The drawing-frame is for attenuating slivers of fiber by passing them through consecutive pairs of rollers, each pair in the succession revolving at a higher speed than its predecessor. Leon Paul, by patent of 1788, claimed a mode of spinning by rollers, but the device did not come into use. (See Spinning.) Richard Arkwright perfected the invention and patented it in 1769.

Arkwright's original spinning-frame was fed with rovings which passed between three pairs of rollers of successively increasing speed. The yarns were wound upon bobbins by means of flyers. It was the culmination of several attempts, and possesses the main features of the throttle and the bobbin and fly-frame in function, as well as in the relative positions of parts. See Spinning, Fig. 5404, page 2271.

The bobbin and fly-frame is similar in principle to the throttle, and is adapted for giving a partial twist to the sliver as delivered from the carding-machine or the doubling-frame. The slivers in cans are fed to the coarse bobbin and fly-frame, where they are reduced and partially twisted so as to give them greater coherence, being elongated say 4 times. The rovings thus produced are wound on bobbins which are placed on the creel of the fine bobbin and fly-frame, by which they are still further reduced and twisted.

These rovings on their bobbins are then transferred to the throttle, a transverse vertical section of which is shown in Fig. 6419.

The lever at the center on a spindle fixed to the framework. At its ends it is connected by the rods to the threads, upon which the bobbins rest, and receives an oscillating motion from the heart-shaped cam through the lever and rod. The cam depressed one side of the lever, which is pulled down on the other side by the weight as the cam recedes. By this means the throttle, and therefore also the bobbins, are moved up and down. The spindle receives their motion from the drum and the belts passing round the small pulleys. The speed of the bobbins and spindles is proportioned to the required fineness of the yarn. For example, the drum making 600 revolutions per minute, the spindle, whose pulleys are 12 of the diameter of the drum, make 3,000 revolutions. There are usually 75 to 150 spindles on each side of the throttle, and they are set about 3 inches apart, all being driven from the drum, which extends the whole length of the machine.

The specific difference between the action of the throttle and the spindle is that the former has a continuous action, drawing, twisting, and winding, while the spindle has an alternate action, drawing and twist, and then winding.

It is thus stated by Tomison:

"The spindle, having made a definite length of yarn, the operation of spinning is suspended, while the yarn is being wound up on bobbins or spindles. In the throttle the yarn is both spun and wound at the same time. The throttle-yarn is smooth and wavy, while the spindle-yarn is soft and downy. Throttle-yarn is employed for warp of heavy goods, and for making sewing-thread; spindle-yarn is used for the warp of heavy goods, and for the warp and weft of soft and fine goods."

See Bobbin and Fly-frame; Drawing-frame; Roving, Male; Doubling, Jersey.

"The throttle derives its name from the singling or humping which it occasioned. It was also called the water-frame from the fact that the machinery in Arkwright's mill, where it was first used, was driven by a water-wheel.

2. A spindle for wool.

**Thro'indle.** 1. (Cotton.) The drawing-frame of the cotton manufacture. The great invention which succeeded the spinning-jenny of Hargreaves. The