each side of the machine, at *a a,* directly under the line of bobbins *b b,* run two shafts, called frame shafts, or frame friction-shafts ; on these shafts at each bobbin are fixed two friction pullies, of about 41/2 inches diameter ; and on the axis of each bobbin are fixed two corresponding pullies, about 11/8 inch diameter. The friction-pullies of the bob­bins rest upon those of the shaft, and receive motion from them. Opposite to each bobbin is a wire, with an eyelet at its end, fixed to a bar of wood *c* *c,* called the traverse bar. This bar, with the eyelets attached, has an alternat­ing motion, right and left, through a space equal to the length of that part of a bobbin on which the silk is to be wound. In front of these eyelets are fixed the guide-rods, or friction rods, *d d d d,* over which the threads glide in their passage from the reel to the bobbins, and which are formed of polished iron, and in front of these the reels *e e e e,* are placed on their bearers *ff* At every se­venth bobbin or so is placed a main frame, like *g g,* and between these stretch bars of wood, for the support of the bobbin and reel bearers. Motion is given to the bobbins, we have said, by the ly­ing shafts bearing friction - pullies, and the threads being passed from the reels, over the friction-bars *d d,* through the eyelets, and attached to the bobbins, are, by the motion of the latter, wound up, and drag round the reel on which the hank is fixed. The bobbins are, with their friction-pullies, repre­sented in figs. 4, 5, and 6. Fig. 4, a section ; fig. 5, a front view, and fig. 6, a plan: *a* is the lying-shaft, with one of its friction-pullies *b b,* and on this rests the fric­tion-pulley *c*, of one of the bobbins *d;* the axis of the bobbin is confined laterally by working in the groove *e* of the bearer, but has perfect freedom of motion up and down, so that its friction-pulley may remain in contact with that of the shaft. If, during the process, a thread happens to break, the bobbin is lifted out of its working-groove and placed in the higher groove *f.* by which its friction-pulley is kept from touching the friction-pulley of the shaft, and it consequently remains at rest ; but when, after the dam­age has been repaired, it is lifted into its former position, its motion is immediately resumed. In front of the bob­bin is seen the traverse bar *g,* carrying the wire *h,* with its eyelet tor the thread ; this traverse bar is moved by an ec­centric in such a manner, as not to spread the thread equally over the bobbins, but to heap it up more in the middle than at the ends.

The reels are called swifts, and are formed of twelve light spokes, about 161/2 inches long, inserted into a wood­en nave in pairs, so as to form a six-sided reel ; the nave has an iron axle, which turns freely on its bearings. The hanks not being all of one size, makes it necessary to have a reel, the diameter of which may be varied. Va­rious means of adapting the reel to the size of the hank have been and still are used. Amongst others, one de­serves notice ; it is, where each spoke of the reel is made in two parts, the one fixed to the nave, formed of tube containing a spiral spring, the other formed of a light rod, nicely fitting the tube, the opposite pairs of rods be­ing joined together by a cross bar, forming the periphery of the reel. When it is wished to put a hank on a reel of this kind, one of the pairs of spokes is pushed into the

tubes, and the hank slipped on ; the spiral springs now exert their force, and throw out the pressed-in spokes with such a force, as to keep the reel in a proper state of ten­sion. But the method generally adopted, if not so elegant, is more simple. The spokes in this case are formed of lance-wood, and the outer extremity of each pair are ra­ther farther asunder than the ends which are inserted into the nave, and are connected together by a band of small cord passed several times round them ; on these bands the hank or skein of silk rests, and, by slipping the bands along the spokes nearer to or further from the centre, the diame­ter of the reel can be adapted to the size of the hank; and when the hank is stretched the bands can be moved in any way, so as to balance the hank, which, as will be afterwards seen, is a matter of considcrable importance. Each pair of spokes, it has been mentioned, slightly diverge as they proceed from the nave ; and, as they are again slightly drawn towards each other by the bands, the tendency to re­turn to their natural position effectually retains the band in any place to which it may be slipped. It has been said, that the reels turn freely on their supports, but it is necessary to create such a friction as will prevent them giving off the silk faster than it can be taken up by the bobbins ; this is sometimes done by a spring being made to press upon the nave of the reel, but more commonly by hanging on its centre a wooden ring, to which weights may be hung, so as to create such a degree of friction on the reel, and, con­sequently, of tension upon the thread, between the reel and the bobbin, as may be desired. The subjoined sketch (figs. 7 and 8 ) shews the reel as it has been de­scribed : *a* is the nave, *b b* the lance-wood spokes, *c c* the bands of cords forming the periphery of the reel, *d* the friction-ring, with the weight hang­ing on it.

Referring again to fig. 3 it will be seen, that in front of the swifts are bars of wood, extending along both sides of the machine ; their use is to support the bars which carry the swifts, and to prevent the persons of those who work the machines from coming in contact with the reels ; from this last use they are termed knee-rails.

Previous to the hanks being put upon the swifts, they are washed in a solution of soap and water, which cleans the silk without depriving it of its gum. In putting the hanks on the reel care is taken to balance them, as, were one side heavier than another, it would be apt to fall suddenly, after having passed the highest point, in turning, and thereby injure the thread.

The winding-machines, under the general superintend­ence of a man called a steward, are tended by girls, who are termed *denters* and *winders;* the deniers put the hanks on the reel, and the winders, or piecers as they are also call­ed, tie the ends of the threads and exchange the bobbins. When the bobbins are filled with thread they are con­veyed from the winding-machine room to the warehouse, to be assorted or separated into finer or coarser quali­ties, which are kept apart throughout the remaining pro­cesses. To carry the bobbins, a board, called a *doffing- boαrd,* is made use of ; this consists of a piece of deal, about a foot wide, and rather more than two feet long, having a number of wires corresponding to the number of bobbins in one side of a frame, and about four inches long, inserted into its surface ; on these wires the bobbins are put. When the separation of the qualities has been made,