404 acres; but the habitable areas are confined to the eastern, or Thames side. These habitable areas, for the sake of securing good gradients for the gravitation sewers, have been divided into three drainage districts. No. 1 contains 43 acres, No. 2, 30 acres, and No. 3, 93 acres. In each district there is an ejector station furnished with two ejectors of 100 gallons each. The positions of these ejector stations are shown on the accompanying outline plan of Wallingford, drawn to a scale of 6 inches to a mile. The position of the air-compressing station is also shown on the plan referred to. From the compressing station the compressed air is delivered to the ejectors in each station, through small cast-iron pipes, laid under the streets, and as the ejectors are automatic, they require very little attention. The two Atkinson "Cycle" gas engine air-compressors employed are also automatic, so that this system of rapidly collecting and ejecting sewage requires the very minimum of attention.

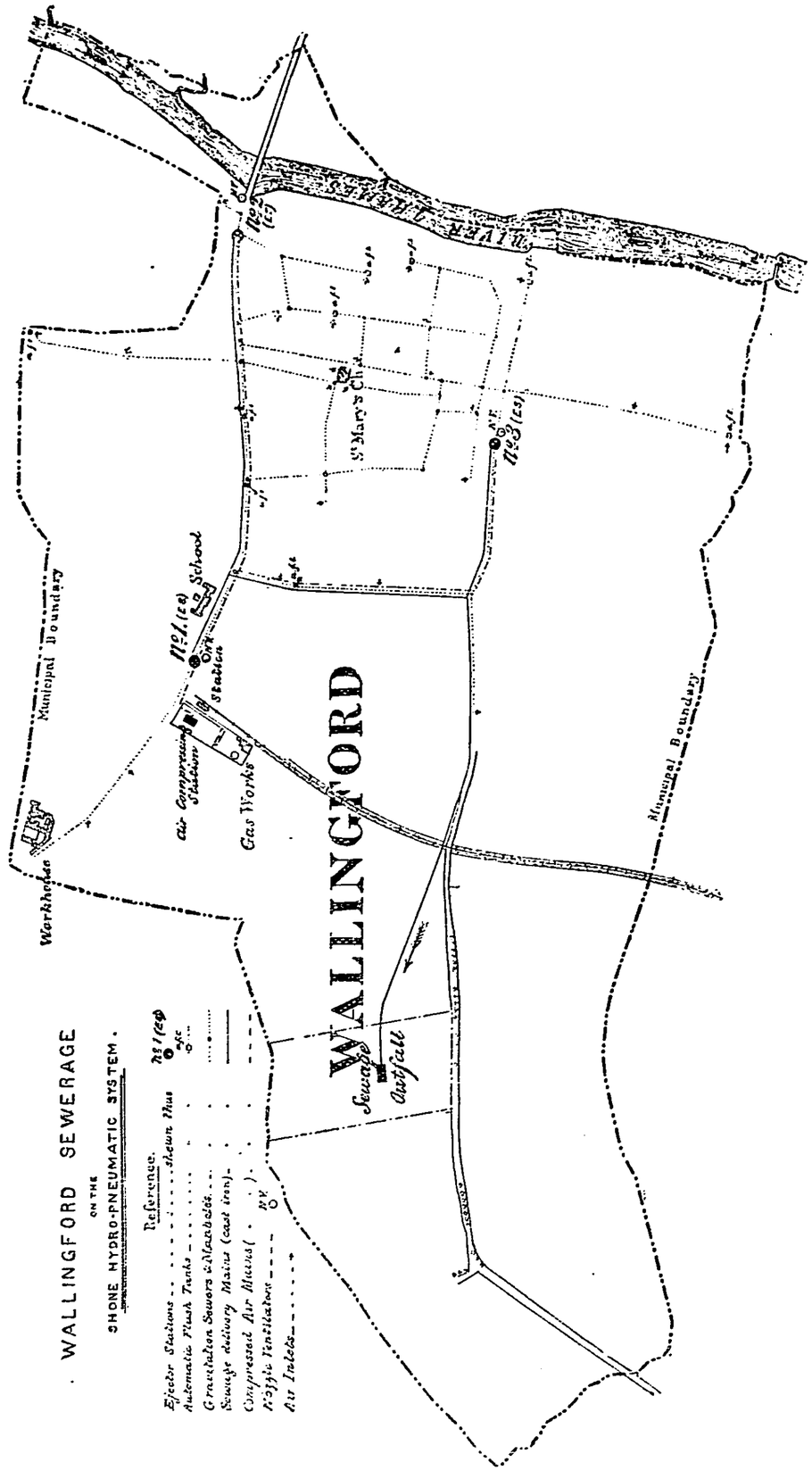
There are nine automatic flush tanks at the heads of the main sewers. All the manholes on the line of the main sewers have hermetically closed covers. Fresh air is admitted into the main sewers through stand-pipes

erected at intervals on the lines of the sewers. The admission of the fresh air takes place at the tops of the inlet stand-pipes which are 7 feet above the level of the streets, and the efflux of the air takes place at the tops of ventilating stand-pipes or shafts 30 feet above the level of the street. These ventilating stand-pipes or shafts are erected in such situations near to the ejector stations as are convenient and suitable for the purpose. Fresh air is drawn into the main sewers through the several air inlets by a more or less powerful vacuum action, produced by pneumatic nozzle ventilators, placed at, or near to, the base of the efflux stand-pipes. The vacuum is created by the action of the exhaust air from the ejectors passing through the nozzles.

The velocity at which the exhaust air proceeds from the ejectors when they are being filled with sewage is sufficiently great, when it is escaping to the efflux ventilating pipe through the nozzle, to induce an extraneous current to follow it, and this latter proceeds from the sewers, having been drawn therein from the atmosphere through the various inlet ventilating pipes.

The induced current of air from the sewers is greatest when the charge of compressed air—after it has done its work in expelling the sewage—is escaping from the ejectors. The action of the induced current may be likened to the action of the water tank discharging its contents suddenly and rapidly into the sewers to flush them.

The Wallingford sewers will thus be flushed with water and with air; and by reason of the comparative steepness of the gradients at which the main collecting sewers pipes are laid throughout the entire system, they will be, or ought to be, rendered permanently self-cleansing; because under such conditions foul air charged with sewage gas cannot be produced within them. The sewage is to be ejected from the three ejector stations through iron sealed pipes on to 10 acres of land outside the town, specially prepared for its utilization and purification. Just as fast or as slow as the sewage is delivered, while fresh and harmless, into the ejectors, so fast, or so slow, will it be delivered in the like condition into an automatic discharging tank of 3,000 gallons capacity at the outfall. At the inflow end of the automatic tank the sewage is screened from its solid accompaniments, and the time occupied in filling this tank will be sufficiently long to permit of a fairly good deposition of the suspended matters, so that when the tank is discharged its contents will be largely freed from those constituents which have a tendency to choke up the pores of the soil in the filtration area on to which it will flow. Moreover the filtration area is divided into beds, which are so arranged that one charge of the tank will only be enough to irrigate, to a moderate extent, one bed at a time. After the whole contents of the tank have been discharged onto a bed the sewage will gradually percolate into the soil, and before a second discharge can take place the first will have been partially if not wholly absorbed; the land now prepared for its reception being very suitable for the purification of sewage by intermittent subsidence in the manner described.



The corporation have been informed that their drainage and water system are more satisfactory than any in existence. Be this as it may, the sanitary condition of Wallingford leaves little to be desired. The sewerage works were designed and carried out by Messrs. Shone and Ault, of Great George Street, Westminster.

The death-rate is only 15·3 per thousand, and it is hoped that under the improved sanitary conditions it may be still further reduced.

The subsoil is composed of gravel and sand throughout, as has been proved during the recent excavations for drainage purposes, and to this fact must be attributed the high standard of health which the town has always preserved.

A market is held here on every Friday. The corporation consists of a mayor, four aldermen, and twelve councillors.

The town hall, *temp.* Charles II., an erection upon massive pillars, is very quaint. It contains portraits by Gainsborough, Sir Thomas Lawrence, G. D. Leslie, R.A., James Hayllar, and others. There is an excellent cottage hospital, a public bathing place, a free library, and three churches, of which the old church of St. Leonard is a very perfect specimen of Norman architecture. The grounds of Wallingford Castle are full of interest, and the neighbourhood is pretty.

The County Borough of Wolverhampton.

Delegates to the Congress.

Alderman Jackson, F.R.C.S., J.P.
Alderman J. C. Major, J.P.

Wolverhampton is a Parliamentary and Municipal Borough of West Staffordshire, and also a County Borough under the Local Government (England and Wales) Act, 1888.

So long ago as A.D. 659, Wulfere, first Christian King of Mercia, established a monastery here, but of this no vestiges remain; and nothing further is known of Wolverhampton until 996, when Wulfruna, widow of the Duke of Northampton, founded a church dedicated to the Virgin (now St. Peter's, or as it is more familiarly called "the Old Church"). This church was accounted one of the King's free chapels, and was annexed by Edward IV. to the Deanery of Windsor.

Little improvement occurred after this date until the reign of Henry III., when that Monarch, on the 4th February 1258, granted a charter for a market to be holden here on every Wednesday, and a fair to be kept annually for eight days, commencing on the vigil of the Feast of St. Peter and St. Paul. The next public event of importance was the erection of the Free Grammar School, which was founded by Stephen Jennyns in 1515; at this school Congreve and Abernethy were educated. The school, one of the most useful of the many public institutions of which the town can boast, is now carried on in a new and imposing building situate in a most pleasant part of the town.

Up to the 54th year of the reign of George III. the only local authority having jurisdiction over the town appears to have been a county magistrate appointed for the district; but in that year an Act was passed for its better government by commissioners. A Court of Request was about the same time established for the recovery of sums under 5*l.*

In recent times the town has rapidly increased in population, wealth, and enlightenment, and is now the largest manufacturing town in the county, being known as the "Metropolis of the Black Country."

The town was enfranchised by the Reform Act of 1832, and was allotted two members. By the Redistribution of Seats Act, 1885, the Parliamentary Borough of Wolverhampton was accorded the privilege of returning three members of Parliament.

The population of the Municipal Borough at the present time is 82,600.

The area is 3,440 acres, and the rateable value 270,125*l.*

Wolverhampton was first incorporated as a Municipal Borough in 1848.

In the year 1850 by Provisional Order confirmed by Act of Parliament, the Public Health Act, 1848, except a small portion thereof, was applied to the borough.

By the Wolverhampton Improvement Act, 1853, provision was made for the improvement, regulation, and cleansing of the borough, and for the maintenance and regulation of the markets and fairs thereon, and for other purposes.

The Corporation, which acts as the Urban Sanitary Authority, consists of 12 aldermen and 36 councillors, presided over by the mayor.

The borough has a Commission of the Peace (the first granted on the 27th July 1849), and a separate Court of Quarter Sessions granted on the 6th May 1864. It possesses also a separate police force, consisting of one chief constable, one superintendent, four inspectors, 12 sergeants, and 62 constables. There is also an efficient fire-brigade.

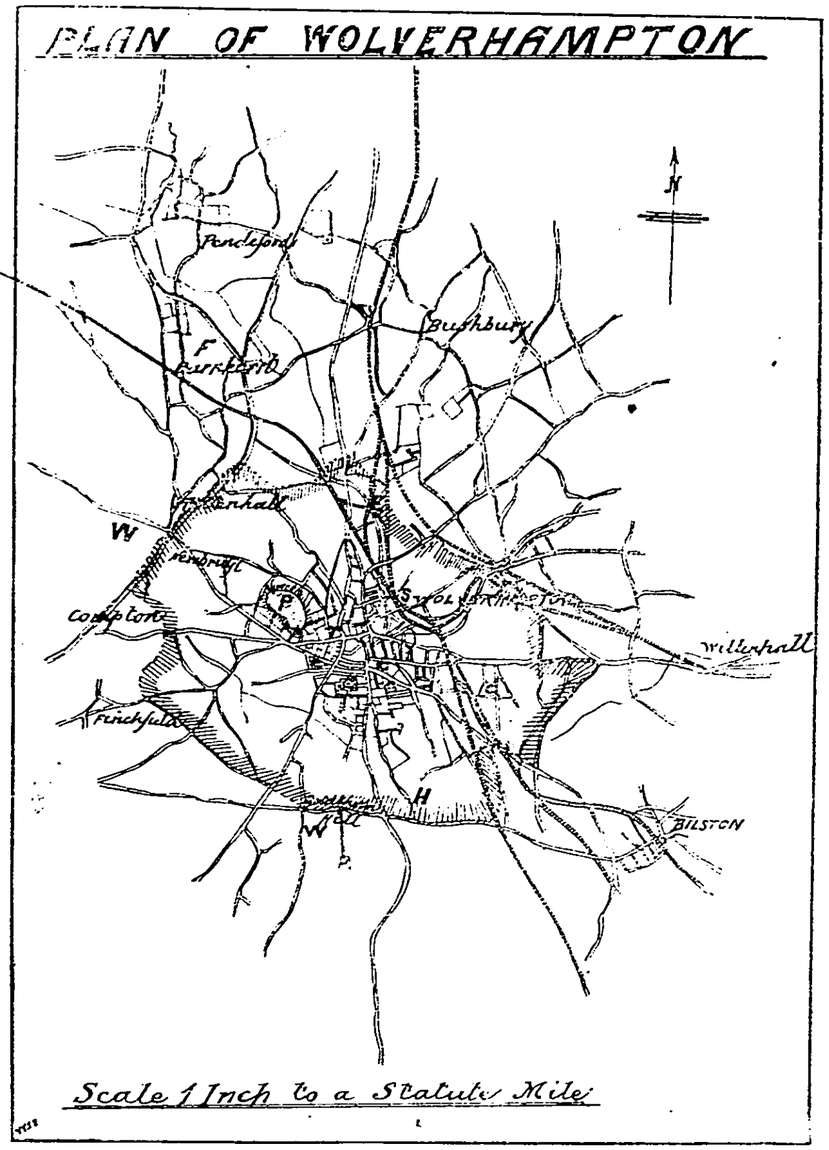
Under the provisions of the Artizans and Labourers Dwellings Improvement Act, 1875, the Corporation acquired, at great cost, a considerable area of land in the heart of the town. The sanitary defects of this area being such as to be irremediable except by some improvement scheme which would lead to the demolition of most of the houses, with a view to a re-arrangement of dwellings and a reconstruction of streets, the Council took all necessary steps to that end. The entire extent of the "condemned area" was 16 acres, inclusive of streets. The total capital expenditure in respect of the scheme is 217,862*l.*

The Market Hall, opened in March 1853, was erected at a cost of about 30,000*l.*, and belongs to the Corporation. Adjoining the Market Hall is an extensive wholesale market, which has been laid out at great cost. The Corporation also possess a commodious cattle market.

The Municipal Buildings (which consist of council chamber, quarter sessions court, magistrates' court, committee rooms, offices, police barracks and cells) are in the Italian style of architecture, and were built at an outlay of nearly 20,000*l.*, in addition to the cost of the greater portion of the site.

The Wolverhampton Baths were erected in the year 1860 by a Joint Stock Company, but they are now the property of the Corporation by whom they were purchased in 1875.

The Art Gallery and Museum have been erected at the expense of a generous burgess upon land appropriated for that purpose by the Corporation. The buildings are of Bath stone in the classic style and the façades exhibit two orders of architecture, the Doric being employed for the ground-floor storey, and the Ionic for the storey above. The ground floor is devoted to the museum, and the upper storey to the picture galleries; the front of this storey and the side facing St. Peter's Church is filled in with sculptured panels in Portland Stone containing emblematic figures in bold relief by Doulton, representing painting, sculpture, and science. Mrs. Maria Christian Cartwright (widow of the late Mr. Sidney Cartwright, a burgess of Wolverhampton) by her will, dated 18th August 1883, bequeathed a valuable collection of pictures to the Corporation. Many other choice pictures and works of art have been gratuituously provided for the gallery, and donations have



INDEX TO PLAN.

C.—Churches.
H.—Infectious Hospital.
W.—Pumping Stations (Wolverhampton Waterworks).
F.—Sewerage Farm and Outfall Works.
T.—Town Hall.
P.—Public Park.
S.—Railway Station.
E.—Fox's Lane Depôt, Night Soil Department.

also been given towards the purchase of other requisities for the same institution.

Upon land appropriated by the Corporation and adjoining the gallery of art, a building has been erected for a school of science and art by means of funds raised by voluntary subscriptions aided by a grant from the Science and Art Department. By the generosity of a deceased townsman a scholarship has been founded in connexion with this institution.

The Municipal Free Library comprises libraries, lecture hall, museum, science class-rooms, and a reading room. There are about 32,000 volumes in the library, including a reference library of 5,633 volumes and a lending library. In connexion with this Institution chemical and metallurgical laboratories have been established.

The rate authorised to be levied under the Public Libraries Act, 1855, being insufficient to defray the expenses necessary for the proper carrying on and maintenance of the Free Library and the Gallery of Art and School of Science and Art, the Corporation obtained powers in the Wolverhampton Corporation Act, 1887, to levy an additional rate of one penny in the pound.

A public park, covering an area of 50 acres, forms one of the most pleasing features of the town, and has been laid out at a cost of 16,000*l*. The property is held upon lease from the Duke of Cleveland for a period of 63 years from the 25th March 1879, with right of pre-emption at the expiration of that term.

In 1869 the Corporation obtained an Act for defining and extending their powers in relation to the management of streets and to sewerage and to police, and other matters of local government, as well as to water supply and for other purposes. This Act was amended by Provisional Order (confirmed by Act of Parliament in 1888), whereby additional powers were conferred upon the Corporation in relation to the public park, new buildings, hackney carriages, and financial matters. In 1882 the Corporation were empowered by Act of Parliament to exercise their statutory borrowing powers for the time being by means of the creation and issue of Corporation Stock.

Under the authority of the Act of 1869 an important sewage scheme was formulated and carried into effect. The Sewage Farm, consisting of 330 acres and th outfall works are situate outside the borough. The total cost of the whole scheme is estimated at upwards of 182,000*l*. Great difficulties have been occasioned in regard to the utilisation of the sewage of the borough by reason chiefly of the geographical situation and the physical altitude of the district, the large volume of the effluent to be carried off and the small capacity of the stream into which it is discharged; special relief was, therefore, extended to the Corporation by the Wolverhampton Corporation Act, 1891.

In 1867 the Corporation acquired the control of the water supply of the borough and of certain adjoining districts by transfer from a water-works company. The water delivered for consumption is, according to analysis, of unusually good quality, superior, in fact, in organic purity to generality of town supplies, not even excepting that obtained by

Glasgow from Loch Katrine. Part of the supply is derived from springs in the red sandstone rock at Tettenhall and Goldthorn Hill, where there are storage reservoirs; the one at Tettenhall is capable of holding 14,000,000, and that at Goldthorn Hill 1,500,000 gallons. The principal supply of water, however, is obtained from an Artesian well at Cosford, near Shifnal (Salop), about 10 miles from Wolverhampton, where the Corporation have a commodious pumping station and a very costly and efficient plant. The daily average consumption of water for all purposes amount to upwards of 3,250,000 gallons.

The Corporation have erected a hospital for the treatment of infectious diseases capable of accommodating about 60 patients. The cost of this building has been about 4,000*l.*

The total number of streets and roads is 370, and their total length 68 miles. They are all lighted and well maintained.

The Corporation have also adopted the Notification of Disease Act, the Infectious Disease (Prevention) Act, and the Public Health Acts Amendment Act.

The gasworks, tramways, and cemetery belong to private companies.

From the foregoing sketch of the municipal history of this borough, it will be observed that Wolverhampton does not fall short of other large towns in its desire to uphold and carry into effect, as far as possible, the principles of local government, whereby the moral, physical, social, and intellectual welfare of its inhabitants may be secured.

The Sanitation of the City of Ahmedabad, in the Bombay Presidency.

BY

RUNCHORELAL CHOTALALL, President of the Ahmedabad Municipality.

The city of Ahmedabad is situated in north latitude 23° 1′ and east longitude 72° 37′, on the left bank of the Saburmattee River, about 173 feet above mean sea-level, and 50 miles north of the Gulf of Cambay. The area within the city walls is about two square miles, and contains a population of 124,716 according to the latest census, that of 1891. The jurisdiction of the Ahmedabad municipality extends to the suburbs situated beyond the city walls, the population of which is 18,948, making the total municipal population 143,664 in 1891. The population by the previous census, that of 1881, was 127,210. There are seven cotton mills in Ahmedabad and its neighbourhood, which attract persons from the surrounding districts, and hence the more than normal increase in population. The average rainfall is about 30 inches, and it generally rains during the four months from June to September; the remaining eight months are the fair season.

The soil on which the city of Ahmedabad stands is a very light sandy loam, very porous and dry. The average level of the subsoil water in a fair season stands about 23 feet below the general level of the city.

With such a dry and naturally healthy soil, and such a favourable condition of the movement of subsoil water, Ahmedabad should be a very healthy city, but, owing to the absence of proper sanitation, it has had the misfortune of showing a very heavy mortality.

There being no drainage system for the removal of liquid filth, all the impurities are being soaked into the soil or evaporated in the streets. For the disposal of sewage and other filthy liquid, a system of cesspools, called "khalcoovas," prevails in Ahmedabad. A "khalcoova" is in construction like a dry well. On a wooden kerb a steining of bricks is built dry without mortar in the joints, so that water may easily find its way through it, and this brick cylinder is sunk to within a few feet of the subsoil water-level. The top of this well, about five feet below ground-level, is arched over with a brick and mortar dome; a connexion with the house drain being made, earth is filled in over the dome. All the sullage water of the house is run off into the "khalcoova"—all the bathing water, the kitchen water, the urine, the washings of the privies, and every conceivable liquid filth. All the liquid thrown into this khalcoova or cesspool filters through the sandy soil at the bottom and sides and finds its way into the subsoil water, and thus these khalcoovas are kept in working order, without opening and cleaning out, for more than 30 or 40 years. But the result of the system has been that water of all the wells in the city is so much

polluted as to be quite unfit for drinking. Most of the wells in the city are so badly affected by these khalcoovas that their water is too brackish to be drinkable in any form whatever; however, this water is freely used for washing, bathing, and all other domestic purposes.

But there are some wells in the city, the water of which is not very badly affected, and is, therefore, used for drinking by the people, though under chemical analysis it shows unmistakeable signs of dangerous sewage pollutions.

It will, therefore, be seen that while the water of all the wells outside the city is good for drinking, the wells in the city are so polluted by the objectionable system of khalcoovas that the water therefrom is totally unfit for this purpose. The present system of disposing of the sewage in Ahmedabad is such as to pollute the earth, water, and air, and the result is that the death-rate of Ahmedabad is almost the heaviest in the Bombay Presidency.

From time immemorial there existed a system of deep-well privies in Ahmedabad into which the solid night-soil was collected within the house itself. These privies were also built on the same principle as khalcoovas, with the exception that they were not arched over and were inside the house. They, too, were not cleansed for years, because the owners managed to throw some quantity of salt into the privies to reduce the solid excreta to a liquid state, so that it might soak out through the bottom and sides. The effluvium arising from these well-privies found its way into the house, and was necessarily mixed with the air breathed by the inmates of the house. The nuisance of these deep-well privies was so horrible that on the representation of the Sanitary Commissioner these privies were closed and filled up in the years 1878–79 and 1879–80, and open privies, which could be cleansed daily, were substituted, and the change was followed by a perceptibly good effect.

There exist returns of the mortality in Ahmedabad for 17 years since 1874, and I have appended a statement showing the population, the total of deaths, and the ratio of deaths per 1,000 of population. I have divided the time into three periods. The first period is of six years, from 1874–75 to 1879–80, when the system of deep-well privies was in existence, and it will be seen that the average death rate of this period was 54·75 per 1,000 of population per annum. The second period of six years, from 1880–81 to 1885–86, is one when all the human excreta from the city were removed and deposited half a mile from the city, and the result has been that the death-rate was reduced to 44·74 per 1,000. But in 1886 the Municipality thought it proper to remove the night-soil depôts from the vicinity of the city to a distance of about three miles in a leeward direction, by laying down a tramway, worked by animal power, and to have the night-soil converted into poudrette to be used as manure; and the result in this third and last period of five years, from 1886–87 to 1890–91, is that the average death rate has been 40·43. The average would have been somewhat less had it not been for the unusual epidemic of influenza in the year 1889–90.

I am glad to state that since the introduction of the system of local self-government, good progress is being made with the assistance and encouragement of Government in the sanitary improvement of Ahmedabad. A line of tramway exists for the removal of night soil, as stated above; and a sufficient supply of water is now an accomplished fact, the new waterworks (the water of which is pronounced by the chemical analyst to be very good) having been opened on the 11th of June 1891, and it is hoped that this will lead to great improvement in the health of the town.

The most important subject of drainage, by which the abominable system of khalcoovas can be done away with, is now under immediate consideration. The Municipality has obtained the advice of the distinguished sanitary expert, Mr. Baldwin Latham, towards draining a portion of the city, and it is hoped that in the course of a year the experiment will be made, which may lead to further extension.

Ahmedabad is not the only city the sanitary condition of which requires to be improved. There are hundreds and thousands of towns in India where the same objectionable system of deep-well privies, and khalcoovas (cesspits), and impure water-supply prevail; but if Government and the municipalities will only do what is necessary, the general death-rate can be so reduced as to save hundreds of thousands of human lives every year.

Appendix.

A Return showing Variations in the Death Rate of the City of Ahmedabad in connexion with the disposal of Night-Soil.

No.	Year.	Population.	Deaths.	Ratio of Deaths per Thousand.	Remarks.
1	1874-75	120,318	5,305	44·09	In this period the system of deep-well privies was in existence.
2	1875-76	121,467	6,604	54·36	
3	1876-77	122,615	6,274	51·17	
4	1877-78	123,764	5,585	45·12	
5	1878 79	124,912	8,452	67·66	
6	1879-80	126,061	8,253	65·47	
		739,137	40,473	54·75	
	Average -	—	6,745	—	
1	1880-81	127,210	5,430	42·69	In this period the filth removed from the city was kept in its vicinity.
2	1881-82	128,855	6,825	52·96	
3	1882-83	130,500	5,061	38·78	
4	1883-84	132,116	5,090	38·52	
5	1884-85	133,791	6,123	45·76	
6	1885-86	135,437	6,729	49·68	
		787,939	35,258	44·74	
	Average -	—	5,876	—	
1	1886-87	137,082	4,497	32·81	In this period night-soil depôts were removed at a distance of three miles in a leeward direction.
2	1887-88	138,727	4,719	34·01	
3	1888-89	140,373	6,805	48·48	
4	1889-90	142,018	7,110	50·28	
5	1890-91	143,664	5,217	36·32	
		701,864	28,378	40·43	
	Average -	—	5,675	—	

The City of Bombay.

Delegate:

E. C. K. Ollivant, C.I.E.

The city of Bombay is situated on the western shore of India. Formerly at high tide it was a collection of islets, and at low tide a pestilential swamp studded with eminences. But by the judicious construction of embankments and breakwaters to shut out the sea (the first of which, viz., Hornby Vellard, was constructed during the period 1771 to 1784, during the time of Governor Horaby) and by the construction of roads across what had hitherto been marsh land (the first of which, Grant Road, was built in 1835), and by the gradual reclamation of the low-lying lands, the sea was excluded, and the islets united together at their bases, and thus a mass of land was formed containing an area slightly in excess of 22 square miles. It is an island, or rather a peninsula, connected with the mainland by two causeways and two lines of railway.

The population of Bombay, estimated to be 10,000 in 1662, had increased to 16,000 in 1716. In 1816 the population was 221,550, which had again increased to 810,000 in 1891.

A writer 200 years ago, when describing Bombay, states "the "unhealthiness of the water bore a just proportion to the scarcity and "meanness of the diet," and then adds, "out of every 500 Europeans "who came to live on the island, not 100 left it." Thirty-two years ago 70 deaths in a day from cholera was not an uncommon occurrence. At that date Bombay was dependent for its water-supply on the local wells and tanks, and the average annual number of deaths from cholera alone was returned at 2,241. On the introduction, however, of water from the Vehar Lake, the average was immediately reduced to 507, and in proportion as that supply has become generally adopted a still further reduction has taken place, the return of deaths by cholera for 1890 being 102. "Guinea worm," which was a common complaint in Bombay, commenced to disappear with the improvement in the water supply, and is now almost unknown.

The city is at present supplied with water from two artificial lakes, viz., Vehar and Tulsi, situated in the island of Salsette, distant about 10 miles north of Bombay. These two lakes, with the necessary service reservoirs in the city cost about Rs. 1,15,00,000 (1,150,000*l.* at 2*s.* the rupee). A third lake has been constructed at Tansa, 55 miles away from the city, which, with the duct which is nearly complete, will cost about 1,500,000*l.*, taking the rupee at 2*s.* The Tansa Lake is the largest of the three, having an area of 5½ square miles, and a watershed of 52·50 square miles. It is expected to be completed, with all its accessory works, in March 1892, and is the most costly municipal work yet undertaken in India, while the masonry dam which impounds the water is believed to be the largest in the world. These three lakes will

supply the city with 32,750,000 gallons of water per diem at an average pressure of 100 feet, which, for a population of 810,000, equals about 40 gallons per head per day. The Tansa Lake is capable of supplying a much larger quantity, which can be made use of when the time comes by adding to the capacity of the duct.

Extensive drainage works have been, and are still being, carried out, and up to date nearly 55·33 miles of sewers have been laid at a cost of Rs. 40,96,561 (406,560*l.*). The main principle on which the sewerage works have been designed is to secure segregation of storm-water from the sewage, a necessity consequent upon the concentration of the annual rainfall within a short period of the year, and on the inability to construct channels to do the dual duty of sewers and drains under the variable condition of flow during the dry and wet seasons. Before the new works were commenced, the city was drained by flat-bottomed masonry drains, many of vast dimensions, which received both storm-water and sewage, and which during fair weather became merely elongated cesspools. Under the present project, the main sewers, both masonry and pipe sewers, have been constructed on the most approved and modern principles of sanitation. The sewerage works when completed will cost probably not less than 1,000,000*l.*

As the greater proportion of the thickly populated area of the city is hemmed in on two sides by ridges of high land, the storm-water falling on the inward slope of the latter, and gravitating to that portion of the city which is flat and below high water mark, used to flood it to a very serious extent.

In order to prevent this, large intercepting drains for a length of 5·21 miles have been recently constructed, to cut off the low-lying from the high level district and to carry away the storm-water falling on the latter directly to the sea. The Municipal Corporation obtained last year from Europe the services of the eminent sanitary engineer, Mr. Baldwin Latham, to report and advise on the drainage and sewerage of the city.

Since the passing of the Municipal Act of 1872 special attention has been paid to the maintenance of roads, and to the construction of new roads. The road surface invariably consists of at least 6 inches of macadamised trap rock laid on 6 inches of rubble packing of the same material. Many new roads have been constructed of late years, and many more have been recently sanctioned, especially for the purpose of developing the northern portion of the island, to meet the ever-increasing demand for building land.

The total length of public roads is 142·57 miles, and the total length of private roads is 36·50 miles. The total area of the public roads is 3,674,138 square yards, and that of private roads is 1,599,459 square yards. The total area of paved footpath is 124,354 square yards. The greater portion of the city is lighted with gaslights, and the northern or suburban portion of the city is lighted with kerosine oil lights. There are 3,600 gas lamps, and 1,512 kerosine oil lamps in the city.

Prior to 1872 most of the public streets were narrow and crooked. Since then many of them have been much improved by taking up land on either side whenever opportunity offered, and by throwing the land so taken up into them. This process, however, is slow and expensive, and the old streets in the thickly-peopled portion of the city leave much to be desired.

Several public markets have been provided in the city, of which the Arthur Crawford Market is the most extensive and the most imposing, having an almost world-wide reputation. An extensive abattoir has also been constructed at the northernmost verge of and without the city, where all animals intended for food are slaughtered and dressed for the market before being sent into Bombay. Here also the carcasses are subjected to inspection, and to rejection if found in any way unfit for human food, while the joints are again inspected on arriving at the market.

There are nine public gardens in the city, having a joint area of 179 acres. In the largest of them, the Victoria Gardens, a small zoological collection is maintained.

There are 11 hospitals, to one of which, viz., the Jamsetjee Jeejeebhoy Hospital, the chief medical school of the Presidency, viz., the Grant Medical College, is attached. An asylum and hospital for lepers was erected last year by public subscription, and contains now more than 240 lepers.

The city, forming as it does the terminus of two of the most important railways in India, viz., the Bombay, Baroda, and Central India Railway, and the Great Indian Peninsula Railway, with its magnificent harbour, affording unlimited protection to shipping of any burthen lying in mid-stream, and also safe and convenient landing at its several wharves and docks (especially the Prince's and the Victoria Docks), has become the chief emporium of trade in India. The average total trade per annum, both export and import, amounted to Rs. 1,38,00,000 at the commencement of the 19th century, and had increased to Rs. 83,18,66,426, or nearly 60-fold, in the year 1889.

Statistical Summary.

Population, 1891, 810,000.

Average death-rate per 1,000 for the last five years, 24·55.

Maximum temperature of air, 100°·20; mean temperature of air, 79°·13; minimum temperature of air, 53°·30; average annual rainfall from 1843 to 1889, 70·97 inches.

Maximum daily rainfall (6th June 1886), 16·10″; maximum hourly rainfall (12th June 1847), 4·22″.

Length of public roads, 142·57 miles; length of private roads, 36·50 miles; area of public roads, 3,674,138 square yards; area of private roads, 1,599,459 square yards; area of paved footpath 124,354 square yards.

Number of gaslights, 3,600; number of kerosine oil lights, 1,512.

Length of brick and pipe sewers, 55·33 miles.

Annual municipal revenue, Rs. 53,42,170; rate of taxation per head (consolidated) $15\frac{3}{4}\%$ on the gross annual rental minus 10%.

Rateable value of properties in Bombay, Rs. 2,73,61,359; number of buildings, 33,106.

Area of Tansa Lake, 5,713 acres; area of gathering ground for Tansa Lake, 33,600 acres.

Area of Vehar Lake, 1,400 acres; area of gathering ground for Vehar, 3,900 acres.

Area of Tulsi Lake, 331 acres; area of gathering ground for Tulsi, 1,714 acres.

Water-supply per head when Tansa Lake is finished, 40 gallons.

Number of fire brigade stations, 9; number of steam fire engines, 7; number of manual engines, 7.

Tram lines (double track), 10·27 miles; tram lines (single track), 7 miles.

Number of public gardens, 9, with an area of 52 acres.

Value of important public buildings, Rs. 1,50,00,000; steam roller for roads, 20; spinning and weaving mills, 69; presses, 6.

Sanitary Improvements in the City of Calcutta.

BY

H. J. S. Cotton, B.C.S., Secretary to the Government of Bengal, Delegate from the Corporation of Calcutta.

The underground drainage system of Calcutta was commenced in 1859. The total expenditure incurred on the work up to the 31st March 1890 is about 110 lakhs of rupees.

The number of premises connected with the sewers is 25,938. There are 37 miles of main or brick sewers, and 147 miles of pipe sewers. The enormous improvement effected by the obliteration of the old open drains—an elongated cesspool, as they have been called—and the substitution of underground drainage in their place, can only be appreciated by those who remember Calcutta in former days; but it may still be partially realised by a visit to the suburbs of the town, where open drains still exist. A survey for the systematic drainage of the suburbs is now in progress.

The total capital sunk in the Calcutta Water Works is, in round numbers, Rs. 1,42,72,000, of which nearly half has been spent on extensions of the original scheme. This outlay has been amply repaid, not only by the improved health of the inhabitants, but also by the increase of wealth and material prosperity which the reputation for good drinking water has attracted to the city. It was officially stated in November last that there were 990 standposts on the filtered, and 2,505 ground hydrants on the unfiltered system. The number of house ferule connexions was 16,321. The daily supply had then reached an average of 35·4 gallons of filtered water, and 8·9 gallons of unfiltered water per head of the population. The filtered water is of the highest possible quality of purity.

The roadway of the town has been augmented during the past 12 years by about 10 per cent., and the area of roads watered by 33 per cent. The lighting of the town has increased from 3,418 lamps to 4,892. The quantity of refuse removed from the town has more than doubled, having increased from about 80,000 to more than 201,000 tons. About 240 impure and insanitary tanks have been filled up, and tanks other than those in private enclosures are now very rare in any part of the town, except the extreme north. In the place of tanks, the town has been studded with 86 bathing platforms for the use of the poorer inhabitants. Six public squares have been constructed and laid out at considerable expense, to the great advantage of the people living in the neighbourhood. Organised measures have been adopted for the reclamation of bastees,* at a cost of more than 10 lakhs of rupees.

It was observed by one of the late health officers of Calcutta, in a published address, that "Calcutta has, to sight and sense, within living

* Clusters of huts inhabited by the poorer classes.

memory, undergone a revolution"; and it may be added that during the past 12 years the changes effected have been more rapid and decisive than in the 20 years which preceded them. Dividing these years into three quadrennial periods, it is found that, during the first of these periods, the total number of deaths was 62,226, during the second 49,863, and during the third 45,793. But the improvement is most marked in its effect upon the wealth of the town. It is stated to be, on the whole, a very moderate estimate that, while the population has practically remained stationary, the value of land has more than doubled since 1878, and that the increased value to the owners is about nine crores of rupees. It would be difficult to produce a more decisive tribute to the wisdom of sanitation.

The present recorded death-rate of Calcutta varies from 25 to 30 per thousand. These statistics, however, place the public health of Calcutta in a fictitiously favourable light. The population is largely an immigrant one, and more than half consists of individuals who are in the full vigour of manhood and womanhood, the majority of whom, when they become seriously ill, leave Calcutta for their homes. On the other hand, it is usual among persons of the respectable and middle classes, when they are old or ill, to come into Calcutta on account of its superior sanitary attractions, and for medical attendance. But while the death-rate cannot be accepted as an absolute test of the health of the city, the statistics do enable a comparison to be made of the mortality in different years; and it is highly interesting to notice the great diminution in the number of deaths from such principal diseases as cholera and fever since the drainage works have been constructed, a pure water-supply given, and other sanitary improvements set on foot.

The mortality from cholera in Calcutta has been carefully registered for the past 50 years, and the average annual number of deaths from this cause during each of the five decades is as follows:—

1840 to 1889.	Average Annual No. of Deaths.
First decade, 1840 to 1849	4,818
Second decade, 1850 to 1859	4,261
Third decade, 1860 to 1869	4,747
Fourth decade, 1870 to 1879	1,327
Fifth decade, 1880 to 1889	1,640

There is, no doubt, a marked periodicity in the mortality from cholera, which seems to point to some biological law in the life-history of cholera contagion. The synchronous rise and fall of cholera in Calcutta and in the neighbouring districts of Bengal is of almost invariable occurrence. Calcutta is affected by causes not peculiar to itself, but common to all the neighbouring localities, and although the incidence of mortality is now low in Calcutta in consequence of the extensive sanitary works which have been undertaken, a more or less corresponding ratio continues to exist between Calcutta and the adjoining

populations. It is owing to this periodic intensity of an epidemic wave of cholera, more than to any other cause, that the average number of deaths during the 10 years from 1880 to 1889 exceeds the average of the previous decade. During 1882, 1883, and 1884, there was a violent outburst of cholera, not in Calcutta only, but throughout the neighbouring districts. It is also true that during the 30 years which preceded the introduction of a pure water-supply, *i.e.*, before 1870, there was a similar periodicity in the cholera death-rate: but during that period the lowest annual number of deaths was 2,268 (in 1867) and 2,502 (in 1848), and the highest was 6,826 (in 1866), 6,553 (in 1860), and 6,127 (in 1846), whereas after the introduction of the water-supply the lowest annual death total has been 796 (in 1871) and 805 (in 1880), and the highest 2,272 (in 1884). Generally speaking, therefore, it may be said that during the last 20 years, when a pure water-supply has been available, the cholera mortality is only one-third of what it was in former times. It may be admitted, as an eminent authority, Dr. J. M. Cuningham, has pointed out, that the fall in cholera mortality in 1870 was partly due to other causes, and that it was pronounced before one drop of water reached the city: but, be this as it may, the comparative average immunity which has persistently prevailed since 1870 can only be explained by attributing it to the improved water-supply which dates from that year. The change which has taken place in Calcutta in regard to cholera is indeed extraordinary, and sanitarians may well appeal to the evidence of these figures as demonstrating with mathematical certainty that sanitary reform, and, above all, the supply of pure water, is the only effectual method for controlling this terrible disease.

With equal confidence may they point to the statistics of the mortality from fever. The following statement, which is derived from the report of the Calcutta Municipality for the year 1888–89, shows in triennial periods for 12 years the average annual number of fever cases treated in the hospitals of Calcutta and the average annual mortality:—

Years.	Average Annual No. of Hospital Fever Cases.	Average Annual Mortality from Fever in Calcutta.
1877 to 1879	41,670	5,344
1880 to 1882	31,835	3,726
1883 to 1885	27,497	3,630
1886 to 1888	24,704	3,291

The marked and continuous improvement, equally apparent in the hospital returns as it is in the health officers' statistics, is attributable to the completion of the drainage system, the consequent obliteration of the surface ditches, the increased dryness of the subsoil and the work done by an organised sewerage service. The figures are, moreover, borne out by common experience. The comparative immunity from fever enjoyed by residents in Calcutta as compared with residents in

1 p. 1855.

the suburbs and in the country is so notorious that persons suffering from fever frequently come to the city under medical advice as to a sanatorium.

Still, satisfactory as these results may appear at first sight, satisfactory as is the enormous increase in the value of landed property, and even more satisfactory the perceptible diminution in mortality, in truth, so much remains to be done to improve the sanitary condition of Calcutta that what has been done can only be pointed to as an encouragement to further exertion.

When all has been said, it must be admitted that the conditions of life in the metropolis of British India are still highly insalubrious. The cholera map of Calcutta is still simply a map in which the whole of the native town appears one mass of red dots indicating cholera deaths, and the inspection of this map with its record of more than 1,000 cannot fail to awaken a sense of how much remains to be done to improve sanitation. The Health Officer of the Corporation has lately called attention in the most prominent manner to the ventilation of the city by proper streets and squares and to the enforcement of proper building regulations as the most important sanitary measures which it remains to undertake. Pure air is as much a necessity for the public health as pure water, and the overcrowding of buildings not only impedes the circulation of air and disseminates disease along the poisonous alleys which divide house from house and harbour the germs of all disease, but it prevents the possibility of laying down efficient drainage and hinders and adds to the cost of scavenging. The ground of Calcutta is literally covered with houses without open space between them; and narrow streets, winding lanes, and zigzag passages afford complete obstacles to thorough ventilation. The statistics which the municipal reports furnish indicate the radical structural defects of Calcutta as a residential city. The roadway of the town extends over 184 miles, of which only 28 miles are roads of 32 feet in width and upwards; 103 miles vary in width from 9 to 31 feet, 17 miles are less than 9 feet in width, and 34 miles are sewered ditches, which, from the nature of the case, are often not more than 3 feet in width. The fine new street, known as the Central Road, which the Municipal Commissioners have, at great expense and with much public spirit, lately determined to cut through that overcrowded and overbuilt portion of the city, is a very important and valuable sanitary improvement. This road is now nearly complete. But it will exercise only a small influence in doing away with the evil of congested and unregulated buildings, unless streets from north to south and from south to north be constructed to meet it. The great structural defect which prevails, especially in Burra Bazaar, but also throughout the whole of the heart of Calcutta where the residents of the city dwell, is, and always has been, due to the toleration of too many houses and too many people on too limited a space, instead of forcing them to spread out on a wider area. The plan of construction of the city being radically defective, the supply of every other sanitary improvement is only palliative while that constitutional defect remains. It will never be possible to wipe away the reproach under which Calcutta labours as the home of cholera until the

present germ-laden air is as purified from contagion as is the filtered water now drunk by the people.

In conclusion, it must be added in justice to the Corporation of Calcutta, that the Municipal Commissioners are fully alive to the urgent necessity of energetically pursuing the course of sanitary improvement. Immense as are the difficulties of introducing sanitation into an Oriental city according to the western ideas of the present day, the problem in Calcutta is now in process of solution. Enormous sums have already been spent, and will continue to be spent; but it must be remembered that progress can only be gradual, and that the local authorities are hampered not only by financial considerations, but by the conservative habits of the people, which in the eyes of a sanitary reformer appear too often to be purely obstructive. It must be remembered, also, that the secret of overcoming this obstruction is to be found, not in attempting to coerce popular feeling by persistent condemnation, but in conciliation and sympathy.

The City of Rangoon.

BY

Major R. C. Temple, Indian Staff Corps, President of the Rangoon Municipality.

Delegates.

J. Thompson, Esq., late Vice-President, Rangoon Municipal Commissioners.

H. M. Mathews, Esq., M.I.C.E., late Manager and Engineer-in-Chief, Burma State Railway, and a Municipal Commissioner, Rangoon.

O. D. Clark, Esq., A.M.I.C.E., late Engineer to the Rangoon Municipal Commissioners.

S. G. Jones, Esq., late a Municipal Commissioner in Rangoon.

Rangoon, the capital of Burma, is situated 21 miles from the sea on the left bank of the Rangoon River, at its junction with the Panlang Creek, the Pazoondoung Creek, and the Pegu River, having surburbs on the right bank of the Rangoon River and on the left bank of the Pazoondoung Creek. As a village, Rangoon, under the name of Dagôn, was, according to the legend usually accepted by the Burmese, founded about 585 B.C. by two brothers, Poo and Ta-paw, who erected the Shway Dagôn Pagoda on a slight laterite ridge over some hairs from Buddha's head, which they had received from Buddha himself, and which they buried there. The village seems to have disappeared from history for long periods, but it was rebuilt and called Aramana by Poonmarecka, the King of Pegu, about 747 A.D. The Burmese occupied it in 1413 A.D. The town often afterwards changed hands and was frequently the scene of struggles between the Burmans and the Talaings, but eventually, in 1763, Alompra captured it for the Burmese, repaired the Pagoda, and named the town Yangoon or, as the Europeans call it, Rangoon, making it the seat of a Viceroy. The town was first occupied by the British from 1824 to 1827, when it reverted to the Burmese. It was again captured in 1852, from which date it has remained in British possession.

In 1852 Rangoon contained but a few offices and principal buildings, situated about one and a half miles from the river, what there was of a town being a collection of bamboo and plank houses and huts built on piles over a swamp partly flooded at spring tides. The spaces beneath the houses are described as being almost invariably receptacles for fæcal matter, dirt of all descriptions and stagnant water, from which, during the heat of the day, pestilential vapours constantly ascended.

It is almost needless to say that the English Rangoon of 1891 bears no resemblance to the Rangoon of 1852. Until 1874 municipal matters were in the hands of the Local Government, and in that year the first Municipal Committee took over the management of the town, which was

then without lights, a proper supply of water, or means of drainage. The exertions of the Government had been devoted to raising the centre of the town above tide level, providing land fit for building purposes, and making roads, bridges, culverts, and surface drains, but these had been only imperfectly, and to a limited extent, carried out before 1874.

Up to 1873 no attempt had been made to deal with sewage and, consequently, the land was honeycombed with cesspools, and the drinking water was little else than diluted sewage. In that year the Local Government ordered the cesspools to be closed, and introduced a system of night scavenging from house latrines and the removal of night-soil in carts to jetties on the river bank, where it was thrown into the river. This horrible system, which polluted the air of Rangoon throughout the night and made traffic in the streets a severe task, remained in force until last year, when it was superseded by the Shone system. The Shone system was adopted after severe criticism and mature deliberation as being really the only one by which the sewage of a flat, tide-locked town, like Rangoon, could be sanitarily dealt with, and, although the town was young and poor, it was thought that 175,000*l.*, the cost of the work, would be well spent if the system fulfilled its promises. Most exhaustive trials have been made of the works, which have now been in operation nearly two years, and the result has placed it beyond doubt that the favourable estimate originally formed of the Shone system has been completely justified by the result of its working. Rangoon is now the only city in the Indian Empire which can boast of a scientific system of drainage which fulfils all the requirements of sanitarians.

Unfortunately house-connexions in Rangoon are few in number, and until they are completed the full value of the perfect drainage system available in the town proper cannot be obtained, but this evil is being decreased daily and, to remedy it effectually, a new Municipal Act is proposed giving full and complete power to the municipal authorities to insist upon house-connexions. The works of the Shone sewage system include 6 miles of sewage mains, 22 miles of gravitating sewers, $4\frac{3}{4}$ miles of air mains and 44 Shone's ejectors.

The water used in Rangoon previous to 1878 was derived entirely from wells and tanks, and, in what is called the town proper, that is, the business and most crowded portion of the city, it was highly polluted. Cholera was always present and small-pox was endemic. In that year a main was laid from the Royal Lake in Dalhousie Park to Pazoondoung, where most of the mills and factories are situated and where a large coolie population was resident. Cholera was so frequent and disastrous in its consequences in this portion of Rangoon that this main was laid as a temporary measure, until a scheme for a proper water-supply could be carried out. The effect on the health of the neighbourhood supplied with good water was instantaneous; cholera practically disappeared and since then has never reached epidemic proportions.

In 1883 waterworks for the town proper, Pazoondoung and the shipping were completed, and now the Municipal Committee is about to carry out filtration works and to increase the supply of water, as the

city is growing so fast that the demand is already rapidly outstripping the supply.

Water is supplied to a large portion of Rangoon at present from a reservoir about five miles distant and near a village called Kokine. This reservoir, called the Victoria Lake, was made by forming embankments joining small hills between which streams ran in the rains, and from it the water is conveyed by iron mains to the Royal Lake, which thus forms a distributing reservoir. The cost of these works was 200,000*l.* High-pressure is obtained by the adoption of the Shone System. Twelve ejectors, each of 500 gallons capacity, have been fixed in an ejector-house near the Royal Lake, and to these the water gravitates. Compressed air has been laid on to the ejectors and a head of 62 feet is obtained by this inexpensive, clean and simple system. The works cost about 20,000*l.* and the expense of their maintenance is trifling, as the machinery that compresses air for the sewage works does the same work for the high-pressure waterworks, and no extra establishment, beyond a caretaker and some watchmen at the Ejector Station, are necessary. A few mill-owners are able to supply themselves with water from artesian wells, but the majority of them purchase water from the Municipality, and the railway and shipping take their supplies almost entirely from the Municipality.

The town proper of Rangoon, and one of the suburbs named Kemendine, are laid out on the block system, each block being 800 feet long by 860 feet wide, having 100 feet streets on all four sides and being intersected at every 115 feet of its width by streets, four of which are 30 feet wide, and one, in the centre of the block, being 50 feet wide. In the extensions of Rangoon to the east and west it has been decided to have no streets less than 50 feet wide.

The lighting of the town extends over 42 miles of roads, and the lighting of some portion of the remaining 50 miles is now suggested. Kerosine oil is the illuminant used.

Rangoon, as before remarked, formerly consisted almost entirely of plank or bamboo houses, and 15 years ago masonry buildings were few and far between. Of late, however, as wealth has increased, good masonry houses have more and more replaced insanitary wooden shanties, and powers will be given to the Municipal Commissioners in the proposed Municipal Act to prescribe the materials of which buildings may be constructed in any particular quarter.

Good slaughter-houses have been built at a cost of nearly 10,000*l.* to replace a wretched shed, which formerly did duty as an *abattoir*, and it is in contemplation to construct a cattle market and sheds and to keep animals a certain length of time before allowing them to be slaughtered.

Rangoon has excellent pleasure grounds: two large commons, which are available for military purposes and for races as well as for links and other public uses; a garden in charge of the Agri-Horticultural Society; an extremely pretty and well-kept garden in the Cantonments; a large square in the heart of the town proper; and, in addition to these, the Royal Lake and Dalhousie Park, which together form one of the

finest recreation grounds which any city can boast of, comprising as they do 295 acres of well-timbered park land and 160 acres of water.

The Civil General Hospital has accommodation for 300 patients, and last year 6,192 in-patients and 37,168 out-patients were treated in it. The Commissioners are about to spend 7,000*l.* in improving the sanitary and other arrangements of this hospital. The Military authorities have their own hospitals in the Cantonments. The Dufferin Institute for providing female medical aid to women has a branch and a small hospital in Rangoon, and endeavours are being made to raise sufficient money by subscription to build a good hospital for the purposes for which the Institute exists.

Contagious diseases (cholera and small-pox) are treated in separate hospitals built outside the most crowded part of the town. The buildings have bamboo mat walls, which answer every practical purpose, and which, being inexpensive, can be taken down and burnt when necessary. Unfortunately, in consequence of agitation in England, the Lock Hospital, which was of inestimable benefit, has been closed.

There are three Municipal, and eight private markets in Rangoon, but their condition admits of great improvement and is now receiving considerable attention at the hands of the Municipal authorities. The markets in Burma are really the most important retail business places in every town. In them nearly everything required by the public, whether food, drapery, clothing, hardware, stationery, medicine, perfumery, toilet requisites, or jewelry can be purchased; people meet there to buy, to sell, to gossip, to flirt, or to gather information; in fact, the English idea of a market conveys no correct impression of one in Burma.

Religious buildings and lands occupy an enormous area of Rangoon compared with its total size. Christians, Buddhists, Hindus, Mussalmans, Pônnâs, Parsis, and Jews all own lands and churches, pagodas, kyoungs, temples, mosques, or synagogues. The Buddhist kyoungs are, many of them, filthy, and a source of danger to the health of the city, but for reasons of policy a considerable amount of leniency has to be used in dealing with the religious buildings and customs of indigenous races in the British Empire in the East.

Burial grounds existed originally in every direction and were several years ago fixed in what was then the outskirts, and is now fast becoming the centre, of the city. A large necropolis is being prepared outside Rangoon, and most of the present graveyards, many of which are in a dangerously overcrowded state, will soon be closed. Cremation is not much practised in Rangoon unfortunately, although the population consists largely of Hindus.

The population of Rangoon was in 1812, 8,250; in 1826, 8,660; in 1863, 61,138; in 1872, 98,745; in 1881, 134,176, and in February 1891, 181,071. During the decade from 1881 to 1891 Rangoon passed through two years of great trade depression caused by the demoralisation consequent on the war in Upper Burma. The population undoubtedly decreased then, and the increase in the whole period is therefore all the more remarkable.

The aggregate death-rate of Rangoon is very high, being over 39 per mille. This is due to two causes. Firstly, the swampy nature of the outskirts of the town proper, which the poorer classes are compelled to use in their present state, as no other land is available. Secondly, there is a large annual Hindu immigration to the mills and factories from the lower orders from the Madras Presidency. The death-rate is found to be highest where the land is low, and among these Hindus. It is they that are the cause of the small-pox existing in the town and that contribute more than half the deaths from cholera and from bowel complaints. Strenuous efforts are being made to improve their lodgings and their present surroundings. A scheme for reclaiming the low lands of the town, to cost about 500,000*l.*, is now being considered in detail, and, when it is accomplished, say during the next decade, the death-rate of the town may be expected to be as low as that of the non-Hindu population, or about 26 per mille. That the death-rate need not be high owing to climate is proved by that of the Christians, who live in a cleanly manner and under sanitary conditions, and amongst whom the death-rate is less than 17 per mille.

Since compulsory vaccination was introduced in 1885, small-pox as an epidemic disease has disappeared from Rangoon, and what of it still occurs is invariably imported by the Madras coolies either from their own country or from the harvest fields of Burma. As showing the effects of compulsory vaccination it may be mentioned that in the six years ending with 1884, the average number of deaths per annum from small-pox was 353, while in the six years since 1884 the average number has been 39 per annum.

It is also interesting to note the effects of the introduction of a fairly pure water-supply into the town; firstly, in 1879, and secondly in 1883. In 1879 water was introduced into the suburbs of Pazoondoung, and the average number of deaths from cholera, which in the three previous years had been 231, was reduced in the next three years to 65. In 1883 water was laid on to the town proper, and the average number of deaths from cholera was reduced from 155 per annum in the six previous years to 59 per annum in the six succeeding years.

The City of Auckland, New Zealand.

BY

P. A. Philip, J.P., Town Clerk.

The City of Auckland, New Zealand, is situated on the southern shore of the Waitemata harbour, possessing two docks, one of which—the largest in the southern hemisphere, being 500 feet long, 80 feet wide, with 35 feet of water on sill at high water, and having a wharf accommodation of nearly 3,000 feet—is ample for vessels of from 100 to 5,000 tons.

The area of the city, which in 1870 was 663 acres, in 1891 is 1,762 acres.

The population in 1872 was 12,745, and in 1891, 29,000.

The death rate in 1870 was 10·12, and in 1891, 1·17 per cent.

The drainage work done comprises 45 miles, inclusive of sewers and pipes, at an outlay of over 50,000*l.*

The city is supplied with a comfortable tramway service (horse); at present the length is about 12 miles.

The water supply, provided at a cost of about 125,000*l.*, is ample and of the purest character; it is drawn from the western springs, about three miles from the city, and is pumped into four large reservoirs on the high levels of the city, and thence supplied by gravitation, the pressure being minimum 100 lbs. to the square inch, maximum 140 lbs. ditto. There are about 80 miles of mains, and the number of service supplies is 2,500, the supply being ample for street watering, fire extinction, and ornamental fountains, drinking troughs, public lavatories, etc.

The total number of streets and roads in 1870 was 122, in 1981 it is 276, and their length is 44 miles.

The Corporation have established swimming baths, both fresh water and salt water, with ample accommodation for both sexes. The fresh water bath, to which salt water is supplied during the summer months, is unequalled in the Colonies. These baths have been provided at a cost of about 9,000*l.*

The city possesses two small but charming parks in the centre of the town, of an area of about 13 acres each, and a Domain, with its native shrubbery (intersected with good roads and paths), of nearly 200 acres close to the city; while the junctions of various streets are all fenced and planted with trees and shrubs, and several of the streets are planted with plane, oak, poplar, and other trees. The Domain comprises one of the largest and best cricket and football grounds in the Colonies. A commodious bowling green and several lawn tennis clubs exist.

The city possesses a handsome free library, with newspaper, magazine, and reference departments; also a lending branch with upwards of 20,000 volumes and 5,000 manuscripts, plans, etc. This library is open to the public daily, and on Sundays from 2 to 10 p.m. For this library the citizens are much indebted to the munificence of Sir G. Grey, and to that of the late Mr. Edward Costley who left 13,000*l.*, the interest upon which is devoted to the purchase of new books.

The art gallery established by the Corporation in the municipal buildings possesses, owing to the munificence of Sir George Grey and the late Mr. J. T. Mackelvie, one of the finest collections of curios, paintings, articles of vertu, etc. in the southern hemisphere.

The citizens are also indebted to the late Mr. Elam, who left 10,000*l.* for the establishment of a school of art, free of cost to pupils, which, under the direction of Mr. Payton at the municipal buildings, is largely attended. The Art Society have a public meeting and reading room, and hold their sittings in the municipal buildings.

The city possesses ample abattoirs, well situated, with good drainage and ample water supply.

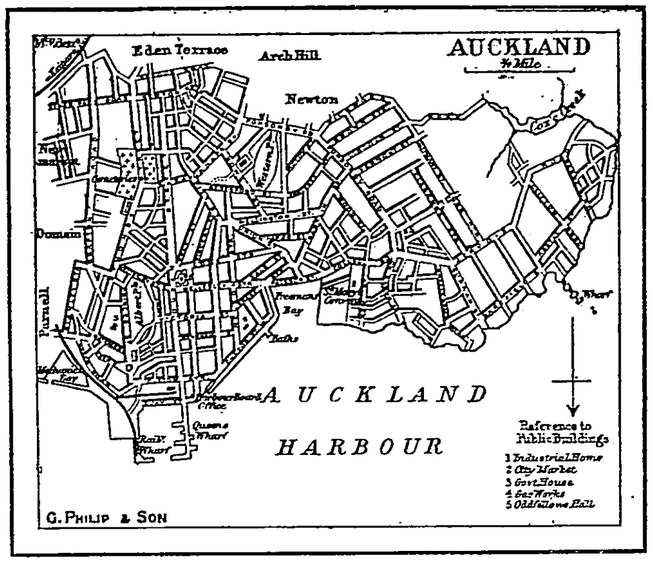
Cemetery provision for the city is well situated about nine miles from town by rail; it comprises an area of 188 acres. Interments, except for blood relations, are no longer permitted in the cemeteries existing within the city.

The city possesses several very large public schools, grammar and high school, and University classes for both sexes. Elementary education is compulsory and unsectarian. There are also several private schools. The number of children attending the public schools is about 8,000.

The city possesses a large well-situated hospital; besides commodious new buildings for old men's and women's refuges, for which the citizens are indebted to the late Mr. Edward Costley, who left 84,000*l.* to be divided amongst the various city institutions. The hospital, etc. is controlled by the Hospital and Charitable Aid Board.

There is a good museum, containing a splendid collection, open every day, Sunday included.

Viewed from sea or land the scenery of Auckland is considered most beautiful, and the city possesses one of the finest harbours in the world.



The Colony of South Australia.

BY

THOMAS BORTHWICK, M.D. (Edin.), Health Officer for Kensington and Norwood, &c., Delegate from the Colony to the Congress.

A short account of the hygiene and sanitary conditions of South Australia will be of interest, inasmuch as it shows these conditions as they exist in a new country, and affords a basis of comparison with older communities.

South Australia comprises a section of the Australian continent from north to south. The western boundary is formed by the colony of West Australia, while on its east lie the colonies of Queensland, New South Wales, and Victoria. Its northern limit is exceeded only a few miles by the most northerly point of Queensland, and a large part of Victoria lies further south than its southern boundary; hence, it is evident that South Australia is a misnomer. It has been proposed to change the name to Central Australia, but this term cannot correctly be applied to a country which extends from north to south. Perhaps the proper designation would be Middle Australia, or, to use one word, Mes-Australia.

The northern half of this middle section of the continent is known as *the Northern Territory*—its acquisition dating from 1863, and as it lies north of the 26th parallel of latitude, and is, consequently, principally within the tropics, it will not be included in this account.

South Australia proper is bounded on the east and west by the colonies already mentioned, the eastern boundary being the 141st and the western the 125th degree of longitude. The 26th parallel of south latitude forms its northern boundary, and it is bounded on the south by the Southern Ocean, the coast-line extending from the 38th to the 31st 45′ parallel of south latitude, a distance of over 2,000 miles. It comprises an area of 380,070 square miles.

Physical features.—The southern coast-line is broken by two large bays, the one extending 90 miles, the other 200 miles inland. They overlap to some extent, and between the two lies a tongue of land which has been compared in configuration to Italy. Various other bays exist, but they are not sufficiently large to affect the configuration of the country. Still, the two gulfs mentioned expose a large extent of the colony to the influence of the sea.

Parallel to these gulfs lies a range of mountains, which attain an elevation of 2,334 feet above sea level. The average breadth of the range is about 30 miles, and as it proceeds northwards it separates into several smaller parallel ranges, whose highest point is 3,000 feet. These end in a series of hills about 29° 31′ south latitude. Other smaller ranges are scattered over the colony, but they are of little importance.

The principal range divides the river system of the colony.

On its eastern side are several small rivers, which have their origin in the mountains, and vary considerably in size and volume. On the western side of the range is the only large river, namely, the Murray; it rises in New South Wales, but has a course of 500 miles through South Australia, being navigable all that distance, and finds its outlet into the sea through a series of lakes. In the interior of the colony are to be found watercourses of great length, which carry the flood-waters of south-west Queensland, sometimes finding their way into the lakes, sometimes losing themselves in the plains. In exceptionally wet seasons, the country is sometimes inundated for hundreds of miles, but these watercourses are frequently dry for long periods.

The lakes of the colony include those mentioned, the lakes at the mouth of the River Murray, and the lakes in the interior. The latter are fed by the flood-waters, but are often almost dry and represented by basins of mud and salt. In the south-east are some volcanic lakes occupying the craters of extinct volcanoes. It is thus evident that the lake system has no hygienic value whatever.

The geological formation of the country may be shortly described as follows:—"The rocks of the mountain ranges belong to the oldest of "the sedimentary series, and outcrops of the same formation are to be "seen in many places rising like islands above the surrounding and "newer strata. Much of the interior must be classed as secondary, "including the great stony downs and tablelands, where sandstone, "conglomerate, quartzite, gypsums, clays, and limestone, in some places "highly fossiliferous, are met with. North of Lake Torrens, extending "from the Nullarbor plains to the eastern boundary, is a broad expanse "of tertiary and post tertiary deposits, interrupted by plutonic rocks "and the primaries that have been referred to. In some places the "tertiaries are 300 feet in thickness, and seem to indicate a period of "slow submergence when beds of sandstone and limestone rich in "marine fossils were formed. Plutonic rocks occur in several localities, "and in the extreme south-east is a series of extinct volcanoes."

The general nature of the surface of the country may, to some extent, be inferred from the preceding description. The mountain ranges are, on the whole, well wooded with various kinds of eucalypti, and have well grassed valleys interspersed. Fertile plains lie between the gulfs and the ranges, while to the eastward is a vast extent of smaller scrub and salt-bush. North of the gulf is an extensive shallow depression containing the lakes and plains of stony desert. Towards West Australia, as far as has been explored, the country seems to consist largely of dense scrub and sandhills, but towards Queensland, and in various other parts of the interior, there is some good pastoral country. Among the interesting features of the interior may be mentioned the "Mound Springs," conical hills from which water flows, occurring singly or in groups; they are natural artesian wells, some of them being warm, others impregnated with minerals, and the natives are said to use them for medical purposes.

Meteorological conditions.—For practical purposes, the year may be divided into two seasons, summer, extending from October to March,

and winter, from April to September (inclusive). The summer months may be described as hot and dry, the winter months as cold and wet. *The temperature* is highest during December, January, February, and March, the mean in the shade exceeding 70° F. It occasionally exceeds 100° F. during those months, the highest recorded temperature being 116·3° F. In March the heat is of shorter duration and the nights are cooler. The same may be said of November, while October, with a mean of about 62° F., has very few hot days, and might almost be classed as a winter month. After March the temperature falls rapidly, and reaches its lowest point in June, July, and August, the mean being about 53° F. The lowest recorded temperature (at Adelaide) is 32·3° F. During April and the early part of May the mean is about 60° F., and the rains which now fall, along with the retained heat in the soil, cause a rapid growth of vegetation, which is only interrupted by the cold of winter, and starts afresh towards the end of August.

In regard to the heat of summer, it is by no means unbearable, and rarely oppressive, except when a hot wind, sometimes laden with dust, blows from the interior; for the extreme dryness of the air, as shown by the wet-bulb registering as much as 67° F., or 21° below the dry-bulb, to a large extent compensates for the heat, and although rain rarely falls, there is frequently cold cloudy weather.

The rainfall is greatest in the months of May, June, July, and August, averaging about 2½ inches; there has been recorded a maximum of 7·8 in June. The average number of wet days is 13 in May, 14 in June, 16 in July, and 16 in August.

The average rainfall of December, January, February, and March is under 1 inch, and frequently during those months little or no rain falls. November averages just over 1 inch, and October, September, and April nearly 2 inches. The average annual rainfall (for 51 years, 1839–89) is 21·114 inches, it has been as high as 30·8, and as low as 13·4 inches. These figures, as well as the preceding, refer to Adelaide, but there is considerable variation throughout the colony. Thus, on the Mount Lofty Ranges it is as much as 40, in the south-east from 30 to 22, along the Murray from 18 to 12, on Yorke Peninsula 13, and at the head of Spencer Gulf about 9 inches. Probably for 100 miles north of Adelaide it averages nearly 21 inches. The interior of the colony is occasionally visited by heavy rains, and when these occur, as they usually do in summer, they are the tropical rains of the northern coast of the continent, which have been carried beyond the usual limit by a strong north-west monsoon. This, however, is a rare occurrence, and the interior is frequently exposed to prolonged drought. Heavy winter rains may fall in the north when the centre of the cyclonic disturbance passes (in its course from west to east) well to the north of Adelaide, but, as a rule, it follows a line parallel to the coast and passes to the south of Adelaide.

The changes in the *barometic pressure* proceed from west to east across the continent, being noted in Western Australia from two to four days before reaching Adelaide. It is highest during the winter

months, with a mean of 30·127 inches, while the mean of summer is 29·990. The highest recorded reading is 30·553, the lowest 29·096 inches. The fluctuations are greatest during winter, the greatest range in any one month being 1·379, and the least 0·474.

The winds, during the summer, tend towards the heated interior of the continent, and south winds predominate, while, during the winter, north and north-east winds prevail. Throughout the whole year the prevailing winds of the interior are south-east, but during summer they are influenced by the north-west monsoon, which, when strong enough, may sweep south through the colony as the hot wind previously referred to. It very rarely carries the rains along with it beyond the McDonnell Ranges of the Northern Territory; but it has been already pointed out that this does occur. Thus, it follows, that with a strong monsoon and tropical rains in the north, there is a hot summer with hot winds further south, but when the monsoon is weak and the interior dry, the polar currents from the south-east prevail, and there is consequently a cool summer in the southern portions of the colony.

The highest *temperature in the sun* by the lampblack bulb is in January, about 160° F.; the lowest, in July, 120° F.

The mean *sunshine* is from 7·5 to 10·5 hours per diem in the summer months, and from 3·7 to 8 in the winter. In regard to the *state of the sky*, the summer months have from 15 to 20 almost wholly clear days, the winter from 10 to 11. Taking the whole sky as 10, the mean amount of cloud in each month is as follows:—January, 4; February, 3; March, 4; April, 4; May, 6; June, 6; July, 6; August, 6; September, 5; October, 4½; November, 5; December, 4.

The relative humidity is from 45 to 50 in the summer, and from 50 to 79 in the winter months.

The amount *of evaporation* from the surface is greatest in January, when it varies from 9 to 11 inches; and least in June, from 1½ to 2 inches. During the three hottest months it averages ⅓ inch per day, and when a hot wind is blowing it may be as much as $\frac{6}{10}$ inch; while in the coldest months it averages about $\frac{7}{100}$ inch per day.

The climate as a whole is salubrious. The cold of winter is not excessive, and the heat of summer is compensated for by the dryness of the air, which permits both work and play to be undertaken with impunity. Almost every variety of climate can be obtained. The cold wet winter of the Adelaide plains can be exchanged for the drier parts of the north, while the summer heat of the plains may be escaped at the seaside or in the hills, where the difference of temperature may be as much as 20° during the day, and still more at night. But throughout the colony generally, the clearness of the atmosphere and the unclouded sky render a large portion of the year exceedingly pleasant.

General progress of the Colony.—The first settlers arrived towards the end of 1836. After an interval of a little over half a century, we find (31st December 1889) a population of 319,166 that has pushed its way for hundreds of miles into the interior. Over 9,000,000 of miles have been alienated, and nearly 3,000,000 brought under cultivation.

There are 170,000 horses, 324,000 cattle, and 6,400,000 sheep in the colony. The staple produce exported during the year amounted to nearly 3,000,000*l.*; while the total export and import trade together exceeded 14,000,000*l.* There are about 14,000 miles of main roads, apart from district roads; and 1,756 miles of railway have been constructed, extending to nearly the centre of the continent on the one hand, and communicating with Melbourne on the other, while a branch extends to the Barrier district of New South Wales. There are 11,677 miles of telegraph and telephone wires; and, perhaps, there is no better example of the energy of this handful of people than their accomplishment of the great work of carrying the telegraph right across the continent, a distance of 2,000 miles, when it was a veritable "*terra incognita*." This trans-continental wire meets the cable of the Eastern Extension Telegraph Company at Port Darwin, and thus places Australia in direct communication with England.

Adelaide, the capital of the colony, has a population of 45,000, or including the suburban towns of over 90,000. It is situated on the plains about midway between the Mount Lofty Ranges and the gulf on a rising piece of ground which is exceedingly advantageous for drainage purposes. It is generally admitted that a more admirable site could not have been selected. The city is about a mile square, and the streets, which are wide and well made, run east and west and north and south. It is surrounded by a belt of land about half a mile wide, called the Park Lands, which are planted with trees and reserved for public purposes. Within the city itself are several large squares laid out with flowers and shrubs, while the Botanic Gardens and Park, an extensive domain, are well known for their experimental and ornamental value. Separating north from south Adelaide is the Torrens river, which formerly in summer consisted of a chain of offensive waterholes, but has now been converted by the construction of a dam into a fine lake, much used for boating purposes. Works of a purely sanitary nature will be referred to again.

The suburban towns combined have a population which exceeds that of Adelaide, and varies individually from 1,000 up to 11,000. They are spread over a considerable area, and, being of more recent date, are not so advanced in public works as the city. The other corporate towns are scattered throughout the colony, and may be classed as seaport towns, mining towns, and agricultural towns (that is, towns forming the centres of agricultural districts). Their populations vary from 700 to 9,000, and, combined, amount to 24,000. They are all well laid out, but have various sanitary drawbacks to contend with, as will appear later.

Sanitary progress.—In considering the sanitary condition of a new country, it must be remembered that a great deal of energy is necessarily expended in bringing nature under subjection. The fact of living is so real that the manner of living is for the time being of secondary importance. Accordingly it is not altogether to be wondered at if we find sanitary requirements sadly neglected in the early days of the colony's history. Previous to 1873 there was no special legislation

in the direction of conserving the public health. In the various municipal Acts which were passed before that date the corporations had power "to adopt all such measures as they may deem necessary "for the cleansing of the said city and the preservation of the public "health, and for the prevention and suppression of nuisances." This seems comprehensive enough; but the energy of the corporations was all spent in other directions, and the sanitary result was feeble indeed. As far as the colony outside the corporate towns was concerned, there was no provision whatever made in regard to the public health, except that the Governor in Council might make an order in case of emergency. Thus, it is apparent how a mass of sanitary arrears was accumulating, and was being debited to the public health account of the colony. To take Adelaide itself as an example, the drainage was effected by open channels in the streets, the cesspits were leaky, the ground was soaked with filth, and in fact it was described as "a city of stinks from one end to the other." In regard to the rest of the colony, official reports show that the following conditions existed in every direction, namely: defective drainage, imperfect construction of cesspits, tainted water supply, and inefficient (if any) scavenging arrangements. While the condition of the city of Adelaide has been remedied, that of the greater part of the colony has unfortunately been but little improved.

In 1873 the "Public Health Act" was passed, and in 1876 it was amended; they constitute practically one Act. A Central Board of Health was created, and also local boards with certain powers. The latter boards are constituted by the councils (for the time being) of all corporate towns and districts; and this constitution is unfortunate in various ways for sanitary progress. On the other hand, the Central Board is hampered by a want of practical sympathy on the part of the Government; and these circumstances, along with the permissive and tentative nature of the Acts themselves, do not conduce to good work being done. Thus, a medical officer of health is appointed by the local boards when the Central Board thinks the circumstances require it, and this has been done in the case of the principal corporate towns; but the officer is so poorly paid, and in fact discouraged to act with anything like zeal, that the appointment is in the majority of instances a sinecure. Still, on the whole, these Acts have been productive of some good results, as may be inferred from Table VIII. in the Appendix.

They were again amended in 1884 by the "Public Health Acts Amendment Act," which gives power to the Government to proclaim any contagious or infectious disease, thereby rendering it compulsory on the medical attendant to notify every case of such disease to the Central Board of Health, a fee of 5*s.* being allowed. Hitherto, only small-pox, cholera, and yellow fever have been proclaimed; and as these diseases are unknown in the colony, the Act is to all intents and purposes a dead letter so far as notification of infectious diseases in the colony is concerned, and is only useful in so far as it assists the operation of the Quarantine Act. Still, its application can be extended, and there is evidence of a public feeling growing in that direction, so

that before long we may hope to see notification of all infectious diseases made compulsory. It may be mentioned, that some corporate towns adopted the system of compulsory notification in 1886 by means of a bylaw placing the onus of notification on the householder; and while it has worked very well, both from a practical and educational point of view, it must be admitted that the dual system is the more satisfactory.

Among the special sanitary difficulties that have to be grappled with is the difficulty of obtaining a pure water supply in many parts of the colony. In some places water itself is scarce, while in others it has to be procured from tainted sources; and the greatest care has to be exercised in preventing contamination. In most of the towns the Government has constructed waterworks, the water being obtained in many instances from creeks and springs by pumping and conducted into tanks and reservoirs. The city of Adelaide and the suburbs are fortunate in having an exceptionally good and abundant water supply, which was introduced about 1857. A short sketch of this and of the drainage system of Adelaide may be of interest as representing the chief sanitary works of the colony, and works which have undoubtedly contributed to the improvement of the public health, as may be seen from Table IX. in the Appendix.

"The source of the water supply is the River Torrens where it issues from the Mount Lofty Ranges; and the catchment area equals about 150 square miles, consisting of very hilly ranges of a slate and sandstone formation, covered with poor soil and sparsely timbered. The flow of the river is constant but variable, according to the season of the year. The headworks consist of a heavy masonry weir, constructed in a narrow gorge. No filtering appliances are used, as the water after the first winter floods have passed over the weir (and been rejected) becomes clear and fit for use. The intake is regulated by a sluice-valve, which can be opened and closed in two minutes; and no bye-washes are needed. An open aqueduct about $3\frac{3}{4}$ miles long conducts the water to two reservoirs, whence it is distributed to the city. The reservoirs contain, respectively, 140,500,000 and 886,915,752 gallons; and the consumption fluctuates from 1,750,000 gallons in winter to 6,000,000 gallons in summer, per diem. The service is high pressure with constant supply, and for domestic use unstinted."

The following analysis of the water is by Prof. Rennie of the Adelaide University:—

Total solids	45·00	per 100,000 parts.
Chlorine	13·25	„ „
Free ammonia	·004	„ „
Albuminoid ammonia	·030	„ „
Nitrates and nitrites	Nil.	
Oxygen consumed (Tidy's process)	·180	„ „

He points out that the albuminoid ammonia is very high, and that the oxygen consumed is greater than it ought to be; but that from the

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comparatively small quantity of free ammonia and the absence of nitrates and nitrites, the impurity is more of vegetable than animal origin.

The drainage system, with which is connected the sewage farm, was begun in 1882, and was finished, as far as the city is concerned, in 1884, but since that date it has continued to be extended to the various suburbs. "The main sewers and branch house-drains from "the sewer to the building line of the streets are laid by the Govern- "ment, while the house-drains inside that line are laid at the owner's "cost under the immediate supervision of the Hydraulic Department. "At the boundary of the premises a boundary trap was fixed, and the "arrangement of all house-drains, traps, vents, and sinks, is designed "by the department after conferring with the owner, so that there is "uniformity of design throughout the whole system." Originally, street grids were placed every 50 feet along the street sewer; but these were found to be vents for the escape of sewer gas, and such intolerable nuisances, that they were finally nearly all closed, and ventilating pipes or shafts fixed wherever practicable. At the same time, the boundary traps were removed back close to the house and a ventilating pipe was placed on the sewer side of the trap. This is the only special difficulty which has occurred in connexion with the drainage system. The smell proceeding from the street grids was so offensive that people passing felt sick, and sometimes vomited. It was described as sickening and offensive, "not like that of fœcal matter so much as it was of decom- posing cabbage water and rotten onions." The smell was confined to the street grids, and was not noticed in the course of the house-drains; hence it was apparent that the boundary traps were working effectively, but that the grids were ventilating the wrong way. It was considered probable that the smell was the result of the accumulation of gas between the street sewer and the boundary trap, where no provision had been made for ventilation; and, certainly, when this defect was remedied there was a complete disappearance of the nuisance. Only one or two grids were left open in each street; and, according to the testimony of the hydraulic engineer, there is a steady current through the sewers, and the air in them is much improved. The sewers are made up of the following lengths and sizes:—

Open concrete channel	-	-	·32 miles.
Covered „ „	-	-	1·31 „
Egg-shaped sewers, 3 feet 4 inches by 5 feet	-	-	1·62 „
„ „ 2 feet 8 inches by 4 feet	-	-	·67 „
„ „ 2 feet 4 inches by 3 feet 6 inches	-	-	·93 „
Wrought-iron tube, 42 inches diameter	-		·04 „

Pipe sewers, earthenware,	24	inches	diameter	-	·57	parts.
„ cast-iron,	24	„	„	-	·27	„
„ earthenware,	21	„	„	-	·38	„
„ cast-iron,	21	„	„	-	·19	„
„ earthenware,	18	„	„	-	1·11	„
„ „	15	„	„	-	2·76	„
„ „	12	„	„	-	7·57	„
„ „	9	„	„		16·55	„
„ „	6	„		-	37·71	„
Total				-	70·00	miles.

"The open concrete channel carries the sewage to the sewage farm, which is situated about four miles from the city. Adelaide being 151 feet and the sewage farm 40 feet above the level of the sea, the force of gravitation is sufficient to cause a rapid flow of the sewage. The farm comprises 470 acres, and the soil varies from a stiff clay to a sandy loam. It is divided into 21 paddocks of from 8 to 25 acres in size, and water has been laid on to each, for the use of cattle depasturing in them. The farm is worked on the broad irrigation principle, combined in the winter months with intermittent downward filtration. The filter beds are thoroughly under-drained, and work most effectually, the effluent carried off therefrom being perfectly clear. The sewage is first strained by revolving strainers, and is then conducted over the farm by means of cement carriers and tarred wooden troughing. The production of the land treated with sewage has been extraordinary, the crops grown consisting of lucern, Italian rye grass, mangolds, sorghum, wheat (for hay), barley, vines, and wattles. A large number of cattle, horses, sheep, and pigs are also kept on the farm. It was at first intended to carry on dairy-farming, but this had to be abandoned, on account of the popular prejudice against the produce. Still, how- ever, the green crops are cut and sold to dairymen outside, and with no bad results. For the two years ending June 30th, 1889, there has been a profit over the working expenses, not including interest on working capital or rent for land."

Referring to the prejudice against the dairy produce of the farm, it may be mentioned that there were no actual grounds for it. As regards the effect of the farm on the public health, a nuisance arising from the smell of the sewage is very rare; and, although suspicion has at times been raised as to the cause of outbreaks of enteric fever, when investigated they have been shown to have an origin from other sources. In one instance, a man employed on the farm was attacked with enteric fever; and, as he was in the habit of drinking the effluent water rather than take the trouble to go to the taps, it is impossible to say how far this was associated with the disease; but it raises the interesting question of the destination of germs in sewage farms. The following is the result of the analysis of two samples of effluent water by Professor Rennie; the first sample was taken after heavy rains on the

two previous days, the second after scarcely any rain for two or three days previously. The figures express parts per 100,000 :—

Sample.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen as Nitrates and Nitrites.	Oxygen consumed.	Total Solids.
1	0·80	0·14	0·36	0·25	177·64
2	0·41	0·05	1·18	0·18	247·8

He points out that as sewage usually contains from 4·5 to 5·5 parts of free ammonia per 100,000, and either no nitrogen as nitrates and nitrites, or mere traces, the above serve to show that though the water is very impure, a very considerable purification has been effected. The presence of nitrogen as nitrates and nitrites shows that a great part of the nitrogenous matter has been oxidised and to that extent destroyed. In the second sample, when the water was flowing slowly, the presence of less ammonia, but more nitrogen as nitrates and nitrites (as compared with the first sample) indicates a more effective oxidation, and this is borne out by the smaller amount of oxygen consumed.

The effect of these works on the sanitary condition of Adelaide is apparent not only in the outward and visible aspect of the city, but in the mortality. In regard to its appearance, from being "a city of stinks" it has come to be looked upon as the cleanest city in the southern hemisphere, while in regard to the mortality, Table IX. shows the various death-rates which bear upon the point.

Other tables are appended in illustration of the preceding remarks and of facts which have of necessity been left out in this short paper.

It may be added, that among various official papers utilised in compiling the foregoing statements, the annual reports of the Government Astronomer and of the Registrar-General have been chiefly drawn upon.

APPENDIX.

Table I.

Population at the Time of each Census.

Date of Enumeration.	Population.			Increase on Previous Census.	
	Males.	Females.	Total.	Numerical.	Per Cent.
1841—Feb. 26 - -	9,526	7,840	17,366	—	—
1846—Feb. 26 - -	12,670	9,720	22,390	5,024	28·8
1851—Jan. 1 - -	35,302	28,398	63,700	41,310	184·5
1855—Mar. 31 - -	43,720	42,101	85,821	22,121	34·7
1861—Apr. 8 - -	65,648	61,782	126,830	41,009	47·7
1866—Mar. 26 - -	85,334	78,118	163,452	36,622	28·8
1871—Apr. 2 - -	95,408	90,218	185,626	22,174	13·5
1876—Mar. 26 - -	110,491	102,780	213,271	27,645	14·0
1881—Apr. 3 - -	149,530	130,335	279,865	66,594	31·2

Table II.

Influence of Immigration and Emigration on Population.

Periods.	Excess of		Proportion of Natural Increase to 100 of Migration Increase.
	Immigration over Emigration.	Births over Deaths.	
1836-89 - -	128,412	186,608	145
1836–65 - - -	52,290	52,893	101
1866–89 - - -	76,121	133,715	175

Table III.

Age Constitution of Population in 1881.

Per Cent.	0—5.	5—10.	10—15.	15—20.	20—25.	25—35.	35—45.	45—55.	55—65.	65—75.	75—
Total - - -	14·8	12 4	11·5	10·6	10·9	15·6	10·6	6·9	3·9	1·7	·56
Males - -	7·5	6·2	5·7	5·2	6·0	9·2	6·0	3·7	2·1	·9	·29
Females - -	7·3	6·1	5·7	5·3	4·9	6·3	4·5	3·1	1·7	·8	·27

Table IV.

Urban and Rural Distribution of Population in 1881.

(Urban includes population of all corporate towns.)

—	Per Cent.
Urban population - -	31·2
Rural „ - - -	68·7

Table V.

Birth, Marriage, and Death Rates.

Year.	Birth Rate.	Marriage Rate.	Death Rate.
1844–50 - - -	36·0	7·4	14·2
1851–60 - - -	43·5	9·9	15·5
1861–70 - - -	42·9	8·3	15·5
1871–75 - - -	37·6	7·6	15·8
1876–80 - -	33·2	8·8	14·9
1881 - - -	38·5	8·3	14·4
1882 - - -	38·0	8·8	15·4
1883 - - -	38·0	8·6	15·0
1884 - - -	39·0	8·4	15·7
1885 - - -	39·0	7·9	12·9
1886 - - -	36·5	6·4	13·8
1887 - - -	35·0	6·4	12·7
1888 - - -	33·8	6·7	12·0
1889 - - -	32·7	6·5	11·1

Table VI.

Infantile Mortality.

Year.*	Infantile Mortality per 1,000 Births.
1885 - - -	113
1886 - - -	126
1887 - - -	111
1888 - - -	96
1889 - - -	94

* Previous to 1885 data are unreliable in this respect.

Table VII.

Death Rates of Age Groups in 1889.

Mean Population.	All Ages.	0–5.	5–10.	10–15.	15–20.	20–25.	25–35.	35–45.	45–55.	55–65.	65–75.	75–
315·402	11·1	28·9	2·9	1·8	3·2	3·8	5·6	6·9	12·3	24·5	60·3	160·2

Table VIII.

Mortality in Relation to Sanitation, taking 1874–76 as a Central Period, which embraces the passing of the Public Health Acts. During this period there occurred severe Epidemics of Scarlet Fever and Measles.

—	1858–65.	1866–73.	1873–76.	1877–82.	1883–89.
Total Death Rate -	16·37	14·75	17·89	14·68	13·37
Measles - - -	·214	·095	·598	·056	·076
Scarlet Fever - -	·801	·073	1·263	·229	·037
Influenza - - -	·069	·032	·031	·010	·008
Whooping Cough -	·296	·310	·031	·173	·190
Diphtheria - -	·584	·514	·312	·260	·307
Croup - - -	·425	·300	·264	·257	·195
*Enteric Fever - -	·663	·629	·597	·423	·467
Diarrhœal Diseases -	1·823	1·528	1·582	1·381	1·169
Phthisis - - -	·946	·946	·983	1·024	1·056

* Along with enteric fever are included simple, continued, and remittent fevers, which terms certainly are synonymous with enteric in this colony.

Table IX. (*a*).

Mortality of Adelaide in Relation to the Deep Drainage.

Note.—The deep drainage system was inaugurated in 1882, and completed about the end of 1884, so that the period 1882-84 forms an intermediate period for purposes of comparison.

—	1877–81.	1882–84.	1885–88.
Colony - - - - -	14·5	15·3	12·5
*Adelaide - - -	21·5	21·1	15·8
*Colony minus Adelaide - -	13·0	14·3	11·9

* Deaths in public institutions of persons not usually resident in the city are excluded from Adelaide and added to Colony minus Adelaide.

Table IX. (*β*).

—	1879–81.		1882–84.		1885–89.	
	*Adelaide.	Colony minus Adelaide.	*Adelaide.	Colony minus Adelaide.	*Adelaide.	Colony minus Adelaide.
Total Death Rate -	24·5	12·4	24·5	13·3	19·0	11·4
Diphtheria - -	·41	·26	·34	·23	·30	·32
Croup - - -	·31	·31	·43	·30	·10	·14
†Enteric Fever -	·76	·28	1·11	·43	·73	·39
Diarrhœal Diseases	1·84	1·13	2·18	1·46	1·21	·96
Phthisis - - -	2·84	·70	2·58	·84	2·56	·81

* Including all deaths in public institutions.
† Enteric fever includes simple, continued, and remittent fevers.