



## CORDAGE.

RUDE ROPES IN ALL AGES AND ALL NATIONS. — INTRODUCTION OF ROPE-MAKING IN AMERICA. — CULTIVATION OF HEMP IN VIRGINIA. — WILD HEMP IN NEW ENGLAND. — INDIAN NETS AND LINES. — CORDAGE MADE BY THE COLONISTS. — MANUFACTURES IN KENTUCKY. — INTRODUCTION OF STEAM POWER. — NEW MACHINES. — PRODUCTION OF EXTENSIVE ESTABLISHMENTS. — ROPE-MAKING BY HAND. — THE MODERN PROCESSES DESCRIBED. — LARGE FACTORIES. — COMPLICATED MACHINERY. — SUPERIORITY OF AMERICAN CORDAGE. — AMERICAN MACHINES ABROAD. — WIRE ROPE. — ADVANTAGES OVER HEMPEN ROPE. — ITS USES.

CORDAGE is the general term for all kinds of hemp rope, from cables twelve inches in circumference, and weighing more than three thousand pounds in a length of one hundred and twenty fathoms, to a common clothes line, and is especially applied to ship rigging. Rude ropes of some kind — made from bark, wood fibres, vines, leathern thongs, willow, flax, and other materials — have been known in all ages, and among all peoples, for ropes and cords were among the earliest mechanical necessities of man.

The history of the introduction and progress of the manufacture of cordage in America is interesting. It was one of the first industries that engaged the attention of the colonists. Among the occupations laid out in London, in 1620, for the Virginia settlers, special mention is made of the manufacture of cordage from hemp, flax, and “especially silk grass,” which was superior for the purpose, and was so esteemed that every family was required to cultivate it. The wild hemp of New England, which the Indians used in making their nets and lines, attracted the attention of the Puritan settlers, who employed it for the same purpose, and in 1629 hemp seed for cultivation was received from England. It was thirty years later, however, before the colonies of Massachusetts and Connecticut took decided steps for raising hemp; especially for cordage for ship rigging, although John Harrison had

made cordage in Boston the year after (1630) hemp was introduced; and John Heyman was "authorized" to make ropes and lines in Charlestown in 1662.

The business spread rapidly through the colonies, and in 1698 there were several extensive rope-walks in Philadelphia. Providence and Newport were early engaged in cordage manufacture, and in 1730 had several manufactories. In 1790 the Maryland ship-yards, at Baltimore, built more vessels than any two other states, and the manufacture of cordage was in proportion. In 1794 Virginia, as well as Maryland, had more rope-walks than any two of the northern and eastern states. A spinning and twisting mill for making cordage was patented in the United States in 1804. In 1808 the Massachusetts manufacturers of twines and lines petitioned Congress for a duty on the imported articles, though then, and for a long time afterwards, much of the hemp and flax worked into cordage came from abroad.

In 1810 the domestic manufacture of cordage of all kinds was claimed to be equal to the home demand; and, besides the manufactories on the Atlantic coast, Kentucky at that time had no less than fifteen rope-walks — at Frankfort, Shelbyville, Louisville, and Lexington. In 1811, though the country was still importing immense quantities of hemp, principally from Russia, the Secretary of the Navy advised an annual appropriation for American hemp for the use of the navy. In 1827 rope factories run by steam were started in Wheeling, Virginia, and at Cincinnati, Louisville, and St. Louis. At the same time there was in use in this country a machine in which the threads on revolving spools passed through perforated iron plates, and then through an iron tube, of different diameters for various sized ropes. In 1834 a new machine was introduced in New York which spun rope-yarn from hemp without the preliminary hatcheling, and saved from eight to ten per cent. of the material. And so, from the earliest manufacture of cordage in this country, rapid progress has been made, — from hand-work to horse-power, and then to steam-power, — till the latest inventions and improvements enable large ropes to be made as easily as twine, and a single establishment in three days, or less, can manufacture a complete "gang" of rigging for the largest ship.

Rope-making requires, in connection with the main building or buildings containing the material and machinery, a rope-walk of twelve or thirteen hundred feet in length. By the old process of rope-making by hand, this was literally a "walk," for the work-

man walked from one end to the other and back again. The method was as follows : After the hemp was hackled by means of a steel toothed comb, and sometimes a series of combs, to straighten out the fibres, the spinner wrapped a bundle of hemp about his body, and, drawing out the fibres in front, and twisting them in his hand, which held a woollen cloth to compress the fibres and keep the cord of uniform size, he walked along, making his yarn as he went, the spinning being done by a wheel turned by an assistant, and the spinner seeing that the fibres were equally supplied, and joining the twisted parts at the ends. Two or more spinners might be going down the walk at the same time, and at the end two spinners joined their yarns together, each then beginning a new yarn, and returning on the walk to the end where the second spinner again took his yarn off the "whirl" and joined it to the end of the first spinner's yarn, so that it continued it on the reel. When a sufficient number of yarns were spun, they were wound from one reel to another, passing between the two through hot tar, and were then ready to be twisted into ropes.

This was the process of rope-making up to fifty years ago, and horse-power was employed to twist the strands into ropes. The first machines for twisting the hand-spun yarns into strands and ropes were imported from England ; but, in 1834, American ingenuity devised a machine for spinning the yarns, and numerous other inventions, greatly facilitating all the processes which are now wholly conducted by machinery, soon followed.

The modern method of rope-making by the latest improved processes has compelled the erection of large factories, in which the machinery is driven by steam engines of two hundred and fifty horse power, while in some establishments as many as three hundred hands, many of them women, are employed. The hemp is hoisted to the top story, where it is oiled, placed in layers, and then "scutched" by a machine which removes the tow. From the "scutcher" the hemp goes to another cylindrical machine called the "lapper," which extends the fibres and lays the hemp in a long bundle. From the lapper it goes to the "drawing-frame," in which, by a series of rollers, the hemp is drawn into a "sliver" (of the size for the particular work required), which goes with other slivers to a second drawing-frame, and from thence by a conductor to the floor below to the spinning-frames. There may be a hundred or more of these frames on one floor, with two girls to every five frames to see that the sliver is regularly supplied

and the filled bobbins are replaced. By this machinery each full set, consisting of one scutcher, one lapper, two drawing-machines, five spinning-frames, attended by three men and six girls, ought to give twelve hundred and fifty pounds of yarn in a day's work, and the daily product of a factory is in this proportion, according to the number of "sets" and hands.

The next process (if for tarred ropes) is to pass the yarns through a trough of tar at the temperature of boiling water, the yarns passing through holes in a plate, thus removing the superfluous tar. The yarns are then twisted by machinery into strands, the machine running on rails the whole length of the walk. The machines for twisting the strands into ropes of various sizes are ingenious and complicated, and for full explanations require diagrams. The final process is coiling and tying in readiness for the ship or warehouse. There are machines, also, for making flat or band ropes; and for ropes of all sizes, for all uses, from the smallest to the largest cable-laid and hawser-laid, and of almost any length.

American made cordage has a high reputation, and is largely exported, and American machines have been extensively introduced into Europe. The principal factories in the United States are at Boston, New Bedford, Plymouth, New York, Brooklyn, and Philadelphia; and cotton rope is made at Norwich, Connecticut, and elsewhere. Some of the large establishments make an average of nearly ten tons of hempen and other rope per day.

Wire ropes (see WIRE DRAWING) have been in use in some of the European mines for the past forty years, and the manufacture has been extensively carried on in England since 1838. The advantage over hempen ropes is more strength and durability, with less weight. The wire ropes are made of iron of the best quality, and sometimes of steel, and they can readily be spliced. For certain purposes they are invaluable, and their universal application in ship-rigging, for mines, for suspension bridge cables, for submarine telegraphs, and for other purposes, has led to their extensive manufacture, and to numerous patents and improvements in the processes.

