

lines are of very different diameters. Other kinds are distinguished by the name of ratline or of lashing; sometimes they are distinguished by the weight of a certain quantity—thus, pound line signifies a line weighing 60 yards to the pound; 160 fathoms of white or untarred yarn weigh from two and a half to four pounds.

In a popular work by Mr. Tomlinson, the different operations of rope-making are described as follow:—1. *Heckling*, or hackling, of which the object is to separate the short fibres or tow, and to straighten the long ones, in order to enable them to run freely in spinning. 2. *Spinning*, or twisting the fibres into threads or yarns. 3. Tawing the yarns. 4. *Twisting* the yarns into strands. 5. Laying, or twisting three strands together, so as to form what is called a *hawser-laid* rope. In this process, which is called the *first lay*, each strand consists of as many yarns as are found requisite to give the required thickness to the rope. 6. *Second lay*, or *shroud hawser-laid rope*. This consists of four strands laid in the same way and under the same conditions. This rope has a straight loose strand, consisting frequently of only a few yarns running through its centre; the object of this core-piece being to render the rope solid. 7. *Third lay*, or *cable-laid* rope. This consists of three hawser-laid ropes, each formed of three large strands, twisted or laid together in one gigantic rope or cable.

A very important consideration is the benefit or injury which is derived from a large or a small quantity of tar, because this, instead of being a preservative in all situations, as is generally supposed, is very often injurious, as is fully illustrated by the following experiments. The abridged account of these is taken from Sir D. Brewster's "Edinburgh Encyclopædia."

It was long ago shown by Dr. Hooke, from several experiments on the strength of cordage in 1669, that the strength of the component parts of the rope was diminished by twisting. This fact, indeed, has been long practically known to sailors, who are familiar with the superior strength of rope yarns when made up into a *salvage*, which is nothing more than a skein without twisting. Salvages are invariably used for slinging great guns, rolling tackles, and for every kind of work where great strength and great pliancy are required.

In the "Memoirs of the Academy of Sciences," M. Reaumur has given an account of his experiments on the strength of ropes compared with that of their parts.

2. The yarn of a skein of white thread bore each, at an average, $9\frac{1}{2}$ lb.	
Two yarns twisted slack into a cord broke with 16 lb.	
Hence we have the absolute strength of two yarns.....	19 $\frac{1}{2}$ lb.
Real strength.....	16
Loss of strength by twisting.....	3 $\frac{1}{2}$
3. The average strength of some thread was such that each broke with 8 lb., whereas when three were twisted, they bore only 17 $\frac{1}{2}$ lb.	
Hence we have absolute strength.....	24 lb.
Real strength.....	17 $\frac{1}{2}$
Loss of strength by twisting.....	6 $\frac{1}{2}$
4. The average strength of some thread was such, that each broke with 7 $\frac{1}{2}$ lb., whereas when four were twisted they broke with 21 $\frac{1}{2}$ lb.	
Hence we have absolute strength.....	30 lb.
Real strength.....	21 $\frac{1}{2}$
Loss of strength by twisting.....	8 $\frac{1}{2}$