

Rope. A general name applied to cordage over one inch in circumference.

Ropes are of hemp, flax, cotton, coir, or wire, and are known by their construction ; as, —

Cable-laid ; three strands of *hawser-laid* rope, twisted right hand.

Hawser-laid ; three strands of yarn twisted left hand, the yarns being laid up right hand.

Shroud-laid or *four-strand* ; having a central strand slightly twisted and three strands twisted around it.

Hemp is laid up *right-handed* into *yarns*.

Yarns are laid up *left-handed* into *strands*.

Three *strands* are laid up *right-handed* into a *hawser*.

Three *hawsers* are laid up *left-handed* into a *cable*.

Coir ropes are made of the fiber of the cocoa-nut, and will float in water.

Wire ropes usually consist of six strands laid or spun around a hempen core ; each strand consisting of six wires laid the contrary way around a smaller hempen core.

Sish-line ; a rope of plaited yarns.

Ropes are known also by their purpose ; as, —

Awning	Brail.	Clew.	Entering.
Bell.	Breast.	Crown.	Fall.
Boat.	Bucket.	Crowfoot.	Foot.
Bolt.	Buoy.	Davit.	Gaub.
Brace.	Cat.	Downhaul.	Grab.

Grapnel.	Keel.	Ring.	Stirrup.
Guest.	Man.	Rudder.	Swab.
Guy.	Mast.	Safety.	Tiller.
Halyard.	Messenger.	Sash.	Top.
Head.	Outhaul.	Sheet.	Tye.
Heel.	Painter.	Signal.	Well.
Inhaul.	Parrel.	Slip.	Yard.
Jaw.	Passing.	Spilling.	Yoke.
Jeer.	Pendant.	Stay.	

See also RIGGING.

A rope is —

Whipped, by winding twine around the end to prevent untwisting.

Payed, by painting or tarring to resist wet.

Served, by coiling yarn around it closely and tightly.

Parceled, by wrapping with canvas.

Puddled, by making a bulky cushion around a part to prevent chafing.

Stopped, when lashed; as the end to the standing part in a hitch.

Stoppered, when a rope is made fast to it to prevent veering.

Bent, when it is secured to an object by a hitch or otherwise.

Hitch, clinch, and knot are forms of fastening. See KNOT.

Wormed, by laying a smaller rope or yarn in the lays of a cable. It is preliminary to *servicing*. *Link-worming* is worming with chains.

Laid, by placing and twisting the twisted strands together in the operation of rope-making.

Grafting and splicing are modes of uniting one rope to another by interweaving the strands. See SPLICE.

Seizing and lashing are sailors' terms to express respectively the binding of one rope to another by a smaller rope or yarn, and the fastening of one object to another by similar means.

Pointing is a mode of finishing the end of a rope by tapering and braiding the strands.

To *marle* a rope is to bind it with spun-yarn or twine, with a knot at each turn, so as to secure the wrapping if cut in one or more places.

Galvanizing is applied to iron-wire rope. It consists in coating the wire or rope with zinc.

Ropes were made of various materials in ancient Egypt, but especially of the papyrus and of leathern strands. The use of the papyrus in this connection has been described by Pliny, and is cited elsewhere in this work, as is also that of the *spartium*, which was employed extensively, though the particular variety was confined to moderate geographical limits. The *spartium* made a coarse article of cordage, as did the *leaf* or fibers of the date-tree, which were used for ropes in ancient and in modern Egypt. For a finer article, flax was used. Pieces of ropes of these materials still remain as mementos of the ancient dwellers by the Nile.

The rope-makers of ancient Egypt seem to have

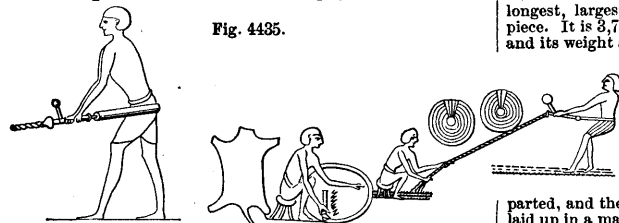


Fig. 4435. Making Ropes of Leathern Strands (from Thebes).

been destitute of machinery. One man engaged a hook at the end of his twister, and then walked backward away from another, who paid out the fiber of hemp, flax, papyrus, palm-fiber, *spartium*, or whatever the material might have been. The weight enabled him to swing the twister, which was mounted on the stem he held in his hand.

In a tomb at Thebes, of the time of Thothmes III., the Pharaoh of the Exodus, is a group representing the process of twisting thongs of leather, which were fastened to the end of a tube, which revolved on a cord slung around the loins of a man who receded backwardly from the person who arranged and payed out the strands. The tube had, in all probability, a collar or sleeve which was grasped by the man, and had a bar and weight which caused it to ro-

tate as it was swung around by the operator. The strands of the rope passed between the legs of the stool and between the feet of the man who arranged the strands and kept them from becoming entangled. The character of the material is indicated in the manner which is so peculiarly Egyptian, by the skin hanging up in the shop, and a man is shown cutting a continuous thong with a knife like our modern leather-knife, and by the same means which we adopt, by turning the piece of leather round as he cuts. Two of the coils are represented hanging up in the shop.

The process of preparing the hemp is shown in the tombs of Beni-Hassan and Thebes. Ropes of the palm are found in the tombs, and it was probably almost as common as *coir* or cocoa-nut fiber in India.

The ropes which supported the planks of the Hellespont bridge constructed for Xerxes were of papyrus and flax. These were the ordinary materials for the purpose in Egypt, from which country the king had a large contingent. See MILITARY-BRIDGE.

Ropes of goat's hair are mentioned by Aristotle and Virgil.

The famous vessel, the "Syracusia," built for Hiero, was furnished with hempen ropes from Rhodes, according to Moschion.

"The ropes of the Tartars are made of camel's hair or horse-hair." — HUC.

Coir rope is manufactured from the husk or pericarp of the cocoa-nut.

The nuts are picked a little before the fruit is ripe, and the rind separated by thrusting it upon an iron stake fixed in the ground. The rind is then water-soaked for several months, to separate the fibers from the interstitial matter, is beaten with a heavy mallet upon a stone, and then rubbed by the hands to rid it of the cellular substance. 40 cocoa-nuts yield 6 pounds of coir, which is twisted into yarns and made into mats or cordage.

Coir rope is more buoyant than hempen, and is an excellent material for hawsers.

Its strength, relatively to hemp, is, for large ropes, 87 to 108; for small ones, 60 to 65. It is not injured by sea-water, and is much used for running rigging, though from its contractibility it is not so suitable for standing rigging.

Wire rope appears to have been first used in the silver-mines of the Hartz Mountains, about 1831. They have since come into very general use for ships' rigging, as well as for transmitting power in other situations. Some ropes of this kind employed in the underground levels of the English coal-mines probably have a length of more than 3,000 feet. One constructed at the works of John A. Roebling, a few years ago, was said to be the longest, largest, and weightiest wire-rope ever made in one piece. It is 3,700 feet in length; its diameter is over 2½ inches, and its weight some 20 tons. The machinery employed is said

to be capable of making a rope twice as long and large as this one. The rope is used upon an inclined plane, for the purpose of raising coal out of the Wyoming Valley. See WIRE ROPE.

Various processes have been patented for making wire rope. For some purposes, untwisted wires bound together by hempen cord or inserted within canvas have been employed.

More generally, however, a slight twist is imparted, and they are formed into strands, which are afterward laid up in a manner analogous to that used in making hempen or manilla ropes. The wires are galvanized, or rather zinced, or else coated with a preservative composition.

Rope or Chain.	Dimensions.	Multiplier for proof of strength.		Proof-strength in fathoms of rope or chain.
		Tons.	ons.	
<i>Hempen Rope.</i>				
Hawser-laid	Girth squared	0.1875	0 0103	1,820
Shroud-laid	Girth squared	0.15	0.01	1,500
Cable-laid	Girth squared	0.12	0.0096	1,250
<i>Wire Rope (36 wires).</i>				
Iron	Girth squared	0.75	0.039	1,923
Steel	Girth squared	1.125	0 04	2,812
<i>Rigging Chain</i>	Diameter of rod	12.00	2.9	414

The preceding are the ordinary rules for calculating the *proof* strength and weights of ropes and chains, in English tons (2,240 pounds); the dimensions being in inches.

The *breaking* load is from two to three times the above. The old rope-makers' rule for hempen rope was to square the girth of the rope in inches, which, multiplied by 4, gave the ultimate or breaking strength of the rope in hundred weights; and it was a good rule for small cordage up to 7 inches in circumference.

The square of half the circumference was considered to represent the weight of a fathom in pounds.

What is believed to be the longest rope in the world is a grappel rope, 10,000 fathoms long without a splice, and has been made for the Siemens Telegraph Company. It is made of three strands, the diameter of the completed rope being 2 inches.

The table below shows the comparative strength of various kinds of rope and chain, the sizes on each horizontal line being of equal strength.

passed around a mast; it is often provided with rollers to enable it to slide up and down easily.

Man-rope; See *Entering-Rope*.

Mast-rope; a rope used for hoisting and lowering masts.

Parral-rope; a single rope secured at the slings or centers of yards, and passed around the mast. Used only on light yards.

Ring-rope; a rope rove through the ring of the anchor and secured to the end of the cable.

Slip-rope; used to suspend the bight of a hawser or cable.

Tiller-rope; a rope connected to the end of the tiller and wound around the barrel of the steering-wheel.

Top-rope; a rope used in swaying up a topmast. It is rove through the top block, hooked in the cap, and through the heel of the topmast.

Yoke-rope; a small rope attached to each end of the yoke by which a boat is steered.

Round-in; to haul upon a rope; generally used with reference to the weather-braces.

Round-up; to haul up; generally applied to the act of hauling up the slack of a rope through its leading block or a tackle, which hangs loose by its fall.

Rouse; to haul or pull together on a rope.

Capacity of the Ropes and Chains.		Round Iron Wire Rope.		Round Steel Wire Rope.		Round Hemp Rope.		Flat Iron Wire Rope.		Flat Steel Wire-Rope.		Iron Chain.	
Working Load.	Breaking Strength.	Circumference.	Weight 100 feet.	Circumference.	Weight 100 feet.	Circumference.	Weight 100 feet.	Size.	Weight 100 feet.	Size.	Weight 100 feet.	Diameter of Link.	Weight 100 feet.
300	1	1	17	...	...	2 3/4	33	.....	.....	.....	.....	1/2	66
550	1 1/2	1 1/4	23	...	...	3	50	.....	.....	.....	.....	5/16	92
800	2 1/2	1 1/2	28	1	17	3 1/2	55	.....	.....	.....	.....	3/8	133
1,500	4 1/2	1 3/4	43	1 1/2	23	4 1/4	78	.....	.....	.....	.....	7/16	183
2,000	6	2	65	1 3/4	36	5	100	.....	.....	.....	.....	1/2	260
2,500	7 1/2	2 1/4	86	1 3/4	45	6	160	.....	.....	.....	.....	9/16	300
3,300	10	2 1/2	108	2	65	6 1/2	166	.....	.....	.....	.....	.....	.....
4,200	12 1/2	2 3/4	124	2 1/4	75	7	200	2 x	.....	.....	.....	.....	400
5,000	15	3	140	2 1/2	86	7 1/2	234	2 1/2 x	.....	.....	.....	11/16	460
6,000	18	3 1/4	158	2 3/4	97	7 3/4	250	2 3/4 x	.....	.....	.....	.....	.....
7,000	21	3 1/2	180	2 3/4	110	8 1/4	284	3 x	.....	.....	.....	.....	.....
8,000	24	3 3/4	200	3	140	9	333	3 x	.....	.....	.....	.....	.....
9,000	27	4	250	3 1/4	158	10	433	4 x	.....	.....	.....	.....	.....
10,000	30	4 1/4	284	3 1/2	180	10 1/2	466	4 x	.....	.....	.....	.....	.....
11,000	33	4 1/2	320	3 3/8	195	11	500	4 1/2 x	.....	.....	.....	.....	.....
12,000	36	4 3/4	350	3 1/2	200	12	567	5 x	.....	.....	.....	.....	.....
13,500	40	5	380	3 3/4	225	13	784	5 1/2 x	.....	.....	.....	.....	.....
18,000	55	5 1/2	440	4	250	14	900	6 x	.....	.....	.....	.....	.....
22,000	65	6	540	4 1/2	280	16	1100	6 1/2 x	.....	.....	.....	.....	.....

The winding drums or pulleys for wire ropes should be one hundred times the size of the rope, and round ropes should lead fair on to and fit the groove of the pulleys.

All the ropes of a vessel composing the standing rigging, running rigging, ground tackle, etc., are distinguished by names corresponding to their uses, without reference to the make or size of the rope; thus, the cable of a vessel may be *hawser-laid*, or the hawser *cable-laid*. The following is a list of those technically termed *ropes*: —

Bell-rope; attached to the bell, on which the half-hours are struck.

Bolt-rope; that to which the head-leaches and foot of a sail are sewed.

Breast-rope; a band of canvas, secured at each end to the rigging for supporting the body of the leadsman while heaving the hand-lead.

Bucket-rope; a lanard attached to a bucket for dipping water from alongside.

Buoy-rope; a rope attached to the crown of the anchor, and to a buoy floating on the surface to show the position of the anchor when in the ground.

Clew-rope; a rope attached to the clew of a sail, and leading up forward; used in clewing up the sails for furling, and rousing the clew forward of the bunt.

Crown-rope; used at the corners of the cable tiers to keep the fakes in their places.

Entering or man rope; a rope secured at the upper end and hanging down the ship's side by the ladder for persons going up or down to hold on by. Also by the ladders at the hatches. The former may be termed *entering*, the latter *man* ropes.

Foot-rope. a. The bolt-rope at the foot of a sail.

b. The rope beneath a yard, or the bowsprit on which the men stand when furling or reefing sail; the former are also called *horses*.

Gaub-rope; a rope extending inboard from each leg of the martingale to secure it.

Grab-rope; used to confine the bunt of a sail in furling.

Guest or guess rope; a rope used for towing a boat or vessel.

Guy-rope; used for steadying a purchase, spar, or other similar object. See *Guy*.

Head-rope; the upper bolt-rope of a square sail

Heel-rope; a rope secured to the heel of a mast or boom to rouse it down, out, or in by, or to lash it.

Jaw-rope; a rope or parral secured to the jaws of a gaff and