

SIR ISAAC HOLDEN, BART.

ALTHOUGH not an engineer, Sir Isaac Holden, Bart., who died on Friday morning, the 13th inst., at the advanced age of 90 years, was endowed with inventive and constructive genius sufficient to place him in the first rank of mechanics; his work in the perfecting of wool-combing machinery will entitle him to honourable mention amongst the industrial benefactors of the century. He was well equipped for his life-work, for although born in poor circumstances, his father being a headsmen in a Renfrewshire mine, he secured what must be regarded as a liberal education, none the less prized because hardly won. Indeed, as is the case with many worthily ambitious Scotch parents, the Holdens intended that their son should "wag his pow in the pulpit," and the rôle of school teacher was but a stepping-stone. We have no occasion here to follow his scholastic career at Paisley, Leeds, Slaithwaite, and Reading, except to remark that its vicissitudes ultimately brought him in touch with one of the large woollen manufacturers when at Glasgow, and resulted in his engagement as bookkeeper with Messrs. Townend Brothers, Cullingworth, near Bingley. That was in 1830, when Holden was in his 23rd year. Soon after his innate mechanical ingenuity was discovered, he became manager, and then partner, when he commenced that long-continued striving after the perfection of certain mechanical appliances in textile manufactures.

The Townends were engaged in the woollen trade, and while they themselves had managed to resist the temptation of entering upon that search for a mechanical means of preparing wool for the weaver in supercession of the laborious manual combing, their young manager was soon drawn into the vortex which had brought to many others vexatious failure or a success provoking in its incompleteness. To make the point of Holden's ultimate success the clearer, it may be explained that the finest of woollen goods require that the short and refractory fibres of wool should be eliminated, while the curly threads have to be straightened and smoothed out, the long fibres being drawn into one united sliver to be sent to the weaver. This work was done up to within 50 years ago, solely by hand combs in cottage workshops. Two combs were used by each worker. The wool was in the first instance lashed in its matted form into one of these, having previously been washed and oiled; and, after been dried in an oven, the other comb was passed through it gently and left in the one end while the first used comb was withdrawn and also passed through the wool in a similar way. Thus the combs were used alternately, the one while "lashed" in the wool being fixed to a standard. The form of comb had much to do with the success and with the subsequent difficulties of mechanical methods. It had three sets of teeth, each set of different height or length, so that when the tip of the comb was used the teeth were wider apart than when subsequently all three rows were worked into the wool. It was on this score that the earlier machines failed, beginning with one of date 1723, and including Dr. Cartwright's of 1790, Collier's of 1827, and others.

Early in the forties four distinguished inventors were at work to overcome the many difficulties which rejoiced the hearts of the hand combers. These men held stated revels at the festival of Bishop Blaize, their patron saint, who is said to have invented wool combing in the days of Diocletian. Heilmann was actively engaged at Alsace, Donisthorpe, Lister (now Lord Masham), and Holden in England. The diligence with which the work was pursued can be imagined when it is explained that two millions sterling have been spent in research and experiment, Holden disbursing himself 50,000*l.*, and Lister even more. Each succeeded, although, perhaps, on different lines, and a magnificent reward was vouchsafed to all of them. Although the subject is fascinating, we cannot afford space to review the successive phases of the friendly rivalry. Heilmann took out the first patent—it was in 1842—although Lister had succeeded before this, the arrangement of the former's invention being on the plan of a horizontal circular comb, with filling and drawing-off motion, working at different parts of the circle. It is, however, with Holden's work that we are more concerned. He had seven of Collier's machines installed at Townend's, and conducted his earlier experiments there, effecting successive improvements in detail, as did others, so as to bring the machine to a higher state of efficiency. But, as we have already hinted, the Townends were not very sanguine as to the ultimate undoubted success of mechanism, and did not fully support Holden in his contention in favour of patents, so that reluctantly the enthusiast had to sever his connection with the firm, and became associated with Lister. It should be stated here that Holden took a common-sense view of the patenting of inventions. He always held that a patent should only be applied for where long and expensive experimental work had to be rewarded; where the invention was accidental or

easily arrived at there was, he urged, no call for such recompense as the Patent Act affords.

It was in 1846 that Holden first joined Lister at Bradford, and then commenced in earnest the work of invention. Holden, from the time he first saw the men deftly but delicately working the hand-comb, was convinced that the mechanism to replace the manual labour should be purely imitative. There is the well-told but sceptically received story of Heilmann being similarly impressed by his daughter combing her flaying locks first loosely with a wide-toothed comb and latterly firmly with a fine-toothed comb. The two inventors worked on different lines, Holden acting on the principle that square motion was the preferable, and that the work could be most effectually done by striking a fine comb into the "beard" of wool near to the comb head and pushing it away at once so as to avoid locking. The first patent for this square motion was taken out in 1848, but even then the idea was far from being finally worked out with success, for when first applied at the mills of Messrs. Lister and Holden at St. Denis, it was found that, except with a very light weight of wool, it was not successful. Incessantly did Holden work; but it is impossible here to review in detail the progress which ultimately brought success. There have been subsequent improvements, particularly with the "Nobel" machine—an adaptation of the Heilmann, and now largely used in England; but the Holden is alone in operation at the Bradford establishment and throughout France, while Heilmann's is most in favour in Germany. It is not necessary to do more than suggest the economic advantage of the new mechanism. The machine can do 100 times the work of the hand combs, and yet more workers are employed, probably 10 times the number; they have better wages, healthier surroundings, and greater leisure. Of this prospect the inventor was satisfied when at Townends, for he had studied Lord Brougham's work on "The Results of Machinery."

We need not review Mr. Holden's other achievements in making heald and genappe yarns, in scouring to remove oil, which was deleterious in any combination in silk, &c., nor his association with Lord Masham in works, in 1848, at St. Denis, afterwards abandoned in 1860, and in 1852 at Rheims and Croix, near Roubaix, as well as at Bradford in 1846. Mr. Lister retired in 1858, and the fact that his interest was bought at 85,000*l.* indicates the worth of the concern at that early date. Indeed, during the years of the American War, immense profits were made, and in 1859 Holden's two sons, Mr. Angus and Mr. Edward, were assumed as partners. As to his political and social career little need be said; the latter brought him happiness in his ample recognition of its duties, or, rather, privileges. He was made a baronet in 1893; but it is an open secret that such honours were offered him earlier. Even to the last he found a satisfaction in following those strict rules of physiology which were characteristic of his life, and of that golden rule of concentrating his energy on the object or purpose of the time, which was an important element in his success as an inventor.