

between Basford and Stafford, of the Liverpool and Birmingham Railway, or, as it was then called, the Grand Junction Railway. Here he evinced considerable knowledge of his business, in carrying heavy embankments successfully over large culverts, or arches ; and under Mr. Locke, M.P., V.P., he remained on that line until its completion. In the course of the construction of these works, Mr. Statham met with an accident on the Madeley Incline, from incautiously jumping off a locomotive engine when descending the incline at full speed, one of the wheels passing over his foot and rendering him a cripple for life. The Grand Junction Line was completed, in July, 1837, and whilst still suffering from the effects of this accident, Mr. Statham, through the recommendation of Mr. Locke, received the appointment, in 1838, of Resident Engineer of the Southern, or Brighton extremity of the London and Brighton Railway, which also included a branch to Shoreham. The works on this portion of the line were very heavy, and he carried them out with such ability, that after the completion of this line, in 1841, he was appointed Managing Engineer both of the works and of the rolling stock, including the locomotives of the whole of the line. This post he held until June 1845, and conducted it with great satisfaction to the Directors, but on a change of management, he sent in his resignation.

In the years 1847 and 1848, he was engaged in surveying and setting out lines of railway in the West Indies, upon which he wrote some able reports, accompanied by estimates, &c. During the last few years of his life, Mr. Statham was intrusted by Mr. Hawksley, M. Inst. C.E. with the superintendence of the construction of a portion of the New Liverpool Water-works.

Mr. Statham was a man of good natural abilities, and great energy of character ; he was an excellent surveyor, with much experience in the practical parts of the profession, taking considerable pride in the excellent finish of the works under his charge. He had an agreeable manner, and was much respected by the mechanics and others employed under him. He was elected a Member of the Institution in 1845, but could only seldom attend the meetings. His death occurred on the 15th of October 1856, in the forty-sixth year of his age.

Mr. FRANCIS WHISHAW, third son of the late Mr. John Whishaw, solicitor, was born on the 13th of July, 1804. He received a sound education, and having displayed, whilst at school, peculiar aptitude for the mathematical and mechanical sciences, it was determined that he should adopt the profession of an Engineer. He was accordingly articled to Mr. James Walker, M. Inst. C.E.

During his pupilage, he was employed in the year 1824, in preparing plans and sections for a railway to be laid down on the Commercial Road, between London and Blackwall. Subsequently, however, a granite tramway was substituted, extending from the entrance of the West India Docks to the top of the Commercial Road. At this time he constructed a model of a flat arch springing from cast-iron plates, connected by wrought-iron ties, so as to counteract the outward thrust, and to facilitate the building of arches with a small rise, and to reduce the thickness of the superstructure. This system has since been extensively adopted in the construction of fire-proof floors.

In 1832, perhaps from living in the neighbourhood, he first directed his attention to devising means for avoiding the evils and dangers of Holborn-hill, which were constantly apparent to him. For this purpose he made a careful survey of the whole district, ascertaining that the average gradient of Holborn-hill was 1 in 24, the greatest inclination being 1 in $14\frac{1}{3}$, and the least 1 in 131; whilst Skinner-street was not much better, the average gradient being 1 in 32. He then suggested the construction of a Viaduct, extending from the Newgate-street end of the Old Bailey, passing over Farringdon-street and market, and to the north of New-street Square; thence by a gentle curve across Plough-court, Blewitt's-buildings and Bartletts'-passage, to the point where Fetter-lane falls into Holborn. By this route the distance would only have been increased about 30 yards, whilst the road would have been level from Fetter-lane to Farringdon-street, and have had an inclination of 1 in 73 from the latter street to the Old Bailey. He presented a petition to Parliament in favour of this project, accompanied by detailed estimates and lithographic drawings; and a model of the design was exhibited for some time in the Adelaide Gallery. What Mr. Whishaw said of this district in August 1835,¹ that "while almost every part of London is daily improving, Holborn-hill remains nearly the same as it has been for centuries," is still a lamentable fact. About this time he published a comparative plan of London, showing the alterations from 1666, the year of the Great Fire, to 1829. In 1830, he was instructed to report upon a proposed railway between Perran-porth and Truro, in Cornwall, a distance of about 8 miles, and subsequently, on two other occasions, he was consulted, with Mr. R. Thomas, on the same subject. In 1835, in conjunction with Mr. T. L. Gooch, M. Inst. C.E., he acted as an Assistant Engineer, under Mr. R. Stephenson, M.P., President, and was employed in preparing the estimates for

¹ Vide "Holborn Hill Improvements. Report on the projected Viaduct from Fetter Lane to the Old Bailey, and Improvement of Farringdon Market." Tract. 8vo., vol. liv. Plates. London, 1835.

the Manchester and Leeds Railway, and in arranging the requisite proceedings, in Parliament. In 1836, he reported on the proposed Hertfordshire Grand Union Railway, which was to form a junction between the London and Birmingham and the Northern and Eastern Railways, and to give railway communication to the towns of Watford, St. Alban's, Hatfield, Hertford, and Ware. In the year 1837, Mr. Whishaw brought out his "Analysis of (projected) Railways,"¹ at which time, as the Preface sets forth, he had given seventeen years' attention to engineering pursuits, and had made repeated surveys of the principal railways of Great Britain. A second edition of this work was published in the following year, and its success was so great, that, in 1840, Mr. Whishaw dedicated "to the Railway Capitalists of the United Kingdom," a quarto volume entitled "The Railways of Great Britain and Ireland, practically Described and Illustrated."² Before this book was written, he took a railway "trip," as he called it, of 7,000 miles, to collect matter for the work, and only three months elapsed, from the time he began to write it, to the day of its publication.

In 1841, he also published a Railway Map, on which he showed upwards of 1,600 miles of new lines, which he thought necessary to complete the railway system, in addition to about 1,700 miles of railway then open. Several of the proposed lines have since been executed.

In the years 1837 to 1840, but principally in 1839, he conducted a series of practical experiments as to the actual working of the trains on all the British railways at that time open, with the view of ascertaining the amount of power employed in ascending and descending different gradients, and the cost of working. The result of this inquiry induced the expression of an opinion, since more generally acted upon, that too much money was expended in obtaining, what were then termed, good gradients. It also led him to advocate the construction of single lines, with passing stations, so that the railway system might be extended into every portion of the United Kingdom. He proposed, that at the passing stations, the locomotive engines should be reversed, so as to be kept at work on that division of the line for which they might be specially adapted. In this year (1839) he presented two Papers to the Institution, one on "A new mode of preparing Railway Sections, as illustrated by that of the Manchester and Leeds

¹ Vide "Analysis of Railways; consisting of a Series of Reports on the Twelve Hundred Miles of Projected Railways," &c. By F. Whishaw. 8vo. London, 1837.

² Vide "The Railways of Great Britain and Ireland, practically Described and Illustrated." By F. Whishaw. 4to. Plates and Diagrams. London, 1840.
[1856-57. N.S.]

Railway,"¹ and the other "Observations on the present mode of executing Railways, with suggestions for a more Economical, yet equally efficient system, of both executing and working them."² This latter Paper was subsequently extended, and published in extenso, under the title of the "Reciprocating System of Railways," in the treatise on the "Railways of Great Britain," before referred to. The subject was again brought forward, when Mr. Whishaw occupied the post of Secretary to the Society of Arts, where he read a Paper "On the Means of extending the Railway System into every portion of the United Kingdom,"³ in which he also described the atmospheric system, then at work on the Dublin and Kingstown Railway. In connection with the railway system, it may be mentioned, that Mr. Whishaw, in a discussion at the Institution, in February, 1845, upon Mr. Vulliamy's Paper "On the Construction and Regulation of Clocks for Railway Stations," laid claim to having suggested, in 1841, that Greenwich mean time should be adopted for ordinary purposes throughout the kingdom; and that all the clocks along the different lines of railway should be regulated to the same time, by means of the electric telegraph.⁴

He had in the previous Session (1838) presented to the Institution a Memoir on the "History and Construction of (Labelye's) Westminster Bridge, accompanied with detailed drawings,"⁵ for which a Telford Medal was awarded to him. This Paper was looked upon at the time, as having given a good history of the state of engineering a century back, and as a historical record, displaying great labour and research, which it was most desirable for the Institution to possess. Westminster Bridge was the only old bridge remaining, and the contrivances there first brought into use, particularly the mode of building by caissons, the result of their employment, and the progress since made, were most interesting to engineers.

In 1837, he invented the Hydraulic Telegraph, which attracted great public attention, and was favourably reported on by officers of the Government; but the introduction of the electric telegraph, which occurred at nearly the same time, prevented its being extensively used. The attention he paid to the subject of telegraphy, induced the consideration of arithmography, or the foundation of a code of signals, by means of the varied combination of numerals, which should be universal in its application; each particular arrangement of figures being made to represent the same word, or thing, in all languages. By this system he con-

¹ *Vide* Minutes of Proceedings Inst. C.E., vol. i. (1839), p. 43.

² *Ibid.*, p. 53.

³ *Vide* Trans. Soc. Arts, vol. lv., p. 183.

⁴ *Vide* Minutes of Proceedings Inst. C.E., vol. iv., p. 71.

⁵ *Vide* Minutes of Proceedings Inst. C.E., vol. i. (1838), p. 44.

ceived, that greater expedition would be insured, and he commenced the preparation of a general arithmographical lexicon, but did not proceed very far with it. An account of his views on this subject was laid before the Society of Arts in 1843.¹ About this time he also communicated to the same Society, two papers on the electric telegraph; one "On the Application of Electricity to the transmission of Telegraphic Signals,"² in which he described the system then in daily use on the Blackwall, Edinburgh and Glasgow, and Manchester and Leeds railways; and the other on "Cooke's improved arrangements of the Conducting Electric Telegraph,"³ as adopted on the Great Western Railway. In November, 1844, he publicly exhibited at the Society of Arts, the first specimens of Gutta Percha which came to this country. He pointed out, at the time, the applicability of that substance, as bands for driving machinery, in place of the ordinary leather bands, as well as the facilities it afforded for reproducing mouldings, cornices, and copies of works of art. Subsequently, in 1846, he was engaged by the Electric Telegraph Company, under the presidency of Mr. J. L. Ricardo, M.P., to form the Signal-Clerk department, but he left the Company before any very material progress was made. His system of signals, is, however, with some modifications, still in use throughout the kingdom. Upon the conclusion of his engagement Mr. Whishaw was presented with a piece of plate by the officers of the Electric Telegraph Company who had served under him. He devoted much time to the question of the introduction of the electric telegraph into India; and with this view examined the telegraphic establishments of England, France, and Prussia. During the Chairmanship of Mr. Shepherd, he, in conjunction with Mr. Hyde Clarke, laid before the Honourable East India Company, a report which tended to determine the adoption of the system for India, though the organization was intrusted to other hands. In this report he recommended that the underground system of laying the line-wires, as carried out in Prussia, should be adopted in that territory, instead of the suspended, or overground system, almost universal in England. The theoretical correctness of this opinion was to some extent confirmed by the experiments of Dr. (now Sir W. Brooke) O'Shaughnessy, to whom was confided the execution of the Indian telegraphs, a work which he has brought to a most successful issue, but from local circumstances the suspended system has been adopted.

About this time he was appointed the Consulting Engineer to the Gutta Percha Company, and he suggested many valuable

¹ *Vide* Trans. of Soc. Arts, vol. liv., p. 176.

² *Ibid.*, p. 170.

³ *Ibid.*, p. 172.

applications of that material, particularly endeavouring to render it useful for telegraphic purposes. But perhaps the greatest of Mr. Whishaw's public services was the direction of his energies to the resuscitation of the Society of Arts, which would probably have died a natural death, had he not opportunely assembled a few influential men who afforded him their support as Secretary, in his highly meritorious and successful task, for the accomplishment of which he is fairly entitled to great praise. About the end of the year 1842, it was seriously contemplated to break up the Society, and a resolution was passed, though never acted upon, to the effect that the funds were no longer sufficient to retain the services of a salaried Secretary. It was under these circumstances that Mr. Whishaw entered upon the duties of that office. He was very energetic and successful in personally canvassing for members, inducing one hundred and forty new members to join within a few months; and he at once introduced improvements in the character of the evening meetings, by obtaining and contributing Papers for discussion. These efforts, combined with the alterations in the general principles and management of the Society, introduced by other Members, who began to take an interest in it, may be said to have laid the foundation of its present prosperity. The communications he laid before the Society, which have not been previously noticed, were, in 1843, "On the Great Pyramid of Gizeh,"¹ from information supplied by Mr. J. K. Perring; and on "Messrs. Young and Delcambre's Type-setting Machine,"² in which the letters were arranged in tubes, or columns, all of the same length, and so placed, that by touching keys, somewhat similar to those of a pianoforte, any particular letter could be released, and thus any desired word, or combination of words, could be composed. In the following year he contributed papers, "On Means of preserving Life in cases of Shipwreck,"³ to which subject the Society had, for upwards of fifty years, paid marked attention, had accumulated many facts regarding it, and had rewarded numerous inventions designed to facilitate this laudable object. Also "On the Means of Cleansing daily the Streets of the Metropolis,"⁴ which Mr. Whishaw, as early as the year 1821, had proposed to carry out by the partial employment of the poor; on "Robson's Patent Signal Lights,"⁵ on "Rendering Paper Hangings useful as well as ornamental,"⁶ in which he described the three processes then practised in printing paper hangings, and suggested that the papers for the walls of schoolrooms and lecture halls, should be arranged in

¹ *Vide* Trans. Soc. of Arts, vol. liv., p. 187.

² *Ibid.*, vol. lv., p. 59.

³ *Ibid.*, p. 134.

⁴ *Ibid.*, p. 168.

⁵ *Ibid.*, p. 113.

⁶ *Ibid.*, p. 150.

panels, and that these should be filled in with such things as it might be desirable to implant firmly in the minds of the pupils; "On the Management of Bees;"¹ and on the "Manufacture of Casks, more particularly those used by brewers, with remarks on the various methods adopted for cleansing and purifying such vessels." Subsequently, in 1847, he read a Paper "On the Application of Heated Currents to Manufacturing and other Purposes,"² in which he described Messrs. Davison and Symington's process for seasoning wood, preserving timber, purifying animal productions, and drying manufactured articles, &c.

In 1844, Mr. Whishaw gave the first *soirée* held at the house of the Society of Arts, which led to a series of *conversazioni*, that soon became the acknowledged *réunions* of all the leading professors of science and art. In the autumn of that year, he attempted to get up an exhibition of paintings, at which money prizes were to be awarded, the candidates themselves to be the judges. The advantages of exhibitions had long been known to the Society, the different forms best suited to advance the Society had often been the subject of discussion, in which Mr. Whishaw, as an active member, took a leading part, and it is probable that he, and all who were in favour of exhibitions and had visited the Paris 'Expositions,' had vague notions of the benefit to be derived from some Great Exhibition. But the particular exhibition recommended by Mr. Whishaw was limited to the products of British industry, as shown by his own advertisement inserted in the "Athenæum" at the time, in which prizes were offered to the amount of £300 for a design for a suitable building, and for paintings, inventions, &c. A private subscription was afterwards raised, and Mr. Whishaw, at the request of some of the influential members of the Society of Arts, visited the chief manufacturing districts as its agent, with the view of ascertaining the feelings of the manufacturers. In the summer of 1845, he accepted an appointment in connection with Prosser's wooden railway, relinquishing the post of Secretary to the Society of Arts, in which he was succeeded by Mr. J. Scott Russell, M. Inst. C.E. When he withdrew from the active duties of Secretary, the Society was in a much improved condition, and his name was retained, in conjunction with Mr. Russell's, for two years. On retiring in 1847, he was elected an Honorary Member of the Society. With regard to the Exhibition question, it may be mentioned, that although, at this period, no direct movement was taken, beyond the small annual Exhibitions of Manufactures held in the Society's rooms, the first of which took place in 1847, yet the subject was kept alive as opportunity offered; friends were conciliated, and

¹ *Vide* Trans. Soc. of Arts, vol. lv., p. 160.

² *Ibid.*, New Series, p. 145.

opposition was neutralized. Mr. Whishaw, having abandoned his idea of a National Exhibition, co-operated with the Council of the Society, in June, 1849, in endeavouring to find parties willing to advance the necessary funds for carrying out a Universal Exhibition; and at last sufficient progress was made to justify an appeal to the public. Of these preliminary proceedings the Great Exhibition of 1851 was the result, the peculiar feature of its universality and of its international character, being due to Mr. Thomas Winkworth, long an active Member, and now a Vice-President, of the Society. The General Executive Committee appointed to arrange the preliminary proceedings for the proposed international Exhibition consisted of Messrs. H. Cole, F. Fuller, J. Farey, J. Woods, and G. Munday (the proposed Contractor for the building), with Mr. J. Scott Russell (the Secretary), and Messrs. J. Payne, P. Le Neve Foster, and T. Winkworth (Treasurers), and by them the patronage of His Royal Highness the Prince Albert, as President of the Society of Arts, was sought and obtained. The matter was then taken up by Sir Robert Peel, Lord Granville, and others, and was brought to a successful issue. In connection with the Exhibition, Mr. Whishaw was engaged to visit the manufacturing districts, and he wrote a series of articles on the mechanical department, which appeared in the "Illustrated London News."

During the latter years of Mr. Whishaw's life, he was a great sufferer from bodily illness, and was, in consequence, unable to attend to professional duties, or to those questions which had so long occupied him. To a man of such indefatigable perseverance this was a source of much sorrow, for in the business of life he displayed such zeal and earnestness, that he could not rest till all that he undertook was accomplished. His earthly career was suddenly terminated, on the 6th of October 1856, in the fifty-second year of his age. Mr. Whishaw joined the Institution of Civil Engineers as a Member in the year 1834, and as will have been gathered from the preceding summary of his life, took an active personal interest in its welfare, by contributing papers and taking part in the discussions.

Mr. THOMAS JACKSON WOODHOUSE was born at Bedworth, in the county of Warwick, on the 9th of December, 1793. He was the son of Mr. John Woodhouse, Civil Engineer, whose Father also had followed the same profession. He was educated under Mr. Thomas White, the head master of a school, of King Edward's foundation, at Towcester, in Northamptonshire, which during the early part of this century, enjoyed a high reputation,