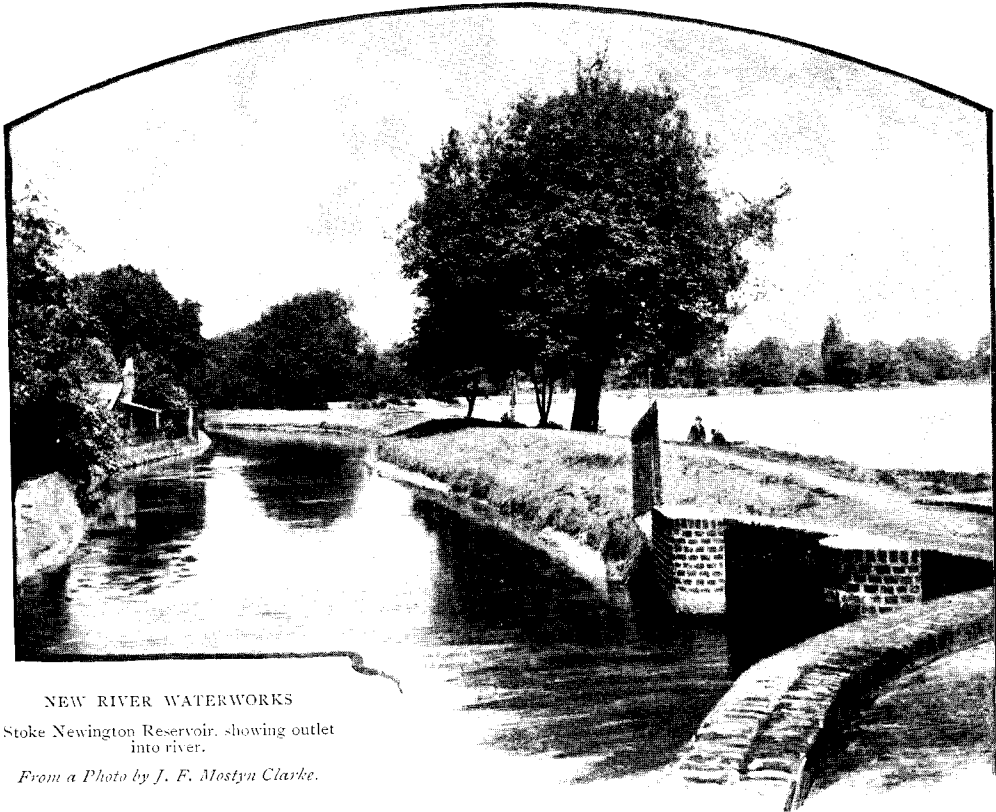


standing until the abolition of the old London Bridge in 1831. We may now conveniently glance at the history of each big company in turn.

The water-supply was at the end of the nineteenth century in the hands of eight private companies, whose 620 square miles of area comprised the whole of the Metropolis and parts of Middlesex, Herts, Essex, Kent, and Surrey. The oldest of these, the New River Company, originated in 1613, in the manner already described. The first shareholders were incorporated in 1619, under the



NEW RIVER WATERWORKS
Stoke Newington Reservoir, showing outlet
into river.

From a Photo by J. F. Mostyn Clarke.

title of "The Governors and Company of the New River brought from Chadwell and Amwell to London." The directorate was vested in twenty-nine persons, who held thirty-six adventurers' shares—so called in contradistinction to those held by the King and his assigns—which had originally belonged to Sir Hugh Myddleton, who at this time retained only two.¹ James I. did not live to receive any profits himself, and the thirty-six King's shares were afterwards resigned by Charles I.

¹ No particular area of supply was granted to the Company, and there was no limitation of capital in the Charter. A Select Committee of the House of Commons in 1821 stated the original cost to have been £369,600. Its capital in 1837 was £1,200,000; revenue £105,000; houses supplied, 73,000. The total income of the nine other companies then existing amounted in 1837 to £193,000.

in return for a yearly payment of £500, which the Crown receives to this day: a paltry sum when compared with the great value the shares were destined to possess at a later date. No dividend was paid till 1633. By the end of the seventeenth century each share of the New River Company was earning a dividend of about £200, and in 1890 a King's share was sold for £95,000. The Company was regulated by Acts of Parliament in 1738, 1739, 1767, 1779, 1805, 1822, and 1830, the last of which empowered it to erect two large impounding reservoirs at Stoke Newington.

When the New River Company absorbed the old London Bridge Waterworks in 1822 they undertook at the same time to supply water to all citizens whom the old Company had served, and to secure the then dividend to the original proprietors for two hundred and sixty years, namely, to the expiry of the lease of five hundred years which had been granted in 1582. Thus the New River Company were bound to pay £3750 per annum to the representatives of the original owners until the year 2082. Other undertakings bought by the Company were the Hampstead Waterworks, the North Middlesex Waterworks, and a private enterprise at Bush Hill Park.

The New River rises at Chadwell Spring, about a mile beyond Ware, in Hertfordshire. A short distance below this point the river is joined by a branch cut which conveys what became the main part of the Company's supply, namely the water from the River Lea. At first this supply was taken without let or hindrance, but after much litigation an arrangement was arrived at between the New River Company and the Lea Trustees whereby the amount of water to be drawn from the larger stream in the smaller was regulated. Originally the New River was 40 miles long, but short cuts over some of the valleys reduced the length considerably. The average quantity of water supplied by the Company is over 250,000,000 gallons of filtered water obtained from the River Lea, Chadwell Spring, and thirteen deep wells sunk into the chalk, and about 2,500,000 gallons of unfiltered water for other than domestic purposes from the same sources and from the Hampstead and Highgate Ponds. Surface water, which used to form a large proportion of the supply, has within recent years been as far as possible excluded from the river. The Company's district extends to 107 square miles, the actual area supplied is less than half, embracing the City and central London. Its boundaries may be described as, on the west, Charing Cross, Haymarket, and Hampstead Road, on the south the Thames, on the east the Tower and Stamford Hill, and on the north Southgate. The Company supply a population of 1,233,303.

2. The Chelsea Waterworks Company obtained their first charter from George I. in 1723, the result of an Act passed in the previous year for better supplying the City and Liberties of Westminster and parts adjacent. The scheme was to bring water from the Thames into canals and ponds, from which it was to be raised into

reservoirs between Oliver's Mount and Hyde Park. A royal warrant in 1726 authorised them to convert two ponds in St. James's Park into reservoirs, and another in 1727 authorised the construction of a reservoir in Hyde Park. The works were situated on the north bank of the river, and the water was drawn from the Thames direct and distributed in its polluted state to the consumers. In 1809, when they were raising 1,456,000 gallons daily, the Company were empowered to take water from the Thames near Ranelagh Creek, and to lay pipes in the river-bed for a distance of 240 feet in order to obtain water below low-water mark. The first attempt at purification was made by allowing the impurities to subside in settling reservoirs, but this did not prove effective. The first filter-bed in London was then introduced in 1829 by Mr. James Simpson, the Company's engineer, who had been instructed some years before to give his whole attention to this subject. The filter-bed was made of gravel and sand, and before being filled with water had the appearance of several channels parallel to one another, formed by banks broad at the bottom and gradually sloping on each side to a point at the top. It had brick sides, occupied about an acre, and was supplied by reservoirs having an area of about an acre and a half. First the water was pumped into the subsiding reservoirs; then, without disturbing the sediment, it flowed through small pipes to the filter-bed, where it soon percolated through the three strata of gravel and sand, which were each 2 feet thick and laid over brick tunnels. In 1852 the Company's intake was removed to Seething Wells, and new works were completed there in 1856, but, as the floods flowing into the Thames from the Mole regularly made the water turbid, the Company sought Parliamentary sanction in 1875 to remove the intake to a point higher up the river, about half a mile below Sunbury Lock, where, accordingly, new works were brought into operation in 1877. Two new filtered-water reservoirs with a total capacity of $11\frac{1}{2}$ million gallons were completed at Putney Heath in 1900, and the storage capacity of the reservoir at Molesey was increased 50 million gallons by the raising of its banks. The Company's district of $20\frac{1}{2}$ square miles is bounded on the north by Old Brompton Road and Knightsbridge, on the east by the New River Company's district, and on the south and west by the Thames. They supply a population of 285,249, and may take 22 million gallons daily from the Thames.

3. Lambeth Waterworks were established under an Act of Parliament passed in 1785 for supplying the inhabitants of Lambeth and parts adjacent with water from the Thames between Westminster Bridge and the confines of the parish of Christchurch. The works, containing an engine of only 20 horse-power, stood on Belvedere Road, close to the site where the footway over Charing Cross railway bridge now ends. One of the chief objects of the owners was to provide protection against fire, but in this respect they received no assistance from the all-powerful fire insurance companies. They had great difficulties to contend with at first owing to a large part of the district being below the ordinary high-water mark of the Thames.

Only 629 houses were on the first list of the supply, and no dividend was paid for twenty years, but the concern was controlled by far-seeing men who had no doubt of their ultimate success. In 1802 the area was extended to the "respectable and populous neighbourhood" of The Horns, Kennington. About 1810 the development of drainage led to a large increase of population in the Company's district, and the works had to be enlarged. By 1820 the wooden pipes were superseded by cast-iron ones. An open reservoir was erected on Streatham Hill in 1832, being served from the Belvedere Road Works, and two years later two large open reservoirs were



CLEANING OUT FILTER-BEDS, BATTERSEA (LAMBETH WATERWORKS)

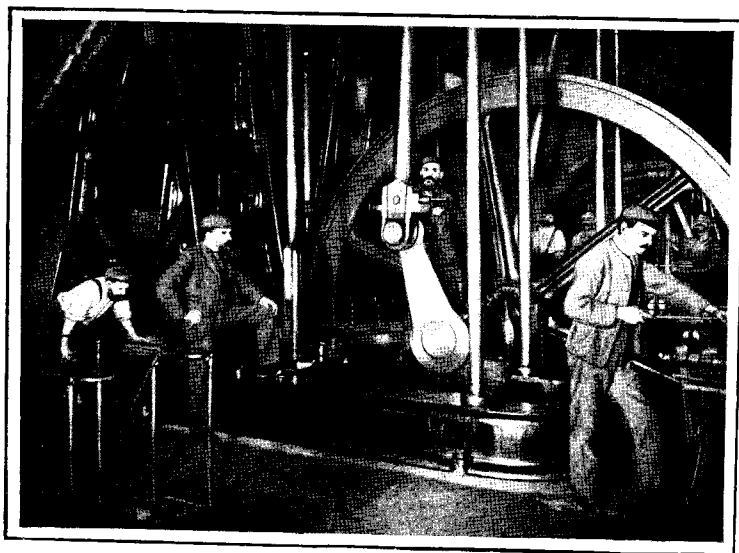
constructed at Brixton. The Company was reincorporated in 1848, and as the water became foul from the reception of sewage in the river they anticipated the Act of 1852 by removing their intake to Seething Wells. Their district was at the same time largely extended, and inhabitants who had been accustomed to buy water from carts at from $\frac{3}{4}$ d. to 2d. per pail, according to its quality, now had a proper supply laid on. Between 1854 and 1861 the Company made extensions to Dulwich, Forest Hill, and surrounding localities, consequent upon the increased population in those districts which followed the opening of the Crystal Palace. Kingston-on-Thames was brought into the Company's area in 1863, and an Act in 1871 added the outlying portions of Esher and East and West Molesey.

To the latter place the Company at the same time removed their intake, and used the gravel there as an additional source of supply. Almost every year witnessed new pipe extensions, and by 1900 the Company had powers to abstract $124\frac{1}{2}$ million gallons daily from the Thames. Their area is 103 square miles, of which 41 are in London, 56 in Surrey, and 6 in Kent. The district is bounded on the north by the Thames at Southwark, on the south by Claygate, on the east by Shortlands, and on the west by Molesey; and the population supplied is 729,234.

4. For the origin of the East London Waterworks Company we go back to the days of Shadwell Waterworks, originated by Thomas Neale, which in 1669 began to supply a large part of East London. Neale obtained a charter in 1687, and formed a company, and in 1681 the shareholders became a body corporate by letters patent. In 1747 George Montgomerie and others were empowered to supply Stratford, West Ham, and the Bow district with water, and a pumping station was erected on a branch of the River Lea. The London Dock Company purchased both those concerns in 1807, but in the same year an Act of Parliament established the East London Waterworks Company, who in 1808 were enabled to purchase them from the Dock Company. The East London immediately replaced the wooden pipes by iron ones, erected a pumping station at Old Ford, bought 30 acres on the banks of the Lea for reservoirs, and in 1828 were pumping 6,512,292 gallons daily. Hackney Waterworks and the Lea Bridge Mills were purchased in 1829, and about the same time the intake was removed from Old Ford to Lea Bridge, from which point the water was conveyed by a conduit to the storage reservoir at Old Ford and pumped thence for the supply of the district. In 1853 authority was obtained to make several new cuts in connection with the Lea, to construct large impounding reservoirs at Walthamstow and filter-beds at Lea Bridge, and to make an intercepting cut or canal on the westerly side of the Lea from Tottenham to beyond Ponders End in order to prevent any polluted water from entering the river above the intake. Parliamentary powers were granted in 1867 to establish works at Sunbury and Hanworth for supplying Thames water to the district, and in the same year the Company were compelled to discontinue the reservoirs at Old Ford, which were in the centre of an area affected by the cholera of the preceding year. An Act was passed in 1886 enabling the Company to make certain cuts and channels to Chingford and Walthamstow, and to sink wells. They have four sources of supply; first and largest the Lea, the intake being at Chingford; second, deep wells in the chalk at Walthamstow, Chingford, Old Ford, Lea Bridge, and Waltham Abbey; third, the Thames at Sunbury; and fourth, springs at Hanworth. They are empowered to supply an area of 139 square miles. On the north their district is bounded by Waltham Abbey, on the south by Stepney, on the east by Hog Hill, and on the west by Hornsey. By an Act in 1867 the Company were allowed to take 10,000,000 gallons daily from the Thames; by the end of the century the

powers had increased to 40,000,000. Additional reservoirs for their Lea supply were authorised in 1897, increasing the total reservoir capacity to 2,200,000,000 gallons; but a Bill in 1899 to enable the construction of further reservoirs containing 5,000,000,000 gallons was thrown out by the House of Lords. Partial failure of the East London supply, owing to the drought in 1898, impelled the Government to pass a Bill in the following year enabling the water companies to link up their mains and thus be in a position to render assistance to one another. The population supplied is 1,376,548.

5. The West Middlesex Water Company was incorporated in 1806 to further the scheme of an engineer named Dodd for supplying the West End. They erected at Hammersmith two steam-engines of 20 horse-power, and at a distance of one furlong



LAMBETH WATERWORKS. PUMPING ROOM

from the Thames two reservoirs to contain 1,333,000 gallons each, a brick tunnel being made from the river to the engine wells. The water was pumped from the wells into the reservoirs, where it was allowed to subside; it was then distributed by the same engines through 6-inch and 8-inch elm pipes. Soon the wooden pipes were discarded in favour of stone ones, which also had a short term, being replaced by cast-iron pipes in 1808. At Campden Hill a high-service storage reservoir was built. Competition against each other was so little palatable to the West Middlesex and New River companies, that in 1815 they agreed to amalgamate; but the Bill to effect this reform was ultimately abandoned, and each quietly pursued its independent course. At Barrow Hill, near Primrose Hill, the West Middlesex built a reservoir in 1825, which was partially filled from a well situated at a point opposite the road now called Wells Road. Water stood in this well at a level of 184 feet from the surface of the ground, but the supply proved so small that it was abandoned.

Subsiding reservoirs were built at Barnes in 1838, the water from them being conveyed to the engines at Hammersmith through a pipe laid in the bed of the river. When the Act of 1852 obliged the removal of the intakes to beyond the tidal limit, the West Middlesex selected Hampton as the best position for their works, and therefore relinquished Barnes in 1855. A special Act in 1866 limited the quantity to be taken from the Thames to 20,000,000 gallons daily, and extended the limits fixed by the Act of 1852 within which the Company can supply water. In 1886 the Thames Conservancy authorised them to take 24,500,000 gallons per day, though certain further powers were obtained in 1899. They are empowered to supply some 85 square miles, and the area which they actually supply stretches from Hendon in the north to Chiswick in the south, and from Acton in the west to Regent's Park in the east. Although for the first thirteen years the West Middlesex paid no dividend, and for many years afterwards only a small dividend, they were the first of the eight companies to pay the maximum dividend allowed by the law. They supply a population of 633,554.

6. Two histories have to be told in the case of the Southwark and Vauxhall Company. About the year 1771 an association was formed to provide a portion of the Borough of Southwark with water from a pond at St. Mary Overies. The property changed hands several times, and in 1820 came into the possession of Mr. Edwards Vaughan. Two years later this gentleman bought from the New River Company for the sum of £26,550 the part of the London Bridge Waterworks lying south of the Thames and supplying South London, and called his business here the Southwark Water Company. When Mr. Vaughan died in 1833 his representatives received Parliamentary sanction to sell the joint concerns, which were known as Southwark Waterworks, and, accordingly, they were disposed of to a new company in 1839 for £41,000. At first this Company obtained their supply of water from the Lambeth Company, paying £2400 annually for it, but when the Southwark Water Company Act of Incorporation of 1834 directed that the supply should be taken from the neighbourhood of Battersea, and filtered previous to delivery, the Company erected works there, which were completed in 1841.

Already, however, parts of South London were supplied by the Vauxhall Waterworks Company, originally established in 1804 as the South London Waterworks. This Company began to supply the inhabitants in 1807, but after six weeks its engine-house and wooden reservoir were burned down. The Company struggled on, obtaining power to raise further capital. The river water was taken from a brook at Brixton called the Washway, which flowed into the Thames at Vauxhall; concerning the jurisdiction over this brook there were frequent disputes. In 1828 the Company built auxiliary works at Cumberland Gardens, adjoining the foot of Vauxhall Bridge, including a 42-inch tunnel into the middle of the river, terminating 8 feet below low-water mark. Some of the water was pumped from the river into

the reservoir at Kennington Lane, but the bulk of it was taken direct from the channel at Vauxhall Creek. When, however, owing to the removal of Old London Bridge, and to the increasing accumulations at Vauxhall, the water from the Creek at neap tides became foul, the Company laid down in 1832 a large tunnel of pipes 48 inches in diameter to communicate with the inlet laid beneath the bed of the river, thus conveying the water directly into the Kennington Lane works. An Act of Parliament in 1834 extended the area of supply, and altered the name of the Company to the Vauxhall Water Company in order to avoid its being confused with the Lambeth and Southwark Companies. But, about the end of 1841, the affairs of the Company became involved, owing partly to the competition of the two rival companies, and partly to the expense of substituting iron for wooden pipes, and erecting more powerful machinery. In the session of 1843 two schemes were brought forward, having for their object the supply of the Vauxhall Company's district. Neither of these succeeded. At a meeting of the Company in December 1843 it was proposed to amalgamate with the Southwark Company; power to do so was granted in 1845, and the two Companies became one on October 1 of that year under the title of "The Southwark and Vauxhall Waterworks Company."

The engines at Cumberland Gardens, near Vauxhall Bridge, and at Kennington Lane were stopped in 1847, and the whole works were concentrated at Battersea. In accordance with the general Act of 1852 the source of supply was removed from Battersea to Hampton on July 26, 1855. About this time the Company began to supply the parish of Putney; in 1857, by agreement with the Lambeth Company, Wimbledon was taken in, and in 1861 they took over the district served by Richmond Water Company, whose works and plant they purchased at the instigation of the parish. Additional works were begun at Hampton in 1867 to meet increasing demand, and subsequent years witnessed repeated extensions, down to the making of six new filter-beds at the end of the century. In 1881 a deep well was sunk in the chalk on land acquired by the Company at Streatham. An arrangement was made in 1884 for obtaining water from the gravel-beds at Hampton, which, with the Streatham well, constituted sources of supply supplementary to that of the Thames itself. The intakes are on the north side above Hampton; the Company are empowered to serve $50\frac{1}{2}$ square miles, and the area of supply is bounded on the north by Southwark, on the east by Nunhead, on the south by Wimbledon, and on the west by Kew Gardens. By an Act of 1898 the Company were authorised to construct two additional reservoirs, and to take an additional quantity from the Thames. They may take 100,000,000 gallons daily from the river, and they supply a population of 833,125.

7. The Kent Waterworks Company dates from 1809, when it was founded to supply Deptford, Greenwich, Lee, Lewisham, and Rotherhithe. The Company bought for £65,000 the Ravensbourne Waterworks, which had existed since 1701,