

**ALLEN GRANT**

BIOGRAPHIES  
OF WORKING  
MEN

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# Grant Allen

## Biographies of Working Men

### PREFACE

My acknowledgments are due to Dr. Smiles's "Lives of the Engineers," "Life of the Stephensons," and "Life of a Scotch Naturalist;" to Lady Eastlake's "Life of Gibson;" to Mr. Holden's "Life of Sir William Herschel;" to M. Seusier's "J. F. Millet, Sa Vie et Ses OEuvres;" and to Mr. Thayer's "Life of President Garfield;" from which most of the facts here narrated have been derived.

**G. A.**

# I

## THOMAS TELFORD, STONEMASON

High up among the heather-clad hills which form the broad dividing barrier between England and Scotland, the little river Esk brawls and bickers over its stony bed through a wild land of barren braesides and brown peat mosses, forming altogether some of the gloomiest and most forbidding scenery in the whole expanse of northern Britain. Almost the entire bulk of the counties of Dumfries, Kirkcudbright, and Ayr is composed of just such solemn desolate upland wolds, with only a few stray farms or solitary cottages sprinkled at wide distances over their bare bleak surface, and with scarcely any sign of life in any part save the little villages which cluster here and there at long intervals around some stern and simple Scottish church. Yet the hardy people who inhabit this wild and chilly moorland country may well be considered to rank among the best raw material of society in the whole of Britain; for from the peasant homes of these southern Scotch Highlands have come forth, among a host of scarcely less distinguished natives, three men, at least, who deserve to take their place in the very front line of British thinkers or workers—Thomas Telford, Robert Burns, and Thomas Carlyle. By origin, all three alike belonged in the very strictest sense to the working classes; and the story of each is full of lessons or of warnings for every one of us: but that of Telford is perhaps the most encouraging and the most remarkable of all, as showing how much may be accomplished by energy and perseverance, even under the most absolutely adverse and difficult circumstances.

Near the upper end of Eskdale, in the tiny village of Westerkirk, a young shepherd's wife gave birth to a son on the 9th of August, 1757. Her husband, John Telford, was employed in tending sheep on a neighbouring farm, and he and his Janet occupied a small cottage close by, with mud walls and rudely thatched roof, such as in southern England even the humblest agricultural labourer would scarcely consent willingly to inhabit. Before the child was three months old, his father died; and Janet Telford was left alone in the world with her unweaned baby. But in remote country districts, neighbours are often more neighbourly than in great towns; and a poor widow can manage to eke out a livelihood for herself with an occasional lift from the helping hands of friendly fellow-villagers. Janet Telford had nothing to live upon save her own ten fingers; but they were handy enough, after the sturdy Scotch fashion, and they earned some sort of livelihood in a humble way for herself and her fatherless boy. The farmers about found her work on their farms at haymaking or milking, and their wives took the child home with them while its mother was busy labouring in the harvest fields. Amid such small beginnings did the greatest of English engineers before the railway era receive his first hard lessons in the art of life.

After her husband's death, the poor widow removed from her old cottage to a still more tiny hut, which she shared with a neighbour—a very small hut, with a single door for both families; and here young Tam Telford spent most of his boyhood in the quiet honourable poverty of the uncomplaining rural poor. As soon as he was big enough to herd sheep, he was turned out upon the hillside in summer like any other ragged country laddie, and in winter he tended cows, receiving for wages only his food and money enough to cover the cost of his scanty clothing. He went to school, too; how, nobody now knows: but he *did* go, to the parish school of Westerkirk, and there he learnt with a will, in the winter months, though he had to spend the summer on the more profitable task of working in the fields. To a steady earnest boy like young Tam Telford, however, it makes all the difference in the world that he should have been to school, no matter how simply. Those twenty-six letters of the alphabet, once fairly learnt, are the key, after all, to all the book-learning in the whole world. Without them, the shepherd-boy might remain an ignorant, unprogressive shepherd all his life long, even his undeniable native energy using itself up on nothing better than a wattled hurdle or a thatched roof; with them, the path is open before him which led Tam Telford at last to the Menai Bridge and Westminster Abbey.

When Tam had gradually eaten his way through enough thin oatmeal porridge (with very little milk, we fear) to make him into a hearty lad of fifteen, it began to be high time for him to choose himself a final profession in life, such as he was able. And here already the born tastes of the boy began to show themselves: for he had no liking for the homely shepherd's trade; he felt a natural desire for a chisel and a hammer—the engineer was there already in the grain—and he was accordingly apprenticed to a stonemason in the little town of Lochmaben, beyond the purple hills to eastward. But his master was a hard man; he had small mercy for the raw lad; and after trying to manage with him for a few months, Tam gave it up, took the law into his own hands, and ran away. Probably the provocation was severe, for in after-life Telford always showed himself duly respectful to constituted authority; and we know that petty self-made master-workmen are often apt to be excessively severe to their own hired helpers, and especially to helpless lads or young apprentices. At any rate, Tam wouldn't go back; and in the end, a well-to-do cousin, who had risen to the proud position of steward at the great hall of the parish, succeeded in getting another mason at Langholm, the little capital of Eskdale, to take over the runaway for the remainder of the term of his indentures.

At Langholm, a Scotch country town of the quietest and sleepest description, Tam Telford passed the next eight years of his uneventful early life, first as an apprentice, and afterwards as a journeyman mason of the humblest type. He had a good mother, and he was a good son. On Saturday nights he generally managed to walk over to the cottage at Westerkirk, and accompany the poor widow to the Sunday services at the parish kirk. As long as she lived, indeed, he never forgot her; and one of the first tasks he set himself when he was out of his indentures was to cut a neat headstone with a simple but beautiful inscription for the grave of that shepherd father whom he had practically never seen. At Langholm, an old maiden lady, Miss Pasley, interested herself kindly in Janet Telford's rising boy. She lent him what of all things the eager lad most needed—books; and the young mason applied himself to them in all his spare moments with the vigorous ardour and perseverance of healthy youth. The books he read were not merely those which bore directly or indirectly upon his own craft: if they had been, Tam Telford might have remained nothing more than a journeyman mason all the days of his life. It is a great mistake, even from the point of view of mere worldly success, for a young man to read or learn only what "pays" in his particular calling; the more he reads and learns, the more will he find that seemingly useless things "pay" in the end, and that what apparently pays least, often really pays most in the long run. This is not the only or the best reason why every man should aim at the highest possible cultivation of his own talents, be they what they may; but it is in itself a very good reason, and it is a sufficient answer for those who would deter us from study of any high kind on the ground that it "does no good." Telford found in after-life that his early acquaintance with sound English literature did do him a great deal of good: it opened and expanded his mind; it trained his intelligence; it stored his brain with images and ideas which were ever after to him a source of unmitigated delight and unalloyed pleasure. He read whenever he had nothing else to do. He read Milton with especial delight; and he also read the verses that his fellow-countryman, Rob Burns, the Ayrshire ploughman, was then just beginning to speak straight to the heart of every aspiring Scotch peasant lad. With these things Tam Telford filled the upper stories of his brain quite as much as with the trade details of his own particular useful handicraft; and the result soon showed that therein Tam Telford had not acted uncannily or unwisely.

Nor did he read only; he wrote too—verses, not very good, nor yet very bad, but well expressed, in fairly well chosen language, and with due regard to the nice laws of metre and of grammar, which is in itself a great point. Writing verse is an occupation at which only very few even among men of literary education ever really succeed; and nine-tenths of published verse is mere mediocre twaddle, quite unworthy of being put into the dignity of print. Yet Telford did well for all that in trying his hand, with but poor result, at this most difficult and dangerous of all the arts. His rhymes were worth nothing as rhymes; but they were worth a great deal as discipline and training: they helped to form the man, and that in itself is always something. Most men who have in them the power to do any

great thing pass in early life through a verse-making stage. The verses never come to much; but they leave their stamp behind them; and the man is all the better in the end for having thus taught himself the restraint, the command of language, the careful choice of expressions, the exercise of deliberate pains in composition, which even bad verse-making necessarily implies. It is a common mistake of near-sighted minds to look only at the immediate results of things, without considering their remoter effects. When Tam Telford, stonemason of Langholm, began at twenty-two years of age to pen poetical epistles to Robert Burns, most of his fellow-workmen doubtless thought he was giving himself up to very foolish and nonsensical practices; but he was really helping to educate Thomas Telford, engineer of the Holyhead Road and the Caledonian Canal, for all his future usefulness and greatness.

As soon as Tam was out of his indentures, he began work as a journeyman mason at Langholm on his own account, at the not very magnificent wages of eighteenpence a day. That isn't much; but at any rate it is an independence. Besides building many houses in his own town, Tam made here his first small beginning in the matter of roads and highways, by helping to build a bridge over the Esk at Langholm. He was very proud of his part in this bridge, and to the end of his life he often referred to it as his first serious engineering work. Many of the stones still bear his private mark, hewn with the tool into their solid surface, with honest workmanship which helps to explain his later success. But the young mason was beginning to discover that Eskdale was hardly a wide enough field for his budding ambition. He could carve the most careful headstones; he could cut the most ornamental copings for doors or windows; he could even build a bridge across the roaring flooded Esk; but he wanted to see a little of the great world, and learn how men and masons went about their work in the busy centres of the world's activity. So, like a patriotic Scotchman that he was, he betook himself straight to Edinburgh, tramping it on foot, of course, for railways did not yet exist, and coaches were not for the use of such as young Thomas Telford.

He arrived in the grey old capital of Scotland in the very nick of time. The Old Town, a tangle of narrow alleys and close courtyards, surrounded by tall houses with endless tiers of floors, was just being deserted by the rich and fashionable world for the New Town, which lies beyond a broad valley on the opposite hillside, and contains numerous streets of solid and handsome stone houses, such as are hardly to be found in any other town in Britain, except perhaps Bath and Aberdeen. Edinburgh is always, indeed, an interesting place for an enthusiastic lover of building, be he architect or stonemason; for instead of being built of brick like London and so many other English centres, it is built partly of a fine hard local sandstone and partly of basaltic greenstone; and besides its old churches and palaces, many of the public buildings are particularly striking and beautiful architectural works. But just at the moment when young Telford walked wearily into Edinburgh at the end of his long tramp, there was plenty for a stout strong mason to do in the long straight stone fronts of the rising New Town. For two years, he worked away patiently at his trade in "the grey metropolis of the North;" and he took advantage of the special opportunities the place afforded him to learn drawing, and to make minute sketches in detail of Holyrood Palace, Heriot's Hospital, Roslyn Chapel, and all the other principal old buildings in which the neighbourhood of the capital is particularly rich. So anxious, indeed, was the young mason to perfect himself by the study of the very best models in his own craft, that when at the end of two years he walked back to revisit his good mother in Eskdale, he took the opportunity of making drawings of Melrose Abbey, the most exquisite and graceful building that the artistic stone-cutters of the Middle Ages have handed down to our time in all Scotland.

This visit to Eskdale was really Telford's last farewell to his old home, before setting out on a journey which was to form the turning-point in his own history, and in the history of British engineering as well. In Scotch phrase, he was going south. And after taking leave of his mother (not quite for the last time) he went south in good earnest, doing this journey on horseback; for his cousin the steward had lent him a horse to make his way southward like a gentleman. Telford turned where all enterprising young Scotchmen of his time always turned: towards the unknown world of London

—that world teeming with so many possibilities of brilliant success or of miserable squalid failure. It was the year 1782, and the young man was just twenty-five. No sooner had he reached the great city than he began looking about him for suitable work. He had a letter of introduction to the architect of Somerset House, whose ornamental fronts were just then being erected, facing the Strand and the river; and Telford was able to get a place at once on the job as a hewer of the finer architectural details, for which both his taste and experience well fitted him. He spent some two years in London at this humble post as a stone-cutter; but already he began to aspire to something better. He earned first-class mason's wages now, and saved whatever he did not need for daily expenses. In this respect, the improvidence of his English fellow-workmen struck the cautious young Scotchman very greatly. They lived, he said, from week to week entirely; any time beyond a week seemed unfortunately to lie altogether outside the range of their limited comprehension.

At the end of two years in London, Telford's skill and study began to bear good fruit. His next engagement was one which raised him for the first time in his life above the rank of a mere journeyman mason. The honest workman had attracted the attention of competent judges. He obtained employment as foreman of works of some important buildings in Portsmouth Dockyard. A proud man indeed was Thomas Telford at this change of fortune, and very proudly he wrote to his old friends in Eskdale, with almost boyish delight, about the trust reposed in him by the commissioners and officers, and the pains he was taking with the task entrusted to him. For he was above all things a good workman, and like all good workmen he felt a pride and an interest in all the jobs he took in hand. His sense of responsibility and his sensitiveness, indeed, were almost too great at times for his own personal comfort. Things *will* go wrong now and then, even with the greatest care; well-planned undertakings will not always pay, and the best engineering does not necessarily succeed in earning a dividend; but whenever such mishaps occurred to his employers, Telford felt the disappointment much too keenly, as though he himself had been to blame for their miscalculations or over-sanguine hopes. Still, it is a good thing to put one's heart in one's work, and so much Thomas Telford certainly did.

About this time, too, the rising young mason began to feel that he must get a little more accurate scientific knowledge. The period for general study had now passed by, and the period for special trade reading had set in. This was well. A lad cannot do better than lay a good foundation of general knowledge and general literature during the period when he is engaged in forming his mind: a young man once fairly launched in life may safely confine himself for a time to the studies that bear directly upon his own special chosen subject. The thing that Telford began closely to investigate was—lime. Now, lime makes mortar; and without lime, accordingly, you can have no mason. But to know anything really about lime, Telford found he must read some chemistry; and to know anything really about chemistry he must work at it hard and unremittingly. A strict attention to one's own business, understood in this very broad and liberal manner, is certainly no bad thing for any struggling handicraftsman, whatever his trade or profession may happen to be.

In 1786, when Telford was nearly thirty, a piece of unexpected good luck fell to his lot. And yet it was not so much good luck as due recognition of his sterling qualities by a wealthy and appreciative person. Long before, while he was still in Eskdale, one Mr. Pulteney, a man of social importance, who had a large house in the bleak northern valley, had asked his advice about the repairs of his own mansion. We may be sure that Telford did his work on that occasion carefully and well; for now, when Mr. Pulteney wished to restore the ruins of Shrewsbury Castle as a dwelling-house, he sought out the young mason who had attended to his Scotch property, and asked him to superintend the proposed alterations in his Shropshire castle. Nor was that all: by Mr. Pulteney's influence, Telford was shortly afterwards appointed to be county surveyor of public works, having under his care all the roads, bridges, gaols, and public buildings in the whole of Shropshire. Thus the Eskdale shepherd-boy rose at last from the rank of a working mason, and attained the well-earned dignity of an engineer and a professional man.

Telford had now a fair opportunity of showing the real stuff of which he was made. Those, of course, were the days when railroads had not yet been dreamt of; when even roads were few and bad; when communications generally were still in a very disorderly and unorganized condition. It is Telford's special glory that he reformed and altered this whole state of things; he reduced the roads of half Britain to system and order; he made the finest highways and bridges then ever constructed; and by his magnificent engineering works, especially his aqueducts, he paved the way unconsciously but surely for the future railways. If it had not been for such great undertakings as Telford's Holyhead Road, which familiarized men's minds with costly engineering operations, it is probable that projectors would long have stood aghast at the alarming expense of a nearly level iron road running through tall hills and over broad rivers the whole way from London to Manchester.

At first, Telford's work as county surveyor lay mostly in very small things indeed—mere repairs of sidepaths or bridges, which gave him little opportunity to develop his full talents as a born engineer. But in time, being found faithful in small things, his employers, the county magistrates, began to consult him more and more on matters of comparative importance. First, it was a bridge to be built across the Severn; then a church to be planned at Shrewsbury, and next, a second church in Coalbrookdale. If he was thus to be made suddenly into an architect, Telford thought, almost without being consulted in the matter, he must certainly set out to study architecture. So, with characteristic vigour, he went to work to visit London, Worcester, Gloucester, Bath, and Oxford, at each place taking care to learn whatever was to be learned in the practice of his new art. Fortunately, however, for Telford and for England, it was not architecture in the strict sense that he was finally to practise as a real profession. Another accident, as thoughtless people might call it, led him to adopt engineering in the end as the path in life he elected to follow. In 1793, he was appointed engineer to the projected Ellesmere Canal.

In the days before railways, such a canal as this was an engineering work of the very first importance. It was to connect the Mersey, the Dee, and the Severn, and it passed over ground which rendered necessary some immense aqueducts on a scale never before attempted by British engineers. Even in our own time, every traveller by the Great Western line between Chester and Shrewsbury must have observed on his right two magnificent ranges as high arches, which are as noticeable now as ever for their boldness, their magnitude, and their exquisite construction. The first of these mighty archways is the Pont Cysylltau aqueduct which carries the Ellesmere Canal across the wide valley of the Dee, known as the Vale of Llangollen; the second is the Chirk aqueduct, which takes it over the lesser glen of a minor tributary, the Ceriog. Both these beautiful works were designed and carried out entirely by Telford. They differ from many other great modern engineering achievements in the fact that, instead of spoiling the lovely mountain scenery into whose midst they have been thrown, they actually harmonize with it and heighten its natural beauty. Both works, however, are splendid feats, regarded merely as efforts of practical skill; and the larger one is particularly memorable for the peculiarity that the trough for the water and the elegant parapet at the side are both entirely composed of iron. Nowadays, of course, there would be nothing remarkable in the use of such a material for such a purpose; but Telford was the first engineer to see the value of iron in this respect, and the Pont Cysylltau aqueduct was one of the earliest works in which he applied the new material to these unwonted uses. Such a step is all the more remarkable, because Telford's own education had lain entirely in what may fairly be called the "stone age" of English engineering; while his natural predilections as a stonemason might certainly have made him rather overlook the value of the novel material. But Telford was a man who could rise superior to such little accidents of habit or training; and as a matter of fact there is no other engineer to whom the rise of the present "iron age" in engineering work is more directly and immediately to be attributed than to himself.

Meanwhile, the Eskdale pioneer did not forget his mother. For years he had constantly written to her, in *print hand*, so that the letters might be more easily read by her aged eyes; he had sent her money in full proportion to his means; and he had taken every possible care to let her declining years

be as comfortable as his altered circumstances could readily make them. And now, in the midst of this great and responsible work, he found time to "run down" to Eskdale (very different "running down" from that which we ourselves can do by the London and North Western Railway), to see his aged mother once more before she died. What a meeting that must have been, between the poor old widow of the Eskdale shepherd, and her successful son, the county surveyor of Shropshire, and engineer of the great and important Ellesmere Canal!

While Telford was working busily upon his wonderful canal, he had many other schemes to carry out of hardly less importance, in connection with his appointment as county surveyor. His beautiful iron bridge across the Severn at Build was another application of his favourite metal to the needs of the new world that was gradually growing up in industrial England; and so satisfied was he with the result of his experiment (for though not absolutely the first, it was one of the first iron bridges ever built) that he proposed another magnificent idea, which unfortunately was never carried into execution. Old London Bridge had begun to get a trifle shaky; and instead of rebuilding it, Telford wished to span the whole river by a single iron arch, whose splendid dimensions would have formed one of the most remarkable engineering triumphs ever invented. The scheme, for some good reason, doubtless, was not adopted; but it is impossible to look at Telford's grand drawing of the proposed bridge—a single bold arch, curving across the Thames from side to side, with the dome of St Paul's rising majestically above it—without a feeling of regret that such a noble piece of theoretical architecture was never realized in actual fact.

Telford had now come to be regarded as the great practical authority upon all that concerned roads or communications; and he was reaping the due money-reward of his diligence and skill. Every day he was called upon to design new bridges and other important structures in all parts of the kingdom, but more especially in Scotland and on the Welsh border. Many of the most picturesque bridges in Britain, which every tourist has admired, often without inquiring or thinking of the hand that planned them, were designed by his inventive brain. The exquisite stone arch which links the two banks of the lesser Scotch Dee in its gorge at Tongueland is one of the most picturesque; for Telford was a bit of an artist at heart, and, unlike too many modern railway constructors, he always endeavoured to make his bridges and aqueducts beautify rather than spoil the scenery in whose midst they stood. Especially was he called in to lay out the great system of roads by which the Scotch Highlands, then so lately reclaimed from a state of comparative barbarism, were laid open for the great development they have since undergone. In the earlier part of the century, it is true, a few central highways had been run through the very heart of that great solid block of mountains; but these were purely military roads, to enable the king's soldiers more easily to march against the revolted clans, and they had hardly more connection with the life of the country than the bare military posts, like Fort William and Fort Augustus, which guarded their ends, had to do with the ordinary life of a commercial town. Meanwhile, however, the Highlands had begun gradually to settle down; and Telford's roads were intended for the far higher and better purpose of opening out the interior of northern Scotland to the humanizing influences of trade and industry.

Fully to describe the great work which the mature engineer constructed in the Highland region, would take up more space than could be allotted to such a subject anywhere save in a complete industrial history of roads and travelling in modern Britain. It must suffice to say that when Telford took the matter in hand, the vast block of country north and west of the Great Glen of Caledonia (which divides the Highlands in two between Inverness and Ben Nevis)—a block comprising the counties of Caithness, Sutherland, Ross, Cromarty, and half Inverness—had literally nothing within it worthy of being called a road. Wheeled carts or carriages were almost unknown, and all burdens were conveyed on pack-horses, or, worse still, on the broad backs of Highland lassies. The people lived in small scattered villages, and communications from one to another were well-nigh impossible. Telford set to work to give the country, not a road or two, but a main system of roads. First, he bridged the broad river Tay at Dunkeld, so as to allow of a direct route straight into the very jaws of the Highlands.

Then, he also bridged over the Beaully at Inverness, so as to connect the opposite sides of the Great Glen with one another. Next, he laid out a number of trunk lines, running through the country on both banks, to the very north of Caithness, and the very west of the Isle of Skye. Whoever to this day travels on the main thoroughfares in the greater Scottish Islands—in Arran, Islay, Jura, Mull; or in the wild peninsula of Morvern, and the Land of Lorne; or through the rugged regions of Inverness-shire and Ross-shire, where the railway has not yet penetrated,—travels throughout on Telford's roads. The number of large bridges and other great engineering masterpieces on this network of roads is enormous; among the most famous and the most beautiful, are the exquisite single arch which spans the Spey just beside the lofty rearing rocks of Craig Ellachie, and the bridge across the Dee, beneath the purple heather-clad braes of Ballater. Altogether, on Telford's Highland roads alone, there are no fewer than twelve hundred bridges.

Nor were these the only important labours by which Telford ministered to the comfort and well-being of his Scotch fellow-countrymen. Scotland's debt to the Eskdale stonemason is indeed deep and lasting. While on land, he improved her communications by his great lines of roads, which did on a smaller scale for the Highland valleys what railways have since done for the whole of the civilized world; he also laboured to improve her means of transit at sea by constructing a series of harbours along that bare and inhospitable eastern coast, once almost a desert, but now teeming with great towns and prosperous industries. It was Telford who formed the harbour of Wick, which has since grown from a miserable fishing village into a large town, the capital of the North Sea herring fisheries. It was he who enlarged the petty port of Peterhead into the chief station of the flourishing whaling trade. It was he who secured prosperity for Fraserburgh, and Banff, and many other less important centres; while even Dundee and Aberdeen, the chief commercial cities of the east coast, owe to him a large part of their present extraordinary wealth and industry. When one thinks how large a number of human beings have been benefited by Telford's Scotch harbour works alone, it is impossible not to envy a great engineer his almost unlimited power of permanent usefulness to unborn thousands of his fellow-creatures.

As a canal-maker, Telford was hardly less successful than as a constructor of roads and harbours. It is true, his greatest work in this direction was in one sense a failure. He was employed by Government for many years as the engineer of the Caledonian Canal, which runs up the Great Glen of Caledonia, connecting the line of lakes whose basins occupy that deep hollow in the Highland ranges, and so avoiding the difficult and dangerous sea voyage round the stormy northern capes of Caithness. Unfortunately, though the canal as an engineering work proved to be of the most successful character, it has never succeeded as a commercial undertaking. It was built just at the exact moment when steamboats were on the point of revolutionizing ocean traffic; and so, though in itself a magnificent and lordly undertaking, it failed to satisfy the sanguine hopes of its projectors. But though Telford felt most bitterly the unavoidable ill success of this great scheme, he might well have comforted himself by the good results of his canal-building elsewhere. He went to Sweden to lay out the Gotha Canal, which still forms the main high-road of commerce between Stockholm and the sea; while in England itself some of his works in this direction—such as the improvements on the Birmingham Canal, with its immense tunnel—may fairly be considered as the direct precursors of the great railway efforts of the succeeding generation.

The most remarkable of all Telford's designs, however, and the one which most immediately paved the way for the railway system, was his magnificent Holyhead Road. This wonderful highway he carried through the very midst of the Welsh mountains, at a comparatively level height for its whole distance, in order to form a main road from London to Ireland. On this road occurs Telford's masterpiece of engineering, the Menai suspension bridge, long regarded as one of the wonders of the world, and still one of the most beautiful suspension bridges in all Europe. Hardly less admirable, however, in its own way is the other suspension bridge which he erected at Conway, to carry his road across the mouth of the estuary, beside the grey old castle, with which its charming design

harmonizes so well. Even now it is impossible to drive or walk along this famous and picturesque highway without being struck at every turn by the splendid engineering triumphs which it displays throughout its entire length. The contrast, indeed, between the noble grandeur of Telford's bridges, and the works on the neighbouring railways, is by no means flattering in every respect to our too exclusively practical modern civilization.

Telford was now growing an old man. The Menai bridge was begun in 1819 and finished in 1826, when he was sixty-eight years of age; and though he still continued to practise his profession, and to design many valuable bridges, drainage cuts, and other small jobs, that great undertaking was the last masterpiece of his long and useful life. His later days were passed in deserved honour and comparative opulence; for though never an avaricious man, and always anxious to rate his services at their lowest worth, he had gathered together a considerable fortune by the way, almost without seeking it. To the last, his happy cheerful disposition enabled him to go on labouring at the numerous schemes by which he hoped to benefit the world of workers; and so much cheerfulness was surely well earned by a man who could himself look back upon so good a record of work done for the welfare of humanity. At last, on the 2nd of September, 1834, his quiet and valuable life came gently to a close, in the seventy-eighth year of his age. He was buried in Westminster Abbey, and few of the men who sleep within that great national temple more richly deserve the honour than the Westerkirk shepherd-boy. For Thomas Telford's life was not merely one of worldly success; it was still more pre-eminently one of noble ends and public usefulness. Many working men have raised themselves by their own exertions to a position of wealth and dignity far surpassing his; few indeed have conferred so many benefits upon untold thousands of their fellow-men. It is impossible, even now, to travel in any part of England, Wales, or Scotland, without coming across innumerable memorials of Telford's great and useful life; impossible to read the full record of his labours without finding that numberless structures we have long admired for their beauty or utility, owe their origin to the honourable, upright, hardworking, thoroughgoing, journeyman mason of the quiet little Eskdale village. Whether we go into the drained fens of Lincolnshire, or traverse the broad roads of the rugged Snowdon region; whether we turn to St. Katharine's Docks in London, or to the wide quays of Dundee and those of Aberdeen; whether we sail beneath the Menai suspension bridge at Bangor, or drive over the lofty arches that rise sheer from the precipitous river gorge at Cartland, we meet everywhere the lasting traces of that inventive and ingenious brain. And yet, what lad could ever have started in the world under apparently more hopeless circumstances than widow Janet Telford's penniless orphan shepherd-boy Tam, in the bleakest and most remote of all the lonely border valleys of southern Scotland?

## II

# GEORGE STEPHENSON, ENGINE-MAN

Any time about the year 1786, a stranger in the streets of the grimy colliery village of Wylam, near Newcastle, might have passed by without notice a ragged, barefooted, chubby child of five years old, Geordie Stephenson by name, playing merrily in the gutter and looking to the outward eye in no way different from any of the other colliers' children who loitered about him. Nevertheless, that ragged boy was yet destined in after-life to alter the whole face of England and the world by those wonderful railways, which he more than any other man was instrumental in first constructing; and the story of his life may rank perhaps as one of the most marvellous in the whole marvellous history of able and successful British working men.

George Stephenson was born in June, 1781, the son of a fireman who tended the pumping engine of the neighbouring colliery, and one of a penniless family of six children. So poor was his father, indeed, that the whole household lived in a single room, with bare floor and mud wall; and little Geordie grew up in his own unkempt fashion without any schooling whatever, not even knowing A from B when he was a big lad of seventeen. At an age when he ought to have been learning his letters, he was bird's-nesting in the fields or running errands to the Wylam shops; and as soon as he was old enough to earn a few pence by light work, he was set to tend cows at the magnificent wages of twopence a day, in the village of Dewley Burn, close by, to which his father had then removed. It might have seemed at first as though the future railway engineer was going to settle down quietly to the useful but uneventful life of an agricultural labourer; for from tending cows he proceeded in due time (with a splendid advance of twopence) to leading the horses at the plough, spudding thistles, and hoeing turnips on his employer's farm. But the native bent of a powerful mind usually shows itself very early; and even during the days when Geordie was still stumbling across the freshly ploughed clods or driving the cows to pasture with a bunch of hazel twigs, his taste for mechanics already made itself felt in a very marked and practical fashion. During all his leisure time, the future engineer and his chum Bill Thirlwall occupied themselves with making clay models of engines, and fitting up a winding machine with corks and twine like those which lifted the colliery baskets. Though Geordie Stephenson didn't go to school at the village teacher's, he was teaching himself in his own way by close observation and keen comprehension of all the machines and engines he could come across.

Naturally, to such a boy, the great ambition of his life was to be released from the hoeing and spudding, and set to work at his father's colliery. Great was Geordie's joy, therefore, when at last he was taken on there in the capacity of a coal-picker, to clear the loads from stones and rubbish. It wasn't a very dignified position, to be sure, but it was the first step that led the way to the construction of the Liverpool and Manchester Railway. Geordie was now fairly free from the uncongenial drudgery of farm life, and able to follow his own inclinations in the direction of mechanical labour. Besides, was he not earning the grand sum of sixpence a day as picker, increased to eightpence a little later on, when he rose to the more responsible and serious work of driving the gin-horse? A proud day indeed it was for him when, at fourteen, he was finally permitted to aid his father in firing the colliery engine; though he was still such a very small boy that he used to run away and hide when the owner went his rounds of inspection, for fear he should be thought too little to earn his untold wealth of a shilling a day in such a grown-up occupation. Humbler beginnings were never any man's who lived to become the honoured guest, not of kings and princes only, but of the truly greatest and noblest in the land.

A coal-miner's life is often a very shifting one; for the coal in particular collieries gets worked out from time to time; and he has to remove, accordingly, to fresh quarters, wherever employment happens to be found. This was very much the case with George Stephenson and his family; all of them being obliged to remove several times over during his childish days in search of new openings.

Shortly after Geordie had attained to the responsible position of assistant fireman, his father was compelled, by the closing of Dewley Burn mine, to get a fresh situation hard by at Newburn. George accompanied him, and found employment as full fireman at a small working, whose little engine he undertook to manage in partnership with a mate, each of them tending the fire night and day by twelve-hour shifts. Two years later, his wages were raised to twelve shillings a week, a sure mark of his diligent and honest work; so that George was not far wrong in remarking to a fellow-workman at the time that he now considered himself a made man for life.

During all this time, George Stephenson never for a moment ceased to study and endeavour to understand the working of every part in the engine that he tended. He was not satisfied, as too many workmen are, with merely learning the routine work of his own trade; with merely knowing that he must turn such and such a tap or valve in order to produce such and such a desired result: he wanted to see for himself how and why the engine did this or that, what was the use and object of piston and cylinder and crank and joint and condenser—in short, fully to understand the underlying principle of its construction. He took it to pieces for cleaning whenever it was needful; he made working models of it after his old childish pattern; he even ventured to tinker it up when out of order on his own responsibility. Thus he learnt at last something of the theory of the steam-engine, and learnt also by the way a great deal about the general principles of mechanical science. Still, even now, incredible as it seems, the future father of railways couldn't yet read; and he found this terrible drawback told fatally against his further progress. Whenever he wanted to learn something that he didn't quite understand, he was always referred for information to a Book. Oh, those books; those mysterious, unattainable, incomprehensible books; how they must have bothered and worried poor intelligent and aspiring but still painfully ignorant young George Stephenson! Though he was already trying singularly valuable experiments in his own way, he hadn't yet even begun to learn his letters.

Under these circumstances, George Stephenson, eager and anxious for further knowledge, took a really heroic resolution. He wasn't ashamed to go to school. Though now a full workman on his own account, about eighteen years old, he began to attend the night school at the neighbouring village of Walbottle, where he took lessons in reading three evenings every week. It is a great thing when a man is not ashamed to learn. Many men are; they consider themselves so immensely wise that they look upon it as an impertinence in anybody to try to tell them anything they don't know already. Truly wise or truly great men—men with the capability in them for doing anything worthy in their generation—never feel this false and foolish shame. They know that most other people know some things in some directions which they do not, and they are glad to be instructed in them whenever opportunity offers. This wisdom George Stephenson possessed in sufficient degree to make him feel more ashamed of his ignorance than of the steps necessary in order to conquer it. Being a diligent and willing scholar, he soon learnt to read, and by the time he was nineteen he had learnt how to write also. At arithmetic, a science closely allied to his native mechanical bent, he was particularly apt, and beat all the other scholars at the village night school. This resolute effort at education was the real turning-point in George Stephenson's remarkable career, the first step on the ladder whose topmost rung led him so high that he himself must almost have felt giddy at the unwonted elevation.

Shortly after, young Stephenson gained yet another promotion in being raised to the rank of brakesman, whose duty it was to slacken the engine when the full baskets of coal reached the top of the shaft. This was a more serious and responsible post than any he had yet filled, and one for which only the best and steadiest workmen were ever selected. His wages now amounted to a pound a week, a very large sum in those days for a skilled working-man.

Meanwhile, George, like most other young men, had fallen in love. His sweetheart, Fanny Henderson, was servant at the small farmhouse where he had taken lodgings since leaving his father's home; and though but little is known about her (for she unhappily died before George had begun to rise to fame and fortune), what little we do know seems to show that she was in every respect a fitting wife for the active young brakesman, and a fitting mother for his equally celebrated son,

Robert Stephenson. Fired by the honourable desire to marry Fanny, with a proper regard for prudence, George set himself to work to learn cobbling in his spare moments; and so successfully did he cobble the worn shoes of his fellow-colliers after working hours, that before long he contrived to save a whole guinea out of his humble earnings. That guinea was the first step towards an enormous fortune; a fortune, too, all accumulated by steady toil and constant useful labour for the ultimate benefit of his fellow-men. To make a fortune is the smallest and least noble of all possible personal ambitions; but to save the first guinea which leads us on at last to independence and modest comfort is indeed an important turning-point in every prudent man's career. Geordie Stephenson was so justly proud of his achievement in this respect that he told a friend in confidence he might now consider himself a rich man.

By the time George was twenty-one, he had saved up enough by constant care to feel that he might safely embark on the sea of housekeeping. He was able to take a small cottage lodging for himself and Fanny, at Willington Quay, near his work at the moment, and to furnish it with the simple comfort which was all that their existing needs demanded. He married Fanny on the 28th of November, 1802; and the young couple proceeded at once to their new home. Here George laboured harder than ever, as became the head of a family. He was no more ashamed of odd jobs than he had been of learning the alphabet. He worked overtime at emptying ballast from ships; he continued to cobble, to cut lasts, and even to try his hand at regular shoemaking; furthermore, he actually acquired the art of mending clocks, a matter which lay strictly in his own line, and he thus earned a tidy penny at odd hours by doctoring all the rusty or wheezy old timepieces of all his neighbours. Nor did he neglect his mechanical education meanwhile; for he was always at work upon various devices for inventing a perpetual motion machine. Now perpetual motion is the most foolish will-o'-the-wisp that ever engaged a sane man's attention: the thing has been proved to be impossible from every conceivable point of view, and the attempt to achieve it, if pursued to the last point, can only end in disappointment if not in ruin. Still, for all that, the work George Stephenson spent upon this unpractical object did really help to give him an insight into mechanical science which proved very useful to him at a later date. He didn't discover perpetual motion, but he did invent at last the real means for making the locomotive engine a practical power in the matter of travelling.

A year later, George's only son Robert was born; and from that moment the history of those two able and useful lives is almost inseparable. During the whole of George Stephenson's long upward struggle, and during the hard battle he had afterwards to fight on behalf of his grand design of railways, he met with truer sympathy, appreciation, and comfort from his brave and gifted son than from any other person whatsoever. Unhappily, his pleasure and delight in the up-bringing of his boy was soon to be clouded for a while by the one great bereavement of an otherwise singularly placid and happy existence. Some two years after her marriage, Fanny Stephenson died, as yet a mere girl, leaving her lonely husband to take care of their baby boy alone and unaided. Grief for this irretrievable loss drove the young widower away for a while from his accustomed field of work among the Tyneside coal-pits; he accepted an invitation to go to Montrose in Scotland, to overlook the working of a large engine in some important spinning-works. He remained in this situation for one year only; but during that time he managed to give clear evidence of his native mechanical insight by curing a defect in the pumps which supplied water to his engine, and which had hitherto defied the best endeavours of the local engineers. The young father was not unmindful, either, of his duty to his boy, whom he had left behind with his grandfather on Tyneside; for he saved so large a sum as L28 during his engagement, which he carried back with him in his pocket on his return to England.

A sad disappointment awaited him when at last he arrived at home. Old Robert Stephenson, the father, had met with an accident during George's absence which made him quite blind, and incapacitated him for further work. Helpless and poor, he had no resource to save him from the workhouse except George; but George acted towards him exactly as all men who have in them a possibility of any good thing always do act under similar circumstances. He spent L15 of his hard-

earned savings to pay the debts the poor blind old engine-man had necessarily contracted during his absence, and he took a comfortable cottage for his father and mother at Killingworth, where he had worked before his removal to Scotland, and where he now once more obtained employment, still as a brakesman. In that cottage this good and brave son supported his aged parents till their death, in all the simple luxury that his small means would then permit him.

That, however, was not the end of George's misfortunes. Shortly after, he was drawn by lot as a militiaman; and according to the law of that time (for this was in 1807, during the very height of the wars against Napoleon) he must either serve in person or else pay heavily to secure a substitute. George chose regretfully the latter course—the only one open to him if he wished still to support his parents and his infant son. But in order to do so, he had to pay away the whole remainder of his carefully hoarded savings, and even to borrow L6 to make up the payment for the substitute. It must have seemed very hard to him to do this, and many men would have sunk under the blow, become hopeless, or taken to careless rowdy drinking habits. George Stephenson felt it bitterly, and gave way for a while to a natural despondency; he would hardly have been human if he had not; but still, he lived over it, and in the end worked on again with fuller resolution and vigour than ever.

For several years Geordie, as his fellow-colliers affectionately called him, continued to live on at one or other of the Killingworth collieries. In a short time, he entered into a small contract with his employers for "brakeing" the engines; and in the course of this contract, he invented certain improvements in the matter of saving wear and tear of ropes, which were both profitable to himself and also in some small degree pointed the way toward his future plans for the construction of railways. It is true, the two subjects have not, apparently, much in common; but they are connected in this way, that both proceed upon the principle of reducing the friction to the smallest possible quantity. It was this principle that Stephenson was gradually learning to appreciate more and more at its proper value; and it was this which finally led him to the very summit of a great and pre-eminently useful profession. The great advantage, indeed, of a level railway over an up-and-down ordinary road is simply that in the railway the resistance and friction are almost entirely got rid of.

It was in 1810, when Stephenson was twenty-nine, that his first experiment in serious engineering was made. A coal-pit had been sunk at Killingworth, and a rude steam-engine of that time had been set to pump the water out of its shaft; but, somehow, the engine made no headway against the rising springs at the bottom of the mine. For nearly a year the engine worked away in vain, till at last, one Saturday afternoon, Geordie Stephenson went over to examine her. "Well, George," said a pitman, standing by, "what do you think of her?" "Man," said George, boldly, "I could alter her and make her draw. In a week I could let you all go the bottom." The pitman reported this confident speech of the young brakesman to the manager; and the manager, at his wits' end for a remedy, determined to let this fellow Stephenson try his hand at her. After all, if he did no good, he would be much like all the others; and anyhow he seemed to have confidence in himself, which, if well grounded, is always a good thing.

George's confidence *was* well grounded. It was not the confidence of ignorance, but that of knowledge. He *understood* the engine now, and he saw at once the root of the evil. He picked the engine to pieces, altered it to suit the requirements of the case, and set it to work to pump without delay. Sure enough, he kept his word; and within the week, the mine was dry, and the men were sent to the bottom. This was a grand job for George's future. The manager, a Mr. Dodds, not only gave him ten pounds at once as a present, in acknowledgment of his practical skill, but also appointed him engine-man of the new pit, another rise in the social scale as well as in the matter of wages. Dodds kept him in mind for the future, too; and a couple of years later, on a vacancy occurring, he promoted the promising hand to be engine-wright of all the collieries under his management, at a salary of L100 a year. When a man's income comes to be reckoned by the year, rather than by the week or month, it is a sign that he is growing into a person of importance. George had now a horse to ride

upon, on his visits of inspection to the various engines; and his work was rather one of mechanical engineering than of mere ordinary labouring handicraft.

The next few years of George Stephenson's life were mainly taken up in providing for the education of his boy Robert. He had been a good son, and he was now a good father. Feeling acutely how much he himself had suffered, and how many years he had been put back, by his own want of a good sound rudimentary education, he determined that Robert should not suffer from a similar cause. Indeed, George Stephenson's splendid abilities were kept in the background far too long, owing to his early want of regular instruction. So the good father worked hard to send his boy to school; not to the village teacher's only, but to a school for gentlemen's sons at Newcastle. By mending clocks and watches in spare moments, and by rigid economy in all unnecessary expenses (especially beer), Stephenson had again gathered together a little hoard, which mounted up this time to a hundred guineas. A hundred guineas is a fortune and a capital to a working man. He was therefore rich enough, not only to send little Robert to school, but even to buy him a donkey, on which the boy made the journey every day from Killingworth to Newcastle. This was in 1815, when George was thirty-four, and Robert twelve. Perhaps no man who ever climbed so high as George Stephenson, had ever reached so little of the way at so comparatively late an age. For in spite of his undoubted success, viewed from the point of view of his origin and early prospects, he was as yet after all nothing more than the common engine-wright of the Killingworth collieries—a long way off as yet from the distinguished father of the railway system.

George Stephenson's connection with the locomotive, however, was even now beginning. Already, in 1816, he and his boy had tried a somewhat higher flight of mechanical and scientific skill than usual, in the construction of a sun-dial, which involves a considerable amount of careful mathematical work; and now George found that the subject of locomotive engines was being forced by circumstances upon his attention. From the moment he was appointed engine-wright of the Killingworth collieries, he began to think about all possible means of hauling coal at cheaper rates from the pit's mouth to the shipping place on the river. For that humble object alone—an object that lay wholly within the line of his own special business—did the great railway projector set out upon his investigations into the possibilities of the locomotive. Indeed, in its earliest origin, the locomotive was almost entirely connected with coals and mining; its application to passenger traffic on the large scale was quite a later and secondary consideration. It was only by accident, so to speak, that the true capabilities of railways were finally discovered in the actual course of their practical employment. George Stephenson was not the first person to construct either a locomotive or a tramway. Both were already in use, in more or less rude forms, at several collieries. But he *was* the first person to bring the two to such a pitch of perfection, that what had been at first a mere clumsy mining contrivance, became developed into a smooth and easy iron highway for the rapid and convenient conveyance of goods and passengers over immense distances. Of course, this great invention, like all other great inventions, was not the work of one day or one man. Many previous heads had helped to prepare the way for George Stephenson; and George Stephenson himself had been working at the subject for many years before he even reached the first stage of realized endeavour. As early as 1814 he constructed his first locomotive at Killingworth colliery; it was not until 1822 that he laid the first rail of his first large line, the Stockton and Darlington Railway.

Stephenson's earliest important improvement in the locomotive consisted in his invention of what is called the steam-blast, by which the steam is made to increase the draught of the fire, and so largely add to the effectiveness of the engine. It was this invention that enabled him at last to make the railway into the great carrier of the world, and to begin the greatest social and commercial upheaval that has ever occurred in the whole history of the human race.

Meanwhile, however, George was not entirely occupied with the consideration of his growing engine. He had the clocks and watches to mend; he had Robert's schooling to look after; and he had another practical matter even nearer home than the locomotive on which to exercise his inventive

genius. One day, in 1814, the main gallery of the colliery caught fire. Stephenson at once descended into the burning pit, with a chosen band of volunteers, who displayed the usual heroic courage of colliers in going to the rescue of their comrades; and, at the risk of their lives, these brave men bricked up the burning portion, and so, by excluding the air, put out the dangerous fire. Still, even so, several of the workmen had been suffocated, and one of the pitmen asked Geordie in dismay whether nothing could be done to prevent such terrible disasters in future. "The price of coal-mining now," he said, "is pitmen's lives." Stephenson promised to think the matter over; and he did think it over with good effect. The result of his thought was the apparatus still affectionately known to the pitmen as "the Geordie lamp." It is a lamp so constructed that the flame cannot pass out into the air outside, and so cause explosions in the dangerous fire-damp which is always liable to occur abundantly in the galleries of coal mines. By this invention alone George Stephenson's name and memory might have been kept green for ever; for his lamp has been the means of saving thousands of lives from a sudden, a terrible, and a pitiful death. Most accidents that now occur in mines are due to the neglect of ordinary precautions, and to the perverse habit of carrying a naked lighted candle in the hand (contrary to regulations) instead of a carefully guarded safety lamp. Yet so culpably reckless of their own and other men's lives are a large number of people everywhere, that in spite of the most stringent and salutary rules, explosions from this cause (and, therefore, easily avoidable) take place constantly to the present day, though far less frequently than before the invention of the Geordie lamp.

Curiously enough, at the very time when George Stephenson was busy inventing his lamp at Killingworth, Sir Humphrey Davy was working at just the same matter in London; and the two lamps, though a little different in minor points of construction, are practically the same in general principle. Now, Sir Humphrey was then the great fashionable natural philosopher of the day, the favourite of London society, and the popular lecturer of the Royal Institution. His friends thought it a monstrous idea that his splendid life-saving apparatus should have been independently devised by "an engine-wright of Killingworth of the name of Stephenson—a person not even possessing a knowledge of the elements of chemistry." This sounds very odd reading at the present day, when the engine-wright of the name of Stephenson has altered the whole face of the world, while Davy is chiefly remembered as a meritorious and able chemist; but at the time, Stephenson's claim to the invention met with little courtesy from the great public of London, where a meeting was held on purpose to denounce his right to the credit of the invention. What the coal-owners and colliers of the North Country thought about the matter was sufficiently shown by their subscription of L1000, as a Stephenson testimonial fund. With part of the money, a silver tankard was presented to the deserving engine-wright, while the remainder of the sum was handed over to him in ready cash. A very acceptable present it was, and one which George Stephenson remembered with pride down to his dying day. The Geordie lamp continues in use to the present moment in the Tyneside collieries with excellent effect.

For some years more, Mr. Stephenson (he is now fairly entitled to that respectable prefix) went on still further experimenting on the question of locomotives and railways. He was now beginning to learn that much unnecessary wear and tear arose on the short lines of rail down from the pit's mouths to the loading-places on the river by the inequalities and roughnesses of the joints; and he invented a method of overlapping the rails which quite got over this source of loss—loss of speed, loss of power, and loss of material at once. It was in 1819 that he laid down his first considerable piece of road, the Hetton railway. The owners of a colliery at the village of Hetton, in Durham, determined to replace their waggon road by a locomotive line; and they invited the now locally famous Killingworth engine-wright to act as their engineer. Stephenson gladly undertook the post; and he laid down a railway of eight miles in length, on the larger part of which the trucks were to be drawn by "the iron horse," as people now began to style the altered and improved locomotive. The Hetton railway was opened in 1822, and the assembled crowd were delighted at beholding a single engine draw seventeen loaded trucks after it, at the extraordinary rate of four miles an hour—nearly as fast as a man could walk.

Whence it may be gathered that Stephenson's ideas upon the question of speed were still on a very humble scale indeed.

Before the Hetton railway was opened, however, George Stephenson had shown one more proof of his excellence as a father by sending his boy Robert, now nineteen, to Edinburgh University. It was a serious expense for a man who was even now, after all, hardly more than a working man of the superior grade; but George Stephenson was well repaid for the sacrifice he thus made on behalf of his only son. He lived to see him the greatest practical engineer of his own time, and to feel that his success was in large measure due to the wider and more accurate scientific training the lad had received from his Edinburgh teachers.

In 1819 George married again, his second wife being the daughter of a farmer at Black Callerton.

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