Current Topics

STEAM and electrical engineers have to deal with machinery of a very simple order. In electrical machinery the chief complexity appears to be with the static portions, such as the switchboard connections. It is when we come to look into textile machinery that we realize what complexity may attain to. The early cotton machinery inventors, such as Arkwright, Hargreaves, Crompton and Kay, were men of genius in devising the methods of dealing with cotton fibre; but the crown of their efforts was put on by Richard Roberts in perfecting the self-acting mule spinning frame.

In this machine the fibre to be spun is delivered in a soft, untwisted bundle, or string of fibres, from between rollers. This fibre is attached to a rapidly rotating spindle, which from a position close up to the rollers retires to a distance of about 60 inches at a speed somewhat greater than that at which the rollers rotate. The newly-formed thread, still only partially twisted, is not broken by this tension. It is a peculiar property of twisted fibres that the twist runs to the thinnest places and leaves the thicker parts soft, less twisted and less strong, and the result of the few inches of stretch in each draw of 60 inches is to draw all thick portions thin. As they thin down and would break, they are as rapidly made strong by the twist which runs into them.

In a modern mule spinning-frame there are many hundred spindles, all doing the same work and carried in bearings on a moving carriage. When the carriage has reached its full travel it stops and the spindles continue to rotate and add the total twist to the yarn necessary to render it sufficiently hard and strong. At this point the spindles all come to rest and turn backwards a few turns for backing off the helically-wound length of yarn extending from the cop, or portion already wound on the spindle up to the nose or point of the spindle. Backing off done, a horizontal wire descends and presses each thread down to the right point, and the spindles again rotate and wind up the yarn exactly as quickly as the carriage moves back towards the rollers, with something additional, namely, about 3 inches extra, which is represented by one turn of the rollers performed while the carriage runs in, this one turn adding about 5 per cent. to the output and using

time. otherwise occupied in running back and winding only. There is an early limit to the speed of running back, so that the extra 3 inches of winding is all gain. The little shape of wound yarn on the spindle is taper on the part where successive layers are wound, so that there must be a steady variation between the speed of the carriage and the winding revolutions of the spindle. All this is provided for, and the spinning mule to-day is certainly one of the most complicated bits of scientific mechanism in use, and it is of Richard Roberts's perfecting. Not merely must the machine perform all these duties, but it is further so arranged that the change of a wheel or two and a rope rim pulley will make it right for performing equally well the same duty in spinning threads finer or coarser. Though a self-acting mule may be 130 feet long, the whole of its many hundred spindles move as one, and, with the exception of a few small wheels and scrolls for roller driving and carriage parallel movement, all the complicated mechanism of the mule is concentrated in a headstock placed mid-length of the machine.

To understand the action of this headstock demands days of careful watching, and is in itself a liberal education in mechanism. Toothed wheels, rim-band wheels, scrolls, copying rails, cams, clutches and link gear are combined to form the harmonious whole of Roberts's self-actor. After him it was easy for other inventors to modify, and modifications of no doubtful value have been made. But the Roberts mule has never been displaced. Roberts patented his mule only in the year 1832, and by 1834 it had already been applied to over 400,000 spindles in sixty factories, showing that in those days a new invention, if good, did not go long a-begging and men knew a good invention when they saw it, which is more than can be said of many of the so-called leaders of industry to-day. Previous to Roberts, the actual inventor of the mule was Crompton, of Bolton; but Crompton's mule was very partially power-driven. The spindles were rotated by power when spinning; but the winding on of the freshly spun length of yarn was done by hand, and the faller wire, which guided the yarn upon the right part of the spindle and cop, was hand-controlled, and Crompton's mule possessed only about fifty spindles, if so many. The mere winding of the yarn upon the cop calls for a good deal of mechanism, for the winding must not be straight and parallel, as on a spool or bobbin: it requires to be slanting on the top and run up and down, so as to bind the cop into a firm, solid bundle of yarn that will not easily break across or pull apart, and, at the same time, when the yarn is put into the fly shuttle to weave, it must run off the cop freely, and yet not in more than a single turn at once. The self-actor accomplishes this in addition to all the rest of the complicated movements, and all these multifarious duties must be performed absolutely to time, and therefore very positively. Compared with the self-actor, the spinning frame of Richard Arkwright was as a barrow to a motor car. It is curious that, though Roberts has been dead forty years, no sort of recognition of his merits had, we believe, been made previous to the unveiling of a bust at Aberystwyth a year or two ago. And the self-acting mule was but one of many inventions made by him in every department of engineering and mechanical industry. He was a genius as an inventor, and a brilliant exception to the rule that inventors are always impossible sort of men, for he was successful in life in the vulgar sense or pecuniarily, and died wealthy.