

COTTON SPINNING.

RING SPINNING:—A General Description of the Modern Ring Frame—The Creel—Roll Stands—Weighting Rolls—Top Rolls—Bottom Rolls—Clearers—Care of Rolls and Roll Stands—Faulty Work of Rolls—Thread Boards—Rings—Ring Holders—Size of Ring to Use—Traveler Clearers—Setting Rings—Care of Rings—Finishing of Rings—Ring Travelers—The Action of the Traveler—How Travelers are Made—Weight of Travelers—Spindle Rails—Spindles—Setting Spindles—Lubrication of Spindles—Bobbins—Bobbin Clutches—Banding—Banding Machines—Band Tension Scale—Tin Cylinders—Ballooning and Separators—Winding—Builder Motions—The Warp Builder—How to Set the Builder Motion—The Filling Builder—Spinning Filling on Paper Tubes—The Combination Builder—The Care of Ring Rails and Lifter Rods—Some Causes for Badly Shaped Bobbins—Doffing.

NOTES:—Management of the Spinning Room—Data on Ring Frames—A new Spindle Drive Device—Care of Machines—Oiling—Leveling Frames—Power Tests—Power Consumption—Arrangement of Machinery.

FAULTY YARNS:—Knots and Bunches—Variations in Counts—Uneven Yarn—Thick and Thin Places—Weak Yarn—Kinky Yarn—Dirty Yarn—Kockled, Curled or Knotty Yarn—Slack Twisted Yarn—Hard Twisted Roving—Cut Yarn—Harsh or Wiry Yarn—Badly Wound Yarn—Bobbins Wound too Low—Soft Wound Bobbins—How to Prevent "Double"—Colored Work—Waste—Breaking Strength of Yarn.

CALCULATIONS:—A general Description on the Subject of Draft, Twist, Production and Gearing—Calculating the Draft from the Gearing—To find the Draft—To find a Constant—To ascertain Draft Change Gear—To Ascertain Hank Roving—To Ascertain Draft—Twist—Standard Twists—Contraction Due to Twist—Notes on Twist—Calculating Twist—To Ascertain Speed of Spindles—Calculating Twist from Gearing—Traverse Gear—Taper—Sizing the Counts—The Grading of Cotton Yarns, Single, Two or More Ply—Production—Programs for Spinning Yarns of Various Counts, from Bale to Spun Thread—Illustrations with Descriptive Matter of the Different Makes of Ring Frames.

The Ring Frame.

(To be continued.)

The bobbins used vary in shape accordingly, as the yarn wound is to be used for warp, or hosiery, or for filling, as does also the manner of winding the yarn upon each type, this being regulated by the builder motion, as will be explained later.

Spindles vary in design, working parts, method of support, and attachment on the spindle rail, etc., as made by different manufacturers, but the object sought for in all patterns is the securing of rapid revolution in a true vertical alignment with the minimum of friction and expenditure of power. It is absolutely essential that the spindle shall be held rigidly in alignment, so that the bobbin will revolve true and have no wobbly motion, otherwise the yarn would be broken constantly and spinning be made impossible. The spindle and the ring must be set concentric in order to accomplish perfect work, the ring may be set to the spindle, or *vice versa*, in either case the adjustment must be exact and rigidly fixed. The top flange of the ring must also be a true circle.

The ring frame, like all the other spinning machinery, has its various parts adjusted according to the yarns being spun. For instance, the velocity of the ring rail is slower for fine than for coarse yarns. The inclination of the axis of the drawing rollers is greater for coarse than for fine yarn, so as to lessen the friction on the thread board.

The revolution of the spindle, which is run at a very high speed (about 9000 R. P. M.), in its attempt to wind on the yarn, pulls the traveler round with it,

and consequently relieves what would otherwise be a tension to the yarn; at the same time, each revolution made by the traveler puts a twist in the yarn, and as the bobbin can only wind on the amount of yarn delivered by the rollers, it follows that the traveler is made to revolve almost as quickly as the spindle, so that we get a most effective twisting operation performed. The function of the traveler being to put twist in the yarn and at the same time lag behind the spindle sufficiently to enable the length of yarn delivered by the rolls to be wound on the bobbin, this necessitates that different weights of travelers be used for different counts of yarn, and the coarser the yarn spun the heavier must be the traveler. The imparting of twist to the yarn and the winding of it on the bobbin are closely related, and if the rotation of the traveler is constant, the yarn will be evenly twisted and properly wound, hence the necessity for having the traveler carefully adjusted to the ring, and the flange of the latter made true and smooth, for if the ring is rough or not perfectly round, a retardation of the speed of the traveler (from friction) will occur when it is passing the uneven parts.

THE OPERATION OF THE RING FRAME MAY BE BRIEFLY DESCRIBED AS FOLLOWS: The passage of cotton through the frame, after the creels have been filled, commences, where double roving is used, by passing the ends from two bobbins through a trumpet which is fastened to the traverse guide rod, the ends being then passed between the top and bottom back rolls, and drawn between the middle and front rolls. The end of the drawn roving is delivered between the front rolls, which are set at such an angle that the twist which is being imparted by the traveler will run as far as possible up to the nip of the front rolls. When this twist has been inserted, the roving becomes yarn, and now passes forward through the thread guide, past the separator plate, if such are used, through the traveler and on to the bobbin. It is desirable that the yarn shall receive the twist instantly as it leaves the nip of the front rolls, on account of the speed and the tension that is put on it. This is especially necessary for soft twisted yarns, such as filling and hosiery yarn, and the angle of the rollers is therefore made as large as possible for these yarns. Fig. 227 shows the passage of the yarn from creel to spindles, in which it will be noticed that the position of the thread board and guide wires is directly over the spindles.

The revolution of the spindle begins to wind the yarn on the bobbin, but since the drafting rolls deliver only a certain length of yarn with each turn, and as the spindle is revolving at a high rate of speed, a tension is produced in the yarn, and this acting on the traveler pulls it around the ring at almost the same speed as the bobbin itself. Every revolution of the traveler puts a turn of twist in the yarn, and at the same time winds on the bobbin the amount of yarn given out by the front drafting rolls. On account of its lag behind its spindle, the traveler also guides the yarn to its proper place on the bobbin, as actuated by the motion of the ring rail, either for warp or for filling wind as explained later.

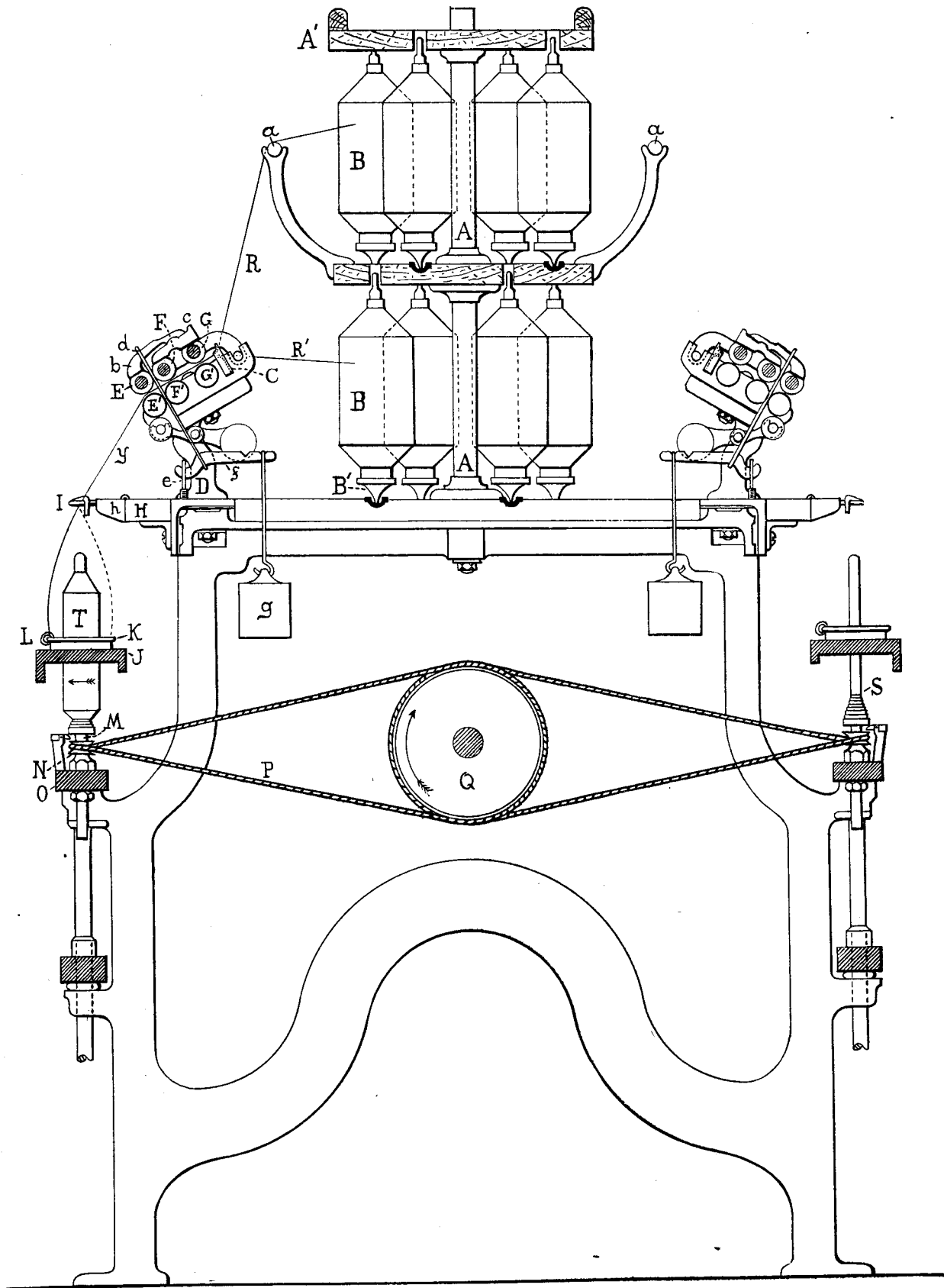


FIG. 227.

As mentioned, the shape of the bobbins varies as they are to be used for warp or for filling, and the winding of the yarn on the bobbins also varies accordingly, in both cases the difference in wind being secured by the up and down movement of the ring rail. In the warp wind, the bobbin is shaped like the roving bobbin and the yarn is wound upon it with each succeeding layer shorter than the preceding one. In the filling wind, the bobbin is built on an entirely different principle, its base being made with a taper, instead of cone shape, and the main barrel has ridges so that the yarn will unwind in layers and not become tangled. The ring rail is moved up and down by the builder motion so that there is first wound a traverse of yarn from the base of the bobbin a short distance up, then each successive traverse starts a trifle higher, the same length of traverse being retained, and this continues until the bobbin is filled, this peculiar shape being the only one possible for the unwinding of the yarn from its bobbin in the shuttle of the loom.

The builder motion, that part of the ring frame which determines and secures the varying methods of winding yarn on the bobbins will be treated fully under a separate heading, its function being to raise and lower the ring rail *J* at determined intervals and distances.

When the bobbins have been filled with yarn, the frame is doffed, *i. e.*, the filled bobbins removed and empty ones placed on the spindles, the procedure being fully described in the chapter on doffing. When the frame starts up, the yarn is guided properly to the bobbin by the ring rail and traveler and the spinning proceeds as before.

The gearing of the ring frame consists principally of one simple train, there being no calculations required except for draft, twist and production. All the power for driving the spindles is derived from the cylinder *Q*, which carries spindle bands for the spindles on both sides of the frame. Another type of a ring frame (of narrower construction—little used here) has two cylinders, one for each side of spindles. Power may be applied to the tin cylinder in various ways, by gearing, belts or individual motors, in any case, the cylinder, acting as a shaft, must be supported so that the power applied at one end and transmitted its entire length, will not cause it to bend, buckle or twist out of true alignment. Cylinders are usually constructed of two thicknesses of tin, to make them stiff and capable of withstanding high speed. They are rarely over 10 feet in length and are commonly made 7 inches in diameter, less frequently 8 or 9 inches. Cylinders usually have steel shafts which revolve in bearings, carrying oilers, etc., and should be carefully balanced before being set into the frame.

The Creel.—The roving bobbins, as coming from the fly frames, are held in a creel, being allowed to revolve on skewers supported in glass or porcelain steps. Creels are built either one or two tiers high, depending upon whether one or two ends are fed together. If intended for single roving, there is only one roving bobbin for each spindle and the creel is one tier usually, whereas for double roving, there are

two roving bobbins or ends for each spindle and the creel is two tiers high. The boards of the creel are generally made adjustable, to accommodate different lengths of roving bobbins, and they may also be hinged to allow easy removal and replacement of bobbins.

A view of a sectional elevation of the creel for a ring frame, for double roving, with the bobbins in place, is shown in Fig. 227 at *A*. The creel consists of bottom, middle and top boards. The latter serves for a shelf upon which full roving bobbins can be placed for a handy supply for the spinner, when needed. The skewers *B'* for holding the roving bobbins *B*, rest in either glass or porcelain steps or cups, which are set into the wood, flush with the top surface of the boards forming the creel. The upper part of the skewers in the illustration referred to, are shown as fitting into sockets in the board above, whereas



FIG. 228.

wire rings are employed in some types of ring frames for holding the top of the skewers. Bobbins should be held in true upright alignment by the skewers and these should be held tightly enough by the creel boards to prevent undue wobbling, otherwise the roving will not be unwound properly. The skewers are supported on steps made of glass or porcelain, or other hard substance, so as to reduce the friction of the skewers to a minimum, and allow the bobbin to rotate with

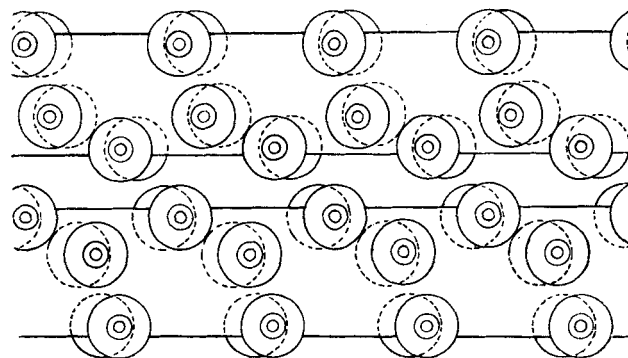


FIG. 229.

the greatest ease. Undue friction will result in too much tension of the roving, or will frequently cause it to break. On each side of the creel are seen brackets which support guide rods *a*, to conduct the ends of roving to the traverse guide rod *C* without its coming in contact with the creel board.

In some mills, a fixed iron box, known as a traveler cup, is placed at each end of the creel, of which an illustration is given in Fig. 228, as a receptacle for a handy supply of travelers, their use contributing to convenience, neatness and economy.

Fig. 229 shows the plan of a typical creel with bobbins for double roving, the bobbins in the upper tier being shown by full lines, and those in the bottom tier by dotted lines, the bobbins being so spaced that the back row can be removed without disturbing the front ones. Creels should be always made as roomy as possible to allow plenty of space for the bobbins and for greater ease and quickness in removing and replacing these—creeling.

It is sometimes customary to have the roving bobbins in the creels some filled more than others (at one time) so that they will not all run out together. Creeling, *i. e.*, to replace the bobbins as they run off, is performed by the spinner, or in some mills by extra hands—creelers. In creeling, it is advisable to see that short piecings are made and that said piecings are not made too hard, in order that they will be properly drawn out by the drafting rolls. Creels should be thoroughly cleaned at least twice a week, removing all the dirt that has accumulated, either on the skewer tops or feet. Between this semi-weekly cleaning, it is necessary that they be dusted oftener by the operator.

A defect, which may cause considerable annoyance to the spinner, is the over running of the roving bobbins on the creel, more particularly in connection with the upper tiers of bobbins, on account of the weight of the roving strand from bobbin to the traverse guide eye, and when, as in the general construction of frames, it is only supported by a common guide rod. Various devices have been employed, more particularly abroad, to obviate this defect, the chief being the employment of a corrugated metal roller, which is brought so close to the bobbins that the weight of the roving between the bobbins and the roller is insufficient to cause the bobbin to rotate. This corrugated surface of the roller acts as a brake. This roller may be formed either out of one piece of tubular metal corrugated on its periphery as required, or can be made up of two parts, namely, a tubular body and an outer metal corrugated covering. When the apex of the flutes or corrugations are brought to a fairly sharp edge, it is found that they offer in conjunction with the projecting fibres of the roving, a certain resistance to the roving, which is sufficient to prevent the loose strand of roving, between bobbin and guide eye, by means of its mere weight, from over running, *i. e.*, unwinding. The fluted roller is driven at the required speed, which is the same as that of the back drafting roll, and the roving is drawn off from the bobbin at a speed which synchronises with the speed of the fluted roller.

(To be continued.)