

of gaskets are used at the joints, permitting, sometimes, one side to be bolted a little tighter than the other, throwing the whole out of line.

Many interesting slides were shown in connection with his work in New York, and particularly the Manhattan Life Building.

The following is the proportion of the actual cost of the various items on this building, the contractor's profit and loss item, for obvious reasons, being proportionate to each item:—

	Per cent.
Labor at site	41.6
Lumber	3.3
Fuel and oil	1.6
Hauling	5.5
Cement	6.3
Crushed stone	2.9
Sand	1.0
Steam and electricity	2.3
Supplies	6.2
General expense8
Shafting, etc.	2.3
Waterproofing	3.1
Caisson material and labor	23.1
	—
	100.0

Summing the work up, we get the following proportions:—

	Per cent.
Caisson work	75.8
Excavating cellar, etc.	11.4
Concreting floor	2.1
Concreting cantilever and grillages	2.1
Waterproofing	3.1
Extra work	5.5
	—
	100.0

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Engineers' Club of Toronto

At the meeting held last Thursday evening, Mr. A. B. Barry, president of the Club presided. The question of changing the Constitution with a view to admitting to associate membership, men who are not engineers by profession, but whose pursuits qualify them to co-operate with engineers in the advancement of professional knowledge, was discussed at some length, and the meeting finally decided to let the matter stand in abeyance until the annual meeting. A proposed amendment to clause 8, having reference to increasing the annual dues for resident members from \$5 to \$7.50, was also postponed. Suggestions for making the meetings more interesting were made and considered, and sundry other business transacted. Mr. Chas. B. Fox, M. A., of Wragge & Fox, civil engineers, Toronto, was admitted to membership.

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On Thursday evening, November 4th. Professor Nobbs, of McGill University, delivered an interesting lecture before Montreal members of The Canadian Society of Civil Engineers, on "The Aesthetics of Design."

Eleven persons on the average have been injured daily and one person has been killed every other day for the last three months by the Chicago street cars.

THE SERVICEABLE LIFE AND COST OF RENEWALS OF PERMANENT WAY OF BRITISH RAILWAYS.*

By R. Price-Williams (London).

Mr. Richard Price-Williams was born at Stoke Newington, London, and educated at a school at Bridgend, where he had a schoolfellow the late Sir James Douglas, the eminent engineer to the Trinity House, who constructed the Eddystone Lighthouse. Among the important posts held by Mr. Price-Williams was that of manager and constructor of Fox & Company's Bessemer steel rail works near Sheffield, and subsequently manager and part constructor of Bessemer Brothers' works at Greenwich. He served his pupilage under the late George Heald, M. Inst. C.E., and afterwards served as an apprentice at Kitson's locomotive works at Leeds. Subsequently he became a consulting engineer, designing and preparing plans, sections and estimates for the construction of the Metropolitan Outer Circle Railway and of the London & Eastbourne Railway. Later he was engaged in surveying and preparing plans and estimates for the construction of the Midland of Western Australia Railway from Perth to Geraldton. Mr. Price-Williams was appointed by the Royal Commission on the Coal Supplies, in 1871, to prepare estimates of their duration, and retained by the recent Royal Coal Commission to prepare and give evidence on the same subject. He is a member of the Institution of Civil Engineers, and many years Member of Council of the Institution of Mechanical Engineers; Fellow, and for many years Member of Council, of the Royal Statistical Society; author of papers read at the Royal Statistical Society on the "Coal Question," and on the "Population of England and Wales," (1801-81); "Population of London," (1801-81); and on the "Railway Rates and Charges Acts of " 1896; also of papers on the maintenance and renewals of permanent way, rolling stock and waterworks, for each of which he was awarded a Telford (1866), (Watt 1870), George Stevenson (1902), Gold Medal by the Institution of Civil Engineers, and awarded in 1898 the Bessemer Gold Medal at the special request of Sir Henry Bessemer.

According to the Board of Trade Railway Returns (1907) there are, roundly speaking, a little over 23,000 miles of railway open for traffic in the United Kingdom, of which about 13,500 miles consist of double and more lines, and about 10,250 miles of single lines, besides which there are 14,000 miles of sidings. The total annual cost of the maintenance and renewal of the permanent way and works amounted to, roundly, eleven millions sterling, nearly 15 per cent. of the entire working expenses, which have now and for some years past reached the exceptionally high figure of nearly two-thirds (63 per cent.) of the entire railway gross receipts.

In this paper the cost of the maintenance and renewals of the permanent way of fifteen of the principal British railways, having an aggregate of 15,184 miles of railway (equivalent to about 80 per cent. of the total mileage of the railways in Great Britain), will alone be dealt with, particulars of which expenditure have been furnished during the last ten years in some valuable tables in the C Appendix to the Board of Trade Returns. From these have been obtained the data from which the results in Table V. in this paper have been compiled, giving in the case of each of these fifteen railways the expenditure in each year in wages and material, in the renewals of the permanent way, and also the average annual cost of renewal in terms per mile of railway

*Read at the Iron and Steel Institute, Great Britain.