DRAWING ROLLS

COMMON ROLLS

BOTTOM ROLLS

1. Introduction.—The principle of roll drafting is the most important feature of parallelizing and attenuating machinery and in the production of good yarn. Therefore, the construction of *drawing rolls* and various points pertaining to them justify a detailed description. **Drawing rolls,** of which there are two kinds—*common* and *metallic*—are placed in pairs one above the other, the lower ones being driven positively by means of gears; the upper ones, when common, are driven by frictional contact from the bottom rolls, while those that are metallic are driven positively, as will be described later.

2. Construction.—Fig. 1 shows a set of **common rolls** consisting of three pairs, a being a bottom roll and a_1 a top roll. The bearings of the bottom rolls rest on stands b that are bolted to the roll beam c. The construction of the bearings for the rolls and the method of adjusting them in order to obtain the desired distance between any two pairs is fully explained in later pages. Fig. 2 shows a cross-section of the bottom roll a, Fig. 1. These rolls are almost always constructed of steel, and are fluted; that is, grooves are cut lengthwise in the surface of the rolls at certain intervals. These flutes aid the bottom rolls in obtaining a better grip on the cotton as it passes between them and the top rolls. The grooves, as shown in Fig. 2, are not perfectly

wedge-shaped, nor do they end in a knife edge, although the face of the roll carries almost a square corner on each side of a flute. A groove is a little less in width at the bottom

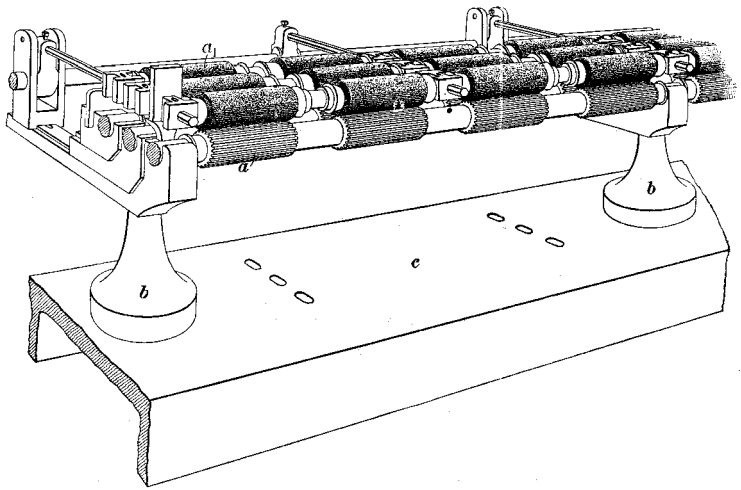

FIG. 1

than at the top, while the number of flutes for the various rolls increases with the diameter of the rolls and with the fineness of the work for which the machine is intended. For example, a roll $1\frac{1}{8}$ inches in diameter will contain more flutes than a roll 1 inch in diameter, while a roll intended to be run on a machine that deals with the stock in the later processes will contain more flutes than a roll of the same diameter that is intended to be run on a machine dealing with the stock in the earlier processes, since the cotton in the former case is not in as bulky a condition.

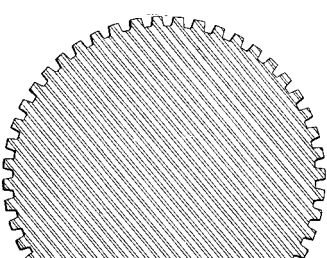

FIG. 2

Rolls are often made with the flutes unevenly spaced; that is, the distance between two flutes in one place is different

from the distance between two flutes in another part of the same roll. This is done in order to prevent the cutting of flutes in the top leather roll that would correspond with those of the bottom roll, which would be detrimental to good work. It is also necessary to have these rolls refluted at times, since the constant action of the cotton on the flutes will wear them very smooth on the edges and thus prevent their gripping the fibers. It is important not to have the roll stands for the bottom rolls too far apart, since in this case the roll, due to the weight of the top rolls and other weight placed on it, will be deflected out of a straight line, causing the roll to run untrue and resulting in poor work.

The bottom rolls are almost always case-hardened in the *necks*, or bearings, and in some cases throughout. They are thus rendered stiffer and stronger, which makes them more capable of resisting torsion, the necks wear longer, and the flutes are not so liable to become damaged by an accident or by carelessness. The preservation of the necks is also assisted by inserting brass bearings into the roll stands.

3. Method of Connecting Sections.—The bottom rolls are built in sections varying from 13 to 24 inches in length, each section being joined to the next by means of a squared end of one roll fitting into a squared recess in another roll. It is of the utmost importance that these ends shall fit into their sockets accurately, and if they become worn, as is sometimes the case with the older makes of rolls composed of soft metal, they should be resquared. It will easily be seen that in a frame 20 or 30 feet long having a number of these joints in each roll, a minute fraction of play at each socket will become an important item in the whole length of the frame and tends to produce what is technically called *cut yarn*. When the rolls are removed in sections, care should be taken that each section is replaced in the position from which it was taken. In order to make this convenient, the end of each section is numbered, the numbers generally running consecutively from the driving end of the machine.

TOP ROLLS

4. Construction.—Top rolls are constructed of iron and are made in short lengths, a portion of their circumference being afterwards covered with cloth and leather. That part of the roll that is used for drawing the cotton, which in common top rolls is the leather-covered portion, is known as the *boss* and is always of a larger diameter than the remainder of the roll. Top rolls may be made with one or

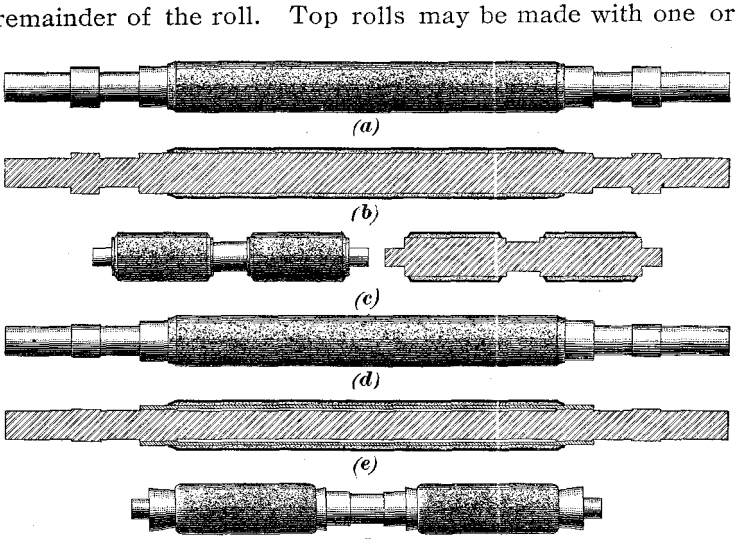

FIG. 3

two bosses, being known as *single-boss* and *double-boss*, respectively; the boss in both single- and double-boss rolls may be detachable. When the boss of a roll is detachable, the roll is known as a *loose-boss*, or *shell*, *roll;* when the boss is not detachable, the roll is known as a *solid roll*. In loose-boss rolls the part that is detachable is known as the *shell* of the roll, while the part on which the shell rests is known as the *arbor*.

Fig. 3 shows the different styles of top rolls. A solid roll having a single boss is shown at (*a*), a longitudinal section of this same roll being shown at (*b*); a solid roll with a double boss and a longitudinal section of the same roll are shown at (*c*). A loose-boss roll having only one boss and a longitudinal section of the same roll are shown at (*d*) and (*e*), while a loose-boss roll with a double boss and its longitudinal section are shown at (*f*) and (*g*).

5. Single- and Double-Boss Rolls. — In certain machines that utilize drawing rolls there is one roll to every delivery; that is, all the fibers passing one roll are gathered together into one sliver at the front; therefore, for these machines the single boss is preferred. In certain other machines there are always two or more ends coming from each roll, so that the **double-boss** construction is preferable. Sometimes one end comes from one boss; in other cases two ends come from one boss; while in still other cases three ends are found coming from each boss of a double-boss roll, making six from the roll.

The advantage of double-boss over single-boss rolls is due to the fact that there are less weights, hooks, and wires on a machine equipped with double-boss rolls and, therefore, the machine can be better and more easily cleaned. The cost of construction is also less with double-boss rolls, and the weighting is simpler. It also requires less oil, thus reducing the probability of staining the cotton. Another advantage that is claimed for double-boss rolls with the loose boss is that any slight variation in the diameter of either boss, as compared with the other, is offset to a certain extent, on account of the independent motion of each boss.

One great advantage that the **single-boss roll** has over the double-boss roll is that more even yarn is produced with the former, as each end or group of ends is treated independently of the others.

6. Solid- and Loose-Boss Rolls.—**Solid-boss rolls** are gradually passing into disuse except for the back rolls of frames, being replaced by rolls with loose bosses. With

a **loose-boss roll** only the shell revolves, consequently the neck and ends do not need oiling. When it is desired to oil the roll, the shell is removed and a few drops of oil placed on the arbor. With such a construction, especially when such thorough lubrication can be obtained, it is very easy for the shell to revolve and there is also little danger of oil getting on the cotton.

The portion of the arbor enclosed by the boss is barrel-shaped, being large at the center and tapering off toward each end. This construction reduces the friction by reducing the bearing surface of the shell on the arbor, and the oil tends to run toward the thickest portion of the arbor, thus insuring proper lubrication and preventing the leakage of oil.

Rolls are also constructed on this principle with the shell having ball bearings on the arbor.

COVERING TOP ROLLS

7. As two metal rolls revolving in contact would tend to crush the delicate cotton fibers, a leather covering is provided for the top rolls of the common type. The iron surface of the roll is first covered with a specially woven woolen cloth, which is cemented to the roll, giving a good, elastic foundation. When a thin leather covering that fits very tightly is drawn over this foundation, the roll is capable of gripping the fibers and, owing to the yielding quality of the leather and cloth, does not damage them.

In order to secure the best results, the greatest care should be exercised in covering the roll, and the best stock should be used. The production of an even thread depends more on the quality of the cloth and the leather, the manner in which it is applied, and the care of the rolls in the machine than on any other factor in the process of manufacture, with the exception of the grade of cotton used. Various substitutes for woolen cloth and lambskin or sheepskin have been tried from time to time, but none have been adopted to any great extent. Woolen cloth and lambskin have been used for over 100 years for covering rolls. In fact, the first frame built

for spinning had top rolls that were covered, the skin being used without any cloth. The uncovered roll known as the metallic roll is the only one that has displaced these materials to any great extent.

8. Roller Cloth.—The cloth that lies underneath the leather should be made of the finest and best wool. The wool should be carefully carded, so that every piece of foreign matter will be removed, and the weaving and the finishing of the cloth should also receive very close attention. It should not be possible to detect by the hand the slightest variation of thickness in any portion of the cloth. American and English roll cloths are used in covering rolls. They vary considerably in weight; the American cloth is figured on a width of 54 inches, while English cloths are figured 27 inches in width. It should be remembered, therefore, in ordering roll cloth that an American 32-ounce, for example, is the same as an English 16-ounce.

In mills covering their own rolls, the old leather should be removed and the cloth carefully examined. If it shows any evidence of disintegration, or wear, or an uneven surface, it should be condemned and removed. The old cloth may be removed by soaking it in water, after which the roll should be cleaned thoroughly. When rolls are sent out to be covered, it is considered advisable to cut the cloth with a knife in order to prevent the same cloth being used again, thus avoiding the danger of having old cloth covered with new leather.

9. Method of Putting on Cloth Covering.—In covering rolls, the cloth is cut into strips slightly narrower than the boss of the roll. A strip of this cloth is then laid flat on a table and a clean roll, the boss of which is covered with glue, is placed on the end of the strip and the cloth wound on the roll. The roll during this operation should be neither hot nor cold—simply warm. The cloth is cut with a sharp knife at the point where it begins to pass around the roll the second time, and the seam is then pressed into place.

Another method of covering rolls with cloth is to lay a number of strips of cloth of the required width in a miter box

and cut them to a gauge of the required length, thus giving 15 or 20 pieces of the exact size required to cover one roll. In this way the cloth may be put on the rolls much faster than when cutting each piece on the roll. After the cloth is put on and the seam pressed together with the fingers, the roll should be put into evening, or smoothing, rolls for the purpose of smoothing out any lumps or foreign matter that may have been in the glue, thereby producing a perfectly true and even surface.

10. Leather Covering for Rolls.—In yarn-preparation machinery it is the duty of a pair of rolls to maintain a firm grip on the fibers of cotton as they are passing between them, and yet the fibers must not be damaged in any degree. The rolls at the time are revolving in some cases at a high rate of speed, and therefore the material with which they are covered should be of such a nature that it will resist a certain amount of wear. The substance that has been found most suitable to meet these requirements is the skin of the lamb or the sheep, or the skin of the goat, which, like the skins of most animals, consists of more than one layer. The outside layer is very thin and tough, and, while horny, is very elastic.

Fig. 4 is a section of sheepskin very much enlarged; *c* represents sweat ducts and *d* the epidermis. This is the part that withstands the wear when at work. It consists of a horny layer above the Malpighian nets, or inside layer, and is commonly called the *grain*. A fibrous tissue *e* binds the true skin *f* to the epidermis *d*. This fibrous tissue is formed of multitudinous fibers bound together by a soft, milky, gelatinous substance. Hollow, loose skins result if this substance is improperly treated during manufacture.

On the character of the fibrous tissue, which is directly beneath the grain, depends the strength of the skin; the larger the size of the skin, the coarser and weaker it will be. The explanation of this is that there are a certain number of fibers in the tissue at the birth of the lamb that increase in thickness but do not increase in numbers with the growth of