STEPHENSON, George (1781-1848), perfecter of the locomotive, was the son of Robert Stephenson, fireman of a colliery engine at Wylam, near Newcastle, where he was born 9th June 1781. In boyhood he was employed as a cowherd, and occupied his leisure in erecting clay engines and similar mechanical amusements. Afterwards he drove the ginhorse at a colliery, and in his fourteenth year became assistant to his father in firing the engine at a shilling a day. He set himself diligently to qualify himself for higher duties, and in his seventeenth year was appointed engineman or plugman. As yet he was unable to read, but, stimulated by the desire to obtain fuller information regarding the wonderful inventions of Boulton and Watt, he began in his eighteenth year to attend a night school, and soon made remarkably rapid progress. In 1801 he obtained the situation of brakesman, and in 1812 was appointed engine-wright at Killingworth high pit at a salary of £100 a year. Meantime he had been employing his leisure in watch and clock cleaning, in studying mechanics, and in various experiments with a view of solving the difficulties connected with the con­struction of a satisfactory locomotive. Having obtained permission from Lord Ravensworth, the principal partner of the Killingworth colliery to incur the outlay for con­structing a “ travelling engine ” for the tramroads between the colliery and the shipping port nine miles distant, he made a successful trial with the engine, which he named “My Lord,” 25th July 1814. Setting himself diligently to improve his invention, he thoroughly satisfied himself that for the proper success of the locomotive a railway as nearly as possible level was an essential condition. In 1822 he succeeded in impressing with the importance of his invention the projectors of the Stockton and Darlington Railway, who had contemplated using horses for their waggons, and was appointed engineer of the railway, with liberty to carry out his own plans, the result being the opening, 27th September 1825, of the first railway over which passengers and goods were carried by a locomotive. The success of the Stockton and Darlington Railway led to the employment of Stephenson in the construction of the Liverpool aud Manchester Railway, which, notwithstanding prognostications of failure by the most eminent engineers of the day, he carried successfully through Chat Moss. He also succeeded in persuading the directors to give the locomotive a trial, and, as his improved invention, the “Rocket,” during her trial trip made 29 miles an hour, his suggestion met with complete approval; with the opening of the line, 15th September 1830, the modern era of railways may be said to have been definitely inaug­urated. While his experiments in connexion with loco­motives were in progress, the construction of a safety lamp for use in mines occupied much of his attention. There can be no doubt regarding the justice of his claims to be considered the first inventor of the tube safety lamp, not­withstanding that the name of Sir Humphry Davy has been chiefly associated with the discovery. In recognition of the “ valuable service he had thus rendered to man­kind,” subscriptions were in 1815 collected in behalf of Stephenson which amounted to £1000, a sum which he found of great convenience in connexion with his locomo­tive experiments. Stephenson was closely connected with the more important of the railway projects which the success of the Liverpool and Manchester line called into existence, but he strongly disapproved of the railway mania which ensued, and predicted that only ruin could result from the prevalent disposition towards railway speculation. He was frequently consulted in regard to the construction of foreign railways, and in this connexion visited Belgium and Spain in 1845. Towards the close of his life he retired from active duties, and at his residence at Tupton House,

Chesterfield, interested himself chiefly in farming and horticultural pursuits. He died 12th August 1848.

See *Story of the Life of George Stephenson,* by Samuel Smiles, 1857, new ed. 1873 ; and Smiles’s *Lives of British Engineers,* vol. iii.

STEPHENSON, Robert (1803-1859), engineer, son of the preceding by his first wife Fanny Henderson, was born at Willington Quay, 16th October 1803. Remembering his own early difficulties owing to deficient instruction, his father bestowed special care on his education, sending him in his twelfth year to attend Mr Bruce’s school in Percy Street, Newcastle, where he remained about four years. In 1819 he was apprenticed to a coalviewer at Killingworth to learn the business of the colliery, after which, to perfect his training in technical science, he was sent in 1822 to attend the science classes at the university of Edinburgh. On his return he assisted his father in the survey of various railway lines, but in 1824 he accepted an engage­ment to take charge of the engineering operations of the Columbian Mining Association of London. On account of the harassing difficulties of the situation he resigned it in 1827, and after his return to England undertook the management of his father’s factory in Newcastle, greatly aiding him in the improvement of his locomotives, the result being the construction of the “Rocket,” which firmly established the practicability of steam locomotion on railways. Subsequently his services were in great request as a railway engineer, and after the retirement of his father he was regarded as the chief authority on the subject. In this connexion his most remarkable achieve­ments were his railway viaducts on the tubular system, constructed with the aid of the practical knowledge of Sir William Fairbairn, and justly characterized as “the greatest discovery in construction in our day.” Among his more notable bridges are the Royal Border bridge at Berwick-on-Tweed, the high-level bridge at Newcastle-on- Tyne, the Britannia tubular bridge over the Menai Straits, the Conway tubular bridge, and the Victoria tubular bridge over the St Lawrence, Canada. In 1847 he entered the House of Commons as member for Whitby. He was frequently consulted in the construction of foreign railways, and was decorated for his services by the king of Belgium, the king of Sweden, and the emperor of the French. In 1855 he was elected president of the Institute of Civil Engineers. He died 12th October 1859, and was buried in Westminster Abbey.

See *The Story of the Life of George Stephenson, including a Memoir of his Son Robert Stephenson,* by Samuel Smiles, 1857, new ed. 1873; Jeaffreson, *Life of Robert Stephenson,* 2 vols., 1864; and Smiles’s *Lives of British Engineers,* vol. iii.

STEREOCHROMY. See Silica.

STEREOSCOPE is an optical instrument for repre­senting in apparent relief and solidity all natural objects by uniting into one image two representations of these objects as seen by each eye separately. That the two eyes form different images of any objects which are near enough to have dissimilar perspective projections has been long known, and may be readily tested by any one. Euclid proved it geometrically with reference to a sphere (26th, 27th, and 28th theorems of his *Treatise on Optics)·,* Galen showed how the demonstration might be made.@@1 Porta *(q.v.),* in his work on *Refraction,* also writes on the subject, and Leonardo da Vinci adduced the want of correspond­ence between the parts of the background intercepted by a near object seen by the two eyes singly “ as the reason why no painting can show a *rilievο* equal to that of natural objects seen by both eyes within a moderate distance.”@@2 In 1613 Aguilonius, a Jesuit, in his work on *Optics,* attributed the union of the two unlike pictures into

@@@1 *De Usu Pαrtiurn Carports Humant,* Lyons, 1550, p. 593.

@@@2 *Trattata della Pictura, Scultura, ed Architettura,* Milan, 1584.