

5. The average strength of other four threads was such that each broke with 9 lb., whereas when twisted, they broke with 22 lb.

Hence we have absolute strength..... 36 lb.
Real strength..... 22

Loss of strength by twisting..... 14

6. A well made and small hempen cord broke in different places with 58, 63, 67, and 72 lb., so that its average strength was $\frac{58+63+67+72}{4} = 65$ lb. The cord consisted of three strands, and another part of it was untwisted, and its three strands separated. One of them bore $29\frac{1}{2}$, another $33\frac{1}{2}$, and the third 35.

Hence the absolute strength of the three strands, when separated, is 98 lb.
Real strength when twisted..... 65

Loss by twisting..... 33

7. Another part of the same cord, which broke with 72 lb., was separated into its strands, when they bore 26, 28, and 30 lb.

Hence we have absolute strength..... 84 lb.
Real strength..... 72

Loss by twisting..... 12

Dr. Robison has given an account of a very interesting experiment by Sir Charles Knowles, upon a piece of of white or untarred rope $3\frac{1}{2}$ inches in circumference. It was cut into many portions, and from each of those portions a fathom was taken off, and carefully opened out. It consisted of 72 yarns, each of which was examined separately, and found to bear 90 lb. at an average for the whole. Each piece of rope corresponding to these was examined separately, and the mean strength of the same pieces was 4,552 lb.

Hence we have absolute strength of yarns..... 6,480 lb.
Real strength..... 4,552

Loss of strength by twisting..... 1,928

As the diminution of strength in the yarns demonstrated by the preceding example, obviously arises from their position when twisted, in consequence of which they do not all bear the load at the same time; and not from any permanent weakness produced by the twisting, it became reasonable to believe, that the twist given to ropes should be as moderate as possible.

The degree of twist commonly employed was such that the rope was *two-thirds* the length of the yarns which composed it. M. Du Hamel,* who made many valuable experiments on this subject, in the royal dock-yards of France, caused some rope to be worked with only *three-fourths* of the length of the yarn. This last rope with the inferior degree of twist, bore 5,187 lb., whereas the other bore only 4,321 lb. He next caused these ropes to be made with different twists, and obtained the following results:—

Degree of twist.	Weight borne by each.	
	One experiment.	Another experiment.
$\frac{2}{3}$	4,098	4,250
$\frac{3}{4}$	4,850	6,753
$\frac{4}{5}$	6,205	7,397

* 'Traité de la Fabrique des Manœuvres pour les Vaisseaux, on l'Art de la Cordiers perfectionnée.'