

# JOHN RENNIE

(1761-1821)  
F.R.S.E., F.R.S.

CIVIL ENGINEER

Contemporary biographical notices reprinted  
on the 250th anniversary of his birth



selected and edited by

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Rennie's first major road bridge at Kelso. Designed in 1798, built 1802-05 with five elliptical spans of 72 ft. Similar in elevation to his Waterloo Bridge, London 1811-17 with nine main spans of 120 ft.

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Rennie's magnificent London Bridge, designed in 1820. With centre arch of 152 ft span [*Cresy Ency.* 445]. Progressed posthumously to completion in 1831 by his sons. Cost c. £2.5m. Lasted until 1968, when sold and dismantled. By 1971 its facings formed part of a re-build at Havasu City, Arizona. This engraving of 1831 is from a drawing by A. Pugin.

## PREFACE

The purpose of this publication is to provide a contemporary impression of the life and work of the eminent civil engineer John Rennie FRSE [1788] & L [1798] to complement lectures, and exhibitions in Dunbar and London, commemorating the 250th anniversary of his birth on 7th June. To this end, these seven biographical notices have been selected, the first being notable for its depiction of the grandeur of Rennie's funeral at St Paul's Cathedral in 1821.

This account is followed by the *Notice Nécrologique* of the celebrated French engineer Baron Charles Dupin, who met Rennie after the cessation of hostilities with France when he was touring and inspecting the civil, military and naval public works of Great Britain in 1816-20 as a preliminary to publication. His account, despite its rather discursive style, represents an authoritative international appreciation of Rennie achievements. Usefully, it also gives Rennie's opinion of French infrastructure and identifies his distinguished French contacts.

Dupin's *Notice* commended itself to the *Scotsman* obituarist in 1821, who included a translation of key elements, to which I have added several more in the footnote. Interestingly, Dupin then placed only Watt, Rennie and Telford in the first rank of British civil engineers.

The fourth and fifth notices were written by John Barrow, Clerk to the Admiralty, author and traveller, in the *Encyclopaedia Britannica*, and by leading scientist David Brewster in the *Edinburgh Encyclopaedia*. Both knew Rennie well. Brewster concludes with a perceptive review of civil engineering, as it then was and should be, placing Rennie's practical engineering in context. Although in Brewster's opinion, and mine, his works "are sometimes characterized by a massiveness and expence which may not have been absolutely necessary", nevertheless they made a immense and essential contribution to the national well-being, with many still in use.

The sixth notice is from Gorton's *Dictionary*. It mentions Bell Rock Lighthouse, "which as proof of Rennie's great skill has excited general admiration". This work was also attributed to Rennie by Dupin, and writers in the *Annual Biography and Imperial Magazine*. It was only after publication of Stevenson's 1824 classic on the lighthouse, in which he played down Rennie's key role, that Stevenson was increasingly credited with both its design and execution.

The final notice is by an English civil engineer, Michael A. Borthwick who in 1837, after painstaking research, provided reviews of the achievements of Rennie and other leading engineers in his introduction to the first volume of *Transactions of the Institution of Civil Engineers*.

The portraits are from Borthwick's extra-illustrated copy of his introduction. The William Behnes portrait on the title, an engraving which prefaced an obituary in the *European Magazine* [November, 1821], is evocative of Rennie as a bibliophile. The portrait on the back cover, of Rennie aged 41, is an early 19th century engraving from a drawing by George Dance.

Rennie as a bibliophile was a man after my own heart. When his fine library was sold at auction in July 1829 it comprised more than two thousand titles of books ranging from the 15th-19th century. It included early printing; history; topography; travel, with such gems as Daniell's *Oriental Scenery* (1795) and *Voyages in Great Britain* (1814-25) and Hakluyt's *Navigations* (1809); works by Defoe, Euclid, Isaac Newton and Euler; and a first folio Shakespeare (1623)! That the sale catalogues contain very few engineering titles, in which Barrow [p.17] confirms Rennie's library to have been strong, suggests that these books were retained by his sons.

I wish to express my gratitude to Willie Johnston of Livingston for his painstaking transcription of most of these notices from my contemporary copies and for advising on layout; to Claire Delgal of the Institution of Civil Engineers Library for her help in translating parts of Dupin's *Notice Nécrologique*, and to the National Library of Scotland for access to Dupin's presentation copy to Rennie of the latter [Stev. 155(12)] and the *Catalogue of the splendid and valuable library of the late John Rennie Esq.* July 1829 [APS.2.82.39(1) and (2).]

I close by also expressing my thanks to Heriot-Watt University for its invaluable support in this and my teaching and research as an *Honorary Professor* since 1990. This support is particularly appropriate in the present venture because of Rennie's close collaboration and friendship from 1784-1819 with our own James Watt, who "first led Mr. Rennie to the study of that branch of civil engineering connected with hydraulic and hydrodynamics, in which he became so celebrated, as to have no rival after the death of Smeaton ..." [p. 14]

**Roland Paxton** *Vice-Chairman ICE Panel for Historical Engineering Works*

## In *The Times*

### THE LATE MR. RENNIE

The remains of this ingenious and much-regretted individual were yesterday deposited in St. Paul's Cathedral. The funeral arrangements were conducted (we understand) by Messrs. Wilkinsons of Ludgate-hill: all the appointments, without any affectation of splendour, were extremely handsome and well devised; and in the long train of mourners who followed this man of science to his grave, were many to whom his exertions had been valuable, and many by whom his talents had been admired. As early as 11 in the forenoon, a considerable crowd had collected itself opposite Mr. Rennie's house in Stamford-street, Blackfriars; and at that time the funeral coaches and private carriages assembled formed a line of nearly a mile in length: a hundred and fifty horses, with a proportionate number of attendants, were employed in the cavalcade. About 12 o'clock, preparations being complete, the removal of the body was commenced. The coffin, which was of gigantic proportion, covered with black velvet and ornamented with gold, was carried by eight bearers through a crowd of uncovered and silent spectators; and the *cortege* consisting of a hearse, with six horses, sixteen mourning coaches, with four horses each, and nineteen private carriages (several of them with four horses also), moved slowly towards the place of its destination. The doors of St. Paul's were surrounded even before the funeral started from Stamford-street; and the key-keepers profited by pence exacted for prompt admission to the curious or impatient; but it was not until near one o'clock that the procession appeared in sight. A few minutes before one o'clock the dark train entered the gates at the top of Ludgate-hill, and, sweeping round the wide area, approached the steps of the Cathedral. The body was then taken from the hearse, and carried, followed by sixty mourners, into the little chapel on the north side of the church; the funeral service was read; and the interment subsequently took place with the accustomed solemnities, in a vault at the east end, and on the south side of the building, near the tomb of the late Lord Collingwood.

Upon the professional talents of Mr. Rennie, little, if any, comment can be necessary. For a long time prior to his death few works of magnitude, either public or private (by whomever they might be devised) were executed without his assistance. A Scotchman by birth, he inherited the sagacity and industry characteristic of his country; and self-educated, self-assisted, he rose, from a station laborious and obscure, to the highest eminence in the scientific profession which he pursued. Upon whatever undertaking proper to an engineer—whether lands were to be drained, or waters to be filtered—bridges erected, or machinery devised—few ever consulted Mr. Rennie without consulting him to advantage. If his plan was ingenious, his execution of that plan would be still more excellent. No man was more anxious for the durability of his works; few so immediately perceived all the difficulties, immediate and remote, with which an operation was likely to be attended. It was not only at what would occur on the morrow that he looked, but at what was to occur 50 years afterwards; not only at the remedy for the existing evil, but for prevention of the evil which might, unprovided for, exist in time to come. Mr. Rennie was for many years an intimate friend of the late Mr. Watt; and possessed much of that untiring ardour in pursuit, that fondness for his profession, which led to the improvements upon improvements devised by the latter in the steam-engine.

To enumerate the inventions of this able engineer, or even the leading objects in which he has been engaged, would compel us far to exceed the brief space which we are enabled to devote to his memory. Among the inventions, his mode of exploding sunken rocks by the assistance of the diving bell, and his device for measuring the force of water, will be within the recollection of every man of science. Among his public works, the Waterloo-bridge, the Breakwater at Plymouth, and the dikes erected after the inundation (a few years since) in Holland [Lincolnshire], will not hastily be forgotten. Many valuable projects will probably have died with Mr. Rennie, and his loss will be deeply felt by those in whose speculations he was engaged: on the other hand, the fortune and reputation to which—to his honour be it spoken—from a station of comparative obscurity he had risen, will animate the exertions of genius under difficulty.

Among a vast number of distinguished persons who followed Mr. Rennie to the grave, we noticed Sir Joseph Yorke, Sir Humphrey Davy, Sir J. Seppings, Sir George Cockburn, Sir J. B. Martin, Sir Thos. Lance, Sir James Shaw, Mr. Geo. Abercrombie Robinson, chairman of the East India Company, Mr. Hamilton, Under Secretary of State, Mr. Chantry, Royal Academician, Mr. W. T. Brande, &c., &c. Mr G. Rennie, the eldest son of the deceased, appeared as chief mourner. The service was read in the chapel by the Rev. Mr. Hayes: the Rev. Mr. Mapleton officiated in the vault. Some confusion arose from the efforts of the crowd to force themselves with the procession into the church, but no serious accident occurred.

*The Times*, 17. 10. 1821, 3a.

### by Baron Charles Dupin (1784-1873)

DEPUIS que le retour de la paix nous a permis de visiter les Royaumes Britanniques, et d'acquérir une connaissance plus précieuse encore que celle des chefs-d'œuvre du savoir et de l'art, (la connaissance et l'amitié des hommes qui sont la gloire d'un grand empire), la mort semble doubler d'impatience, pour frapper du coup fatal les artistes et les savants dont les magnifiques travaux ou le noble caractère, ont fait le plus d'honneur à leur patrie.—Sir Joseph Banks qui, réunissant en frères tous les hommes distingués par leurs œuvres et leur génie, s'était rendu, par son accueil et ses bienfaits, le patriarche de cette immortelle famille.—Le Général Mudge qui conduisit pendant long-temps, avec un égal succès, l'école royale des ingénieurs militaires et des officiers d'artillerie, et les travaux scientifiques auxquels sera due la carte magnifique de la Grande Bretagne, levée et publiée aux frais du gouvernement.—Le professeur Playfair qui, sans marquer dans un rang élevé, parmi les inventeurs, occupera cependant une place éminente dans l'histoire des sciences, par la vaste étendue de ses connaissances exactes, par la philosophie de ses écrits, et par le souvenir du charme de son caractère.—M. James Watt dont les découvertes mécaniques forment, en même temps, une époque dans la théorie et dans la pratique des arts les plus importants au bien-être de la société.—Enfin, Mr. John Rennie, l'ami de tous ces hommes célèbres, le compagnon des travaux de Watt et de Boulton, dans les applications nombreuses de la plus puissante des machines, aux plus utiles des arts; applications qui ont donné pour long-temps, à la Grande Bretagne, une prépondérance marquée dans plusieurs branches d'industrie, ainsi que la puissance et la richesse que produit toujours cette prépondérance:—M. J. Rennie, le digne successeur de Smeaton, et l'ingénieur auquel est due l'exécution des plus beaux monuments d'utilité publique érigés, depuis vingt ans, sur tous les points des trois Royaumes Britanniques.

Dans le court espace de deux années, tous ces hommes célèbres sont descendus dans la tombe. Leur patrie est désormais privée de leurs nobles services; elle ne garde d'eux que leurs leçons, leurs exemples, et les travaux fructueux auxquels est attachée leur gloire à jamais durable.

J'essaierai de payer un faible tribut d'estime et de regrets, à l'illustre ingénieur qui fut bienveillant envers moi dès son premier accueil, qui m'accorda son amitié dès que j'eus conquis son estime, qui m'ouvrit les trésors de son riche portefeuille et de son expérience plus riche encore; et qui, jusqu'aux confins de l'Irlande et de l'Ecosse, m'a fait retrouver dans l'hospitalité de ses élèves, et dans la libéralité de leurs communications, les lumières et les services que j'avais eu le bonheur de trouver auprès de lui.

M. J. Rennie était également affable et bienveillant avec tous les ingénieurs étrangers qui venaient en Angleterre étudier ses travaux, et profiter de ses lumières. Il était lié d'une amitié particulière avec notre célèbre confrère M. de Prony; d'autres ingénieurs distingués par leurs travaux et leurs écrits, MM. Girard, Cordier, et Dutens ont profité de ses communications bienveillantes et libérales.

C'est en vain que d'obscurs écrivains ont tenté de semer la discorde entre les ingénieurs les plus éminents de deux nations dignes d'être rivales, mais qui jamais ne devraient être ennemies. Déplorable acharnement de la médiocrité! Dans l'espoir d'exciter l'attention par l'attrait du scandale, et d'obtenir des lecteurs, en flattant des passions trop communes, en caressant des préjugés vulgaires, et surtout en nourrissant des jalousies, des animosités

nationales, certains adulateurs qui ne savent honorer leur idole qu'en déchirant des victimes sur les marches de l'autel, de tels hommes n'ont jamais cru pouvoir louer les beaux ouvrages de M. J. Rennie, sans les rehausser par des comparaisons injustes et de mauvaise foi, faites dans la vue d'avilir les chefs-d'œuvre de l'étranger, et surtout les chefs-d'œuvre de la France.

Les écrivains qui crurent ainsi flatter l'orgueil d'un ingénieur à qui la vérité suffisait pour rendre célèbres ses travaux, et qui crurent acheter son approbation aux dépens de la vérité même, se sont trompés dans leur attente.

Au dessus du sentiment de l'envie, M. J. Rennie savait rendre aux monuments des peuples étrangers une justice que des critiques ignorants osaient leur refuser. Après son dernier voyage dans les ports et l'intérieur de la France,\* [\* En 1819, M. J. Rennie désira visiter les arsenaux de Brest et de Cherbourg. Le ministre de la marine française s'empressa d'accéder à ce désir, en recommandant aux officiers supérieurs de ces deux ports, de recevoir M. J. Rennie avec autant d'égards et d'obligeance que cet ingénieur en avait mis à faire recevoir M. Dupin dans les ports d'Angleterre. Quels qu'aient été les fruits du voyage de M. J. Rennie, nous pouvons hardiment assurer que, dans cet échange de lumières et de bons procédés, ce n'est pas la France qui a retiré la moindre part de bénéfice. (Note de l'Éditeur.)] je l'ai moi-même entendu louer, en juge éclairé, les beaux travaux des ports de Brest et de Cherbourg, et les ponts, et les canaux, et les chaussées qu'on admire dans toutes les parties de la France.

Pour nous, qui croyons pouvoir admirer en même temps les chefs-d'œuvre de l'art, sur les bords de la Seine et sur les bords de la Tamise, dans les ports de Brest et de Sheerness, dans les ports de Cherbourg et de Plymouth; en remettant à d'autres temps, à d'autres écrits, le juste tribut d'admiration que méritent ces chefs-d'œuvre de notre patrie, contentons-nous en ce moment d'apprécier, d'après leurs propres mérites, les constructions si remarquables qui sont dues à l'excellent ingénieur auquel est consacrée cette Notice.

M. J. Rennie s'est élevé par son seul mérite. Dans un pays où l'éducation est générale, il reçut, dès son enfance, une instruction dont il sut plus tard reconnaître dignement le bienfait.

L'Ecosse a la gloire d'avoir produit la plupart des ingénieurs civils qui, depuis près d'un siècle, ont exécuté les plus beaux monuments des trois royaumes, et les machines les plus ingénieuses; James Watt, John Rennie, Thomas Telford, etc. secondés avec tant d'habileté par les Nimmo, les Jardine, les Stevenson, etc.

M. J. Rennie commença sa carrière par des travaux mécaniques; il exécuta pour MM. Watt et Boulton les moulins que devaient mettre en mouvement les machines à vapeur;\* [\* On cite particulièrement les machines de l'établissement connu sous le nom d'*Albion Mills*.] il fit lui-même l'application de ce puissant moteur à la machine à curer dont il a rendu l'usage plus fréquent et plus efficace, pour approfondir ou nettoyer des canaux, des fleuves, des bassins et des ports.

Bientôt M. J. Rennie apprit de Smeaton l'art de diriger les constructions hydrauliques; il se forma par les conseils et les exemples de ce grand ingénieur, et par l'étude des travaux d'un maître qu'il devait égaler à quelques égards et surpasser à beaucoup d'autres.

Il a donné les plans et dirigé les travaux des Docks des Indes orientales et du Dock de la ville de Londres (*London Dock*);\* [\* Dans ces travaux M. J. Rennie fut particulièrement secondé par M. Thomas qui dirige actuellement les grandes constructions hydrauliques de Sheerness.] également remarquables par la grandeur de l'ensemble, l'intelligence dans la distribution des parties, et la beauté de l'exécution. La construction des Docks des Indes occidentales, confiée d'abord à M. Jessop, fut, après la mort de cet habile ingénieur, terminée par M. J. Rennie.

Je citerai comme des chefs-d'œuvre de simplicité, d'élégance et de solidité, les hangars que ce dernier ingénieur a bâtis sur les quais du Dock des importations, pour recevoir et mettre à l'abri les produits des Indes occidentales, aussitôt après leur débarquement.

Au moment même où la mort allait le frapper et nous l'enlever, il achevait une construction nouvelle, également ingénieuse par son architecture et par son mécanisme. Des toits vastes, supportés par de hautes colonnes en fer coulé, présentent au milieu de leur charpente, des routes aériennes, sur lesquelles on fait courir des chariots dont le mécanisme est disposé de manière à pouvoir, par leur secours, suspendre, transporter, monter et redescendre à volonté, d'énormes arbres d'acajou, tenus en dépôt dans ces beaux magasins. Au moyen de ce système ingénieux, quelques manœuvres exécutent à présent, en peu de

minutes, des mouvemens et des transports qui demandoient auparavant des heures entières et beaucoup d'ouvriers.

Les ports de Liverpool,\* [\* Les travaux de Liverpool sont conduits avec talent par M. Forster, d'après les plans de M. J. Rennie.] de Hull, de Greenock, de Leith, de Holyhead, de Port Patrick, de Howth, de Dunleary, et beaucoup d'autres encore, offrent des exemples variés des ressources du génie mécanique et des talens de M. J. Rennie, comme architecte et comme hydraulicien. Partout, les opérations de chaque espèce d'ouvriers ont été combinées de manière à se succéder sans perte de temps, et de manière à produire, avec un nombre donné d'hommes, le plus grand résultat possible; partout, des machines sont employées pour exécuter ce qu'elles seules peuvent bien exécuter, avec économie, avec précision, avec rapidité.

M. J. Rennie a porté ce même esprit de combinaison et de calcul dans les travaux, non moins variés et non moins nombreux, qu'il a dirigés pour la construction de canaux entièrement neufs, ou l'amélioration de canaux déjà construits; il faut citer surtout les travaux du canal Crignan [i.e. Crinan] qui présentaient le plus de difficultés naturelles.

Il faut citer encore, parmi les entreprises qui font le plus d'honneur à son talent, les opérations exécutées sous sa direction pour effectuer le dessèchement des vastes marécages que présentait la partie orientale de la Grande-Bretagne, dans les comtés de Lincoln, de Bedford, de Norfolk et de Cambridge.

Les habitans de Perth eurent besoin des travaux de M. Rennie pour améliorer la navigation du Tay, de ce fleuve dont le cours et les abords sont si beaux, qu'en découvrant la vallée qu'il arrose, les soldats d'Agricola, croyant revoir un des sites majestueux du Latium, s'écrièrent, transportés d'enthousiasme: "*Voilà le Tibre!*"

M. Rennie rendit à ses compatriotes le service qu'ils avaient demandé avec instance; mais lorsqu'ils voulurent lui donner la juste récompense de ses travaux, il se contenta de répondre qu'il l'avait reçue depuis long-temps, dans l'académie de Perth, où il avait fait ses premières études.

Non loin de l'embouchure du Tay, sur le rescif de Bell-Rock, à douze milles du rivage, M. J. Rennie a bâti le beau phare qui rivalise avec celui d'Eddystone, dont il rappelle la forme, dont il égale la hardiesse et la grandeur.\* [\* C'est M. Stevenson, habile ingénieur civil qui a conduit les travaux du phare de Bell-Rock sous la surintendance de M. John Rennie.]

Parmi les monuments qui font le plus d'honneur au talent de M. J. Rennie, il faut compter ceux dont les arsenaux et les ports militaires de la Grande-Bretagne lui doivent l'érection; les grandes et nouvelles formes de construction de Chatham, de Portsmouth et de Plymouth; le beau quai de la Tamise, devant les établissemens publics de Woolwich: enfin, les travaux de Sheerness, et la jetée de Plymouth.\* [\* Ces travaux sont décrits en détail et accompagnés de planches très-soignées dans les *Voyages dans la Grande-Bretagne*, publiés par M. Dupin. (*Note de l'éditeur*).]

Dans les constructions hydrauliques de Sheerness, on voit l'art luttant contre les difficultés de la nature, et triomphant de ces difficultés. L'arsenal entier est établi sur un sol artificiel; les édifices qu'on y bâtit sont fondés sur des coques d'anciens vaisseaux, ensevelies sous les alluvions qui forment l'île de Sheppey. Pour mettre les bassins qui contiendront les vaisseaux, à l'abri des filtrations qui les assécheraient lors des basses marées, il a fallu les excaver bien au dessous de leur profondeur ordinaire, et les remplir ensuite dans toute leur superficie, par une couche de terre glaise dont l'épaisseur surpasse la hauteur de deux hommes d'une taille élevée. Des contreforts elliptiques, bâtis en briques et remplis de pierres calcaires cimentées avec de la pouzzolane, servent à soutenir des murailles de granit dont les blocs rejoints avec un soin extrême, sont, par leur masse et par leur nature, également à l'épreuve des outrages du temps et de la main des hommes. On croit voir un ouvrage des Romains, dans les beaux temps de leur puissance!

La jetée de Plymouth présente un autre spectacle;\* [\* Les travaux du Breakwater de Plymouth sont dirigés sur les lieux par M. Whidby, qui lui-même a perfectionné beaucoup de moyens d'exécution.] c'est au milieu d'une mer orageuse que s'élève cette barrière hardie. Ici le marbre remplace le granit; les formes irrégulières des matériaux sont substituées à leur parfait équarissage; mais un enchaînement méthodique offre tous les avantages de force et de durée qui forment le caractère de ces constructions cyclopéennes, intactes encore, après

trente siècles d'outrages des hommes et du temps; et qui sont les soubassemens inaltérables de monumens à demi ruinés, quoiqu'élevés par des peuples plus récents de dix siècles, peut-être! Telle sera la durée des constructions sous-marines de la jetée de Plymouth.

Cette inaltérable solidité, assurée par la sagesse des formes et par la prudence des dimensions, nous semble être le caractère essentiel et distinctif des grands travaux de M. J. Rennie. Ce caractère est surtout remarquable dans les deux plus beaux ponts qui décorent la métropole de l'empire britannique.

Le pont de Southwark est le premier où l'on ait conçu l'idée hardie d'employer le fer coulé par masses pleines, et d'une étendue qui surpasse beaucoup celle des voussoirs en pierre des plus grandes dimensions. Les arches de ce pont sont formées par des voussoirs métalliques, qui ne pouvaient être coulés que dans une contrée où la métallurgie fut portée au plus haut degré de la perfection. M. J. Rennie a tiré de cet état avancé de l'industrie tout l'avantage que son talent pouvait en retirer. Lorsque l'on considère et l'étendue et l'élévation des arches de ce pont, et l'énormité des éléments qui le composent, l'on acquiert une idée plus grande de la force de l'homme; et l'on s'écrie involontairement en admirant ce chef-d'œuvre: C'est le pont des géants!

Arrêtons-nous, enfin, au dernier pont en pierre que M. J. Rennie ait bâti. Le pont du Strand est, dans son genre, le plus hardi, le plus régulier, le plus grand de tous ceux qu'on peut voir aujourd'hui dans les trois Royaumes Britanniques.

Les Anglais citaient jadis avec orgueil les ponts de Blackfriars et de Westminster. Mais, depuis que le nouveau pont est jeté sur le bassin qui sépare ces deux beaux monuments d'utilité publique, ils semblent avoir perdu leur régularité, leur étendue et toute leur majesté.

Les trois ponts de Blackfriars, de Westminster et de Londres (*London-Bridge*), ayant été construits en pierre tendre et susceptible de se décomposer à l'air, ont déjà prodigieusement souffert des ravages du temps. Il en est de même de la plupart des édifices qui décorent aujourd'hui la métropole.

Si par l'effet incalculable des révolutions qu'éprouvent les empires, les peuples à venir, se demandent un jour ce qu'était autrefois la nouvelle Sydon, et ce qu'est devenue la Tyr de l'Occident, qui couvrait toutes les mers de ses vaisseaux? ... —La plupart des édifices, dévorés par un climat destructeur, ne seront plus là pour répondre à la curiosité des hommes, par la voix des monuments; mais le pont bâti par Rennie, au centre du monde commercial, subsistera pour redire aux générations les plus reculées: Ici fut une ville riche, industrielle et puissante. Le voyageur, à la vue de ce monument superbe, supposera qu'un grand prince aura voulu, par maintes années de travaux, illustrer la fin de son règne, et consacrer à jamais la gloire de sa vie, par cette imposante structure. Mais, si la tradition instruit le voyageur, que six années ont suffi pour entreprendre et finir cet ouvrage; s'il apprend qu'une simple association de quelques marchands, eut assez d'opulence pour bâtir à ses frais ce monument colossal, digne des Sésostris et des Césars, il admirera plus encore la nation où de semblables travaux purent être le fruit des efforts de quelques individus obscurs et perdus dans la foule des citoyens industriels.

Sans concevoir la folle espérance que mes écrits vivent assez pour apprendre aux âges futurs ce qu'ont été les moyens, les ressources et les travaux employés pour ériger de semblables monuments; j'essaierai, du moins, de redire à nos contemporains, à nos plus proches neveux, quels furent les moyens employés par des hommes ingénieux, pour embellir leur terre natale par des édifices dont l'utilité fait, aux yeux du sage, le plus magnifique ornement.

Peut-être la grandeur des œuvres que j'entreprends de décrire, donnera quelque valeur à des descriptions dont la fidélité sera du moins le mérite. Ces descriptions seront un hommage à la mémoire d'un ami dont je déplorerais toujours la perte.

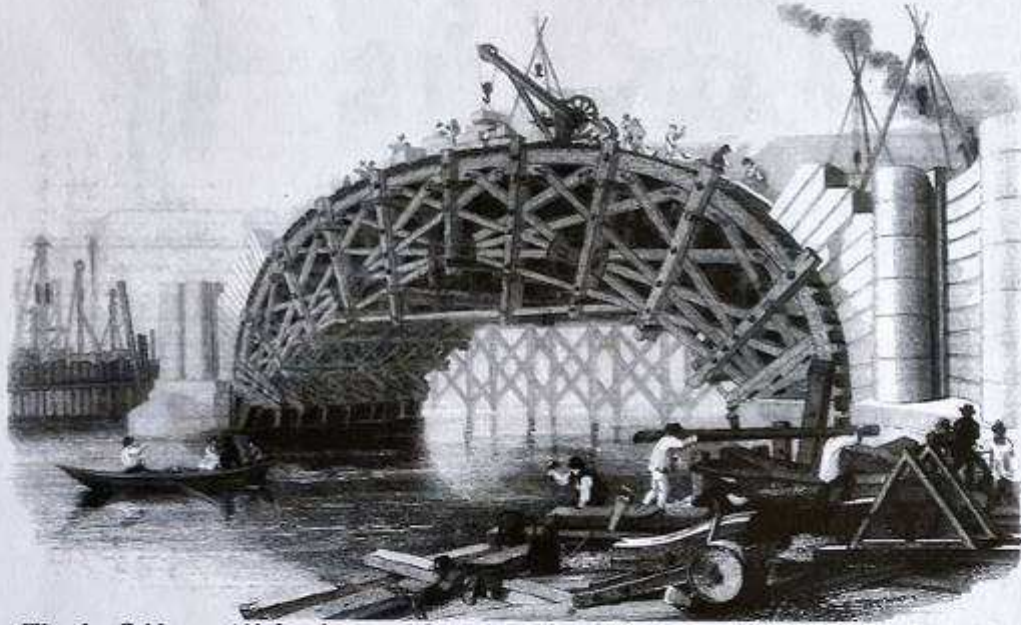
Il laisse à sa nombreuse famille une honnête opulence, acquise par les mêmes travaux que sa gloire. L'héritage d'un nom rendu célèbre d'un bout à l'autre de l'Europe doit être, pour ses fils, une obligation de marcher avec éclat dans la carrière dont il a reculé les limites.

L'aîné de ces fils, M. George Rennie, qui s'est déjà fait connaître en dirigeant l'érection des grandes forges de Woolwich, et en faisant sur la force des métaux d'utiles expériences, est inspecteur des machines de la monnaie. Son second frère, M. J. Rennie, après avoir conduit sous l'inspection de son père, l'érection des nouveaux ponts de Londres, vient de parcourir



les contrées de l'Europe les plus riches en monuments anciens ou modernes, afin d'ajouter l'expérience des autres peuples et des autres siècles, à l'expérience qu'il avait acquise auprès du meilleur des guides que pût lui donner sa patrie. Ainsi, dans un âge où les jeunes ingénieurs commencent leurs études pratiques, M. J. Rennie (junior) a déjà toute l'expérience qui peut le mettre en état de conduire, par lui-même, des travaux tels que ceux dont il avait la direction, avant la perte de son célèbre père.

*Notice Nécrologique sur John Rennie ...Adressée à l'Institut Royal de France ...*  
Londres, Chez Martin Bossange, 1821. [A partial translation follows in *The Scotsman*]



Waterloo Bridge – a 120 ft arch span under construction. Bridge opened with great splendour with a procession headed by the Prince Regent and the Dukes of York and Wellington on 18th June 1817.  
From a drawing by E. Bloore engraved by Edmund Turrell published in 1826.

### *In The Scotsman*

#### THE LATE MR RENNIE

M. Dupin, who is so well qualified to do justice to the merits of the late Mr Rennie, has in a *Notice Nécrologique* respecting him, addressed to the Royal Institute of France, paid a tribute to the virtues and amiable qualities of that distinguished individual, and given a brief but masterly account of his principal works.

Mr Rennie, says M. Dupin, raised himself by his merit alone. In a country in which education is general, he received from his infancy, the benefit of instruction, which he afterwards knew how to appreciate.

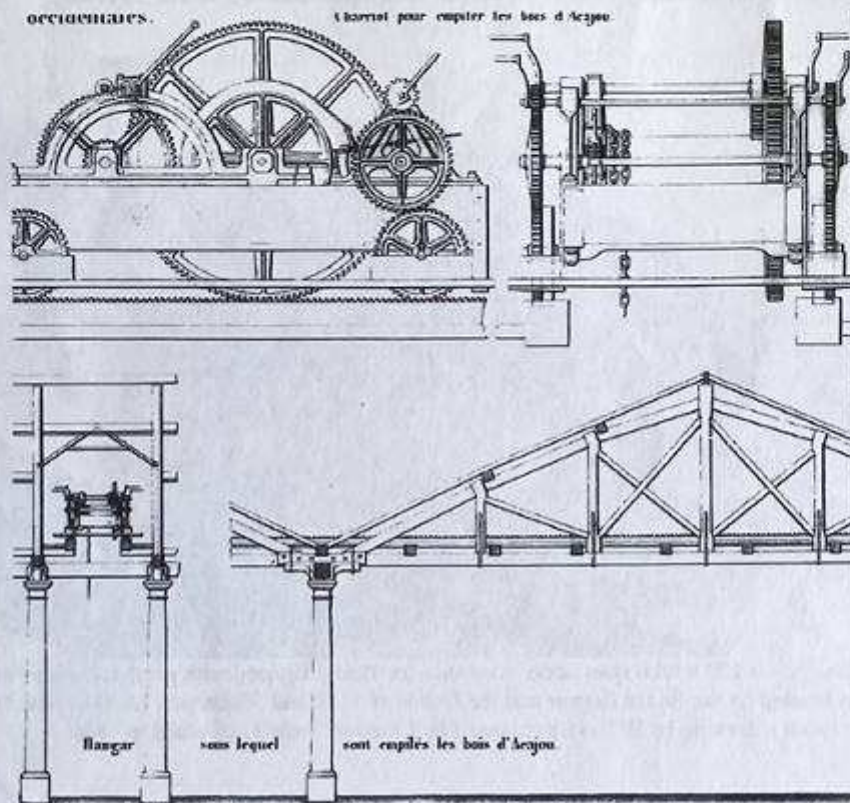
Scotland has the glory of having produced the most of the civil engineers who, for nearly a century, have executed the finest monuments in the three kingdoms, and the most ingenious machines; James Watt, John Rennie, Thomas Telford, &c. seconded with so much ability by the Nimmos, the Jardines, the Stevensons, &c.

After enumerating the works executed by Mr Rennie, for Messrs. Watt and Boulton, and his application of steam to machinery for clearing canals, he observes—

Mr Rennie immediately learned from Smeaton the art of directing hydraulic constructions; he formed himself by the counsels and example of that great engineer, and by the study of the works of a master, whom he was to equal in some respects, and surpass in many others.

M. Dupin then alludes to the East India and London Docks, and the completion of the West India Docks, and observes [of the latter]

At the very moment he was snatched from us by death, he was busied in finishing a new construction equally ingenious for its architecture and its mechanism. Vast roofs, supported by lofty columns of cast-iron, present in the middle of their structure, aerial roads, on which are made to run carriages, whose mechanism is so contrived, that by their means, enormous mahogany trees kept in these fine magazines may be raised and let down at pleasure. By means of this ingenious system a few workmen now execute in a few minutes what required formerly whole hours, and a greater number of workmen.



Dupin engraving showing Rennie's innovative application of cast-iron to an overhead cog railway and carriage for transporting mahogany trunks at West India Docks.

[Dupin's *Voyages dans la Grande Bretagne*. Paris 1822, pt.3, pl. XI]

Our limits will not allow us to follow M. Dupin through his account of the various works of Mr Rennie. We cannot, however, allow ourselves to omit the following observations with which he concludes his view of the Breakwater of Plymouth:—

This unalterable solidity, secured by the judiciousness of the forms and the prudence of the dimensions, appears to us to be the essential and distinctive character of the great works of Mr Rennie. This character is particularly remarkable in the two most beautiful bridges which adorn the metropolis of the British empire.

The Southwark Bridge is the first in which the bold idea of using cast iron in solid masses, and of an extent greatly surpassing that of the largest stones employed in arches. The arches of this bridge are formed by metallic masses of a size which could only be cast in a country in which metallurgy is carried to the highest degree of perfection. Mr Rennie derived from this advanced state of industry all the advantage which it could furnish to his talents. When we consider the extent and the elevation of the arches of this bridge, and the enormity of the elements of which it is composed, we acquire a higher idea of the force of man, and we exclaim involuntarily in our admiration of this *chef-d'œuvre*, "This is the Bridge of Giants."

We conclude with the following striking reflections on the new character which has been given to the erections of this country by Mr Rennie:—

If from the incalculable effect of the revolutions which empires undergo, the nations of a future age should demand one day what was formerly the New Sydon, and what has become

of the Tyre of the West which covered with her vessels every sea? The most of the edifices, devoured by a destructive climate, will no longer exist to answer the curiosity of man by the voice of monuments; but the bridge built by Rennie in the centre of the commercial world will subsist to tell the most distant generations here was a rich, industrious, and powerful city. The traveller, on beholding this superb monument, will suppose that some great Prince wished, by many years of labours, to consecrate for ever the glory of his life by this imposing structure. But if tradition instruct the traveller that six years sufficed for the undertaking and finishing of this work; if he learns that an association of a number of private individuals were rich enough to defray the expense of this colossal monument, worthy of the Sésostris and the Césars, he will admire still more the nation in which similar undertakings could be the fruit of the efforts of a few obscure individuals lost in the crowd of industrious citizens.

We are told that Mr Rennie had a high opinion of the works at Brest and Cherbourg, and the bridges, canals, and causeways in every part of France.

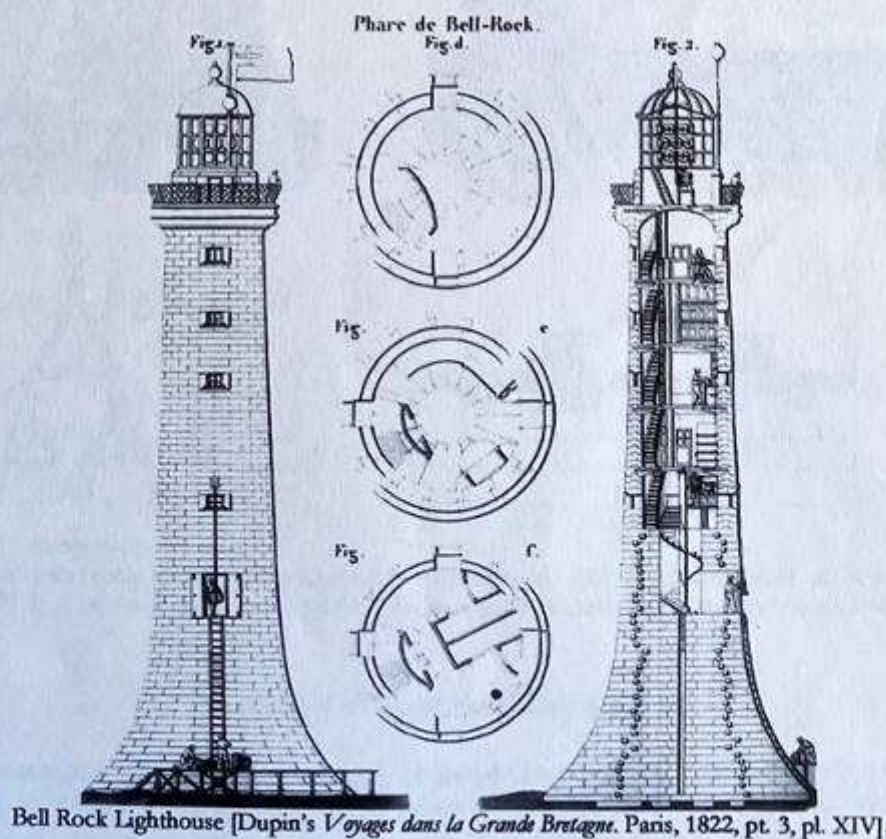
*The Scotsman*, 10.11.1821, 355.

Note: Parts of the translation not included in this notice which the editor feels of interest are:

Mr. J. Rennie was affable and kind with all foreign engineers who came to England to study his works and benefit from his knowledge. He was particularly friendly with our famous colleague M. de Prony and other engineers distinguished by their work or writings, MM. Girard, Cordier et Dutens have enjoyed his kind and liberal communication.

After his last visit to the ports and interior of France, Mr. J. Rennie wished to visit the arsenal of Brest and Cherbourg. The French Marine Minister facilitated this by recommending the two senior port officers to show him great consideration, in a similar way to which Mr. Dupin was welcomed in the English ports.

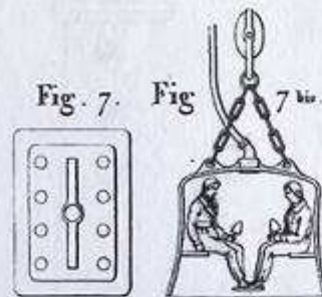
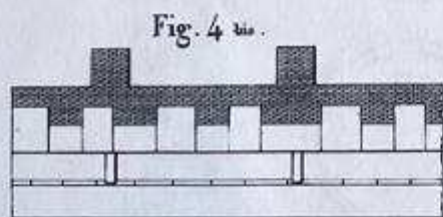
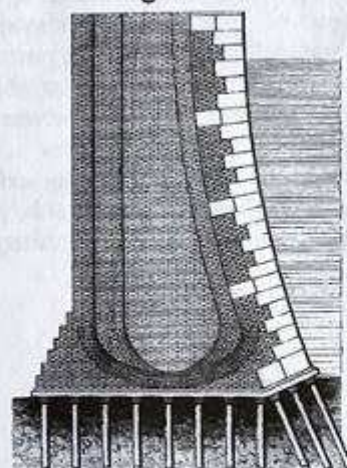
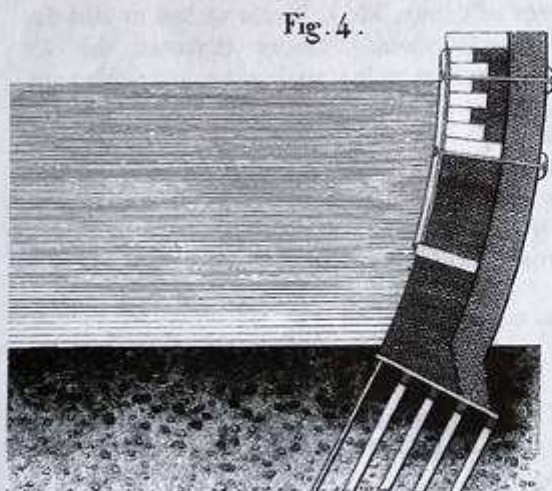
Mr. J. Rennie started his career in mechanical works, for Messrs Watt and Boulton on mills powered by steam engines ... he applied the steam engine to dredgers to increase their efficiency and use in deepening and cleaning canals, rivers, basins and ports ... The ports of Liverpool, Hull, Greenock, Leith, Holyhead, Portpatrick, Howth, Dunleary and many more provide examples of the wide variety of his mechanical engineering genius and talent.



Not far from the mouth of the Tay, on the reef of the Bell Rock at twelve nautical miles from the coast Mr J. Rennie has built the most beautiful lighthouse, which compares with Eddystone, being of similar shape and competing with its audacity and greatness. [1821 editorial note – Mr. Stevenson was the able engineer who executed the lighthouse under the superintendence of Mr. J. Rennie.]

In the hydraulic construction of Sheerness Naval Dockyard, art has overcome the difficulties of nature. The entire dockyards are built on artificial ground; the foundations of the buildings are built over ships hulls buried under the alluvial deposits which formed Sheppey Island. To place the basins which will contain the ships, and protect them from the leakage at low tide, the foundations had to be much deeper than usual and covered over with a layer of clay of a thickness of two tall men. Elliptical buttresses built with bricks, and filled in with calcareous stones cemented with pozzolana, support granite walls in which the blocks are jointed with extreme care as well as by their amount and nature, ready to stand the test of time and the hands of men, It is like seeing the work of the Romans at the time of their power! ... [At Plymouth Breakwater] the unfailing strength of the construction guaranteed by stone blocks of prudent shape and dimensions seem to be the distinct character of Mr. J. Rennie's huge projects.

Murs de quai de l' Ars  
Fig. 5.



Cloche à plongeur

Sheerness Dockyard completed 1823 – note the quay wall details, piling into the placed clay, and improved diving bell (see p. 16). [Dupin's *Voyages dans la Grande Bretagne* 1821. Paris, pt. 2, pl. IV]

by Sir John Barrow (1764-1848)

RENNIE (JOHN, F.R.S.), a distinguished Mechanist, Architect, and Civil Engineer, was born on the 7th June 1761, at Phantassie, in the parish of Prestonkirk, in the county of East

Lothian. His father, a highly respectable farmer, died in 1766, leaving a widow and nine children, of whom John was the youngest. The first rudiments of his education were acquired at the village school; and as it frequently happens, that some trifling circumstance in early life gives a bent to the pursuits, and fixes the destinies, of the future man, so it fared with young Rennie. The school was situated on the opposite side of a brook, over which it was necessary to pass by means of a rustic bridge of stepping-stones; but when the freshes were out, the only alternative of crossing the stream was by means of a boat, which was kept at the workshop of Mr Andrew Meikle, an ingenious mechanic, well known in Scotland as the inventor of the threshing-machine, and many improvements in agricultural implements. In passing through this workshop, which stood on his family property, young Rennie's attention was forcibly drawn to the various operations that were in progress; and a great part of his leisure and holiday-time was passed therein. The sons of Mr. Meikle, and the workmen, seeing the delight which he appeared to take in examining their labours, were in the habit of indulging him with their tools, and showing him their various uses. His evenings were chiefly employed in imitating those models which had particularly attracted his attention in the workshop; and it is known in the family, that, at little more than ten years of age, he had constructed the model of a windmill, a pile-engine, and a steam-engine. That of the pile-engine is still in existence, and is said to be remarkably well made.

Having continued at Preston school till twelve years of age, he had about that time a quarrel with his schoolmaster, whom he deemed incompetent to give him further instruction, and therefore entreated that he might be permitted to leave the school. But his active mind soon became restless; for the first time he felt the hours hang heavily on his hands; and having expressed a wish to be placed under his friend Mr Meikle, he employed himself with this ingenious mechanic for about two years: but his mind expanding with his growth, he began to feel that the progress of his intellectual faculties was likely to be retarded by a constant application to manual labour. He therefore at length determined to place himself under the tuition of Mr Gibson, an able teacher of mathematics at Dunbar; where he soon distinguished himself in so particular a manner, that Mr David Loch, General Inspector of the Fisheries in Scotland, in describing a visit which he paid to the school at Dunbar in 1778, notices the great proficiency displayed by young Rennie; prophesying that at no distant period he would prove an honour to his country.\* [\* Loch's *Essays on the Trade, Commerce, Manufactures, and Fisheries of Scotland*, Vol. III. Edinburgh, 1778. p. 211.] From this school, in less than two years, he returned to Mr Meikle, with a mind well stored with every branch of mathematical and physical science which Mr Gibson could teach him. About this time, Mr Gibson being appointed master to the public academy of Perth, he earnestly recommended young Rennie to succeed him at Dunbar. But his views were of a more aspiring cast. As a matter of favour, he undertook the management of the school for about six weeks, when he returned to his family, occasionally visiting and assisting his friend Mr Meikle, but mostly improving himself in drawing and making models of machinery. His first essay in practical mechanics was the repairing of a corn-mill in his native village; and he erected two or three others, before he was eighteen years of age.

Resolved, however, that these mechanical occupations should not interfere with his studies, he laid his plans so that he should be able to proceed occasionally to Edinburgh, with a view of improving himself in physical science. He there attended the lectures of Professors Robison and Black, and formed that acquaintance with the former of these gentlemen, which was gradually raised into friendship, and which, perhaps, may be said to have laid the foundation of his future fortune; for by him he was introduced to Messrs Boulton and Watt of Soho near Birmingham. With these gentlemen he remained but a few months, for the purpose of receiving explanations respecting the plan of the Albion Mills, then erecting, the machinery of which he superintended. This exactly suited his views; for, conscious of his own powers, he deemed the Capital the proper theatre to try their strength, and in this he was not mistaken.

In proceeding from Edinburgh to Soho, he had taken the route by Carlisle, Lancaster, Liverpool, and Manchester, for the purpose of visiting the different mills and public works in those great commercial and manufacturing towns; and the remarks which he made on the bridge then building over the Lune at Lancaster, on the docks at Liverpool, and more

particularly on the Bridgewater canal, are distinguished by great sagacity, and were of essential use to him afterwards. On leaving Soho, he again made a tour through the manufacturing districts of Leeds, Sheffield, Rotherham, and Newcastle.

For some time after he was settled in London, the Albion Mills, of which Boulton and Watt and Mr Wyatt were the projectors and leading proprietors, and who engaged him to superintend the execution of the mill-work, occupied a great share of his attention. Mr Watt, in his *Notes* to Professor Robison's *Account of the Steam-Engine*, says, that, "in the construction of the mill-work and machinery, they derived most valuable assistance from that able mechanic and engineer Mr John Rennie, then just entering into business, who assisted in placing them, and under whose direction they were executed." He also says, that the machinery, which used to be made of wood, was here made of cast-iron, in improved forms, and thinks that this was the commencement of that system of mill-work which has proved so beneficial to this country. In fact, Rennie's mills are the most perfect species of mechanism in that way that exist, distinguished by a precision of movement, and a harmony and proportion of parts that now serve as models throughout the empire. His water-mills are so accurately calculated, that every particle of water is effectively employed, and none of it lost, as in the common mode of constructing water-wheels. There is reason to believe that the difficulties which occurred at the Albion Mills with regard to the ebb and flow of the tides, and which required all the ingenuity of that extraordinary genius, Mr Watt, first led Mr Rennie to the study of that branch of civil engineering connected with hydraulics and hydrodynamics, and in which he soon became so celebrated, as to have no rival after the death of Smeaton, in whose steps, he always used to say, he was proud to follow.

Our limited space will not permit us to enter upon even an enumeration of all his great works, much less to give any detailed account of them; we must therefore content ourselves by mentioning some of the most important designs and undertakings in his threefold capacity of mechanist, architect, and civil engineer; three branches of art so intimately blended, as scarcely to admit of a separation.

*First, as a Mechanist.*—Immediately after the completion of the Albion Mills, in 1786 or 1787, Mr Rennie's reputation was so firmly established in every thing connected with mill-work, that he found himself in a very extensive line of business. To him the planters of Jamaica and of the other West India islands applied for their sugar-mills, which he constructed in a manner so superior to the old ones, that he soon obtained almost a monopoly of these expensive works. The powder-mill at Tunbridge, the great flour-mill at Wandsworth, several saw-mills, the machinery for various breweries and distilleries, were mostly of his manufacture; and wherever his machinery was required to be impelled by steam, the incomparable engines of his friends Messrs Boulton and Watt supplied the moving power; but, contrary to what has been stated in some of the public journals, he never had the least concern in directing, contriving, or advising any one part or movement of the steam-engine. He also constructed those beautiful specimens of machinery, the rolling and triturating mills at the Mint on Tower-Hill, to which Boulton and Watt's engines give motion; and, at the time of his death, he was engaged in the construction of a rolling-mill, and similar machinery, for the intended mint at Calcutta.

As a bold and ingenious piece of mechanism, which may be considered as distinct from positive architecture, there is nothing in Europe that can bear a comparison with the Southwark Bridge. The three immense arches, the centre one of 240, and each side arch of 210 feet span, consist entirely of masses of cast-iron, of various forms and dimensions, put together, on the same principle as a similar fabric of hewn stone; a method of employing iron which may be considered to form a new epoch in the history of bridge building. Various sinister predictions were entertained against this light and beautiful bridge, which was to be rent in pieces by the expansive power of the first summer's heat, or, if it escaped that, by the contraction of the first winter's cold; but it has stood the test of many winters and summers, and appears not to feel either. Mr Rennie was applied to by the East India Company for the design of a cast-iron bridge to be thrown over the river Goomty at Lucknow, at the desire of the Nabob Vizier of Oude. It consisted of three arches of cast-iron, the centre arch ninety, and each of the other arches eighty feet span. The arches were cast, and a superintending engineer sent out with them, but on their arrival the Nabob, in one of those moments of

caprice to which eastern despots, even in their impotency, are so liable, changed his mind, and would not allow it to be put up.

*Secondly, as an Architect.*—As there are few parts of civil engineering that do not occasionally require the aid of architecture, Rennie, at a very early stage of his progress, was called upon for a display of his skill in this line. Among his first undertakings in either line was that of the Lancaster Canal, which presented many difficulties, and, among others, that of carrying it by an aqueduct over the Lune, so as not to interrupt the navigation of the river. Being one of the largest fabrics of its kind in Europe, and of a pleasing design, it is an object that arrests the attention of strangers, and is very generally admired. The bridges of Leeds, Musselburgh, Kelso, Newton-Stewart, Boston, New Galloway, and a multitude of others, attest the architectural skill, the solidity, and, we may add, the good taste of Rennie; whilst a thousand smaller ones, with the various locks, wharf-walls, quays, embankments appertaining to canals, rivers, and harbours in every part of the United Kingdom, are so many proofs of his diversified talent, and his skill in adapting the means to the end. The Breakwater in Plymouth Sound can scarcely be called an architectural work, but it is constructed on true hydrodynamic principles, and so gigantic in its dimensions, and cyclopean in its structure, as to defy equally the force of the waves and the ravages of time. To Mr Whidby, who zealously superintended the execution of this immortal work, the highest praise is also due; nor was the plan finally determined on without his advice and assistance.

But the architectural work which, above all others, will immortalize the name of Rennie, is the Waterloo Bridge, a structure which, even foreigners admit, has no parallel in Europe (and if not in Europe, certainly not in the whole world) for its magnitude, its beauty, and its solidity. That a fabric so immense, presenting a straight horizontal line, stretching over nine large arches, should not have altered more than a few inches, not five in any one part, from that straight line, is an instance of firmness and solidity utterly unknown, and almost incredible;\* [\* The Bridge of Neuilly, which the vanity of the French led them to rank as superior to that of Waterloo, actually sunk 23 inches.] but all Rennie's works have been constructed for posterity. He made nothing slight; nor would he engage in any undertaking where, from an ill-judging economy, a sufficiency of funds was not forthcoming to meet his views.

Another work, executed from a design of his, is that of stone bridge over the Thames, to replace that disgrace to the present age, the existing London Bridge. His design, which was selected by a Committee of the House of Commons out of at least thirty that were offered, consisted of a granite bridge of five arches, the centre one of 150 feet span, being the largest stone arch in the world constructed in modern times. The execution of this work will form a remarkable feature in the future history of the capital for, of the five bridges which connect the two banks of the Thames within the precincts of London, three have been built from the designs of one man;—a fact which must throw a lustre on the name of Rennie, and be regarded with a feeling of pride by the most distant connection of his family.

*Thirdly, as a Civil Engineer.*—The first great attempt in this line of his profession was the survey and execution of the Crinan Canal, a work remarkable for the multitude of practical difficulties that occurred throughout the whole of this bold undertaking; it being necessary in many places to cut down through solid rock, to the depth of sixty feet; and it is rather remarkable, that the second undertaking, the Lancaster Canal, was also replete with difficulties, and called for the exercise of his skill as an architect, as we have already seen in noticing the aqueduct over the Lune. But these two works established his reputation as a civil engineer, and his opinion and assistance were required from all quarters. His faculties were now called into full play, and they expanded with the demands made upon them. The rage for canals had pervaded every part of the kingdom, and scarcely any of these useful means of conveyance and communication was thought of without a previous consultation with Rennie; so that in a few years the surveys he was called upon to make were so numerous, that he knew the surface of England as it were by heart, and could tell at once, when a canal was projected, whereabouts the line of it ought to be carried. The following are some of the most important of those the execution of which he personally attended: Aberdeen, Brechin, Grand Western, Kennet and Avon, Portsmouth, Birmingham, Worcester, besides many others.

But the resources of his mind were displayed in all their vigour in the plans and construction of those magnificent docks, which are at once an ornament to the capital, and of the utmost utility to commerce and navigation. Nor are these splendid and useful works confined to the metropolis. The docks at Hull, Greenock, Leith, Liverpool, and Dublin, attest his skill; and the harbours of Queensferry, Berwick, Howth, Holyhead, Dunleary (now called Kingstown Harbour), Newhaven, and several others, owe their security and convenience to his labours.

But even those works, splendid as they are, must yield to what he has planned and executed in his Majesty's dock-yards at Portsmouth, Plymouth, Chatham, and Sheerness. The latter was a mere quicksand of forty feet in depth, mixed with mud and the wrecks of old ships; the whole of which was excavated, and a magnificent basin constructed, with a beautiful surrounding wall of granite, with which three of the finest dry-docks in the universe communicate; and that important dock-yard, which may be said to command the mouths of the Thames and the Medway, from being an unhealthy and detestable place, and wholly inefficient for its purpose, is now, by being raised many feet, and laid out with skill and judgment, one of the most convenient in the kingdom. He also planned the new naval arsenal at Pembroke, which is considered as a perfect model for a building-yard. But his plan for the projected naval arsenal at Northfleet on the Thames was far superior to all in design; and upon a scale so grand as to be capable of containing afloat two-thirds of the whole navy, with dry-docks and slips for repairing and building ships of all classes to the same extent, and with all manner of storehouses, workshops, and manufactories of all such articles as were required for consumption in the navy. But the estimated sum of eight millions, which would probably have amounted to ten, induced the Government to pause, and it was finally deemed prudent to abandon the design altogether.

Mr Smeaton, we believe, was the first who used the diving-bell effectually for building with stone under water; but the machine he employed for that purpose was very defective, and could be used only in certain situations. Rennie, however, by improvements in the instrument itself, and in the machinery by which its movements could be regulated, was enabled to carry on the finest masonry, and the foundations of sea-walls, piers, and quays, as well under water as above it. The repairing of the pier-head of Ramsgate Harbour was a remarkable instance of this kind. The violence of the waves, acting upon the bad quality of the stone, had so completely undermined it, that the stability of the whole pier began to be endangered. It was from ten to thirteen feet below the level of low-water, spring-tides; yet, by means of the improved diving-bell, and its apparatus, the pier-head was not only effectually secured, but rendered more solid and durable than it originally had been. In the harbour of Howth the diving-bell was of the utmost use; and it is remarkable enough, that the masons who have been for a little while accustomed to work under water prefer it, at least the Irish masons do, to working in the air; it being cooler in summer, and warmer in winter; though an increase of pay for submarine work is probably the real cause of preference.

The last effort of Rennie's genius, to which we shall advert, was the drainage of that vast tract of marsh land bordering upon the rivers Trent, Witham, New Welland, and Ouse, which for centuries past had baffled the skill of some of the ablest men in that department of civil engineering. Upon the same principles, he laid down a grand scheme for draining the whole of that immense district known by the name of the Bedford Level, which has in part been carried into execution by the completion of the Eau-brink Cut, near Lynn. The estimate he made for draining the whole amounted to L. 1,200,000.

Such are some of the grand undertakings which Rennie, during the last thirty years of his life, was either employed to project or to carry into execution, and which, on a rough estimate, collected from his valuable *Reports*, did not fall far short of forty millions Sterling; about twenty millions of which were expended under his own immediate superintendence. Indeed, few great works were carried on, either by the public or individuals, on which he was not either employed or consulted. His industry was very extraordinary. Fond of the society of his select friends, and of rational conversation, he never suffered amusement of any kind to interfere with his business, which seldom engaged him less than twelve hours, and frequently fifteen in the day. His conversation was always amusing and instructive. He possessed a rich



fund of anecdote, and, like his old friend James Watt, told a Scotch story admirably. As a travelling companion, he was highly entertaining; he knew everybody on the road, and everybody knew John Rennie. Of an ardent and anxious mind, and naturally impetuous, he was gifted with the most perfect self-control; and the irritation of the moment was seen but as a light summer's cloud, passing across his finely marked features, which were on so large a scale, though blended with much mildness as well as dignity, as to obtain for his noble bust by Chantrey, when exhibited in Somerset House, the name of *Jupiter Tonans*.

Were we to seek for a parallel to Rennie, the name of Smeaton would at once suggest itself. Their boyhood was employed precisely in the same manner, in making models of pumps and windmills, whilst their school-fellows were at play; their pursuits in manhood were similar, and their paramount success pretty nearly the same. But the spirit of speculation and improvement was but just springing up, when Smeaton finished his career, and when Rennie began his. He was, in fact, the successor of Smeaton. There was a strong characteristic likeness between Rennie and the late Mr Ramsden. The pursuits of the former embraced a wider sphere of action, but they both arrived at their proposed objects by the most simple and obvious, and, at the same time, most effectual means. They were both equally clear in their mode of communicating information to others; and it is sufficiently remarkable that, in their illustrations, both of them had recourse rarely to any other instrument than a two-foot rule, which each always carried in his pocket. Many a time has the writer of this article derived instruction from the two-foot rules of John Rennie and Jesse Ramsden. They were both equally communicative, when they saw that information was desired; and nothing like professional jealousy, or selfish feelings, actuated either of these ingenious men, who, on the contrary, were always kind and condescending to the more humble artists of their respective professions.

Mr Rennie possessed considerable skill in bibliography, and being a zealous and liberal collector, he succeeded in forming a very valuable library, consisting of the best and rarest books in all the branches of science and art, of voyages and travels, and many curious books in the black-letter; whilst in his own department, it contained every work of the least merit, in whatever language it might be written. He had, besides, a good collection of mathematical and astronomical instruments, and frequently spoke of erecting an observatory, but did not live to carry his intention into execution. He had for some years laboured under a disease of the liver, which had apparently yielded to the usual treatment; but a relapse took place, and on the 16th October 1821, after a few days illness, he expired without a struggle, in the sixtieth year of his age.

Mr Rennie, in 1789, married Miss Mackintosh, who died in 1806, leaving a family of seven young children, six of whom are now living. The two eldest, George and John, are successfully following the profession, and promise to tread in the footsteps of their able and excellent father.

Sixteen mourning coaches, filled with his friends, mostly men of eminence in the arts, sciences, or literature, followed his hearse to St Paul's, where his remains were interred near those of Sir Christopher Wren. A plain granite slab covers his grave, on which is the following appropriate inscription:

Here lie the mortal remains of  
JOHN RENNIE,  
Civil Engineer,  
F.R.S. L.& E. F.A.S. &c. &c.  
Born at Phantassie, in East Lothian, 7th June 1761;  
deceased in London 4th Oct. 1821.  
THIS STONE  
testifies his private virtues,  
and records  
the affection and the respect of  
his family and his friends;  
but  
the many splendid and useful works

by which,  
under his superintending genius,  
England, Scotland, and Ireland,  
have been adorned and improved,  
are  
the true monuments  
of  
his public merit.

*Encyclopædia Britannica*, Supplement to third, fourth and fifth editions, vol. VI, part ii  
Edinburgh, 1824, 420-423. Reprinted here with the minor additions and revisions included in  
the *Seventh edition*, vol. XIX, Edinburgh, 1842, 120-123. The articles in both editions bear  
the signature letters K and M respectively of John Barrow. He was knighted in 1835.

by [David Brewster (1781-1868)]

RENNIE, JOHN, a celebrated civil engineer, was the youngest son of a respectable farmer at Phantassie, in the parish of Prestonkirk, and county of East Lothian, and was born there on the 7th June, 1761. He had the misfortune to lose his father at the early age of five, but his education was carried on at the parish school by his surviving relatives. The peculiar talents of young Rennie seem to have been called forth and fostered by his proximity to the workshop of the celebrated mechanic, the inventor or improver of the thrashing machine, and in his frequent visits to that scene of mechanism, he was constantly occupied in using, and perhaps as often in abusing the tools that fell in his way. As he advanced in years, however, he began to imitate at home the models of machinery which he had seen, and at the early age of ten he had made the model of a windmill, a steam engine, the last of which is said to exhibit much practical dexterity.

In the year 1773, Rennie left the school at Prestonkirk, in consequence of some misunderstanding with the schoolmaster, whom he had conceived to be incapable of advancing him in his studies; and he entered into the employment of Andrew Meikle, with whom he continued till 1775. Finding, however, that he was still far behind in his education, he went to Dunbar to study mathematics under Mr. Gibson, and in 1777 he returned to work with Mr. Meikle, with considerable addition to his former stock of knowledge.

Mr. Gibson having, about this time, been elected Master of the Academy of Perth, recommended Rennie as his successor at Dunbar; but though he taught the school for some weeks, to oblige his friend, he never thought of continuing it as a profession; and he accordingly renewed his mechanical labours under Mr. Meikle, employing his leisure hours in modelling and drawing machinery. Before he had reached the age of eighteen, he had erected two or three corn mills in his native parish; but the first undertaking which he executed on his own account was the rebuilding of the flour mills at Invergowrie near Dundee.

By zealously prosecuting his professional labours in summer, he was enabled to visit Edinburgh in the winter season, when he attended [from 1781-1783] the lectures of Dr. Robison on Natural Philosophy, and those of Dr. Black on Chemistry, and thus to fit himself for the profession of a civil engineer, to which he seems now to have aspired. Dr. Robison recommended him to Messrs. Boulton and Watt at Soho, and on his way to that place [in 1783], he examined the aqueduct bridge at Lancaster [the reviewer was probably referring to Skerton road bridge engineered by Thomas Harrison over the Lune completed in 1788], the docks at Liverpool, and the interesting works on the Bridgewater canal. After remaining some months at Soho, Mr. Rennie made a tour through the manufacturing districts of Yorkshire, and then settled in London.

The erection of the Albion Mills in London about this time may be considered as an epoch in the history of the great practical establishments of Britain. Messrs. Boulton and Watt, and Mr. Wyatt, who planned this scheme, and were the principal proprietors of it, had the millwork and machinery executed and put up under the direction of Mr. Rennie; and Mr. Watt has himself recorded the valuable assistance which had been derived from his friend in

this great work.\* [\* Robison's *Elements of Mechanical Philosophy*, vol. ii. p. 137. *Note.*] The fine establishment of the Albion Mills, completed in 1786 or 1787-9, and which was an honour to our country, was abused by the learned as well as by the ignorant mob of the date, as a monopoly injurious to the public good, whereas, it cannot be doubted that they greatly reduced the price of flour while they continued at work. The destruction of these mills in 1791 by fire, which was certainly the result of design; and the loss of all the machinery which they contained, will be ranked among those disgraceful outrages against individual property which have cast a stain upon our national character. "The Albion Mills," says Mr. Watt, (*loc. cit.*) "consisted of two engines, each of fifty horses power, and twenty pairs of millstones, of which twelve or more pairs, with the requisite machinery for dressing the flour and for other purposes, were generally kept at work. In place of wooden wheels, always subject to frequent derangement, wheels of cast-iron, with the teeth truly formed and finished, and properly proportioned to the work, were here employed, and other machinery which used to be made of wood, was made of cast-iron in improved forms; and I believe the work executed here may be said to form the commencement of that system of millwork which has proved so useful to this country.

In the construction of that millwork and machinery, Boulton and Watt derived most valuable assistance from that able mechanic and engineer Mr. John Rennie, then just entering into business, who assisted in planning them, and under whose direction they were executed. The engines and millwork were contained in a commodious and elegant building, designed and executed under the direction of the late Mr. Samuel Wyatt.\* [\* Mr. Watt, in the work just quoted, has engraven one of the Albion Mill engines, which was a double one, with the grinding machinery which it put in motion.]

The mechanism of the Albion Mills introduced Mr. Rennie most favourably to the notice of the public, and he soon obtained very extensive employment in constructing numerous sugar mills for the West India planters. Mr. Rennie was also employed to construct the machinery of the powder mill at Tunbridge, the flax mill of Wandsworth, the rolling and triturating mills of the Mint in London, and the machinery of various breweries and distilleries.

In all the millwork erected by Mr. Rennie, there was one striking improvement which he mentioned to the writer of this notice, as introduced by himself. It was formerly usual to place the vertical axis of the running millstone in a bush, placed in the middle of the horizontal bridgetree, which was supported only at its two extremities. The effect of this was that the bridgetree yielded to the variations of pressure arising from the greater or less quantity of grain which was admitted between the millstones, which was conceived to be an useful effect. Mr. Rennie, however, made the bridgetree perfectly immoveable, and thus freed the machinery from that irregular play which sooner or later proves fatal to every kind of mechanism.

Mr. Rennie was no less celebrated in the architectural than he was in the mechanical branch of his profession. We are not correctly acquainted with the precise share which Mr. Rennie had in the design of the aqueduct bridge over the Lune at Lancaster, which has been ascribed to him; but the stone bridges of Kelso, Leeds, Musselburgh, Newton Stewart, Boston, and New Galloway, testify sufficiently his judgment and taste in the art of bridge building. The first of these bridges, which was completed between 1799 and 1803, is thrown over the Tweed, immediately below its junction with the Tiviot, and consists of a level roadway resting on five elliptical arches, each of which has a span of seventy-three feet, and a rise of twenty-one feet. Its character is peculiarly suited to the fine scenery which surrounds it, and it is perhaps one of the most beautiful specimens of the art which is to be seen. The writer of this article, when he first had the pleasure of being introduced to Mr. Rennie, stated to him this high opinion of the superiority of Kelso bridge, without being aware that it had been designed by himself. Mr. Rennie was highly gratified by this honest testimony to his talents, and the more so, as he considered the design of Kelso bridge as one of the very best which he ever made.

We may here mention an anecdote respecting the bridge of Musselburgh, with which Mr. Rennie himself was much entertained. When he was taking that work off the hands of the contractor, one of the magistrates who was present took an opportunity of asking a

countryman who was passing at the time with his cart, how he like the new bridge. "Brig," replied the man, "it's nae brig ava; ye neither ken when ye gang on't or when ye come aff't." The old bridge has a very precipitous roadway, and being in this and in other respects the very counterpart of the new one, the homely opinion given above may be considered as one of the highest compliments that could have been paid to the engineer.

Mr. Rennie's celebrity as a bridge builder, however, must always be attached to the Waterloo bridge over the Thames, one of the grandest monuments of architectural skill, and of British enterprise. This stupendous work, completed in 1817, has not altered more than five inches from a straight line on any one part of it.\* [\* An account of this bridge has been given in our article LONDON, Vol. XIII. page 153.] One of the best designs of Mr. Rennie was that of a stone bridge over the Thames, on the site of the present London bridge. It was selected by the Committee as the best of at least thirty plans, and is to be executed in Aberdeen granite, of five arches, the middle one of which is to have a span of 150 feet.

The principal iron bridges designed and constructed by Mr. Rennie, are a small one over the Witham at Boston, which has been engraven in our article BRIDGE, Vol. IV. p. 489, Plate XCIV.; and the great one at Southwark,\* [\* See our article LONDON, Vol. XIII. p. 153. col. 2.] which, notwithstanding the various prophecies against its stability, has stood unaffected either by the summer's heat or the winter's cold. Mr. Rennie likewise designed another of three arches, of ninety, eighty, and seventy feet span, for the river Goomty at Lucknow, but the Nabob of Oude would not allow it to be erected, after it was sent out by the East India Company.

In those public works, which come more immediately under the profession of a civil engineer, Mr. Rennie had still more experience, and has been equally successful.

Among the canals, the execution of which he personally superintended, have been enumerated the Lancaster canal, that at Aberdeen, the Grand Western, the Kennet and Avon, the Portsmouth, the Birmingham, and the Worcester,\* [\* Mr. Rennie's biographer, whom we have followed in this enumeration, has added the *Brechin canal*, but no such canal exists.] &c. &c.

Besides the West India docks already described in our account of the Metropolis, (see the article LONDON, Vol. XIII. p. 163,) Mr. Rennie is said to have planned the docks at Hull, Greenock, Leith, Liverpool, and Dublin; together with the harbours of Berwick, Dunleary, Holyhead, Howth, Newhaven, Queensferry, &c. In addition to these naval works, he planned various important improvements on his Majesty's dockyards at Portsmouth, Plymouth, Chatham, and Sheerness, and the new naval arsenal at Pembroke was constructed from his designs. He made a design also of a new naval arsenal at North-fleet on the Thames, but the sum of eight millions was considered by government as too great a sum to be expended on the undertaking.

The greatest of all Mr. Rennie's naval works, however, is undoubtedly the Breakwater at Plymouth, of which we have already given a very full description.\* [\* See our article PLYMOUTH BREAKWATER, Vol. XVI. p. 663.]

In concluding this list of Mr. Rennie's labours, which has necessarily become a meagre one, in consequence of our having given accounts of them in other parts of our work, we must not omit his drainage of that tract of marsh lands on the river Trent, Witham, New Welland, &c. and his plan for draining the Bedford level, which has been partly carried into execution.

These various public concerns are said, by one of Mr. Rennie's biographers, to have cost little less than fifty millions sterling, nearly twenty millions of which were spent under his own superintendence.

Although Mr. Rennie was a man of robust figure, and of corresponding strength of constitution, yet, during some of the last years of his life he had been afflicted with an inflammation of the liver. The disease, however, began to assume a more serious form, and finally cut him off, on the 16th of October, 1821, in the 60th year of his age. His remains were interred in St. Pauls, near those of Sir Christopher Wren, and a plain granite slab, with a suitable inscription, was laid upon his tomb.

Mr. Rennie, who married in 1789, and survived his wife, left behind him six children. The eldest of these, Mr. George Rennie, has already exhibited very great talents in his father's profession, and the second son, John, promises to sustain the reputation of the family.

Mr. Rennie may be justly considered as the first of that school of *practical* Engineers which has been established in Great Britain. No mistake can be greater than to suppose, (as has been generally stated,) that Mr. Rennie was a profound mathematician, or a natural philosopher. Had he been either, he would never have executed those great works which have given renown to his own name, and to that of his country. When we consider the vast superiority of the French engineers to our own, in *theoretical acquirements*, and their inferiority to ours in practical knowledge of every kind, we cannot avoid drawing the conclusion, that it is from experience alone that those resources of skill and judgment are to be derived which have given pre-eminence to all the works of British engineers. The experience of foreign countries has shown, that a mere knowledge of pure mathematics is more easily acquired than that of any branch of science, or of useful knowledge; and consequently, the possession of it indicates no talent, and no genius of any kind. Those, therefore, who have been early initiated into its abstractions, experience great difficulty in abandoning the results of theory, and in throwing themselves entirely upon the resources of experiment and observation; while those who have founded their professional acquirements upon the great practical truths, which are often collected from the experience of ages, have frequently rejected the aid of theory, even in those cases where its assistance might have been advantageously accepted. Like all extremes, these two are to be carefully avoided; but that extreme is to be especially guarded against, which would lead us to renounce those opinions of the value of practical science, which, without naming any living examples, are founded on the history of the lives and labours of Boulton, and Watt, and Rennie.

Although Mr. Rennie did not devote himself to the acquisition of theoretical knowledge, excepting to that general extent which is required by every well informed engineer, yet he was fond of those investigations of a mixed character, where the results of experiment were combined by mathematical rules, and a train of inquiry directed and modified by the lights of theory. The writer of this article cannot forget the pleasure which he one day afforded to Mr. Rennie, by giving him a minute account of the beautiful results obtained by Coulomb, respecting the resistance of fluids by his fine application of the principles of Torsion.

Rennie has been compared with Smeaton as an engineer; but the parallel is, in our opinion, not a correct one. Smeaton possessed much more theoretical knowledge than Rennie, and Rennie surpassed Smeaton in his practical resources. The latter was more of a man of science; and, if he was less of a practical engineer, we may ascribe it, in some degree, to his having flourished at an earlier period of the arts, and at a time when the military and naval resources of our country were not called forth for its defence, and when British capital, and British enterprise, had not dared to embark themselves in works of national magnitude and interest.

If we could venture, at such an early period after Mr. Rennie's death, when the adage of *De mortuis nil nisi bonum* is in full force, to give an opinion upon his works, we should be disposed to say, that they are sometimes characterized by a massiveness, and, consequently, by an expence which *may not* have been absolutely necessary under all the circumstances of their erection. The perfection of civil engineering must always be held to consist in the production of a work with the least expence of labour and materials. In looking forward to the ravages of time and of accident, there is of course no point at which we can set limits to our caution. The engineer may, with more propriety, strengthen his bridge or his aqueduct against some future assault of hostile cannon, than defend them against floods that never flowed, against pressures that never pressed, or against winds that never blew. In contemplating the firmness of fresh granite, or the toughness of newly-forged iron, we are apt to forget that time corrodes and disintegrates both; and that diseases to which even their obdurate nature is subject, sometimes unite their strength to that of the great destroyer. If these observations have any force in regard to works whose expence is defrayed out of the public treasury, their application must be still more pointed to those of a commercial character, which have been undertaken by individuals as an investment of their capital. Here the economy of construction ought to be the principal object of the engineer, and a regard

for his own reputation, and even many public considerations, ought to be kept in due subordination to this leading object.

Had it been our fortune to be a well-employed engineer, we would have cheerfully witnessed the failure of some favourite erections, provided we could, at some distant period, be indulged with the sight of the remainder balanced in skilful equilibrium, and exhibiting their airy stability to the wonder and admiration of succeeding ages.

The caution of those engineers (among whom Mr. Rennie cannot be placed) who habitually shelter their scientific character under a mass of stone and iron, may be compared to the prudery of some men of science, who are exceedingly timorous of error, and who spend their lives in polishing and working up some slender or perhaps considerable discovery. The bold and skilful engineer, on the contrary, resembles those adventurous spirits who pant only after triumphs, and forget the slips they may have committed in securing them. The failures of the one, and the errors of the other genius, are no doubt emblazoned for a while by contemporary or local malignity; but time refuses to collect the chaff which the breath of envy has raised, and posterity takes cognisance only of those labours of genius which never die.

We have been led into these remarks solely with the view of explaining the grounds of the criticism which, with much hesitation, we have made on the character of some of Mr. Rennie's undertakings; but this criticism, even if it is a correct one, cannot be supposed to affect our opinion of his pre-eminent merits as a civil engineer.

We are not aware that Mr. Rennie is the author of any Memoir in the transactions of our learned societies. [Rennie's many publications were work related, mostly plans and reports]

An excellent bust of Mr. Rennie was executed in his life-time, by our great artist Chantrey, and a good medallion by Bain has been copied from it. The late Sir Henry Raeburn also painted two excellent portraits of him. Mr. Rennie had a fine commanding figure, and was of a robust make, and greatly above the middle size. His features were strong and large, and his expression mild and agreeable.

Various biographical sketches of Mr. Rennie have appeared in our periodical works, and an eulogy upon him was written soon after his death by M. Charles Dupin.

*Edinburgh Encyclopaedia*, Edinburgh, 1830, volume XVII, part 1, 334-336 [written c. 1825]. David Brewster was knighted in 1832.

### by John Gorton (ed.)

RENNIE (John) a celebrated engineer, was born near Linton in East Lothian, in 1760. His father was a respectable farmer, who gave him a good education, and placed him with an eminent millwright. After serving out his articles he commenced business on his own account, but in 1783 was induced to remove to London, where he first distinguished himself by the construction of the Albion mill. His next work of magnitude was the formation and erection of the machinery of Whitbread's brewery.

His reputation from this time rapidly increased, until he was finally regarded as standing at the head of the civil engineers of this country. Among his public works may be mentioned Ramsgate harbour, Waterloo and Southwark bridges, at least as to construction; the Breakwater at Plymouth, and the Bell Rock Lighthouse, erected on the same principles as that of the Eddystone, which last proof of his great skill has excited general admiration. Mr. Rennie was admirably adapted, by steady resolution and inflexible perseverance, to contend with the great physical operations of nature which he was called on to control or guard against; and accordingly, no one has effected greater performances in that branch of his profession. He was at the same time, in the highest degree punctual and steady in all his engagements; and although in some respects a self-taught man, he acquired the respect of the most distinguished men of science and learning in his day, and was elected a member of the Royal Society. His death took place at his house in Stamford-street, Blackfriars, October 4 1821, in his sixty-first year, and he was buried with the respect due to his eminent talents in St. Paul's cathedral.— [In *A General Biographical Dictionary*, ed. John Gorton. London,

Whittaker, Treacher, and Co., 1830, II, 739, as greatly abridged from pages 402-411 of *The Annual Biography and Obituary for the year 1822*. London, 1822.] The 1822 full version [Nat. Lib. Scot. A.35.f.] is of interest in describing Bell Rock Lighthouse as "the masterpiece of his [Rennie's] great genius.". Also, for including a detailed account of Waterloo Bridge which the reviewer considered Rennie's "chief work". The reviewer mentioned that an obelisk was to be erected on each side of the bridge in Rennie's honour and suggested that it should bear the same inscription as that to Sir Christopher Wren in St. Paul's Cathedral - "Si monumentum requires, circumspice" [if you seek his monument, look around you.]

### by Michael Andrews Borthwick (1810-1856)

John Rennie, born at Phantassie in Haddingtonshire in 1761 – died in 1821, held a foremost place in maturing and executing ... mighty projects, public and private, and his previous training had admirably qualified him for the duties they required. He displayed almost in childhood the mechanical turn that marked his future character, and whether as the apprentice of the ingenious Meikle, the inventor of the threshing machine, or as an occasional student under some of the most celebrated of the men by whose labours the university of Edinburgh acquired fame throughout Europe, all his subsequent pursuits tended in the direction that was to lead him to eminence. He began business as a millwright in his native county, but was soon after led to change the scene of his busy life, in consequence of an introduction to James Watt\*, who invited him to the capital to superintend the erection of the Albion flour-mills by which and other works in the same line, undertaken on his own account in quick succession, he soon acquired reputation as a very superior mechanist, and in the year 1791 or 2, he was appointed to direct the execution of the Lancaster canal. This and the Crinan ship canal (insulating the isthmus of Cantire in Argyllshire) with which he was entrusted about the same time, were his first essays in civil engineering, and by the greatness and difficulty of some of their works (as the fine aqueduct over the river Lune in the former, and the massive rock excavations of the latter), they afforded an excellent opportunity of testing his skill.

Rennie soon became firmly established, - the government of the land afterwards ranked among his clients, - the three kingdoms bear witness to the extent of his subsequent labours. The navigations already mentioned, to which the Kennet and Avon and the Portsmouth canals fall to be added; the completion of the Eau Brink cut and the project of the new Nene outfall for the improvement of drainage in the immense fens of Norfolk, Lincoln and Cambridgeshire; a participation in a greater or less degree in the formation of three of the large dock establishments in the port of London, with Leith docks and extensive additions to those of Liverpool and Hull, for commercial purposes; the still more stupendous undertakings in aid of war at His Majesty's dock-yards, especially Sheerness, raised by his creative hand out of a quicksand five-and-twenty feet deep and ten feet under low water, and Pembroke, which he hardly lived to see completed; the breakwater in Plymouth Sound, the artificial harbours of Kingstown, Howth, Holyhead and Donaghadee, and two great bridges over the Thames in the heart of the metropolis, with the design for a still nobler third, built since his death, and other bridges in the country, of which that over the Tweed at Kelso and Wellington Bridge in Leeds particularly challenge notice,—all these were wholly or in chief part produced by Rennie, and they by no means exhaust the list of his works, of which the variety, magnitude and importance need not be expatiated upon after such an enumeration.

\* Born at Greenock, in 1736—died in 1819. In early life Watt himself practised as a surveyor and engineer, and had he continued in the profession would to all probability have taken the lead,—a more glorious immortality awaited him, but no one has contributed more essentially to the progress of engineering than that illustrious man, from the facilities, before unknown, given by his steam-engine to its operations.

From M. A. Borthwick's introduction to the first volume of the *Transactions of the Institution of Civil Engineers*, London, 1837.

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[New findings attribute the design and construction of the Bell Rock Lighthouse to both Rennie and Stevenson and identify their respective contributions]



John Rennie,  
drawn by George Dance (1741-1825),  
28th May 1803