

needed in the way of engineering was then accomplished. Mr. Walker's solemn word of warning does not seem to have had much effect, for the number of members of the institution which in his time was about 400 has since increased over 7,000.

The following brief review of the work done since the beginning of the century will show how utterly groundless Mr. Walker's fears were and at the same time we can form an idea of the amount of work which will be begun at least within the next quarter of a century and which will certainly afford employment for very many engineers.

First with regard to railroads. In Great Britain and Ireland there have been constructed 21,000 miles at a cost of 5,000 million dollars (just ten times as much as was constructed at the time of Mr. Walker's address). The immense importance of these railroads may be learned from the fact that the gross receipts are 410 million dollars each year. The total mileage of Europe is 162,000 and of the United States of America 180,000. We can perhaps realize what this means if we remember that the bridges on the railroads of the United States would reach from New York to Liverpool. Canada has 16,270 miles of railroads all constructed since 1836. It is evident, therefore, on comparing the areas of North America with Great Britain and Ireland that much railroad work still remains to be done on our continent. In Asia we have hardly any railroads yet except some 25,000 miles in India, and in Africa we have only the Cape railways, about 2,000 miles. It will be many years also before we can say that there is no more work for the railroad engineer in South America, Mexico, and Australia.

Canal construction, which has been carried on as we saw from the earliest times, received a great impetus by the construction and subsequent financial success of the Suez Canal. The Kiel

and Manchester ship canals, the latter of which cost over \$77,000,000, will doubtless be followed by several others. Nor must the Canadian canals be forgotten. Constructed at a cost of \$80,000,000 and maintained at a nett loss of \$300,000 per annum, they afford satisfactory evidence that our paternal government can always find work to keep our engineers at home if that is necessary. In the near future too we shall probably see the completion of the Panama Canal, on which already work whose estimated value is \$125,000,000 has been expended and which according to a report of a special commission, which has spent four years investigating its condition, only requires \$100,000,000 for its completion.

The rapid strides which have been made in ship-building make it hard for us to realize that it is only sixty years ago that the first regular trans-Atlantic steamship service was opened by the "Great Western," whose average time between Bristol and New York was fourteen days. But ship-building and the even more prominent electrical engineering would each furnish matter for a much longer address than this; but attention must be called to the large fields of work being opened up to the engineer by the utilization of water power by means of enormous electrical installations and the way in which electrical is replacing steam traction on even some of the larger railroads in the United States. The first Atlantic cable is only forty years old and yet already in British cables alone is invested over \$200,000,000.

Passing over the important work that has been done in the construction of harbors and docks, a hasty glance at Sanitary Engineering must conclude this review. In 1848 the first Public Health Act in the history of the world was passed, and an attempt was made to revive Sanitary Engineering from the state of torpor in which it lay since