

CARDING, the process of using the "card" (Lat. *carduus*, a thistle or teasel) for combing textile fibrous materials. The practice of carding is of such great antiquity that its origin cannot be traced. It consists in combing or brushing fibres until they are straight and placed in parallel lines; in doing this, imperfect fibres are separated from perfect ones, all impurities are removed, and the sound fibres are in condition for further treatment. The teasels once used have long given place to hand cards, and these in turn to what, in the rudest form, were known as "stock cards," namely, two wire brushes, each 4 in. broad by 12 in. long, and having teeth bent at a uniform angle. One was nailed upon a bench with the teeth sloping from the operator, the other was similarly secured upon a two-handled bar with the teeth sloping towards the operator. The material to be treated was thinly spread upon the fixed card, and the movable one drawn by hand to and fro over it. When sufficiently carded, a rod furnished with parallel projecting needles, called a "needle stick," was pushed amongst the card teeth to strip the fibres from the comb. The strip thus procured was rolled into a sliver and spun. James Hargreaves, the inventor of the spinning jenny, suspended the movable comb by passing two cords over pulleys fixed in the ceiling and attached balance weights to opposite ends of the cords. This enabled him to lengthen the cards, to apply two or three to the same stock and to manipulate the top one with less labour, as well as to produce more and better work. In May of 1748, Daniel Bourn, of Leominster, patented a machine in which four parallel rollers were covered with cards, and set close together. Fibres were fed to the first rotating roller, each in turn drew them from the preceding one, and a grid was employed to remove the carded material from the last roller. This introduced the principle of carding with revolving cylinders whose surfaces were clothed with cards working point to point. In December of the same year Lewis Paul, of Birmingham, the inventor of drawing rollers, patented two types of carding engines. In one, parallel rows of spaced cards were nailed upon a cylinder which was revolved by a winch handle. Beneath the cylinder a concave trough had a card fixed on the inside, so that as the fibres passed between the two series of teeth they were combed. This was the origin of "flat-carding," namely, nailing strips of stationary cards upon transverse pieces of wood and adjusting the strips or flats by screws to the cylinder. In 1762, the father of Sir Robert Peel, with the assistance of Hargreaves, erected and used a cylinder carding engine which differed in some important particulars from Bourn's invention. But although roller-carding and flat-carding are the only principles in use at the present time, to Sir Richard Arkwright belongs the merit of introducing an automatic carding engine, for between the years 1773 and 1775 he combined the various improvements of his predecessors, entirely remodelled the

machine, and added parts which made the operation continuous. So successful were these cards that some of them were in use at the beginning of the present century. Notwithstanding the numerous and important changes that have been made since Arkwright's time, carding remains essentially the same as established by him. (See COTTON-SPINNING MACHINERY.)
(T. W. F.)