

brought to Edinburgh, and were interred in the Grange Cemetery. The funeral was attended by a very large company, including the magistrates and council of the city, ministers of nearly every denomination, both in the city and from different parts of the country, representatives of various public bodies, the directors and children of the Original Ragged School, as well as the personal friends and relations of the deceased. The procession extended for about three quarters of a mile, and moved through an immense crowd of people of all classes, assembled to show the last mark of respect to one than whom no citizen of Edinburgh was better known or more universally esteemed, as well for his private virtues and noble character as for his unwearied exertions for the benefit of others, especially for the relief of the destitute and the recovery of the fallen.

3. Obituary Notice of Mr R. W. Thomson. By Professor Fleeming Jenkin.

MR R. W. THOMSON, most widely known as the inventor of the road-steamer, died on the 8th of March 1873, in the fiftieth year of his age. By his death the community has lost a distinguished engineer, a remarkable thinker, and a highly original inventor.

Born in 1822, in Stonehaven, Mr Thomson furnishes one more example of the many Scotchmen who by sheer force of character, without any adventitious aid, have risen to be leaders in their profession and benefactors to their country. His father started on a small scale the only factory which even now Stonehaven possesses, and destined his eldest son (the subject of our memoir) to the pulpit, but the lad showed such dislike to classical studies that he was sent to Charleston, U.S., at the age of fourteen, to be educated as a merchant. Commerce proved as distasteful as the classics, and he returned at the age of sixteen to this country, where he began his self-education, aided materially by a weaver who chanced to be a mathematician.

Now, when scientific and technical education is almost thrust upon careless students, it is well to remember how this able and successful engineer acquired his knowledge, and to learn that energy in the pursuit of science is far more important than the

most elaborate machinery for its distribution. At this time Mr Thomson conceived the idea of the ribbon saw, afterwards worked out by other hands. The elliptic rotary steam-engine, to which he afterwards gave much time, was also then first conceived by him. He gained some experimental knowledge of 'chemistry and electricity, and his successful application of these sciences in after years proves the rare judgment with which he directed his studies. A short practical apprenticeship in workshops at Aberdeen and Dundee formed the next step in his education. He had great pleasure in telling how the foreman at the end of the first fortnight's work paid him more than he expected to receive, and when the apparent error was pointed out, told him that there was no mistake, "he was worth it." He was next employed by a cousin, Mr Lyon (the builder of the Dean Bridge), in connection with the blasting by which Dunbar Castle was blown down, and on this occasion conceived the happy idea of firing mines by electricity. Having brought his idea into a practical form, he went at the age of nineteen to London. Faraday, to whom the invention was shown, gave him hearty encouragement; and Sir William Cubitt was so much struck by the idea that he at once gave him an important charge in connection with the blasting operations then in progress near Dover. About this time he was engaged with a civil engineer in Glasgow, and subsequently passed into the employment of the Stephensons.

At the time of the railway mania, he was twenty-two years old, and began business on his own account, having a large staff, at ten guineas per diem, engaged in making plans and surveys for a line in the Eastern counties. He even achieved a triumph over Stephenson before a Parliamentary Committee, having refused to withdraw from competition at the instance of influential directors. The route he had chosen was ultimately adopted, although by other men, as the railway panic at the time stopped the undertaking.

Debarred by the result of the panic from prosecuting his profession as a business, Mr Thomson began again to invent, and devoted much time to the introduction of india-rubber tires, which he patented. The patent was not profitable, for the material was scarce and dear, and its manufacture ill understood; but he was fortunately rewarded at a later date by finding an important and

successful application for these tires in connection with his road-steamer. At this period of comparative leisure, he read much, and probably laid the foundation for that great cultivation and wide range of information which were so remarkable in the later years of his life.

When railway business revived, he did not seek to re-enter on the practice of this branch of his profession, which had no attractions for him, partaking as it does more of the nature of commerce than science. As a boy he nearly lost his place in the workshop by refusing to repeat some operation with which he was familiar, and as a man he never cared for the familiar routine which is most profitable. He sent in a creditable design for the great Exhibition of 1851, and a little invention of his, "the fountain pen," was sold in the building. In 1852 he went as agent for an engineering firm to Java, to erect some sugar machinery, and here he found a new field in which his powers could be worthily exerted. Although without capital, he was offered and he accepted a partnership in an important house shortly after his arrival. He then designed machinery for the manufacture of sugar so greatly superior to anything previously in use in the island, as to give a great impulse to the production of that commodity; and up to the time of his death he continued to supply the best machinery used in Java, where his honourable character commanded the unbounded confidence of the Dutch planters.

We owe perhaps the most universally useful of Mr Thomson's inventions to the refusal of the Dutch authorities to allow him to erect a waterside-crane, unless it could be removed every night, lest the natives should stumble over it. Mr Thomson hereupon designed the first portable steam-crane. He did not patent the idea, but Messrs Chaplin, who made the first small steam-crane for him, had, when he next re-visited England, two large factories engaged in the manufacture of these now indispensable appliances. The invention consisted mainly in employing the boiler as a counterpoise. In 1860 he re-visited Europe, to order a hydraulic dock consisting of a few types or classes of plates, each plate being interchangeable with every other plate of its class. He by this plan avoided the expense of double erection in England and abroad. The first dock thus made sunk when erected, in Mr

Thomson's absence, owing to the inexperience of the young engineer to whom it was intrusted. Fortunately two other docks from Mr Thomson's designs were in course of construction,—one for the French Government at Saigon, and the other for a company at Callao. These have been thoroughly successful.

In 1862 Mr Thomson retired from business in Java and settled in Edinburgh. He devoted much time and labour to perfecting the elliptic rotary engine, a clear and simple model of which may be seen in the Industrial Museum. His next invention, the Road Steamer, was the result of a direct practical want. An efficient traction engine was required for the transport of sugar-canes in Java, and none could be found capable of doing the work. Mr Thomson recurred to his old idea of india-rubber tires, and found in these a solution of the main difficulty in designing a traction engine. The tires are not fastened to the wheel, but adhere to it by friction. They form a broad pad or elephant's foot, by which the great weight of the engine is distributed over a large surface. The outer surface adapts itself to every peculiarity of the ground, and the inner surface forms, as it were, a constant endless platform on which the comparatively rigid engine works. The india-rubber does in a thoroughly practical manner what Boydell attempted to do by his impracticable endless railway. Both inventors wished to enable the steam-engine to work under constant conditions, but Mr Thomson's plan is strong, simple, and yielding, where Boydell's was weak, complex, and rigid. The perfect success of the plan is perhaps best attested by the numerous imitations which it has called forth, the object in most of these being to dispense with the expensive material india-rubber. The steel-protecting grooves for the tires are a later invention, and only a day or two before his death the inventor made an important improvement in their construction.

The zeal and energy of the true inventor in conquering difficulties and discouragement have often been told. Those who had the privilege of knowing Mr Thomson have seen this spectacle heightened in tragic interest by the grandeur of mind with which he contended against the terrible malady which has so much too soon closed his labours. If mental and moral qualities could be as simply described as mere mechanical inventions, more should

be said of the man, and less of the engineer. No written record can express the singular powers of Mr Thomson's mind and the charm of his character. The specialist in science, the professed chemist, the professed electrician, the professed geologist, the professed lawyer, all received suggestions from his fertile mind. The able and original paper on coal, read in this Society shortly before his death, affords an illustration of this sagacity of thought on subjects not specially his own. In art he had a cultivated taste, in narration and conversation he was unrivalled. All who conversed with him felt that they had never spoken so well themselves, and had seldom met with so sympathetic a listener. He had an untiring toleration for the failings of mankind, without abating for an instant in its application to himself the high standard which he shrank from applying to others. Even under terrible pain, his enjoyment of truth, of nature, of all that was noble, seemed not to flag. He never repined, but worked to the last hour, not with mere resignation, but with a noble contentment.

4. Obituary Notice of Archibald Smith. By Sir William Thomson.

[Abridged (by direction of the Author) from *Proc. R. S.*]

ARCHIBALD SMITH, only son of James Smith, of Jordanhill, Renfrewshire, was born on the 10th of August 1813, at Greenhead, Glasgow, in the house where his mother's father lived. His father had literary and scientific tastes with a strong practical turn, fostered no doubt by his education in the University of Glasgow, and his family connection with some of the chief founders of the great commercial community which has grown up by its side. In published works on various subjects he left enduring monuments of a long life of actively employed leisure. His discovery of different species of Arctic shells, in the course of several years' dredging from his yacht, and his inference of a previously existing colder climate in the part of the world now occupied by the British Islands, constituted a remarkable and important advancement of geological science. In his "Voyage and Shipwreck of St Paul," a masterly application of the principles of practical seamanship renders St Luke's narrative more thoroughly intelligible to us now