The Mechanics of Textile Processes

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Pressure: Top rollers = 968 + 70 = 1038 lbs.
Second rollers = 1038 + 78 = 1116 lbs.
Third rollers = 1116 + 82 = 1198 lbs.

The levers shown in the last two examples are used for consolidating the opened and fluffy cotton, so that the sheet thus formed can be rolled up as a lap and readily unrolled without the surfaces of the cotton adhering.

Ex. The dish feed-roller on the carding machine is weighted as shown in Figs. 142 and 143. The distance $x =$

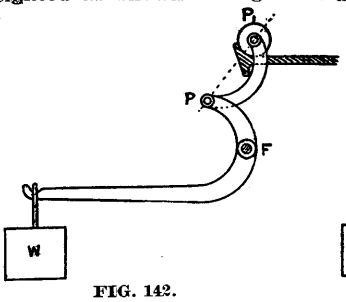

FIG. 142.

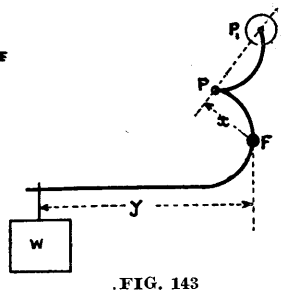

FIG. 143

12 in. and the distance $y = 2$ in. The weight $W = 13$ lbs. What pressure is exerted on the end of the feed-roller?

This is an interesting example of a bent lever. By joining

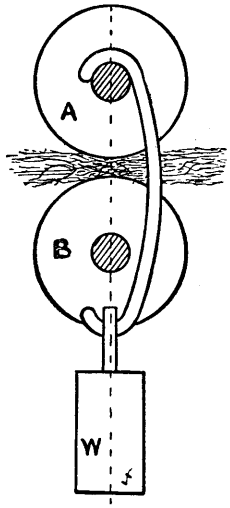

FIG. 144.

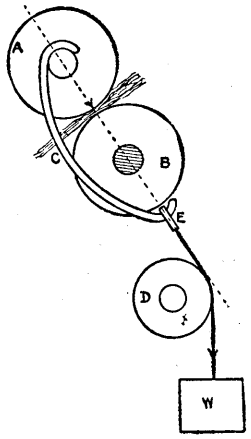

FIG. 145.

P and P_1 we obtain the direction in which the pressure acts. The actual connection is made by a curved link. The distance x is the perpendicular distance to the fulcrum from the direction in which the weight acts. The distance y is the perpendicular distance of the fulcrum from the direction in which the pressure acts.

$$Wx = Py$$
$$Wx \div y = P$$
$$P = (13 \times 12) \div 2 = 78 \text{ lbs.}$$

Fig. 143 is a diagram of the lever.

Fig. 144 illustrates what is termed a dead weight arrangement. Clearly the pressure on the cotton between A and B will be the weight of W.

On the other hand, the application of a dead weight in the way shown may not be practicable, and in such a case the weight may be arranged as in Fig. 145. The pressure on the material between A and B will be practically equal to the weight W, as the tension in the connecting chains from W to E is uniform.

Another type of direct weighting is shown in Fig. 146. The weight W acts vertically, but the pressure acts along the line joining the centers of A and B. Fig. 147 shows how this pressure is found. Draw W to scale equal to half the weight

FIG. 147.

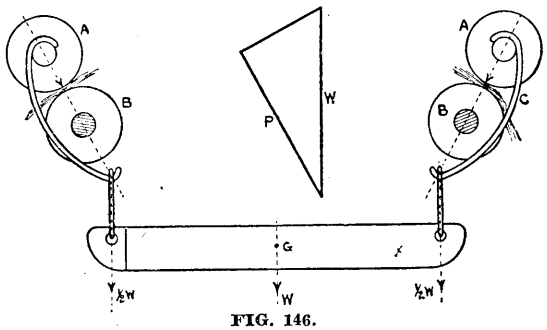

FIG. 146.

of W in Fig. 146, and from one end draw P parallel to the pressure line. From the other end of W draw a line at right angles to P, then the line P will equal the pressure between the two rollers. This type of weighting is common in some textile machines.

A form of lever, often used for textile purposes in the weighing of yarn, is shown in Fig. 148. It consists of a bent lever fulcrumed at F, one end or arm carrying a pivoted hook or pan on which the yarn is placed; the other arm is weighted and acts as a pointer on a circular scale. This scale is usually a quadrant of a circle, and is divided so that the weight of the yarn can be read off.

This yarn balance is shown in Fig. 149. When the apparatus is in a state of equilibrium, the long arm pointer is at

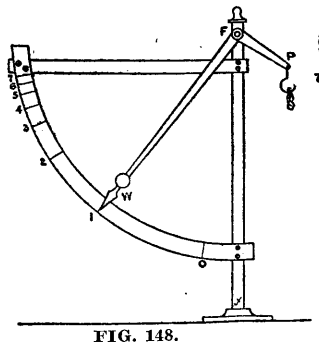

FIG. 148.

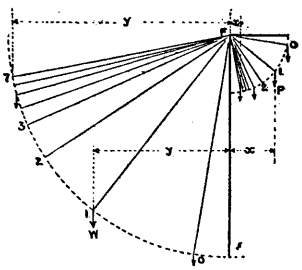

FIG. 149.

zero on the scale, this point being some little distance to the left of the stand. The yarn placed on the hook depresses the arm FP and raises the pointer FW. The effect has been to alter the leverages or moments of the arms; for when the arms come to rest, it is seen that the weight in P is nearer to the vertical line through F, while W is farther away. As P increases its moment decreases, while the moment of W increases. W itself is a constant quantity. The result of

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these changes in the moments of the arms is to cause the scale to have unequal divisions, the readings contracting as they ascend the scale.

The lea strength tester is a bent lever of a special type. Fig. 150 gives a diagrammatic view of its features. One end of a chain or cord is attached to a small drum; the other end carries a hook, to which the yarn is attached. On the axle of the drum is fixed a weighted pointer W. As the yarn is

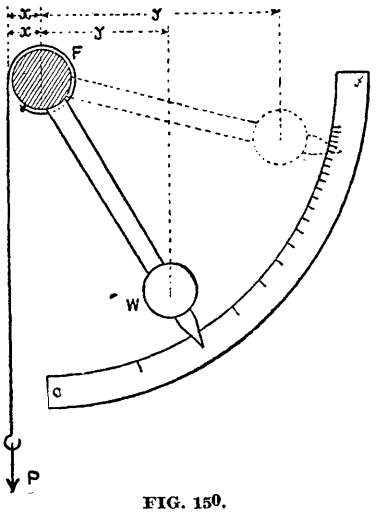

FIG. 150.

pulled at P, the drum F is turned, and the pointer rises along a quadrant scale which is graduated to indicate the force P in pounds. The pull of the yarn has a constant leverage or moment, but the weight W has a varying leverage as it moves upwards.