SUCCESSFUL ENGINEERS AND INVENTORS.

GEORGE STEPHENSON.

George Stephenson began life as a pit-engine boy, receiving for his wages twopence a day. From some cause or other, the engine he had to mind was out of repair, and without seeking instruction from any one, he applied himself with complete success to put it in working order. The ingenuity he displayed on this occasion secured his early promotion to the post of engine man, and his wages were advanced to twelve shillings per week. So elated was he by this change of position that he declared to a companion that he was now made "a man for life." The use of waggon-ways for conveying coals from the place of excavation along the galleries to the shaft, familiarized him with the notion of railroads, and by affording opportunities for the exercise of his talents in repairing and improving them, gradually fitted him for the great undertakings in which he was thereafter to engage. The following extracts from a speech which he delivered many years afterwards, will give the clearest view of the difficulties with which he had to contend in his earlier years, and the perseverance that enabled him to overcome them :—" At the coal pit I had to work early and late, often rising to my labor at one o'clock in the morning. Time rolled on, and I had the happiness to make some improvement in engine work. The first locomotive I made was at Killingworth colliery, and with Lord Ravensworth's money, I then said to my friends there was no limit to the speed of such an engine, provided the works could be made to stand. I betook myself to mend my neighbors' clocks and watches at night, and thus obtained money for educating my son. He got an appointment as overlooker and at night we worked at our engineering. I got leave to go from Killingworth to lay down a railway at Helton, and next to Darlington, and then to Liverpool to plan a line from that place to Manchester. I there pledged myself to attain a speed of ten miles an hour. I said I had no doubt it might be made to go much faster, but we had better be moderate at the beginning.—The directors said I was quite right; for if, when they went to parliament, they talked of going at a greater rate than ten miles an hour a cross would soon be put on the concern." When he gave his evidence before the parliamentary committee, some inquired whether he was a foreigner, others hinted that he was mad; but his intelligence and energy carried him through the ordeal, and the still more severe trial which the actual undertaking presented. The difficulties he had to encounter in constructing the Manchester and Liverpool railroad are well known. The most astounding achievement was the completion of a solid and enduring road over Chat Moss, a bog covering about twelve miles. The moss was of the softest and worst description, and in forming the embankment at the eastern boundary an immense mass of earth was thrown in and totally disappeared before anything like a palpable foundation for the road could be obtained. This part of the undertaking was finished in eighteen months, and the road was opened the whole distance on the 15th of September, 1830, in the presence of not fewer than half a million of spectators.—From this time to his death, in 1848, Mr. Stephenson's history is identical with that of railway extension in this country and on the continent; he became an extensive owner of collieries and iron works, and left behind him a large fortune, incomparably less valuable, however, than the inheritance of his example and his genius. In looking at such men after they have obtained celebrity we are ready to imagine that something of the supernatural assisted them in obtaining it. The early life of Brindley and Stephenson is sufficient to dispel the illusion; the only witchcraft they employed was that of close application and untiring industry. Without any idea of attaining to affluence, much less renown, they diligently improved the advantages of the present moment, always endeavored to make the best use of their faculties, and in this way realized a measure of success beyond their most sanguine dreams. Here is a lesson for the enterprising; in gazing perpetually at the object of their desires, in pondering deep laid schemes of aggrandizement they must surely miss their mark, PRESENT DUTY—a conscientious use of PRESENT MEANS—this is the ladder which Providence places at our feet, and on which we may ascend to distinction.

WELDING COPPER.

Mr. Philip Rust, Bavarian Inspector of Salt Words, writes as follows :—The great obstacle heretofore experienced in welding copper has been that the oxide formed is not fusible. Now, if any fusible compound of this oxide could be found, it would render such a weld possible. We find in mineralogy two copper salts of phosphoric acid—viz., libethenite and pseudo-malachite, each of which melts readily before the blow-pipe. It was therefore natural to suppose that a salt which contained free phosphoric acid, or which would yield the same at a red heat, would make the weld easy by removing the oxide as a fusible slag. The first trial was made with microcosmic salt (phosphate of soda and ammonia) and succeeded perfectly. As this salt was dear, it was found advisable to use a mixture of one part phosphate of soda, and two parts boracic acid, which answered the same purpose as the original compound, with the exception that the slag formed was not quite as fusible as before. This welding powder should be strewn upon the surface of the copper at a red heat; the pieces should then be heated up to a full cherry red or yellow heat, and brought immediately under the hammer, when they may be as readily welded as iron itself.—For instance, it is possible to weld together a small rod of copper which has been broken; the ends should be beveled, laid on one another, seized by a pair of tongs, and placed together wirh the latter in the fire and heated; the welding powder should then be strewn on the ends, which, after a further heating, may be welded so soundly as to bend and stretch as if they had never been broken.

Mr. Rust states that as long as 1854 he welded strips of copper plate together and drew them into a rod; he also made a chain the links of which were made with pretty thick wire and welded. It is necessary to carefully observe two things in the course of the operation: 1st. The greatest care must be taken that no charcoal or other solid carbon comes into contact with the points to be welded, as, otherwise, phosphide of copper would be formed, which would cover the surface of the copper and effectually prevent a weld. In this case it is only by careful treatment in an oxidising fire, and plentiful application of the welding powder, that the copper can again be welded. It is therefore advisable to heat the copper in a gas flame. 2nd. As copper is a much softer metal than iron, it is much softer at the required heat than the latter at its welding heat, and the parts welded cannot offer any great resistance to the blows of the hammer. They must, therefore, be so shaped as to be enabled to resist such blows as well as may be, and it is also well to use a wooden hammer, which does not exercise so great a force on account of its lightness.