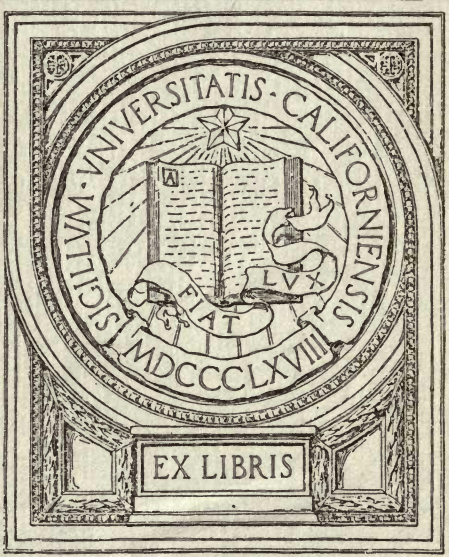
WATERBURY

WIRE ROPE
ARMORED ROPE
FIBRECLAD ROPE
MUSIC WIRE
MANILA ROPE
SISAL ROPE
DRILLING CABLES

PACIFIC COAST BRANCH
151-161 MAIN STREET
SAN FRANCISCO
CALIFORNIA

WATERBURY COMPANY
NEW YORK CITY, U. S. A.



WATERBURY

WIRE ROPE · ARMORED ROPE · FIBRECLAD ROPE
MUSIC WIRE · MANILA ROPE · SISAL ROPE
DRILLING CABLES

Trade Mark
Reg. U. S. Pat. Office

GENERAL CATALOGUE AND PRICE LIST

FEBRUARY, 1920

WATERBURY COMPANY
63 PARK ROW NEW YORK

BRANCH OFFICES

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1315-21 WEST CONGRESS STREET

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SAN FRANCISCO
151 MAIN STREET

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WORKS:
BOROUGH OF BROOKLYN
NEW YORK
(Covering two city squares)

TO OUR CUSTOMERS
PRESENT AND PROSPECTIVE

IN compiling this general catalogue we have endeavored to incorporate in it all information about wire rope and cordage that the average rope user requires, and to make it a useful Hand Book for rope buyers.

We have made no effort to increase its size by including statistics and other information rarely used and of questionable value. It is merely a comprehensive wire rope and cordage catalogue, of handy size, arranged to quickly give the user list prices and other essential data in connection with Wire Rope and Fittings, Armored Wire Rope, Fibre-clad Wire Rope and Cordage. We have also included in its pages reliable information about Music Wire.

With regard to quality we do not believe it is possible, in the present state of the art, to manufacture better rope than is catalogued herein. Next to actual experience with it in service the best evidence of its superiority is the constantly increasing demand for our product.

In buying Waterbury Products you are assured of as high a quality as it is possible to make, also prompt and courteous attention.

WATERBURY COMPANY

Index on pages 214 to 219.

HOW TO ORDER WIRE ROPE

OWING to the variety of sizes and types of wire ropes, as well as the different materials from which they are made, ropes suited to one purpose are frequently useless for another. Buyers should incorporate full details on all orders. Unless we know exactly what is wanted we must delay shipment while writing for further information.

HOISTING OR WINDING ROPES

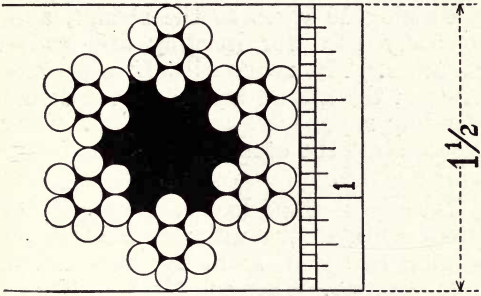
Number of Ropes required
Length of each Rope in feet
Diameter of Rope required
Underlap or overlap
Drum (diameter) and description
Pulleys, their diameters
Distance from Drum to Pulley
Load exclusive of Rope
Rope now in use
Number of Wires to strand
Hemp in strands and heart of Rope or Wire
Quality of present Rope — Speed of Rope
Life of last Three Ropes — Length
Its operation Wet or Dry — Diameter

HAULAGE ROPES

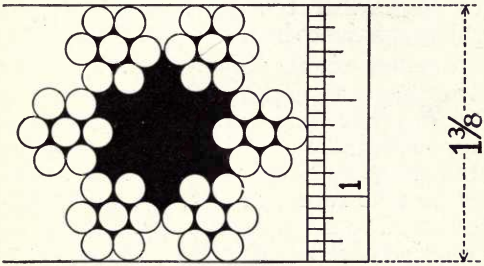
Number of Ropes required
Length of each Rope in feet
Diameter of Rope required
Surface or Underground
Number of Degrees and Angles
Drum and Sheave diameters
Load exclusive of Rope
Rope now in use
Number of strands and Wires to strand
Hemp in strands and heart of Rope or Wire
Quality of present Rope — Length
Life of last three Ropes — Diameter
Wet or dry working — Gradients

MEASURING WIRE ROPE

The right and wrong ways to measure wire rope: The diameter of a wire rope is that of a true circle.



Right way to measure (A true circle)



Wrong way to measure (Not a true circle)

The diameter of a wire rope is that of a circle enclosing the rope. Care should be taken in measuring to obtain this diameter. If a rope is measured the wrong way (see diagrams above), and a wheel is ordered grooved to take the rope, the groove would be too small.

CORRECT PRACTICE IN THE USE OF WIRE ROPE

THERE are various kinds of Wire Rope manufactured, one of the most pliable containing 19 wires to the strand, and is generally used for hoisting and running purposes. The ropes with 12 wires and 7 wires in the strand are better adapted for standing rope, guys and rigging. Orders should state the use of the rope, and advice will be given.

For safe working load, allow one-fifth to one-seventh of the ultimate strength, according to speed, so as to get good wear from the rope. When substituting wire rope for hemp rope it is good economy to allow for the former the same weight per foot which experience has approved for the latter.

Wire rope is as pliable as new hemp rope of the same strength; the former will therefore run over the same size sheaves and pulleys as the latter, but the greater the diameter of the sheaves, pulleys or drums, the longer wire rope will last. Sheaves should be scored to diameter of rope. In the construction of machinery for wire rope, it will be found good economy to make the drums and sheaves as large as possible.

Experience has demonstrated that the wear increases with the speed. It is therefore better to increase the load than the speed.

Wire rope is manufactured either with a wire or a hemp center. The latter is more

pliable than the former and will wear better where there is short bending. Orders should specify what kind of center is wanted.

In no case should *galvanized rope* be used for running rope. One day's use scrapes off the coating of zinc and rusting proceeds with twice the rapidity.

The grooves of cast iron pulleys and sheaves should be filled with well-seasoned blocks of hard wood, set on end, to be renewed when worn out. This end-wood will save wear and increase adhesion. The smaller pulleys or rollers which support the ropes on inclined planes should be constructed on the same plan. When large sheaves run with very great velocity, the grooves should be lined with leather set on end, or with india rubber. This is done in the case of all sheaves used in the *transmission of power* between distant points by means of rope, which frequently run at the rate of 4,000 feet per minute. Full information will be given on the size of rope and the size and speed of sheaves to be used for transmitting power.

Steel ropes are taking the place of iron ropes where it is a special object to combine lightness with strength.

But in substituting a steel rope for an iron running rope the object in view should be to gain an increased wear from the rope, rather than to reduce the size.

Avoid, if possible, overlapping of wire rope on drums.

For shafts and elevators, the load lifted

should not be more than one-tenth of the strength of the rope.

Do not subject wire rope to sudden strain.

For wire rope to be exposed to intense heat, a wire core may be substituted for the ordinary hemp center.

The grooves on drums and sheaves should be a trifle larger than the rope, perfectly smooth and uniform to the surface of the rope.

Wire ropes should run around all sheaves without chafing the sides of the grooves.

WAYS OF UNCOILING A WIRE ROPE

WIRE rope is shipped in coils or on reels and should always be unwound by revolving the coil or reel axially either on a horizontal shaft mounted on bearings, as shown in Fig. 1, or on a turntable or swift, as shown in Fig. 2, or by rolling on the ground, as in Fig. 3.

Wire rope should never be pulled out from a stationary coil in the manner illustrated in Fig. 4, as this is sure to result in kinks which injure the rope and are almost impossible to straighten out.

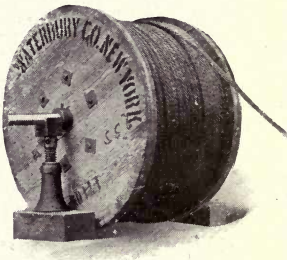


Fig. 1. Right way

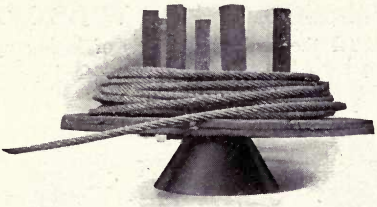


Fig. 2. Right way

Fig. 3. Right way

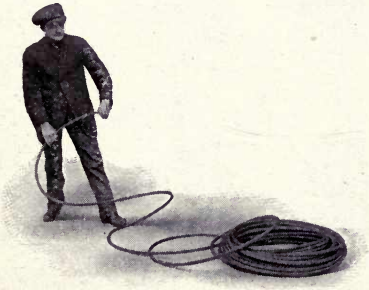
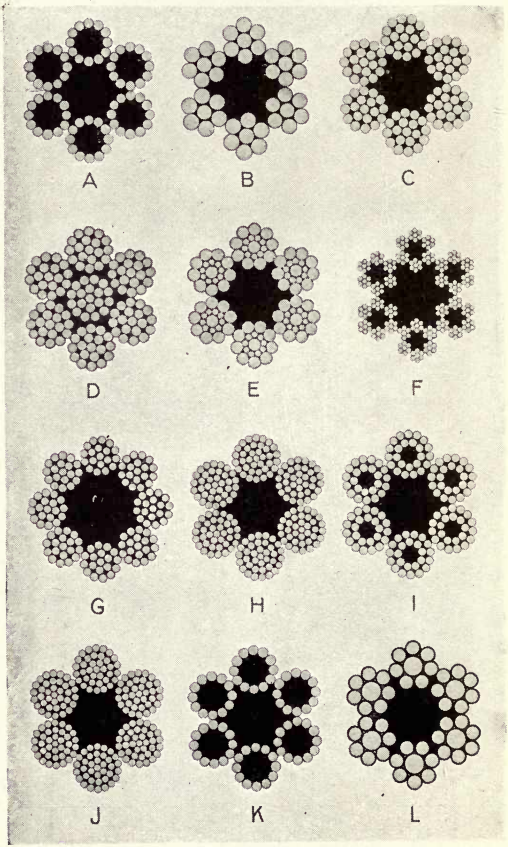


Fig. 4. Wrong way

CROSS-SECTIONS OF WIRE ROPE

SHOWING the various methods of laying up wire ropes; i. e., the number of wires composing each strand, and the number of strands composing the rope.



A. Galvanized Compound Running Rope, 6 strands, each of 12 wires, laid about a hemp core, in turn laid about a hemp core.

B. Transmission or Haulage Rope, 6 strands, each of 7 wires laid about a hemp core.

C. Hoisting Rope, 6 strands, each of 19 wires, laid about a hemp core.

D. Hoisting Rope with wire core, 6 strands, each of 19 wires, laid about a wire strand of 19 wires.

E. Cable Construction Seale Lay, each strand of 19 wires, 9 outer wires, 9 small inner wires and 1 large center wire, the several strands laid about a hemp core.

F. Tiller Rope, composed of 6 independent wire ropes, laid about a hemp core.

G. Flexible Hoisting Rope, 8 strands, each strand composed of 19 wires, laid about a hemp core.

H. Extra Flexible Hoisting Rope, 6 strands, each of 37 wires, laid about a hemp core.

I. Galvanized Steel Hawser and Mooring Line, composed of 6 strands of 24 wires per strand, laid about a hemp core with an additional hemp core in each strand.

J. Galvanized Steel Hawser, composed of 6 strands of 37 wires per strand, laid about a hemp core.

K. Galvanized Steel Hawser and Mooring Line, 6 strands each composed of 12 wires with a hemp core and in turn laid about a hemp core.

L. Deep Well Drilling Cable, composed of 6 strands, 8 wires to the strand with one hemp core.

WIRE ROPE PRESERVATIVES

Lubrication Adds Life

WIRE Ropes should be coated occasionally with some suitable material to preserve them from rust and corrosion. A good coat of boiled linseed oil will answer the purpose for ropes subjected only to atmospheric conditions. For haulage ropes, and especially such as have to run in wet places, we recommend some standard preparation of crude petroleum, or a mixture of this with graphite. The latter is specially applicable to shaft ropes, as it fills the interstices well and is not readily washed off. Materials containing acids should be avoided.

Compounds expressly prepared for coating wire ropes are offered by parties making a specialty of such materials.

Wire Ropes should be examined frequently and a new one ordered before the old one is worn out. Attention to this will insure safety and prevent accidents.

Wire Ropes can be manufactured to any size or strength, and we will cheerfully give estimates on any ropes not listed in this catalogue.

When Wire Rope is cut, a binder should be wrapped on each side of the place where the division is to be made, to prevent the rope from untwisting.

CONSTRUCTION OF WIRE ROPE

WIRE Rope is referred to as rope of so many strands of so many wires. Ordinarily, 6 strands with 7 or 19 wires to the strand. In case of 7 wires to the strand, rope would be made up of 42 wires over a hemp core. If made 19 wires to the strand, it would be made up of 114 wires over a hemp core.

Rope is generally made with a hemp center unless called for with a wire core. Some term it 6 strand rope with wire core, while others call it 7 strand rope of so many wires per strand.

When made 6 strands of 7 wires each, it is known as HAULAGE, TRANSMISSION or STANDING ROPE.

When made 6 strands of 19 wires each, it is known as HOISTING ROPE.

When made 6 strands of 37 wires each, it is known as SPECIAL FLEXIBLE ROPE.

When made 8 strands of 19 wires each, it is known as EXTRA FLEXIBLE ROPE.

When made 6 strands of 12 wires each, it is generally termed RUNNING ROPE.

When made of 6 ropes of 6 strands, each strand containing 7 wires to the strand, it is known as TILLER or HAND ROPE.

Wire Rope cores may be of 7 wires, of 19 wires, or of rope made 6 strands of 7 wires, 6 strands of 19 wires, or 6 strands of 37

wires, depending on the construction and size of rope.

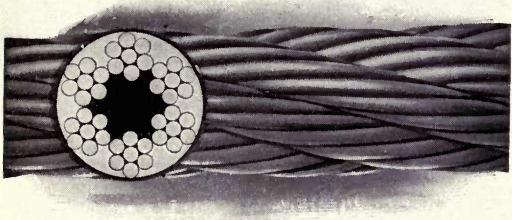
It is most common to furnish rope of one size wire construction, such as 6 strands of 19 wires, all of one size wire in the strand.

Three-size wire construction, termed "Warrington" lay, is of 7 inside wires of uniform diameter surrounded by 12 wires which are alternately large and small. This combination increases the metallic area and strength by approximately 10%. "Warrington" lay is generally made 6 strands of 19 wires to the strand, with the three-size wire construction, as above stated.

"Seale" lay is generally made 6 strands of 19 wires to the strand, construction being the center wire large, the next layer of 9 wires small, and the outer layer of 9 wires large. These strands produce a rope somewhat stiffer than the first two mentioned.

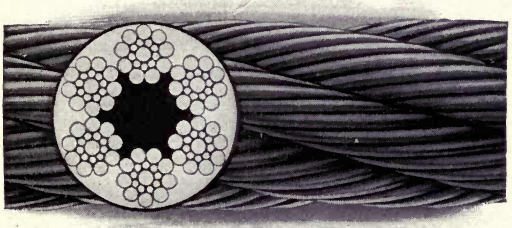
This type of rope will withstand abrasion. Is used on slopes, planes, cable roads, where no sharp angle bends are encountered to stress the outside wires. The use of this rope is largely governed by conditions. Obtain our advice when contemplating use as against Standard Construction. In this type of rope there is proportionately less metal in the center wires, although the outside wires contain more metal than in Standard Hoisting Rope.

HAULAGE, TRANSMISSION AND STANDING ROPE



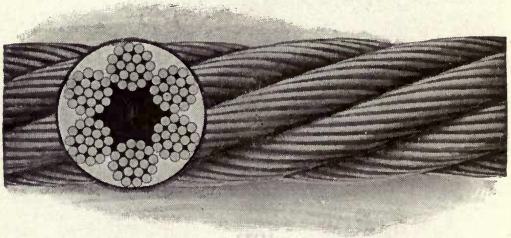
In HAULAGE, TRANSMISSION and STANDING ROPE CONSTRUCTION, the 6 x 7 construction makes a relatively stiff rope capable of resisting external wear or abrasion. Large sheaves are necessary.

SEALE CONSTRUCTION



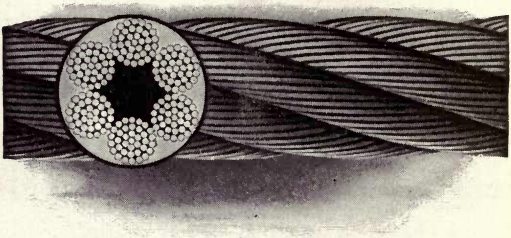
The next class of rope, 6 x 12 construction, is somewhat more flexible, but not so flexible as 6 x 19. When made "Seale" construction, it is suited to but a limited number of uses. If made 6 x 12 or 6 x 19, the list is the same as 6 x 19 regular rope, based on the grade of stock furnished.

HOISTING ROPE



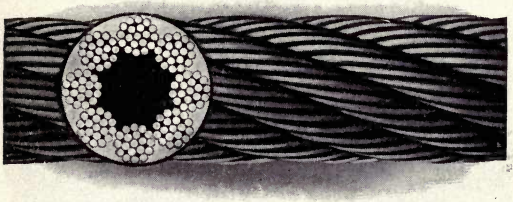
In the 6 x 19 construction, universally known as HOISTING ROPE, the wires are smaller than 6 x 7 and 6 x 12. This rope is less able to resist abrasion, but can be more readily bent around sheaves and drums.

SPECIAL FLEXIBLE HOISTING ROPE



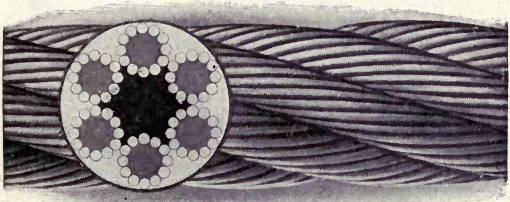
In the SPECIAL FLEXIBLE HOISTING ROPE, 6 x 37, the wires are still smaller than in 6 x 19, and the rope may be used over fairly small sheaves. This class of rope is not to be subjected to much external wear, particularly in the smaller sizes, as the wires will wear too quickly.

EXTRA FLEXIBLE HOISTING ROPE



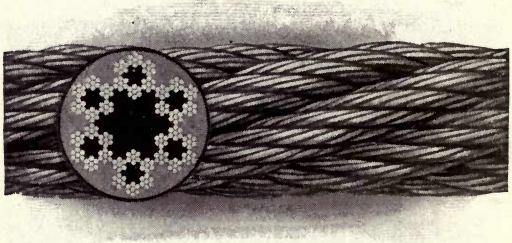
In the EXTRA FLEXIBLE HOISTING ROPE, known as 8 x 19, it is more flexible than the 6 x 19, being composed of two additional strands, and can be used over smaller sheaves than 6 x 19. In flexibility, it is about the same as 6 x 37, but not so strong owing to its larger hemp center.

RUNNING ROPES MOORING LINES



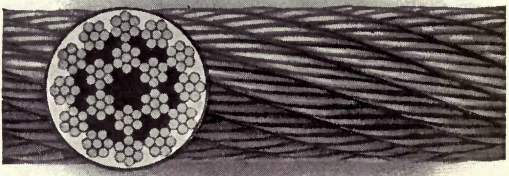
In 6 x 12 Rope, known as RUNNING RIGGING CONSTRUCTION and MOORING LINES, this is generally made galvanized. It has a hemp core in each strand or seven hemp cores in the rope. This construction is more flexible than 6 x 19 but only about two-thirds as strong.

TILLER ROPE



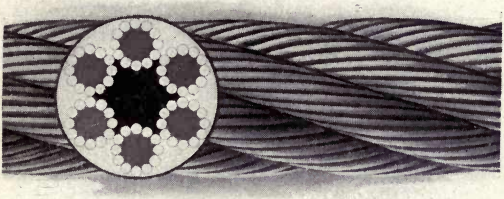
TILLER ROPE CONSTRUCTION is 6 ropes of 6 strands of 7 wires each. It is the most flexible rope made and can be bent around very small sheaves. Its construction is of very fine wires, hence will stand less surface wear than other types of ropes. The load should be light.

NON-SPINNING ROPE

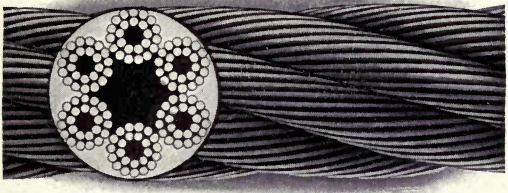


NON-SPINNING ROPE, made of 18 strands of 7 wires. See notes in connection with list on pages 55, 56 and 57.

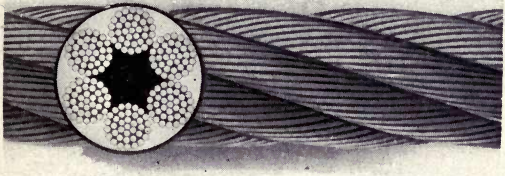
GALVANIZED STEEL HAWSERS AND MOORING LINES



6 strands—12 wires to the strand—7 hemp cores



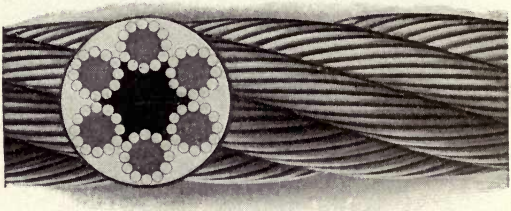
6 strands—24 wires to the strand—7 hemp cores



6 strands—37 wires to the strand—1 hemp core

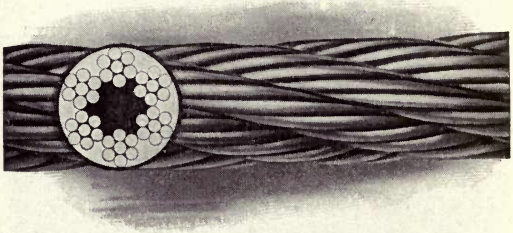
RUNNING ROPE

Galvanized Iron and Crucible Steel



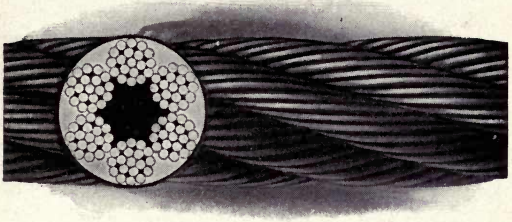
6 strands—12 wires to the strand—7 hemp cores

GALVANIZED CRUCIBLE CAST STEEL YACHT RIGGING OR GUY ROPE



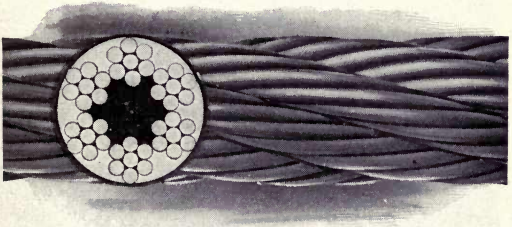
6 strands—7 wires to the strand—1 hemp core

FLEXIBLE GALVANIZED CRUCIBLE CAST STEEL YACHT ROPE



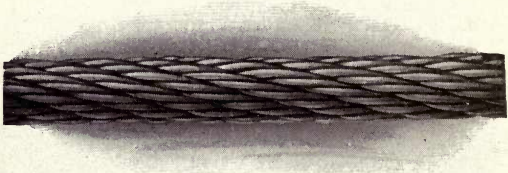
6 strands—19 wires to the strand—1 hemp core

GALVANIZED SHIP'S RIGGING OR GUY ROPE



7 or 12 wires to the strand—1 hemp core

GALVANIZED MAST-ARM OR ARC LIGHT ROPE



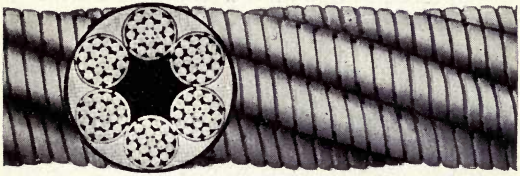
SASH CORD

GALVANIZED STRAND

7 steel wires twisted into a single strand

WATERBURY ARMORED WIRE ROPE

(GORE PATENT)



WATERBURY ARMORED WIRE ROPE (Gore Patent) is fully described in pages 99 to 128 of this catalogue.

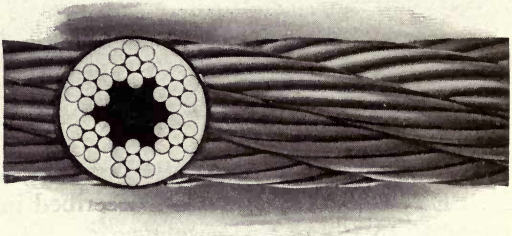
FIBRECLAD WIRE ROPE

FIBRECLAD, MARLINE COVERED WIRE ROPE is fully described in pages 129 to 150 of this catalogue.

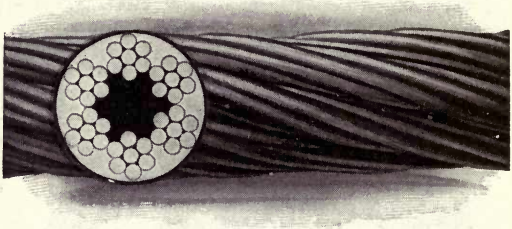
WIRE ROPE LAYS

THE lays of Wire Rope are known as Regular and Lang lay.

In the Regular lay of rope, the strands are twisted in one direction and the strands laid into rope in the opposite direction.



Regular lay rope

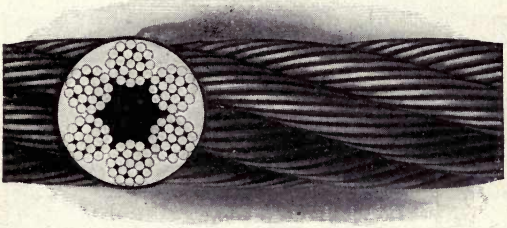


Lang lay rope

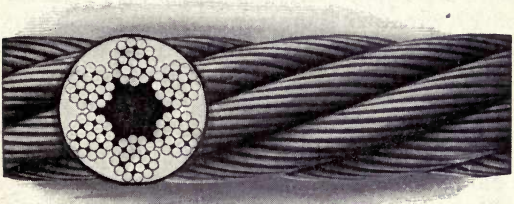
In Lang lay rope, for which no additional charge is made, the strands of the rope are twisted in the same direction.

Lang lay rope is more readily untwisted than Regular lay rope. It is more difficult to tuck the strands securely in the splice, but is especially adapted to resisting external wear and grit action. The use of

Lang lay rope is generally confined to mining operations. Inquiries for Lang lay rope had best be submitted to this office for necessary attention.



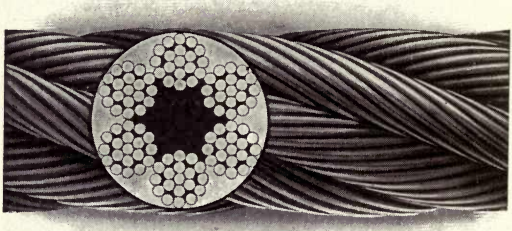
Right lay rope



Left lay rope

Ropes are made right hand lay, also left hand lay. Right hand lay rope corresponds to a right hand threaded screw of long pitch, and left hand lay to a left hand screw of long pitch. The use of left hand lay rope is limited principally to elevators and places where the tendency of left hand lay rope to untwist in one direction is offset by the

tendency of the right hand lay rope to untwist in the opposite direction. In drilling cable operations the majority of oil well drilling ropes are made left hand lay.



There is also what is known as Right and Left lay rope, generally made of 6 strands of 19 wires to the strand, 3 strands being made Regular lay and 3 strands Lang lay. This rope is seldom called for and we do not recommend it for ordinary service.

The range of application is broad. A few of the uses, however, may be found noted below.

HAULAGE ROPE for mines and docks.

HOISTING ROPE for elevators, coal hoists, ore hoists, conveyors, derricks, stump pullers, steam shovels, dredges, logging, ballast and unloaders.

SPECIAL FLEXIBLE 6 x 37 and EXTRA FLEXIBLE 8 x 19 used for cranes, counterweights, ammunition hoists and dredging operations in some instances.

Standard ropes are used for derricks, ship's rigging, etc., when made GALVANIZED. When made EXTRA GALVANIZED in HOISTING and RUNNING ROPE CONSTRUCTION, they are used for mooring and messenger lines, cargo hoists, ship's rigging, etc.

GALVANIZED HAWSERS, made 6 x 12, 6 x 24 or 6 x 37 for mooring and towing.

FACTORS OF SAFETY

THE tables, per catalogue, generally figure a factor of safety 5 to 1, but where the conditions are hoisting, they are increased from 7 to 10.

Great care should be exercised as regards size and quality of rope to meet stresses.

It might be noted that in a rope of given strength, one could use on hoisting rope, say, 1″ Crucible Steel or a 7/8″ Plow Steel and get almost the same factor of safety. In a case where the sheaves must of necessity be small, 7/8″ Plow Steel 6 x 19 would probably be preferable to the 1″ Crucible Steel 6 x 19. A safe rule to follow is to have the sheave diameter at least thirty times the diameter of the rope.

Iron, which enters into the making of Wire Rope, has a breaking strain of approximately 85,000 pounds per square inch, although the range is from 75,000 to 100,000 pounds per square inch.

In Crucible Cast Steel, the tensile strength will run about 150,000 to 200,000 pounds per square inch of sectional area, depending upon the size of the finished wire.

Extra Crucible Cast Steel is a stronger grade of crucible open hearth steel, and will run from 180,000 to 220,000 pounds per square inch of sectional area.

Plow Steel is a higher grade of open hearth steel of a tensile strength running from 200,000 to 250,000 pounds per square inch of sectional area.

Improved Plow Steel, our GREEN STRAND GIANT stock, will run from 220,000 to 280,000 pounds per square inch of sectional area. This is the toughest grade of material of high strength that has been produced and will be found most satisfactory for hazardous operations. It must be borne in mind, however, that owing to the high tensile strength something is sacrificed for flexibility—larger sheaves are required than following the use of the softer grades of stock.

See lists for "Green Strand" on pages 34, 42, 47, 51, 52 and 57.

WIRE ROPE DIFFERENTIALS

WHEN iron or steel rope is galvanized or tinned, but not so listed, add 10% to the list per foot and apply galvanized discount.

When made with wire center, add 10% to the list price per foot.

For ropes of more than 19 wires to the strand and less than 37 wires, unless specially listed herein, apply list for 37 wires.

For ropes with more than 37 wires to the strand, add 10% to list price per foot.

All ropes not specially listed herein and composed of 6 strands with more than 7 and less than 19 wires to the strand, take 19 wire list, with the exception of the 6 x 8, which takes an intermediate list between 6 x 7 and 6 x 19.

Hawsers of sizes not in list, to take list for next larger size.

IRON TRANSMISSION, HAULAGE OR STANDING ROPE

6 Strands—7 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.55	32	6.4	16	$0.51
1⅜	4¼	3	28	5.6	15	.43
1¼	4	2.45	23	4.6	13	.36
1⅛	3½	2	19	3.8	12	.30
1	3	1.58	15	3	10.5	.24
⅞	2¾	1.20	12	2.4	9	.18½
¾	2¼	.89	8.8	1.7	7.5	.14
11/16	2⅛	.75	7.3	1.5	7.25	.12
⅝	2	.62	6	1.2	7	.10
9/16	1¾	.50	4.8	.96	6	.08¼
½	1½	.39	3.7	.74	5.5	.06½
7/16	1¼	.30	2.6	.52	4.5	.05½
⅜	1⅛	.22	2.2	.44	4	.04½
5/16	1	.15	1.7	.34	3.5	.03¾
9/32	⅞	.12½	1.2	.24	3	.03¼

All ropes not herein listed and composed of more than 7 and less than 19 wires to the strand, with the exception of 6 x 8, take 19-wire list. Siemens-Martin steel rope, having 25 per cent greater strength than iron rope, at same prices as iron rope. Add 10 per cent to prices for wire center or galvanized rope.

Iron haulage rope is not extensively used at present, except in some of the smaller sizes. It is composed of soft wires, which do not possess high tensile strength. Some of the sizes given above are never used, but figures are given for comparison with the stronger grades.

CRUCIBLE CAST STEEL TRANSMISSION, HAULAGE OR STANDING ROPE

6 Strands—7 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.55	63	12.6	11	**$0.60**
1⅜	4¼	3	53	10.6	10	**.51**
1¼	4	2.45	46	9.2	9	**.43**
1⅛	3½	2	37	7.4	8	**.36**
1	3	1.58	31	6.2	7	**.29**
⅞	2¾	1.20	24	4.8	6	**.22½**
¾	2¼	.89	18.6	3.7	5	**.17**
11/16	2⅛	.75	15.4	3.1	4¾	**.14½**
⅝	2	.62	13	2.6	4½	**.12**
9/16	1¾	.50	10	2	4	**.10**
½	1½	.39	7.7	1.5	3½	**.08**
7/16	1¼	.30	5.5	1.1	3	**.06½**
⅜	1⅛	.22	4.6	.92	2¾	**.05½**
5/16	1	.15	3.5	.70	2¼	**.04½**
9/32	⅞	.12½	2.5	.50	1¾	**.04**

All ropes not listed herein and composed of more than 7 and less than 19 wires to the strand, with the exception of 6 x 8, take 19-wire list. Add 10 per cent to list prices for wire center or galvanized rope.

This rope covers a wide range of utility, being particularly adaptable for use in mine haulage work, which includes tail rope and endless haulage systems, gravity hoists, as well as coal and ore dock haulage roads operating small grip cars. In sizes, ⅜, 7/16, ½, 9/16, ⅝, it finds use as sand lines for oil wells, and in the larger sizes, ⅝, ¾, ⅞, 1, is used for oil well drilling. In general, rope from this list can be used where abrasion is severe and flexibility requires a minimum quantity.

EXTRA STRONG CRUCIBLE CAST STEEL TRANSMISSION, HAULAGE OR STANDING ROPE

6 Strands—7 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.55	73	14.6	11	$0.75
1⅜	4¼	3	63	12.6	10	.64
1¼	4	2.45	54	10.8	9	.53
1⅛	3½	2	43	8.6	8	.44
1	3	1.58	35	7	7	.35
⅞	2¾	1.20	28	5.6	6	.27
¾	2¼	.89	21	4.2	5	.20
11/16	2⅛	.75	16.7	3.3	4¾	.17
⅝	2	.62	14.5	2.9	4½	.14¼
9/16	1¾	.50	11	2.2	4	.12
½	1½	.39	8.85	1.8	3½	.09½
7/16	1¼	.30	6.25	1.25	3	.07½
⅜	1⅛	.22	5.25	1.05	2¾	.06
5/16	1	.15	3.95	.79	2¼	.05½
9/32	⅞	.12½	2.95	.59	1¾	.05

All ropes not listed herein and composed of more than 7 and less than 19 wires to the strand, with the exception of 6 x 8, take 19 wire list. Add 10 per cent to list prices for wire center or galvanized rope.

This being the next stronger rope of this construction, its use is practically the same as that of the crucible steel, except that in many cases a smaller rope can be used and the same strength obtained. This rope also covers a wide range of utility, being particularly adaptable for use in mine haulage work, which includes tail rope and endless haulage systems, gravity hoists, as well as coal and ore dock haulage roads operating small grip cars. In sizes ⅜, 7/16, ½, 9/16, ⅝, it finds use as sand lines for oil wells, and in the larger sizes, ⅝, ¾, ⅞, 1, is sometimes used for oil well drilling. In general, rope from this list can be used where abrasion is severe and flexibility requires a minimum quantity.

When made galvanized, is used for Derrick Guys.

PLOW STEEL TRANSMISSION, HAULAGE OR STANDING ROPE

6 Strands—7 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.55	82	16.4	11	$0.90
1⅜	4¼	3	72	14.4	10	.76
1¼	4	2.45	60	12	9	.62
1⅛	3½	2	47	9.4	8	.51
1	3	1.58	38	7.6	7	.41
⅞	2¾	1.20	31	6.2	6	.32
¾	2¼	.89	23	4.6	5	.24½
11/16	2⅛	.75	18	3.6	4¾	.21
⅝	2	.62	16	3.2	4½	.17½
9/16	1¾	.50	12	2.4	4	.14½
½	1½	.39	10	2	3½	.11½
7/16	1¼	.30	7	1.4	3	.09
⅜	1⅛	.22	5.9	1.2	2¾	.06¾
5/16	1	.15	4.4	.88	2¼	.06
9/32	⅞	.12½	3.4	.68	1¾	.05½

All ropes not listed herein and composed of more than 7 and less than 19 wires to the strand, with the exception of 6 x 8, take 19-wire list. Add 10 per cent to list prices for wire center or galvanized rope.

This is a very strong rope, and its wires are harder and capable of withstanding more external wear than the softer crucible steel. Its general scope of application is for mine haulage, including endless, tail rope systems and gravity hoists, as well as ore and coal dock haulage, roads operating small grip cars. Where it is necessary to secure increased strength and the physical requirements render it impossible to alter the working conditions, a plow steel rope may be used to distinct advantage without increasing the diameter of the rope.

When galvanized, is adapted to use for standing rigging on yachts and affords greatest strength for the weight.

GREEN STRAND GIANT PLOW STEEL TRANSMISSION HAULAGE OR STANDING ROPE

6 Strands—7 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.55	90	18	11	$1.05
1⅜	4¼	3	79	16	10	.88
1¼	4	2.45	67	13	9	.72
1⅛	3½	2	52	10	8	.58
1	3	1.58	42	8.4	7	.48
⅞	2¾	1.20	33	6.6	6	.37
¾	2¼	.89	25	5	5	.28½
11/16	2⅛	.75	20	4	4¾	.24½
⅝	2	.62	17½	3.5	4½	.20½
9/16	1¾	.50	13	2.6	4	.17
½	1½	.39	11	2.2	3½	.13½
7/16	1¼	.30	7¾	1.5	3	.11½
⅜	1⅛	.22	6½	1.3	2½	.08¾

All ropes not listed herein and composed of more than 7 and less than 19 wires to the strand, with the exception of 6 x 8, take 19 wire list. Add 10 per cent to list prices for wire center or galvanized rope.

Oil Well Drilling. The principal ropes are Drilling Cables and Sand Lines. Drilling Cables are generally made left lay, running from 5/8" to 1" diameter, 6 x 19, 6 x 8 or 6 x 7 construction. The largest call is in Crucible Cast Steel stock. In some instances Extra Strong is called for, and in a few instances Plow Steel stock is called for. The list for 6 x 8 Drilling Cable is intermediate between list for 6 x 7 and 6 x 19. Other ropes known in drilling operations are tubing, casing and sucker rod lines, which are made 6 strands, 19 wires to the strand with a hemp center. Pumping lines are made 6 x 7, cleaning out cables are made 6 x 19 and 6 x 8 or 6 x 7, and steel wire dead lines are generally made endless of 6 x 19 Crucible Cast Steel stock.

CRUCIBLE CAST STEEL DRILLING CABLES

6 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	List Price per Foot
1	1.58	30	6	**$0.31**
7/8	1.20	23	4.6	**.24**
3/4	.89	17.5	3.5	**.19**
5/8	.62	12.5	2.5	**.14**

EXTRA STRONG CRUCIBLE CAST STEEL DRILLING CABLES

6 Strands—19 Wires to the Strand—1 Hemp Core

1	1.58	34	6.80	**$0.37**
7/8	1.20	26	5.20	**.29**
3/4	.89	20.2	4.04	**.22**
5/8	.62	14	2.80	**.16½**

Note: 19-wire oil well lines used extensively for drilling new holes, while the 7-wire lines are adapted to cleaning out or redrilling a wet hole.

COARSE LAID CAST STEEL DRILLING CABLES

6 Strands—7 Wires to the Strand—1 Hemp Core

Diam. in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	List Price per Foot
1	1.58	31	6.2	**$0.29**
7/8	1.20	24	4.8	**.22½**
3/4	.89	18.6	3.7	**.17**
5/8	.62	13	2.6	**.12**

CRUCIBLE CAST STEEL DRILLING CABLES

6 Strands—8 Wires to the Strand—1 Hemp Core

1	1.58	31	6.2	**$0.30**
7/8	1.20	24	4.8	**.23¼**
3/4	.89	18.6	3.7	**.18**
5/8	.62	13	2.6	**.13**

This construction combines pliability and strength, and being composed of large wires it has an excellent wearing surface.

PLOW STEEL DRILLING CABLES

6 Strands—8 Wires to the Strand—1 Hemp Core

1	1.58	38	7.6	**$0.42**
7/8	1.20	31	6.2	**.33**
3/4	.89	23	4.6	**.25¼**
5/8	.62	16	3.2	**.18¼**

This quality and construction of cable is recommended for deep drilling where the weight of the rope becomes a considerable part of the load.

As this quality of drilling cable is stronger than that shown in the preceding list, the drums and sheaves should in every case be ample in size.

STANDARD IRON HOISTING ROPE

6 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	111	22.2	17	$1.70
2½	7⅞	9.85	92	18.4	15	1.40
2¼	7⅛	8	72	14.4	14	1.17
2	6¼	6.30	55	11	12	.95
1⅞	5¾	5.55	50	10	12	.88
1¾	5½	4.85	44	8.8	11	.80
1⅝	5	4.15	38	7.6	10	.65
1½	4¾	3.55	33	6.6	9	.57
1⅜	4¼	3	28	5.6	8.5	.49
1¼	4	2.45	22.8	4.56	7.5	.40
1⅛	3½	2	18.6	3.72	7	.33
1	3	1.58	14.5	2.90	6	.26
⅞	2¾	1.20	11.8	2.36	5.5	.20
¾	2¼	.89	8.5	1.70	4.5	.16
⅝	2	.62	6	1.20	4	.12
9/16	1¾	.50	4.7	.94	3.5	.10
½	1½	.39	3.9	.78	3	.08½
7/16	1¼	.30	2.9	.58	2.75	.07½
⅜	1⅛	.22	2.4	.48	2.25	.07
5/16	1	.15	1.5	.30	2	.06¾
¼	¾	.10	1.1	.22	1.50	.06½

All ropes not listed herein and composed of strands made up of more than 19 and less than 37 wires, take 37-wire list. Siemens-Martin Steel Rope, having 25 per cent greater strength than iron rope, at same price as iron rope. Add 10 per cent to list for wire center or galvanized rope.

The wires in our iron rope are of the best quality iron, soft, tough and pliable. Iron Hoisting Rope is generally used for elevator hoisting where the strength is sufficient. It is employed for counterweight ropes, except on traction elevators. For traction elevators we recommend the Mild Steel Hoisting Rope, see next page.

Iron hoisting rope is sometimes used for power transmission where the pulleys are comparatively small.

MILD STEEL ELEVATOR HOISTING ROPE

6 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.55	54	10.80	7	$0.66
1⅜	4¼	3	45	9	6.25	.56
1¼	4	2.45	38	7.60	5.75	.46
1⅛	3½	2	30.5	6.10	5.25	.38
1	3	1.58	24	4.80	4.50	.31
⅞	2¾	1.20	18.5	3.70	4	.24
¾	2¼	.89	13.5	2.70	3.5	.19
⅝	2	.62	9.5	1.90	3	.14
9/16	1¾	.50	7.7	1.54	2.70	.12
½	1½	.39	6	1.20	2.30	.11
7/16	1¼	.30	4.6	.92	2	.10
⅜	1⅛	.22	3.4	.68	1.75	.09½

Made for traction elevators in tall buildings where, on account of usual quick starting and stopping, a stronger and lighter rope is required than the iron quality. This Mild Steel Elevator Hoisting Rope is not recommended for all styles of elevators. For elevators employing separate counterweight ropes, the Iron Hoisting Rope is recommended.

STANDARD CRUCIBLE CAST STEEL HOISTING ROPE

6 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	211	42.2	11	**$2.10**
2½	7⅞	9.85	170	34	10	**1.75**
2¼	7⅛	8	133	26.6	9	**1.44**
2	6¼	6.30	106	21.2	8	**1.16**
1⅞	5¾	5.55	96	19	8	**1.02**
1¾	5½	4.85	85	17	7	**.90**
1⅝	5	4.15	72	14.4	6.5	**.77**
1½	4¾	3.55	64	12.8	6	**66**
1⅜	4¼	3	56	11.2	5.5	**.56**
1¼	4	2.45	47	9.4	5	**.46**
1⅛	3½	2	38	7.6	4.5	**.38**
1	3	1.58	30	6	4	**.31**
⅞	2¾	1.20	23	4.6	3.5	**.24**
¾	2¼	.89	17.5	3.5	3	**.19**
⅝	2	.62	12.5	2.5	2.5	**.14**
9/16	1¾	.50	10	2	2.25	**.12**
½	1½	.39	8.4	1.68	2	**.11**
7/16	1¼	.30	6.5	1.30	1.75	**.10**
⅜	1⅛	.22	4.8	.96	1.50	**.09½**
5/16	1	.15	3.1	.62	1.25	**.09¼**
¼	¾	.10	2.2	.44	1	**.09**

All ropes not listed herein and composed of strands made up of more than 19 and less than 37 wires, take 37-wire list. Add 10 per cent to list prices for wire center or galvanized rope.

This rope is applicable to a great variety of uses, among which might be noted mine hoisting, logging, derricks, hay presses, dredges, cable-ways, inclined planes, coal hoists, conveyors, ballast unloaders, skip hoists, crane service, tubing, casing and dead lines, freight elevators, and many other applications. The material used in making this rope is about double the strength of iron in the same diameter.

STANDARD EXTRA STRONG CRUCIBLE CAST STEEL HOISTING ROPE

6 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	243	48.6	11	$2.55
2½	7⅞	9.85	200	40	10	2.10
2¼	7⅛	8	160	32	9	1.70
2	6¼	6.3	123	24.6	8	1.34
1⅞	5¾	5.55	112	22.4	8	1.25
1¾	5½	4.85	99	19.8	7	1.10
1⅝	5	4.15	83	16.6	6.5	.94
1½	4¾	3.55	73	14.6	6	.80
1⅜	4¼	3	64	12.8	5.5	.68
1¼	4	2.45	53	10.6	5	.56
1⅛	3½	2	43	8.6	4.5	.46
1	3	1.58	34	6.80	4	.37
⅞	2¾	1.20	26	5.20	3.5	.29
¾	2¼	.89	20.2	4.04	3	.22
⅝	2	.62	14	2.80	2.5	.16½
9/16	1¾	.50	11.2	2.24	2.25	.14
½	1½	.39	9.2	1.84	2	.12½
7/16	1¼	.30	7.25	1.45	1.75	.11½
⅜	1⅛	.22	5.30	1.06	1.50	.11
5/16	1	.15	3.50	.70	1.25	.10¾
¼	¾	.10	2.43	.49	1	.10½

All ropes not listed herein and composed of strands made up of more than 19 and less than 37 wires, take 37-wire list. Add 10 per cent to list prices for wire center or galvanized rope.

This rope is made from selected steel wires of higher tensile strength than the crucible cast steel, and possessing greater strength, rope from this list may be used with somewhat heavier loads than crucible steel. It has been found particularly useful for oil well drilling and tubing lines. Its other general uses are similar to those of the crucible cast steel, except that it may be used where loads are somewhat heavier.

STANDARD PLOW STEEL HOISTING ROPE

6 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	275	55	11	**$3.00**
2½	7⅞	9.85	229	46	10	**2.50**
2¼	7⅛	8	186	37	9	**2.00**
2	6¼	6.3	140	28	8	**1.58**
1⅞	5¾	5.55	127	25	8	**1.46**
1¾	5½	4.85	112	22	7	**1.30**
1⅝	5	4.15	94	19	6.5	**1.08**
1½	4¾	3.55	82	16	6	**.93**
1⅜	4¼	3	72	14	5.5	**.79**
1¼	4	2.45	58	12	5	**.65**
1⅛	3½	2	47	9.4	4.5	**.54**
1	3	1.58	38	7.6	4	**.43**
⅞	2¾	1.20	29	5.8	3.5	**.34**
¾	2¼	.89	23	4.6	3	**.26**
⅝	2	.62	15.5	3.1	2.5	**.19**
9/16	1¾	.50	12.3	2.4	2.25	**.16**
½	1½	.39	10	2	2	**.14**
7/16	1¼	.30	8	1.6	1.75	**.13**
⅜	1⅛	.22	5.75	1.15	1.50	**.12½**
5/16	1	.15	3.8	.76	1.25	**.12¼**
¼	¾	.10	2.65	.53	1	**.12**

All ropes not listed herein and composed of strands made up of more than 19 and less than 37 wires, take 37-wire list. Add 10 per cent to list prices for wire center or galvanized rope. This is a very strong type of hoisting rope, largely used for heavy mine hoisting, derricks, inclined planes, dredges, cableways for heavy logging, scraper lines, wrecking lines, ballast unloader ropes, heavy cranes, and similar uses. In deep mine shafts and long inclines it is especially efficient, because it possesses great strength for its weight. It is the most economical rope to use where the weight of the rope has to be considered, or where the capacity of the machinery is to be increased without a corresponding increase in sheaves and drums.

GREEN STRAND GIANT PLOW STEEL HOISTING ROPE

6 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	315	63	11	$3.45
2½	7⅞	9.85	263	53	10	2.80
2¼	7⅛	8	210	42	9	2.50
2	6¼	6.30	166	33	8	1.85
1⅞	5¾	5.55	150	30	8	1.75
1¾	5½	4.85	133	27	7	1.60
1⅝	5	4.15	110	22	6½	1.30
1½	4¾	3.55	98	20	6	1.10
1⅜	4¼	3	84	17	5½	.90
1¼	4	2.45	69	14	5	.75
1⅛	3½	2	56	11	4½	.62
1	3	1.58	45	9	4	.50
⅞	2¾	1.20	35	7	3½	.39
¾	2¼	.89	26.3	5.3	3	.31
⅝	2	.62	19	3.8	2½	.22½
9/16	1¾	.50	14.5	2.9	2¼	.19
½	1½	.39	12.1	2.4	2	.17
7/16	1¼	.30	9.4	1.9	1¾	.15½
⅜	1⅛	.22	6.75	1.35	1½	.14½
5/16	1	.15	4.50	.9	1¼	.13½
¼	¾	.10	3.15	.63	1	.13

Add 10 per cent to list prices for wire center or galvanized rope.

This grade of hoisting rope is unequaled for strength. It is particularly useful on derricks, skidders, dredges and stump pullers. Being very strong, a smaller rope may be used than any other grade of this construction. It is stiffer in the same diameter than the plow and crucible steel grades, but strength for strength, it is equally flexible. Sheaves should be somewhat larger for this quality of rope, to obtain the very best results.

EXTRA FLEXIBLE IRON HOISTING ROPE

8 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1	3	1.42	16	3.1	6	$0.29
7/8	2 3/4	1.08	13	2.6	5.5	.22
3/4	2 1/4	.80	9.5	1.9	4.5	.18
5/8	2	.56	7	1.4	4	.14
9/16	1 3/4	.45	6	1.2	3.5	.11 1/2
1/2	1 1/2	.35	5	1	3	.09 1/2
7/16	1 1/4	.27	2.3	.46	1.5	.085
3/8	1 1/8	.20	1.7	.34	1.3	.080
5/16	1	.13	1.2	.24	1.1	.074
1/4	3/4	.09	.75	.15	1.0	.070

Extra Flexible (8 x 19) rope is sometimes preferred to (6 x 19) for operating the safety governors on passenger and freight elevators where sheaves are small and the velocity is high.

REGULAR LAY. The Regular Lay is used for rapid operation and light loads on coal hoists, derricks, cargo falls and other types of hoists where pulleys, sheaves and drums are small and great flexibility is essential.

Having eight strands in place of six, the hemp center is larger and the rope more flexible. Care should be taken in substituting this rope on account of its large hemp center and correspondingly lower breaking strength.

SEALE LAY. A very successful rope where large sheaves and heavy abrasion are encountered, and while this type of 8 x 19 is less flexible than the regular construction as above, the larger outside wires better withstand severe conditions when used over a larger number of pulleys or over rocks and exposed places.

EXTRA FLEXIBLE CRUCIBLE CAST STEEL HOISTING ROPE

8 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.19	58	11.6	3.75	$0.73
1⅜	4¼	2.70	51	10.2	3.5	.62
1¼	4	2.20	42	8.4	3.2	.51
1⅛	3½	1.80	34	6.8	2.83	.42
1	3	1.42	26	5.2	2.5	.34
⅞	2¾	1.08	20	4	2.16	.27
¾	2¼	.80	15.3	3.06	1.83	.21
⅝	2	.56	10.9	2.18	1.75	.16
9/16	1¾	.45	8.7	1.74	1.5	.14
½	1½	.35	7.3	1.46	1.33	.12
7/16	1¼	.27	5.7	1.14	1.16	.11
⅜	1⅛	.20	4.2	.84	1	.10½
5/16	1	.13	2.75	.55	.83	.10¼
¼	¾	.09	1.80	.36	.75	.10

Add 10 per cent to list prices for galvanized rope.

This rope is particularly adaptable for use over fairly small size sheaves on derricks, steam dredges, coal and ore handling machinery, pile drivers, and also for logging purposes, as well as tubing lines for oil wells. It is not quite as strong in the same diameter as the regular hoisting rope, 6 x 19, due to its larger hemp center, but it is more flexible. This rope, when galvanized, is known as galvanized extra flexible crucible cast steel hoisting rope and is much used by yachtsmen.

EXTRA FLEXIBLE, EXTRA STRONG CRUCIBLE CAST STEEL HOISTING ROPE

8 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.19	66	13	3.75	$0.88
1⅜	4¼	2.70	57	11	3.5	.75
1¼	4	2.20	47	9.4	3.2	.62
1⅛	3½	1.80	38	7.6	2.83	.51
1	3	1.42	29.7	5.9	2.5	.41
⅞	2¾	1.08	23	4.6	2.16	.32
¾	2¼	.80	17.6	3.5	1.83	.25
⅝	2	.56	12.4	2.5	1.75	.18½
9/16	1¾	.45	10.1	2	1.5	.16
½	1½	.35	8	1.6	1.33	.14
7/16	1¼	.27	6.30	1.26	1.16	.13
⅜	1⅛	.20	4.66	.93	1	.12¼
5/16	1	.13	3.05	.61	.83	.12
¼	¾	.09	2.02	.40	.75	.11¾

Add 10 per cent to list prices for galvanized rope.

This rope is made from selected cast steel wires of higher tensile strength than the crucible steel, and possessing greater strength, ropes from this list may be used for somewhat heavier loads than crucible steel. Its general uses are similar to those of the crucible steel described on the preceding page.

EXTRA FLEXIBLE PLOW STEEL HOISTING ROPE

8 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.19	74	14.8	3.75	$1.03
1⅜	4¼	2.70	64	12.8	3.5	.87
1¼	3	2.20	52	10.4	3.2	.72
1⅛	3½	1.80	43	8.6	2.83	.60
1	3	1.42	33	6.6	2.5	.48
⅞	2¾	1.08	26	5.2	2.16	.38
¾	2¼	.80	20	4	1.83	.29
⅝	2	.56	14	2.8	1.75	.21
9/16	1¾	.45	11.6	2.32	1.50	.18
½	1½	.35	8.7	1.74	1.33	.16
7/16	1¼	.27	6.90	1.38	1.16	.15
⅜	1⅛	.20	5.12	1.02	1	.14
5/16	1	.13	3.35	.67	.83	.13½
¼	¾	.09	2.25	.45	.75	.13¼

Add 10 per cent to list prices for galvanized rope.

This is a strong and flexible rope, principally used on derricks, dredges, coal and ore handling machinery, pile drivers and logging, where small sheaves necessitate a flexible rope and where greater strength than shown for preceding grades is required. This rope is also made galvanized, and is then known as galvanized extra flexible plow steel hoisting rope, largely used on ships and yachts.

EXTRA FLEXIBLE GREEN STRAND GIANT PLOW STEEL HOISTING ROPE

8 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
1½	4¾	3.19	80	16	3.75	$1.19
1⅜	4¼	2.70	68	13	3.5	.98
1¼	4	2.20	56	11	3.2	.82
1⅛	3½	1.80	46	9.2	2.83	.68
1	3	1.42	36	7.2	2.5	.55
⅞	2¾	1.08	28	5.6	2.15	.43
¾	2¼	.80	22	4.4	1.83	.34
⅝	2	.56	15	3	1.75	.25
9/16	1¾	.45	12	2.4	1.5	.22
½	1½	.35	9.5	1.9	1.33	.19

Add 10 per cent to list prices for galvanized rope.

Very efficient for strength where loads are heavy, it being the strongest rope that can be made in this type of construction. It is preferable to employ sheaves somewhat larger with this quality so as to insure greater durability.

SPECIAL FLEXIBLE CRUCIBLE CAST STEEL HOISTING ROPE

6 Strands—37 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	200	40	. . .	$2.30
2½	7⅞	9.85	160	32	. . .	1.92
2¼	7⅛	8	125	25	. . .	1.60
2	6¼	6.30	105	21	. . .	1.35
1⅞	5¾	5.55	94	18.8	. . .	1.20
1¾	5½	4.85	84	17	. . .	1.05
1⅝	5	4.15	71	14	. . .	.89
1½	4¾	3.55	63	12	3.75	.79
1⅜	4¼	3	55	11	3.5	.65
1¼	4	2.45	45	9	3.2	.55
1⅛	3½	2	34	7	2.83	.46
1	3	1.58	29	6	2.5	.37
⅞	2¾	1.20	23	5	2.16	.28
¾	2¼	.89	17.5	3.5	1.83	.23
⅝	2	.62	11.2	2.2	1.75	.18
9/16	1¾	.50	9.5	1.9	1.5	.15
½	1½	.39	7.25	1.45	1.33	.13
7/16	1¼	.30	5.5	1.1	1.16	.12½
⅜	1⅛	.22	4.2	.84	1	.12

Ropes composed of strands made up of more than 37 wires, add 10 per cent to list price of 6 x 37. Add 10 per cent for wire center.

Ropes of this construction may be used for general hoisting work where loads are moderate and where sheaves are small. It is stronger construction than the extra flexible, but somewhat more expensive, and its wires will not stand as much abrasion as the 6 x 19 construction.

SPECIAL FLEXIBLE EXTRA STRONG CRUCIBLE CAST STEEL HOISTING ROPE

6 Strands—37 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	233	47	. . .	**$2.80**
2½	7⅞	9.85	187	37	. . .	**2.35**
2¼	7⅛	8	150	30	. . .	**1.90**
2	6¼	6.30	117	23	. . .	**1.55**
1⅞	5¾	5.55	106	21.2	. . .	**1.41½**
1¾	5½	4.85	95	19	. . .	**1.28**
1⅝	5	4.15	79	16	. . .	**1.07**
1½	4¾	3.55	71	14	3.75	**.95**
1⅜	4¼	3	61	12	3.5	**.78**
1¼	4	2.45	50	10	3.20	**.65**
1⅛	3½	2	39	8	2.83	**.55**
1	3	1.58	32	6.4	2.5	**.44**
⅞	2¾	1.20	25	5	2.16	**.34**
¾	2¼	.89	19	3.8	1.83	**.27**
⅝	2	.62	12.6	2.5	1.75	**.21**
9/16	1¾	.50	10.5	2.1	1.5	**.17½**
½	1½	.39	8.25	1.65	1.33	**.15**
7/16	1¼	.30	6.35	1.27	1.16	**.14**
⅜	1⅛	.22	4.65	.93	1	**.13**

Ropes composed of strands made up of more than 37 wires, add 10 per cent to list price of 6 x 37. Add 10 per cent for wire center.

This is the next stronger grade of this construction and can be used for heavier loads than the crucible steel, being considerably stronger in the same diameter. Its general uses are similar to the crucible steel.

SPECIAL FLEXIBLE PLOW STEEL HOISTING ROPE

6 Strands—37 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	265	53	. . .	**$3.30**
2½	7⅞	9.85	214	43	. . .	**2.75**
2¼	7⅛	8	175	35	. . .	**2.20**
2	6¼	6.30	130	26	. . .	**1.80**
1⅞	5¾	5.55	119	23.8	. . .	**1.65**
1¾	5½	4.85	108	22	. . .	**1.50**
1⅝	5	4.15	90	18	. . .	**1.25**
1½	4¾	3.55	80	16	3.75.	**1.10**
1⅜	4¼	3	68	14	3.5	**.91**
1¼	4	2.45	55	11	3.2	**.75**
1⅛	3½	2	44	9	2.83	**.64**
1	3	1.58	35	7	2.5	**.51**
⅞	2¾	1.20	27	5	2.16	**.40**
¾	2¼	.89	21	4	1.83	**.31**
⅝	2	.62	14	3	1.75	**.24**
9/16	1¾	.50	11.5	2.3	1.5	**.20**
½	1½	.39	9.25	1.85	1.33	**.17**
7/16	1¼	.30	7.2	1.4	1.16	**.16**
⅜	1⅛	.22	5.1	1	1	**.15**

Ropes composed of strands made up of more than 37 wires, add 10 per cent to list price of 6 x 37. Add 10 per cent for wire center.

Used on electric traveling cranes, dredges and similar machinery, where loads are heavy and sheaves are of necessity small. These ropes are very efficient and give excellent service where conditions favor their use.

SPECIAL FLEXIBLE GREEN STRAND GIANT PLOW STEEL HOISTING ROPE

6 Strands—37 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
2¾	8⅝	11.95	278	55	. . .	$3.75
2½	7⅞	9.85	225	45	. . .	3.15
2¼	7⅛	8	184	37	. . .	2.50
2	6¼	6.30	137	27	. . .	2.10
1⅞	5¾	5.55	125	25	. . .	1.92½
1¾	5½	4.85	113	23	. . .	1.75
1⅝	5	4.15	95	19	. . .	1.45
1½	4¾	3.55	84	17	3.75	1.25
1⅜	4¼	3	71	14	3.50	1.05
1¼	4	2.45	58	11	3.20	.86
1⅛	3½	2	46	9.2	2.83	.75
1	3	1.58	37	7.4	2.50	.59
⅞	2¾	1.20	29	5.8	2.16	.46
¾	2¼	.89	23	4.6	1.83	.36
⅝	2	.62	16	3.2	1.75	.27
9/16	1¾	.50	12.5	2.5	1.50	.23
½	1½	.39	9.75	1.9	1.33	.20
7/16	1¼	.30	7.50	1.5	1.15	.18½
⅜	1⅛	.22	5.30	1.06	1	.17½

Ropes composed of strands made up of more than 37 wires, add 10 per cent to list price of 6 x 37. Add 10 per cent for wire center.

This is the strongest rope of the 6 x 37 construction made and suitable where conditions are unusually severe. It is largely used on dredges both for main hoist and spud ropes. We recommend its use where loads have to be increased without corresponding increase in diameter of rope.

SPECIAL WIRE ROPE

6 Strands—61 Wires to the Strand—1 Hemp Core

Crucible Cast Steel

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Proper Working Load in Tons of 2000 Pounds	Diam. of Drum or Sheave in Feet Advised	List Price per Foot
3¼	10¼	16.60	280	56	11	
3	9½	14.20	240	48	10	
2¾	8⅝	11.95	200	40	9	**$2.53**
2½	7⅞	9.85	160	32	8	**2.112**
2¼	7⅛	8.00	125	25	7	**1.76**
2	6¼	6.30	105	21	6	**1.485**
		Extra Strong Crucible Cast Steel				
3¼	10¼	16.60	315	63	11	
3	9½	14.20	275	55	10	
2¾	8⅝	11.95	233	47	9	**$3.08**
2½	7⅞	9.85	187	37	8	**2.585**
2¼	7⅛	8.00	150	30	7	**2.09**
2	6¼	6.30	117	23	6	**1.705**
		Plow Steel				
3¼	10¼	16.60	350	70	11	
3	9½	14.20	310	62	10	
2¾	8⅝	11.95	265	53	9	**$3.63**
2½	7⅞	9.85	214	43	8	**3.025**
2¼	7⅛	8.00	175	35	7	**2.42**
2	6¼	6.30	130	26	6	**1.98**
		Green Strand Giant Plow Steel				
3¼	10¼	16.60	370	74	11	
3	9½	14.20	325	65	10	
2¾	8⅝	11.95	278	56	9	**$4.125**
2½	7⅞	9.85	225	45	8	**3.465**
2¼	7⅛	8.00	184	37	7	**2.75**
2	6¼	6.30	137	27	6	**2.31**

Add 10 per cent to above list prices for wire center.

Ropes of this construction are used for dredging purposes, and are generally made with a wire center. The Plow Steel and Green Strand grades most frequently used.

TILLER ROPE OR HAND ROPE

6 Strands of 42 Wires Each—252 Wires in All—7 Hemp Cores

Diam. in Inches	Circumference in Inches	Approximate Wgt. Per Foot in Lbs.	Diam. of Drum or Sheave in Inches Advised	Approximate Breaking Strength		List Price per Foot	
				Iron Pounds	Crucible Cast Steel Pounds	Iron	Crucible Cast Steel
1	3	1.10	24	22,000	35,000	$0.33	$0.43
7/8	2 3/4	.84	21	15,500	26,000	.27	.36
3/4	2 1/4	.62	18	11,000	18,000	.22	.30
5/8	2	.43	15	7,000	13,500	.17	.24
9/16	1 3/4	.35	13 1/2	6,300	11,000	.14	.20
1/2	1 1/2	.28	12	5,800	9,000	.11 1/2	.17
7/16	1 1/4	.21	10 1/2	4,000	6,500	.10	.15
3/8	1 1/8	.16	9	3,000	4,800	.09	.14
5/16	1	.11	7 1/2	1,900	3,600	.08	.12 1/2
1/4	3/4	.07	6	1,300	2,500	.07 1/2	.11

The wires in this rope are very fine, and should not be subjected to much abrasive wear.

It is used to a limited extent for steering lines on yachts and motor boats. Galvanized Crucible Cast Steel Yacht Rope, 6 strands, 19 wires to the strand, 1 hemp core, is preferred by many for motor boats.

Three-eighths and one-half-inch diameter iron Tiller or Hand Rope is used for starting and stopping elevators. This rope is also called Elevator Shipper Rope.

Tiller Rope of tinned or galvanized iron or steel is furnished if required. For this rope add 10 per cent to the foregoing list prices.

LIST PRICES FOR LABOR FOR SPLICING ENDLESS ROPE

Diameter of Rope in Inches	List of Splicing	Diameter of Rope in Inches	List of Splicing
1/4 to 5/16	$2.50	7/8	$4.75
3/8 to 7/16	3.00	1	5.00
1/2	3.50	1 1/8	5.50
5/8	4.00	1 1/4	6.00
3/4	4.25	1 1/2	8.00

The above charges are for labor in making splices at our works, and do not include the additional 20 to 30 feet of rope used in making the splice. A special charge will be made for splicing done elsewhere, such charge depending on the circumstances of each individual case.

Exact lengths of endless transmission ropes should be specified, or else the exact distance from center to center of sheaves, together with circumference of sheaves.

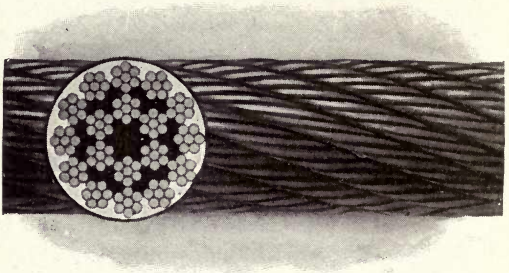
NON-SPINNING HOISTING ROPE

CONSTRUCTION: 18 strands, 7 wires to the strand with hemp center. Used principally as a hoisting rope. Is non-rotating, *i. e.*, non-spinning, and made to overcome the spinning of loading buckets, beams or whatever may be hoisted.

It is also used for bridge construction work or where single-line derricks are in use, also for crane elevator work, mine hoisting, etc.

Quarrymen and others, when hoisting by a single line, require two or more men with guide ropes to prevent blocks from revolving in their ascent. Our rope overcomes this difficulty.

The principle of Non-Rotating Rope is quite fully explained below. Improvement in this rope, *i. e.*, Non-Spinning Wire Rope, according to invention, has for its object the production of a wire rope which is non-rotating, of greater flexibility and wearing surface, and with more sectional area to stand a larger amount of wear and tear than wire rope of 6 strands, 19 wires.



The object is accomplished by forming a wire rope of the inner rope, the outer casing constructed, arranged and twisted with the inner rope, to wit:—the outer casing consists of a maximum number of strands, each having a stated number of wires of a stated area. The inner rope is composed of a stated number of strands, each having a stated number of wires. The interstices of inner rope are wormed with lubricated hemp fibre, giving cushion effect to the outer strands, thus enabling same to better withstand abrasion. The outer strands and the inner rope strands respectively are by preference twisted in opposite directions, thus counter-balancing the outer strand wires. The rope is constructed of round wires which are not subject to as much internal friction as flat or irregular shaped core wires.

We are prepared to furnish the rope in all classes of wire, *i. e.*, Iron, Crucible Cast Steel, Extra Strong Crucible Cast Steel and Plow Steel. List on succeeding page.

NON-SPINNING HOISTING ROPE—18 Strands, 7 Wires to the Strand

Diameter in Inches	Circumference in Inches	Approximate Weight per Foot	SWEDISH IRON		CAST STEEL		EXTRA STRONG CAST STEEL		PLOW STEEL		GREEN STRAND GIANT STEEL	
			Approximate Breaking Strain	List Price per Foot	Approximate Breaking Strain	List Price per Foot	Approximate Breaking Strain	List Price per Foot	Approximate Breaking Strain	List Price per Foot	Approximate Breaking Strain	List Price per Foot
1¾	5½	5.50	45.8	$0.80	85.9	$0.90	101.0	$1.10	111.1	$1.30	122.0	$1.60
1⅝	5	4.65	39.8	.65	74.4	.77	87.6	.94	96.3	1.08		
1½	4¾	3.90	34.	.57	63.8	.66	75.	.80	82.5	.93	90.7	1.10
1⅜	4¼	3.30	28.2	.49	52.	.56	62.4	.68	68.6	.79	75.5	.90
1¼	4	2.75	23.4	.40	43.8	.46	51.6	.56	56.8	.65	62.5	.75
1⅛	3½	2.20	19.6	.33	36.8	.38	43.2	.46	47.5	.54	52.2	.62
1	3	1.73	14.95	.26	28.	.31	33.0	.37	36.3	.43	39.	.50
⅞	2¾	1.30	11.95	.20	22.5	.24	26.5	.29	31.8	.34	35.	.39
¾	2¼	.95	8.85	.16	16.7	.19	19.6	.22	24.6	.26	27.	.31
⅝	2	.67	5.9	.12	11.10	.14	13.1	.16½	15.75	.19	17.3	.22½
9/16	1¾	.55	4.85	.10	9.10	.12	10.7	.14	12.8	.16		
½	1½	.43	3.65	.08½	6.90	.11	8.10	.12½	9.75	.14	10.7	.17
7/16	1¼	.33	2.63	.07½	4.90	.10	5.8	.11½	6.85	.13		
⅜	1⅛	.25	2.10	.07	3.90	.09½	4.60	.11	5.55	.12½	6.1	.14½

NOTE—Non-Rotating Rope has:
50% more wearing surface than 6 x 19 Hoisting Rope.
11% more section area than 6 x 19 Hoisting Rope.
12% more wires than 6 x 19 Hoisting Rope.
It is fully as flexible as standard Hoisting Rope.
Attention, however, is called to the fact that this type of rope is not spliced as readily as 6 or 8 strand rope.

GALVANIZED IRON SHIP'S RIGGING OR GUY ROPE

6 Strands—7 or 12 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Circumference of Manila Rope of Equal Strength	List Price per Foot	
					7 Wires per Strand	12 Wires per Strand
1 3/4	5 1/2	4.85	42	11	$0.44	$0.46
1 11/16	5 1/4	4.42	38	10 1/2	.41	.43
1 5/8	5	4.15	35	10	.38	.40
1 1/2	4 3/4	3.55	30	9 1/2	.35	.37
1 7/16	4 1/2	3.24	28	9	.31 1/2	.33 1/2
1 3/8	4 1/4	3	26	8 1/2	.28 1/2	.30 1/2
1 1/4	4	2.45	23	8	.25	.26 1/2
1 3/16	3 3/4	2.21	19	7 1/2	.22 1/2	.24
1 1/8	3 1/2	2	18	6 1/2	.19 1/2	.21
1 1/16	3 1/4	1.77	16.1	6	.17 1/2	.18 1/2
1	3	1.58	14.1	5 3/4	.15	.16
7/8	2 3/4	1.20	11.1	5 1/4	.13	
13/16	2 1/2	1.03	9.4	5	.11	
3/4	2 1/4	.89	7.8	4 3/4	.09	
5/8	2	.62	5.7	4 1/2	.08	
9/16	1 3/4	.50	4.46	3 3/4	.07	
1/2	1 1/2	.39	3.39	3	.06	
7/16	1 1/4	.30	2.35	2 1/2	.05	
3/8	1 1/8	.22	1.95	2 1/4	.04 1/2	
5/16	1	.15	1.42	2	.03 1/2	
					5 strands	
9/32	7/8	.125	1.20	1 3/4	.03	
1/4	3/4	.09	.99	1 1/2	.02 1/2	
7/32	5/8	.063	.79	1 1/4	.02 1/4	
3/16	1/2	.04	.61	1 1/8	.02	

Used for guying stacks and derricks, also for shrouds and stays aboard ship.

GALVANIZED CRUCIBLE CAST STEEL YACHT RIGGING OR GUY ROPE

6 Strands—7 Wires to the Strand—1 Hemp Core

FLEXIBLE GALVANIZED CRUCIBLE CAST STEEL YACHT ROPE

6 Strands—19 Wires to the Strand—1 Hemp Core

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Circumference of Manila Rope of Equal Strength	List Price per Foot	
					Guy Rope 7 Wires per Strand	Flexible Yacht Rope 19 Wires per Strand
1 1/4	4	2.45	42	13	$0.47	$0.50
1 5/16	3 3/4	2.21	38	12	.44	.46
1 1/8	3 1/2	2	34	11	.39 1/2	.41 3/4
1 1/16	3 1/4	1.77	31	10	.35	.38
1	3	1.58	28	9	.31 3/4	.34
7/8	2 3/4	1.20	22	8 1/2	.24 3/4	.26 1/4
13/16	2 1/2	1.03	19	8	.22	.23 1/2
3/4	2 1/4	.89	16.8	7	.18 1/2	.20 3/4
5/8	2	.62	11.7	6	.13	.15 1/4
9/16	1 3/4	.50	9	5 1/4	.11	.13
1/2	1 1/2	.39	7	4 3/4	.08 3/4	.12
15/32	1 3/8	.34	6	4 1/2	.08	.11 1/2
7/16	1 1/4	.30	5	4 1/4	.07	.11
3/8	1 1/8	.22	4.2	3 3/4	.06	.10 1/4
5/16	1	.15	3.2	3	.04 3/4	.10

In ordering, specify exact construction desired.

This rope is extra galvanized. Used where exposure to weather is constant or to periodical moisture.

6 x 19 construction is used largely for Backstays, Outhauls, Topping Lifts, or wherever strong, pliable mooring or messenger lines are used.

6 x 7 construction is used for standing rigging on ships and yachts.

If greater strength than listed is required we are prepared to furnish galvanized plow steel wire. Prices on application

GALVANIZED IRON AND CRUCIBLE CAST STEEL RUNNING ROPE

6 Strands—12 Wires to the Strand—7 Hemp Cores

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds		List Price per Foot	
			Iron	Crucible Cast Steel	Iron	Crucible Cast Steel
1 1/16	3 1/4	1.18	10.1	22.5	$0.22	$0.30
1	3	1.05	5.7	19.5	.20	.27
7/8	2 3/4	.80	6.9	15.5	.17	.23
13/16	2 1/2	.68	6	13.5	.14 1/2	.20
3/4	2 1/4	.59	8.1	11.5	.12	.16 1/2
5/8	2	.42	3.6	8	.10	.14
9/16	1 3/4	.33	2.8	6.5	.08	.11
1/2	1 1/2	.26	2.2	5	.07	.09
7/16	1 1/4	.20	1.7	3.9	.06 1/2	.08 1/2
3/8	1 1/8	.14	1.3	2.85	.06	.07 3/4
5/16	1	.10	.82	1.98	.05 1/2	.07

In ordering, specify whether Iron or Crucible Cast Steel quality is desired.

Designed for service where great flexibility is required and exposure to moisture is frequent.

GALVANIZED STEEL HAWSERS AND MOORING LINES

6 Strands—12 Wires to the Strand—7 Hemp Cores

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Size of Manila Hawsers of Equal Strength Circumference	List Price per Foot
2 1/16	6 1/2	4.43	83	. . .	$0.78
2	6 1/4	4.20	77	. . .	.72
1 15/16	6	3.89	71	. . .	.67
1 13/16	5 3/4	3.42	66	. . .	.62
1 3/4	5 1/2	3.23	61	13.5	.57
1 11/16	5 1/4	2.94	57	13	.53
1 5/8	5	2.76	53	12.5	.49
1 1/2	4 3/4	2.36	45	12	.44
1 7/16	4 1/2	2.16	41	11.5	.41
1 3/8	4 1/4	2	38	11	.38
1 1/4	4	1.63	31	10	.35
1 3/16	3 3/4	1.47	28	9.25	.33
1 1/8	3 1/2	1.33	26	8.75	.31

For smaller sizes, see Galvanized Running Rope, 6 strands, 12 wires to the strand, 7 hemp cores.

GALVANIZED STEEL HAWSERS AND MOORING LINES

6 Strands—24 Wires to the Strand—7 Hemp Cores

Diam. in Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	Size of Manila Hawsers of Equal Strength Circumference	List Price per Foot
2 1/16	6 1/2	5.81	113	. . .	$1.22
2	6 1/4	5.51	106	. . .	1.14
1 15/16	6	5.09	98	. . .	1.06
1 13/16	5 3/4	4.48	88	. . .	1.00
1 3/4	5 1/2	4.24	82	. . .	.93
1 11/16	5 1/4	3.86	76	. . .	.86
1 5/8	5	3.63	74	. . .	.80
1 1/2	4 3/4	3.10	63	13.5	.73
1 7/16	4 1/2	2.92	55	13.0	.67
1 3/8	4 1/4	2.62	50	12.0	.62
1 1/4	4	2.15	42	12.0	.57
1 3/16	3 3/4	1.93	38	11.0	.51
1 1/8	3 1/2	1.75	34	10.25	.45
1 1/16	3 1/4	1.54	27	9.25	.40
1	3	1.38	25	8.75	.35
7/8	2 3/4	1.05	20	. . .	.29
13/16	2 1/2	.90	17	. . .	.25
3/4	2 1/4	.78	14	. . .	.22

For mooring large vessels. Made of tough, strong wires. Has great strength and flexibility. Made to withstand abrasion due to snubbing rope through hawser holes and around anchorages.

GALVANIZED STEEL DEEP SEA TOWING HAWSERS

6 Strands—37 Wires to the Strand—1 Hemp Core

Diam. in. Inches	Circumference in Inches	Approximate Weight per Foot in Pounds	Approximate Strength in Tons of 2000 Pounds	List Price per Foot
2 3/8	7 1/2	8.82	188	$1.60
2 5/16	7 1/4	8.36	182	1.52
2 1/4	7 1/8	8	171	1.44
2 1/8	6 3/4	7.06	155	1.35
2 1/16	6 1/2	6.65	140	1.28
2	6 1/4	6.30	132	1.20
1 15/16	6	5.84	125	1.12
1 13/16	5 3/4	5.13	112	1.05
1 3/4	5 1/2	4.85	104	.98
1 11/16	5 1/4	4.42	97	.91
1 5/8	5	4.15	87	.84
1 1/2	4 3/4	3.55	76	.77
1 7/16	4 1/2	3.24	72	.71
1 3/8	4 1/4	3	66	.65
1 1/4	4	2.45	54	.60
1 3/16	3 3/4	2.21	47	.54
1 1/8	3 1/2	2	42	.48
1 1/16	3 1/4	1.77	38	.42
1	3	1.58	31.5	.37
7/8	2 3/4	1.20	26	.31
13/16	2 1/2	1.03	22	.26
3/4	2 1/4	.89	20	.23

Where great strength and pliability are essential, this type of hawser, by reason of construction, is superior to all other forms. More than 50 per cent of the wires in the strands are on the inside, so that the outside layer of wires may be considerably worn before the strength of the inside wires becomes impaired.

GALVANIZED STEEL CABLES FOR SUSPENSION BRIDGES

Composed of 6 Strands, with Wire Center

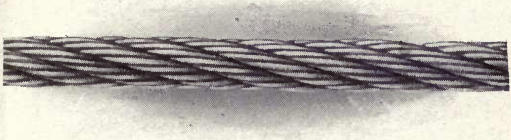
Diam. in. Inches	Approximate Circumference in Inches	Weight per Foot in Pounds	Approximate Breaking Stress in Tons of 2000 Pounds Plow Steel	Price per Foot
2¾	8⅝	12.7	310	Prices on application
2⅝	8¼	11.6	283	
2½	7⅞	10.5	256	
2⅜	7½	9.50	232	
2¼	7⅛	8.52	208	
2⅛	6⅝	7.60	185	
2	6¼	6.73	164	
1⅞	5⅞	5.90	144	
1¾	5½	5.10	124	
1⅝	5	4.34	106	
1½	4¾	3.70	90	
1⅜	4¼	3.10	75	
1¼	4	2.57	62	

We do not build or erect suspension bridges, but are prepared to supply cables.

Further particulars and prices furnished upon application.

Suspension Bridge cables are generally made 6 strands, 7 wires to the strand, with a wire strand in center, or commonly known as 7 x 7. In some cases they are made 6 strands, 19 wires to the strand and a hemp center, or 6 strands, 12 wires to the strand and one hemp center.

SASH CORD



6 Strands—7 Wires to the Strand—1 Cotton Core

Trade Number	Diameter in Inches	Weight per Foot in Pounds		Approximate Breaking Stress in Pounds			List Price per Foot		
		Iron	Copper	Bright Iron	Annealed Iron	Bright Copper	Iron Annealed or Bright	Tinned or Galvanized Iron	Copper
26	1/4	.101	.115	2200	1650	1320	$0.03	$0.04	$0.09
27	7/32	.077	.087	1800	1411	1080	.02 3/4	.03 1/2	.07 1/2
27 1/2	3/16	.056	.064	1400	1100	840	.02 1/4	.03	.06
28	1/8	.025	.029	550	425	350	.01 3/4	.02 1/4	.04 1/2
28 1/2	3/32	.014	.016	320	250	200	.01 1/2	.02	.03 1/2
29	1/16	.006	.007	140	110	90	.01 1/4	.01 3/4	.03

Sash cord will be made "soft" unless ordered to the contrary. Used principally for window weights, bell cords, automobile brakes and whistles. Three-thirty-second-inch diameter Galvanized Sash Cord is used on electric open-car curtain fixtures. One-sixteenth-inch Galvanized Sash Cord is used on steam car curtain fixtures.

GALVANIZED MAST-ARM OR ARC LIGHT ROPE

Diameter in Inches	Weight per Foot in Pounds	Approximate Breaking Stress in Pounds	Construction	List Price per Foot
1/2	.335	4700	9 x 7	$0.07
7/16	.245	3400	9 x 7	.06
3/8	.163	2200	9 x 7	.05
5/16	.107	1530	9 x 4	.03 1/2
1/4	.077	1125	9 x 4	.02 3/4

Used for arc lights, mast-arms or other purposes where exposed to moisture. This rope is more durable than manila rope and does not shrink.

STONE SAWING STRAND

3 Wires Twisted Together

Approximate Diameter in Inches	Approximate Gauge of Wire	Approximate Weight per 1000 Feet	List Price per 1000 Feet
.210	12	100	$13.50
.184	13	70	11.50
.160	14	50	9.50
.144	15	45	8.00
.126	16	35	6.75

This is suitable for sawing blocks of sandstone or similar soft stone but should not be used for marble or granite.

GALVANIZED STRAND

7 Steel Wires Twisted into a Single Strand

Standard Steel Strand Galvanized or Extra Galvanized

Diameter in Inches	Seizing Strand Trade Number	Approximate Weight per 1000 feet Pounds	Approximate Strength in Pounds	List Prices per 100 Feet
5/8	..	800	14000	$8.50
9/16	..	650	11000	7.00
1/2	..	510	8500	5.50
7/16	..	415	6500	4.50
3/8	..	295	5000	3.50
5/16	..	210	3800	2.50
1/4	..	125	2300	1.75
7/32	..	95	1800	1.50
3/16	..	75	1400	1.25
5/32	..	55	900	1.15
9/64	18	40	700	1.10
1/8	19	32	500	1.00
7/64	20	25	450	.90
3/32	21	20	400	.80
5/64	22	13	300	.70

This strand is used chiefly for guying poles and smokestacks, for supporting trolley wire, and for operating railroad signals.

Intermediate sizes take next higher list. Strands of larger diameter than listed in the table or those to be prepared from Special Stock. Prices on application.

Galvanized Strand is furnished both single and double galvanized. Special prices apply when made double galvanized.

GALVANIZED SEIZING STRAND

Diameter in Inches	Seven Wires of No.	Weight per 1000 Feet	Price Per Pound
11/64	18	50	$0.18
9/64	19	37	.19
1/8	20	30	.20
3/32	21	25	.21

EXTRA GALVANIZED SPECIAL STRAND

7 Steel Wires Twisted into a Single Strand

We manufacture three qualities of special grades of Extra Galvanized Strand that should meet all requirements for durability, strength, toughness and light weight.

Extra Galvanized Siemens-Martin Strand.
Extra Galvanized High Strength (Crucible Steel) Strand.
Extra Galvanized Extra High Strength (Plow Steel) Strand.

All three qualities are composed of 7 wires, having the heaviest coating of galvanizing that will ensure the longest life.

Extra Galvanized Siemens-Martin Strand

Diam. in Inches	Tensile Strength in Pounds	Minimum Elongation Per Cent in 10 Inches	List Price per 100 Feet	Diam. in Inches	Tensile Strength in Pounds	Minimum Elongation Per Cent in 10 Inches	List Price per 100 Feet
5/8	19,000	10	$8.25	1/4	3,060	10	$1.70
1/2	11,000	10	5.25	3/16	2,000	10	1.35
7/16	9,000	10	4.30	1/8	900	10	.90
3/8	6,800	10	3.25				
5/16	4,860	10	2.50				
9/32	4,380	10	2.05				

Extra Galvanized High Strength Strand

5/8	25,000	6	$12.00	9/32	7,300	6	$2.80
1/2	18,000	6	7.25	1/4	5,100	6	2.25
7/16	15,000	6	6.00	3/16	3,300	6	1.80
3/8	11,500	6	4.40	1/8	1,500	6	1.20
5/16	8,100	6	3.20				

Extra Galvanized Extra High Strength Strand

5/8	42,500	4	$14.60	9/32	10,900	4	$3.50
1/2	27,000	4	8.80	1/4	7,600	4	2.85
7/16	22,500	4	7.20	3/16	4,900	4	2.40
3/8	17,250	4	5.25	1/8	2,250	4	1.60
5/16	12,100	4	4.25				

When either intermediate sizes and strengths are called for, if they are exactly midway between two sizes provided for, the average price of the two sizes shall apply; otherwise the price of the nearest size and strength shall apply.

This class of strand costs more than ordinary strand of equivalent diameter. The higher strength admits of the use of smaller sizes. Lasts longer and is more economical in use.

TRACK CABLE FOR AERIAL TRAMWAYS

List Prices per 100 Feet

Diameter in Inches	No. of Wires in Strand	Weight per 100 Feet in Pounds	Crucible Steel Breaking Stress in Tons of 2000 Pounds	Plow Steel Breaking Stress in Tons of 2000 Pounds
2½	91	1310	285.00	335.00
2¼	91	1036	233.00	266.00
2⅛	91	935	204.00	240.00
2	61	840	185.00	218.00
1⅞	61	728	161.00	189.00
1¾	61	659	145.80	171.00
1⅝	61	563	124.00	146.00
1½	37	488	108.40	127.50
1⅜	37	401	88.80	105.00
1¼	37	323	71.80	84.60
1⅛	37	270	60.00	70.70
1	19	220	49.20	58.00
⅞	19	169	37.60	44.40
¾	19	124	27.60	32.50
⅝	19	86	19.20	22.30
½	19	55	14.30	18.00
⅜	19	30	8.98	11.27
¼	19	14	4.10	5.12

Prices on application.

This strand is designed to give as much flexibility as possible as well as a fairly smooth surface for traveler wheels to run upon. The plow steel quality affords the greatest strength with the least weight—a very important advantage, especially in long spans.

LOCOMOTIVE SWITCHING, WRECKING AND BALLAST UNLOADER ROPE

Single Fittings

Hook and thimble in one end; thimble and link in other end.

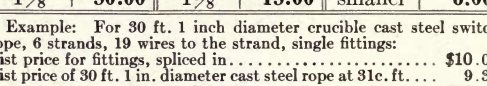
To determine the list price of Locomotive Switching, Wrecking, and Ballast Unloader Ropes, add to the list price of the length, size and quality of rope specified (the length to be added being measured from the bearing of hook in one end to the bearing of the last link in the other end), the following extras for fittings spliced in.

List Prices for Fittings Fastened to Ropes

Diam., In.	List Fit'gs	Diam., In.	List Fit'gs	Diam., In.	List Fit'gs
2	**$55.00**	1 1/2	**$25.00**	1	**$10.00**
1 7/8	**45.00**	1 3/8	**21.75**	7/8	**8.75**
1 3/4	**35.00**	1 1/4	**16.50**	3/4 and	
1 5/8	**30.00**	1 1/8	**13.00**	smaller	**6.00**

Example: For 30 ft. 1 inch diameter crucible cast steel switch rope, 6 strands, 19 wires to the strand, single fittings:

List price for fittings, spliced in..... $10.00
List price of 30 ft. 1 in. diameter cast steel rope at 31c. ft.... 9.30
List price complete, 30 ft. single switch rope..... $19.30



Double Fittings

Hook, thimble and link at one end; thimble and two links in other end.

List Prices for Fittings Spliced to Rope

Diam., In.	List Fit'gs	Diam., In.	List Fit'gs	Diam., In.	List Fit'gs
2	**$65.00**	1 1/2	**$29.00**	1	**$12.00**
1 7/8	**52.00**	1 3/8	**25.00**	7/8	**10.50**
1 3/4	**40.00**	1 1/4	**20.00**	3/4 and	
1 5/8	**32.50**	1 1/8	**15.00**	smaller	**7.50**

Extras for other Styles

List for thimble and two links spliced in both ends is same as for *double*.

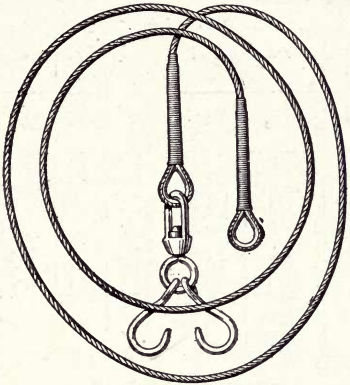
List for thimble and two links spliced in one end is *one-half* of *double*.

List for thimble and two links spliced in one end and thimble and hook in other end, or thimble and link spliced in one end and thimble link and hook in other end, is *half way* between *single* and *double*.

EXTRA FLEXIBLE PLOW STEEL PULLING-IN CABLES

8 Strands—19 Wires Each—1 Hemp Center

Thimble spliced in one end.
Thimble, swivel and sister hooks spliced in other end.



Diameter of Rope in Inches	List Prices of Rope per Foot	List Prices of Thimble Spliced in	List Prices of Thimble, Swivel and Sister Hooks Complete Spliced in
5/8 9/16 1/2 7/16 3/8 5/16	Prices furnished on application		

For pulling cables into under-ground conduits, and for cleaning sewers. The sister hooks snap into the eye of a wire pulling grip that is attached to the end of the cable to be drawn into the conduit. The thimble end is wound on a small drum or hand winch. Common sizes are 3/8-inch and 1/2-inch diameter. Lengths vary from 300 feet to 600 feet.

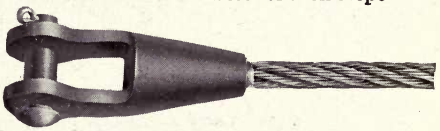
CLOSED SOCKETS

For use with either Steel or Iron Rope

Circumference of Rope in Inches	Diam. of Rope in Inches	Iron and Steel Rope		Circumference of Rope in Inches	Diam. of Rope in Inches	Iron and Steel Rope	
		Loose	Fastened			Loose	Fastened
7 1/8	2 1/4	$26.00	$37.00	2 3/4	7/8	$2.50	$4.50
6 1/4	2	24.00	33.50	2 1/4	3/4	1.80	3.30
5 1/2	1 3/4	16.00	24.00	2	5/8	1.35	2.65
5	1 5/8	10.00	16.00	1 3/4	9/16	1.10	2.35
4 3/4	1 1/2	9.00	14.00	1 1/2	1/2	1.00	2.15
4 1/4	1 3/8	6.50	10.75	1 1/4	7/16	.80	1.95
4	1 1/4	6.00	9.50	1 1/8	3/8	.75	1.75
3 1/2	1 1/8	4.00	6.85	1	5/16	.65	1.55
3	1	3.50	5.75	3/4	1/4	.60	1.50

OPEN SOCKETS

For use with either Steel or Iron Rope



7 1/8	2 1/4	$37.00	$48.00	2 3/4	7/8	$3.40	$5.40
6 1/4	2	34.00	43.50	2 1/4	3/4	2.70	4.20
5 1/2	1 3/4	22.00	30.00	2	5/8	2.10	3.40
5	1 5/8	12.50	18.50	1 3/4	9/16	1.70	2.95
4 3/4	1 1/2	11.50	16.50	1 1/2	1/2	1.60	2.75
4 1/4	1 3/8	8.50	12.75	1 1/4	7/16	1.25	2.40
4	1 1/4	8.00	11.50	1 1/8	3/8	1.20	2.20
3 1/2	1 1/8	5.00	7.85	1	5/16	.90	1.80
3	1	4.50	6.75	3/4	1/4	.85	1.75

SWIVEL HOOK AND SOCKET

For use with either Steel or Iron Rope

Diameter of Rope in Inches	Circumference of Rope in Inches	List Prices for Steel Rope		List Prices for Iron Rope	
		Loose	Fastened	Loose	Fastened
1½	4¾				
1⅜	4¼				
1¼	4				
1⅛	3½				
1	3				
⅞	2¾				
¾	2¼	Prices furnished on application			
⅝	2				
9/16	1¾				
½	1½				
7/16	1¼				
⅜	1⅛				
5/16	1				
¼	¾				

HOOK AND SOCKET

For use with either Steel or Iron Rope

Diameter of Rope in Inches	Circumference of Rope in Inches	List Prices for Steel Rope		List Prices for Iron Rope	
		Loose	Fastened	Loose	Fastened
1 1/2	4 3/4	Prices furnished on application			
1 3/8	4 1/4				
1 1/4	4				
1 1/8	3 1/2				
1	3				
7/8	2 3/4				
3/4	2 1/4				
5/8	2				
9/16	1 3/4				
1/2	1 1/2				
7/16	1 1/4				
3/8	1 1/8				
5/16	1				
1/4	3/4				

These fittings may be attached to any style or construction of rope, but they are especially useful when attached to our Non-Spinning Rope, page 57. An open socket can be supplied, if desired.

HOOK AND THIMBLE

For use with either Steel or Iron Rope

Diameter of Rope in Inches	Circumference of Rope in Inches	List Prices for Steel Rope		List Prices for Iron Rope	
		Loose	Fastened	Loose	Fastened
1 1/2	4 3/4				
1 3/8	4 1/4				
1 1/4	4				
1 1/8	3 1/2				
1	3				
7/8	2 3/4				
3/4	2 1/4	Prices furnished on application			
5/8	2				
9/16	1 3/4				
1/2	1 1/2				
7/16	1 1/4				
3/8	1 1/8				
5/16	1				
1/4	3/4				

Used in many places, such as derricks, cranes, skidders, slings, etc.

SWIVEL HOOK AND THIMBLE

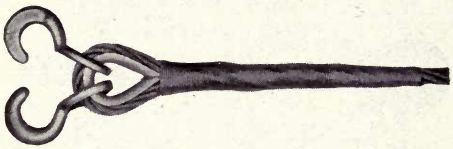
For use with either Steel or Iron Rope

Diameter of Rope in Inches	Circumference of Rope in Inches	List Prices for Steel Rope		List Prices for Iron Rope	
		Loose	Fastened	Loose	Fastened
1 1/2	4 3/4	Prices furnished on application			
1 3/8	4 1/4				
1 1/4	4				
1 1/8	3 1/2				
1	3				
7/8	2 3/4				
3/4	2 1/4				
5/8	2				
9/16	1 3/4				
1/2	1 1/2				
7/16	1 1/4				
3/8	1 1/8				
5/16	1				
1/4	3/4				

This hook swivel and thimble permits the load to rotate without unduly untwisting the rope.

SISTER HOOKS AND THIMBLE

For use with either Steel or Iron Rope



Diameter of Rope in Inches	Circumference of Rope in Inches	List Prices for Steel Rope		List Prices for Iron Rope	
		Loose	Fastened	Loose	Fastened
1 1/2	4 3/4	Prices furnished on application			
1 3/8	4 1/4				
1 1/4	4				
1 1/8	3 1/2				
1	3				
7/8	2 3/4				
3/4	2 1/4				
5/8	2				
9/16	1 3/4				
1/2	1 1/2				
7/16	1 1/4				
3/8	1 1/8				
5/16	1				
1/4	3/4				

Sister hooks are frequently employed where a rope has to be quickly attached and detached from a load and at the same time to hold the load locked in position so long as the rope is under strain. Illustration shows the two parts of the hook apart ready to attach load. Such devices are frequently used for logging and drawing-in cables.

GALVANIZED THIMBLE SPLICED INTO ROPE

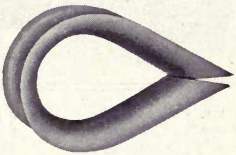
For use with either Steel or Iron Rope

Diameter of Rope in Inches	Circumference of Rope in Inches	List Prices Complete for Steel Rope	List Prices Complete for Iron Rope
1½	4¾	$11.00	$10.50
1⅜	4¼	10.50	10.00
1¼	4	8.00	7.65
1⅛	3½	5.50	5.25
1	3	3.50	3.35
⅞	2¾	2.85	2.70
¾	2¼	2.20	2.05
⅝	2	2.00	1.90
9/16	1¾	1.90	1.80
½	1½	1.40	1.30
7/16	1¼	1.35	1.25
⅜	1⅛	1.30	1.20
5/16	1	1.10	1.00
¼	¾	1.10	1.00

GALVANIZED OVAL THIMBLES

For use with either Steel or Iron Rope

Regular



Extra Large

Size Thimble Width of Score in Inches	Circumference of Rope in Inches	Diameter of Pin that May Be Inserted in Regular Thimble in Inches	Diameter of Pin that May Be Inserted in Extra Large Thimble in Inches	Length Inside in Inches Regular Thimble	Length Inside in Inches Extra Large Thimble	Approximate Weight in Pounds Regular Thimble	Approximate Weight in Pounds Extra Large Thimble	List Price, Each, Regular
1 1/2	4 3/4	2 9/16	. . .	3 7/8	4 3/4	1.80	2.20	$0.50
1 3/8	4 1/4	2 7/16	2 11/16	3 7/8	4 1/2	1.40	2.00	.42
1 1/4	4	2 3/8	2 11/16	3 3/4	4 3/8	1.05	1.50	.33
1 1/8	3 1/2	1 15/16	2 1/2	3 3/8	4 1/4	.90	1.20	.25
1	3	1 13/16	2 5/16	3 1/8	4 1/8	.60	.85	.20
7/8	2 3/4	1 9/16	2	2 1/2	3 1/2	.44	.75	.16
3/4	2 1/4	1 7/16	1 3/4	2 3/8	3 1/2	.37	.50	.15
5/8	2	1 1/4	1 9/16	2 1/8	2 7/8	.22	.30	.13
9/16	1 3/4	1 1/8	. . .	2	. . .	.13	. . .	.12
1/2	1 1/2	1 1/16	. . .	1 7/8	. . .	.13	. . .	.11
7/16	1 1/4	1	. . .	1 3/4	. . .	.09	. . .	.10
3/8	1 1/8	7/8	. . .	1 1/2	. . .	.06	. . .	.09
5/16	1	3/4	. . .	1 1/2	. . .	.05	. . .	.08
1/4	3/4	5/8	. . .	1 3/8	. . .	.03	. . .	.08

Prices for Extra Large furnished on application.

WIRE ROPE CLIPS

For use with either Steel or Iron Rope

Circum. of Rope in Inches	Diameter of Rope in Inches	Price	Circum. of Rope in Inches	Diameter of Rope in Inches	Price
7 7/8	2 1/2	Prices furnished on application	3	1	Prices furnished on application
7 1/8	2 1/4		2 3/4	7/8	
6 1/4	2		2 1/4	3/4	
5 1/2	1 3/4		2	5/8	
4 3/4	1 1/2		1 1/2	1/2	
4 1/4	1 3/8		1 1/8	3/8	
4	1 1/4		1	5/16	
3 1/2	1 1/8		3/4	1/4	

CROSBY WIRE ROPE CLIPS—GALVANIZED

For use with either Steel or Iron Rope

Size Clip Corresponding to Rope Diameter in Inches	Approximate Weight Each in Pounds	List Price Each	Size Clip Corresponding to Rope Diameter in Inches	Approximate Weight Each in Pounds	List Price Each
2 1/2	. . .	**$11.50**	1	3.00	**$0.85**
2 1/4	. . .	**9.50**	7/8	2.00	**.75**
2	. . .	**7.50**	3/4	1.75	**.65**
1 3/4	. . .	**5.50**	5/8	.87	**.55**
1 5/8	. . .	**3.50**	1/2	.75	**.45**
1 1/2	5.75	**1.50**	7/16	.37	**.45**
1 3/8	5.75	**1.25**	3/8	.37	**.40**
1 1/4	3.75	**1.10**	5/16	.25	**.35**
1 1/8	3.75	**.95**	1/4	.25	**35**

WIRE ROPE CLAMPS

For use with either Steel or Iron Rope

Extra Heavy

Size Clamp and Diameter of Rope in Inches	Circumference of Rope in Inches	List Price Each	Size Clamp and Diameter of Rope in Inches	Circumference of Rope in Inches	List Price Each
2¼	7⅛	$13.75	1	3	$1.75
2	6¼	8.50	⅞	2¾	1.30
1¾	5½	5.50	13/16	2½	1.15
1⅝	5	5.00	¾	2¼	1.05
1 7/16	4½	3.80	⅝	2	.90
1¼	4	2.50	9/16	1¾	.60
1 3/16	3¾	2.25	½	1½	.60
1⅛	3½	1.90	7/16	1¼	.45
1 1/16	3¼	1.90	5/16	1	.30

POWER TRANSMITTED BY WIRE ROPE

A table showing the proper relation between the rope and wheels used in transmitting power by means of wire rope, and approximately the amount of power that may be thus transmitted. The calculations are based upon a rope of the 6 strand, 7 wires per strand construction.

Diameter of Wheel in Feet	Number of Revolutions per Minute	Diameter of Rope	Horsepower	Diameter of Wheel in Feet	Number of Revolutions per Minute	Diameter of Rope	Horsepower
3	80	3/8	3	7	140	9/16	35
3	100	3/8	3 1/2	8	80	5/8	26
3	120	3/8	4	8	100	5/8	32
3	140	3/8	4 1/2	8	120	5/8	39
4	80	3/8	4	8	140	5/8	45
4	100	3/8	5	9	80	9/16	47
4	120	3/8	6	9	100	5/8	48
4	140	3/8	7	9	120	9/16	58
5	80	7/16	9	9	140	5/8	60
5	100	7/16	11	10	80	9/16	69
5	120	7/16	13	10	100	5/8	73
5	140	7/16	15	10	120	9/16	82
6	80	1/2	14	10	140	5/8	84
6	100	1/2	17	12	80	5/8	64
6	120	1/2	20	12	100	11/16	68
6	140	1/2	23	12	120	5/8	80
7	80	9/16	20	12	120	11/16	85
7	100	9/16	25	14	80	5/8	96
7	120	9/16	30	14	100	11/16	102
						5/8	112
						11/16	119
						11/16	93
						3/4	99
						11/16	116
						3/4	124
						11/16	140
						3/4	149
						7/8	173
						1	141
						1 1/8	148
						1	176
						1 1/8	185

TABLE FOR INCLINED PLANES

Use of wire rope on slopes, inclined planes, etc., by which the strain produced by any load can easily be calculated.

The table gives the strain on a rope due to a load of one ton of 2,000 pounds, allowing for rolling friction. An additional allowance for the weight of the rope will have to be made.

Example: For an inclination of twenty-five feet in 100 feet, corresponding to an angle of fourteen degrees and two minutes, a load of 2000 pounds will produce a strain on the rope of 534 pounds, and for a load of 8000 pounds the strain on the rope will be

$$\frac{534 \times 8000}{2000} = 2136 \text{ pounds.}$$

Elevation in 100 Feet	Corresponding angle of inclination	Strain in pounds on rope from a load of 2000 pounds	Elevation in 100 Feet	Corresponding angle of inclination	Strain in pounds on rope from a load of 2000 pounds
5	2°52′	150	95	43°32′	1414
10	5°43′	249	100	45° 0′	1449
15	8°32′	346	105	46°24′	1482
20	11°19′	441	110	47°44′	1514
25	14° 2′	534	115	48°59′	1542
30	16°42′	623	120	50°12′	1569
35	19°17′	707	125	51°20′	1593
40	21°48′	789	130	52°26′	1615
45	24°14′	867	135	53°28′	1637
50	26°34′	939	140	54°28′	1657
55	28°49′	1008	145	55°24′	1674
60	30°58′	1072	150	56°19′	1692
65	33° 1′	1132	155	57°10′	1707
70	35° 0′	1188	160	58° 0′	1722
75	36°52′	1240	165	58°47′	1736
80	38°40′	1289	170	59°32′	1749
85	40°22′	1333	175	60°15′	1761
90	41°59′	1375	180	60°57′	1772

In selecting a rope, a factor of safety from six to eight should be taken; that is, the working load on the rope should only be one-fifth to one-seventh of its breaking strength. As a rule, ropes for shafts should have a factor of safety of six, and for inclined planes, where the wear is much greater, the factor of safety should be seven.

Further information and advice as to the best rope to use in particular cases will be supplied on application.

COMPARISON OF STRENGTH BETWEEN WIRE ROPE AND MANILA ROPE

Approximate Breaking Stress Calculated in Tons of 2,000 Pounds

Diameter in Inches	Wire Transmission Rope. One hemp core surrounded by six strands of seven wires each				Wire Hoisting Rope. One hemp core surrounded by six strands of nineteen wires each				Average Quality New Manila Rope
	Iron	Crucible Cast Steel	Extra Str'g Crucible Cast Steel	Plow Steel	Iron	Crucible Cast Steel	Extra Str'g Crucible Cast Steel	Plow Steel	
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
2¾	. . .	. . .	. . .	. . .	111	211	243	275	26
2½	. . .	. . .	. . .	. . .	92	170	200	229	21½
2¼	. . .	. . .	. . .	. . .	72	133	160	186	18½
2	. . .	. . .	. . .	. . .	55	106	123	140	15
1¾	. . .	. . .	. . .	. . .	44	85	99	112	12½
1⅝	. . .	. . .	. . .	. . .	38	72	83	94	10
1½	32	63	73	82	33	64	73	82	8½
1⅜	28	53	63	72	28	56	64	72	7½
1¼	23	46	54	60	22.8	47	53	58	6¼
1⅛	19	37	43	47	18.6	38	43	47	5¼
1	15	31	35	38	14.5	30	34	38	4
⅞	12	24	28	31	11.8	23	26	29	3¼
¾	8.8	18.6	21	23	8.5	17.5	20.2	23	2¼
⅝	6	13	14.5	16	6	12.5	14	15.5	2
9/16	4.8	10	11	12	4.7	10	11.2	12.3	1½
½	3.7	7.7	8.85	10	3.9	8.4	9.2	10	1 1/5
7/16	2.6	5.5	6.25	7	2.9	6.5	7.25	8	¾
⅜	2.2	4.6	5.25	5.9	2.4	4.8	5.30	5.75	½
5/16	1.7	3.5	3.95	4.4	1.5	3.1	3.50	3.8	⅜
9/32	1.2	2.5	2.95	3.4	. . .	. . .	. . .	. . .	3/10
¼	. . .	. . .	. . .	. . .	1.1	2.2	2.43	2.65	¼

SHEAVE AND DRUM TABLES

Showing Relative Effects of Various Sized Sheaves or Drums on the Life of Wire Rope.

Cast Steel Ropes for Inclines

6 Strands of 7 Wires Each—Hemp Center

Diam. of Rope in Inches	Diameter of Sheaves or Drums in Feet, Showing Percentages of Life for Various Diameters						
	100%	90%	80%	75%	60%	50%	25%
1½	16	14	12	11	9	7	4.75
1⅜	14	12	10	8.5	7	6	4.5
1¼	12	10	8	7.25	6	5.5	4.25
1⅛	10	8.5	7.75	7	6	5	4
1	8.5	7.75	6.75	6	5	4.5	3.75
⅞	7.75	7	6.25	5.75	4.5	3.75	3.2
¾	7	6.25	5.5	5	4.25	3.5	2.75
⅝	6	5.25	4.5	4	3.25	3	2.5
½	5	4.5	4	3.5	2.75	2	1.75

Cast Steel Hoisting Ropes

6 Strands of 19 Wires Each—Hemp Center

1½	14	12	10	8.5	7	6	4.5
1⅜	12	10	8	7	6	5.25	4.25
1¼	10	8.5	7.5	6.75	5.5	5	4
1⅛	9	7.5	6.5	5.5	5	4.5	3.75
1	8	7	6	5.5	4.5	4	3.50
⅞	7.5	6.75	5.75	5	4.25	3.5	3.
¾	5.5	4.5	4	3.75	3.25	3	2.25
⅝	4.5	4	3.75	3.25	3	2.5	2
½	4	3	3	2.75	2.25	2	1.5
⅜	3	....	....	2	....	1.5	....

Iron Hoisting Ropes

6 Strands of 19 Wires Each—Hemp Center

1½	12	11	9	7.5	6	5	4
1⅜	10	9	7.5	7	5.25	4.75	3.50
1¼	9	7.75	6.5	5.75	4.5	4	3.25
1⅛	8	6.75	5.5	5	4.25	3.5	3
1	6.75	6	5	4.75	4	3.25	2.75
⅞	6.75	6	5	4.5	4	3	2.50
¾	5	4.75	4	3.75	3	2.75	2
⅝	4.5	3.75	3.25	3	2.75	2.25	1.75
½	3.5	3.25	3	2.75	2	1.5	1.25
⅜	3	....	2	....	....	1.25	1

DIAMETERS AND APPROXIMATE WEIGHTS OF WATERBURY ROUND WIRE ROPES

Made of 6 Strands and a Hemp Core—if made with a Wire Core add One-seventh to Weight given.

Circumference		Diameter			Approximate Weights		
In Ins.	In m/m	Fraction of an Inch	Decimals of an Inch	In m/m	Pounds per Fathom	Pounds per Foot	Kilos. per Metre
1	25	5/16	.318	8	1	0.16	.25
1 1/8	29	3/8 bare	.358	9	1 1/4	0.22	.32
1 1/4	32	3/8 full	.397	10	1 1/2	0.25	.37
1 3/8	35	7/16	.437	11	1 3/4	0.30	.44
1 1/2	38		.477	12	2 1/8	0.36	.53
1 5/8	41		.517	13	2 1/2	0.42	.62
1 3/4	44	9/16	.557	14	3	0.50	.74
1 7/8	48		.596	15	3 1/2	0.58	.86
2	51	5/8	.636	16	3 3/4	0.66	.99
2 1/8	54		.676	17	4 1/2	0.70	1.00
2 1/4	57	11/16	.716	18	5	0.79	1.16
2 3/8	60	3/4	.756	19	5 1/2	0.88	1.30
2 1/2	63	13/16 bare	.795	20	6	1.00	1.48
2 5/8	67		.835	21	6 1/2	1.14	1.68
2 3/4	70	7/8	.875	22	7 1/2	1.21	1.80
2 7/8	73		.915	23	7 3/4	1.30	1.92
3	76	15/16 full	.955	24	8 1/2	1.42	2.10
3 1/8	79	1	.994	25	9 1/4	1.54	2.30
3 1/4	83	1 1/32	1.034	26	11	1.70	2.48
3 3/8	86		1.074	27	11 1/2	1.79	2.66
3 1/2	89	1 1/8 bare	1.114	28	12	1.92	2.85
3 5/8	92		1.174	29	13	2.04	3.03
3 3/4	95		1.193	30	14	2.21	3.28
3 7/8	98	1 1/4 bare	1.233	31	15	2.37	3.53
4	102		1.273	32	16	2.50	3.72
4 1/8	105		1.313	33	17	2.70	3.96
4 1/4	108	1 3/8 bare	1.352	34	18	2.80	4.21
4 3/8	111		1.392	35	19	3.17	4.46
4 1/2	114		1.432	36	20	3.34	4.71
4 5/8	117		1.472	37	21	3.50	4.96
4 3/4	121	1 1/2 full	1.512	38	22	3.66	5.27
4 7/8	124		1.551	39	24	3.83	5.70
5	127	1 5/8 bare	1.591	40	25	4.00	5.95
5 1/4	134	1 5/8 full	1.671	42	28	4.50	7.00
5 1/2	140	1 3/4	1.750	44	30	4.84	7.79
5 3/4	146		1.830	46	31 1/2	5.34	7.80
6	152	1 7/8	1.909	48	36	6.00	8.68
6 1/4	159	2	1.989	50	39	6.50	9.42
6 1/2	162		2.070	52	42	7.00	10.16
7	178	2 1/4	2.222	56	49	7.84	11.65

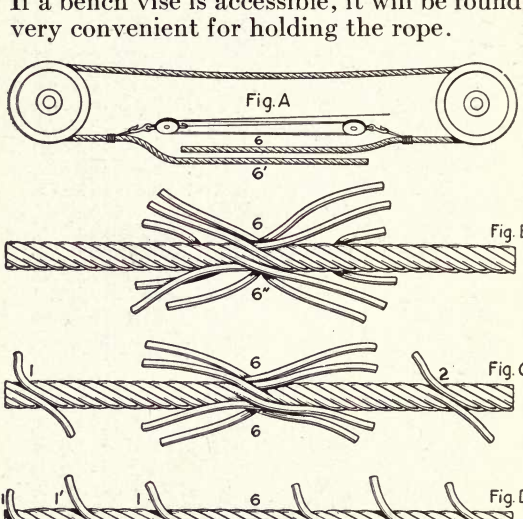
The weights vary slightly with more flexible and compound ropes.

DECIMALS OF AN INCH AND MILLIMETERS FOR EACH 1–16 INCH

1/32 Inch	1/64 Inch	Decimal Inch	mm.	Fraction	1/32 Inch	1/64 Inch	Decimal Inch	mm.	Fraction
	1	.015625	.3968			33	.515625	13.0966	
1	2	.03125	.7937		17	34	.53125	13.4934	
	3	.046875	1.1906			35	.546875	13.8903	
2	4	.0625	1.5874	1/16	18	36	.5625	14.2872	9/16
	5	.078125	1.9843			37	.578125	14.6841	
3	6	.09375	2.3812		19	38	.59375	15.0809	
	7	.109375	2.7780			39	.609375	15.4778	
4	8	.125	3.1749	1/8	20	40	.625	15.8747	5/8
	9	.140625	3.5718			41	.640625	16.2715	
5	10	.15625	3.9686		21	42	.65625	16.6684	
	11	.171875	4.3655			43	.671875	17.0653	
6	12	.1875	4.7624	3/16	22	44	.6875	17.4621	11/16
	13	.203125	5.1592			45	.703125	17.8590	
7	14	.21875	5.5561		23	46	.71875	18.2559	
	15	.234375	5.9530			47	.734375	18.6527	
8	16	.2500	6.3498	1/4	24	48	.75	19.0496	3/4
	17	.265625	6.7467			49	.765625	19.4465	
9	18	.28125	7.1436		25	50	.78125	19.8433	
	19	.296875	7.5404			51	.796875	20.2402	
10	20	.3125	7.9373	5/16	26	52	.8125	20.6371	13/16
	21	.328125	8.3342			53	.828125	21.0339	
11	22	.34375	8.7310		27	54	.84375	21.4308	
	23	.359375	9.1279			55	.859375	21.8277	
12	24	.375	9.5248	3/8	28	56	.875	22.2245	7/8
	25	.390625	9.9216			57	.890625	22.6214	
13	26	.40625	10.3185		29	58	.90625	23.0183	
	27	.421875	10.7154			59	.921875	23.4151	
14	28	.4375	11.1122	7/16	30	60	.9375	23.8120	15/16
	29	.453125	11.5091			61	.953125	24.2089	
15	30	.46875	11.9060		31	62	.96825	24.6057	
	31	.484375	12.3029			63	.984375	25.0026	
16	32	.500	12.6997	1/2	32	64	1.0000	25.3995	1

DIRECTIONS FOR SPLICING WIRE ROPE

THE tools required will be a small marlinespike, nipping cutters, and either clamps or a small hemp rope sling with which to wrap around and untwist the rope. If a bench vise is accessible, it will be found very convenient for holding the rope.



In splicing rope, a certain length is used up in making the splice. An allowance of not less than 16 feet for ½-inch rope, and

proportionately longer for larger sizes, must be added to the length of your endless rope in ordering.

Having measured carefully the length the rope should be after splicing, and marked the points 6 and 6′, Fig. A, you unlay the strands from each end of the Rope to 6 and 6′, and cut off the hemp center at 6 and 6′, and then—

First. Interlock the six unlaid strands of each end alternately and draw them together so that the points 6 and 6′ meet as shown in Fig. B.

Second. Unlay a strand from one end, and following the unlay closely, lay into the seam or groove it opens, the strand opposite it belonging to the other end of the rope, until within a length equal to three or four times the length of one lay of the rope, and cut the other strand to about the same length from the point of meeting, as shown at 1, Fig. C.

Third. Unlay the adjacent strand in the opposite direction, and following the unlay closely, lay in its place the corresponding opposite strand, cutting the ends as described before at 2, Fig. C.

It will be well after laying each pair of strands to tie them temporarily at the points 1 and 2.

Pursue the same course with the remaining four pairs of opposite strands, stopping each pair about eight or ten turns of the rope short of the preceding pair, and cutting the ends as before.

You now have all the strands laid in their proper places, with their respective ends passing each other, as shown in Fig. 4, D.

All methods of rope splicing are identical to this point; their variety consists in the method of tucking the ends. The one given below is that most generally practiced.

It now remains to secure the ends:

Clamp the rope either in a vise at a point to the left of 1, Fig. D, and, by a hand clamp applied near I, open up the rope by untwisting sufficiently to cut the hemp core at I, and seizing it with the nippers, let your assistant draw it out slowly, you following it closely; crowding the strand in its place until it is all laid in. Cut the hemp core where the strand ends, and push the end back in its place. Remove the clamps and let the rope close together around it. Draw out the hemp core in the opposite direction and lay the other strand in the center of the rope, in the same manner. Repeat the operation at the five remaining points, and hammer the rope lightly at the points where the ends pass each other at I, 1, 2, 2, etc., with small wooden mallets, and the splice is complete, as shown in Fig. E.

If a clamp and vise are not obtainable, two rope slings and short wooden levers may be used to untwist and open up the rope.

A rope spliced as above will be nearly as strong as the original rope and smooth everywhere. After running a few days, the splice, if well made, cannot be pointed out except by close examination of an expert.

TO SPLICE A THIMBLE INTO A WIRE ROPE OF SIX STRANDS

TAKE your thimble and make it fast at A. Be sure to leave your rope long enough from A to the numbered ends for splicing; better a little too long than short. For a $\frac{5}{8}$-inch or $\frac{3}{4}$-inch diameter rope take at least two feet. After you have made your thimble fast at A, bend your rope around it and clip it in a vise at D B and screw up close (being careful not to cut any of the wires with the corners of the vise). Put a band around it at D B to keep it in place. Take it from the vise and suspend it from a beam by a rope attached to A. Have C hanging down with a weight attached to it, which will help to keep it steady while splicing. Unlay the strands as far as the band D B, and cut away the hemp core. Take your splicing knife and insert it below the band on the side D, and drive it right through the center of the rope, so as to have three strands on each side of your knife. Keep your knife there while you get No. 1 through above it. Before passing each end through take a little of the twist out of the strand. It will lay better if you do; then pull at the strand with your left hand, and with your knife in the right hand, and still through the rope, force the strand up toward and as close as you can get it to the band D B. Take out the knife, insert again in the same place as before, but bring it out one strand to the left of the last—that is, have two

strands on the left and four on the right side of the knife. You are working from the side D, and when we speak of the left of the knife you will take it from your left. Put No. 2 through above the knife, and, with the aid of the knife, force this also as close and as tight as possible to the band. Insert your knife again at the same place as last, but only let there be one strand on the left and five on the right side of it. Take No.3 through and force it also up toward the band. After this you will open one strand at a time, and bring Nos. 4, 5 and 6, in their turn, over and under a strand. If you have followed us rightly, you will now have the six ends through; no two ends will be out between the same two strands; each one will have its own place. You must now begin again with No. 1, but do not this time take it through the middle of the rope, but serve it as you did the last three—that is, take it and the others in their turn over and under one strand only. Now split your strands and take half of each through again. File or break off the wires about one-quarter inch from the face of the rope. Now hammer the splice into shape. If you wish to hide the ends of the broken wires you can cover with marline twine.

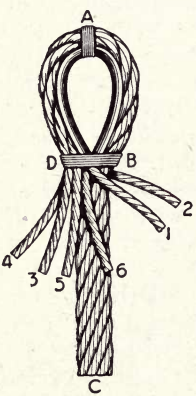


TABLE OF STANDARD WIRE GAUGES

With Equivalents in Decimal Parts of an Inch and Weights

Number of Wire Gauge	Birmingham or Stubbs'	Weight per Lineal Foot 1 Inch Wide by Stubbs' Gauge	American or Brown & Sharpe	Washburn-Moen Waterbury	Weight per 100 Ft. in Lbs. W. & M. Gauge	Music Wire	Fractions of an Inch with Decimal Equivalents
0000	.454	1.512	.460	.393	40.94	....	1–64– .016
000	.425	1.415	.410	.362	34.73	....	1–32– .031
00	.380	1.265	.365	.331	29.04	.0085	3–64– .047
0	.340	1.132	.325	.307	27.66	.009	1–16– .062
1	.300	1.000	.289	.283	21.23	.010	5–64– .078
2	.284	.946	.258	.263	18.34	.011	3–32– .094
3	.259	.863	.229	.244	15.78	.012	7–64– .109
4	.238	.793	.204	.225	13.39	.013	1– 8– .125
5	.220	.733	.182	.207	11.35	.014	9–64– .140
6	.203	.676	.162	.192	9.73	.016	5–32– .156
7	.180	.600	.144	.177	8.03	.017	11–64– .172
8	.165	.550	.128	.162	6.96	.019	3–16– .187
9	.148	.493	.114	.148	5.08	.022	13–64– .203
10	.134	.446	.102	.135	4.83	.024	7–32– .219
11	.120	.400	.091	.120	3.82	.027	15–64– .234
12	.109	.363	.081	.105	2.92	.029	1– 4– .250
13	.095	.316	.072	.092	2.24	.030	9–32– .281
14	.083	.276	.064	.080	1.69	.032	5–16– .312
15	.072	.240	.057	.072	1.37	.034	11–32– .344
16	.065	.217	.051	.063	1.05	.036	3– 8– .375
17	.058	.193	.045	.054	.77	.038	13–32– .406
18	.049	.165	.040	.047	.58	.040	7–16– .437
19	.042	.140	.036	.041	.45	.042	15–32– .469
20	.035	.117	.032	.035	.32	.044	1– 2– .500
21	.032	.107	.028	.032	.27	.046	17–52– .531
22	.028	.093	.025	.028	.21	.048	9–16– .562
23	.025	.083	.023	.025	.175	.050	19–32– .594
24	.022	.073	.020	.023	.140	.054	5– 8– .625
25	.020	.067	.018	.020	.116	.058	21–32– .656
26	.018	.060	.016	.018	.093	.062	11–16– .688
27	.016	.053	.014	.017	.083	.066	23–32– .718
28	.014	.047	.0125	.016	.074	.070	3– 4– .750
29	.013	.044	.011	.015	.061	.074	25–32– .781
30	.012	.040	.010	.014	.054	.078	13–16– .812
31	.010	.0333	.009	.0135	.050	.082	27–32 - .844
32	.009	.0300	.008	.013	.046	.086	7– 8– .875
33	.008	.0266	.007	.011	.037	.090	29–32– .906
34	.007	.0233	.0063	.010	.030	.094	15–16– .937
35	.005	.0167	.0056	.0095	.025	.098	31–32– .969
36	.004	.0133	.005	.009	.021	.102	1– –1.000

WATERBURY STEEL MUSIC WIRE

Grades

WHITE LABEL
RED LABEL
BLUE LABEL
BROWN LABEL
GREEN LABEL

Brick Cutting Wires

Looped and soldered; 7 to 9 gauge, 8 to 12 inches in length.

Looped and soldered; 12 to 19 gauge, 12 to 20 inches in length.

Odd sizes of special length; prices quoted on application.

Explanation of Grades

WHITE LABEL MUSIC WIRE is made and intended for Springs.

BLUE LABEL, for Musical Instruments, will swage and loop; this wire has a very high breaking strain.

RED LABEL, for cutting wires, mild in temper; will swage and loop. Is used principally for soap, dough, butter and brick tile cutting, also silk mills, and in fact for all cutting purposes.

BROWN LABEL is used for treble strings on pianos; spinning wire and short bend springs.

GREEN LABEL is a mild-tempered wire for dental and surgical instruments.

Trade Requirements

Generally put up as follows:

HARDWARE TRADE, 1 pound coils.

PIANO TRADE, 5 pound coils.

Or, special packages, ¼ to ½ pound in coils, or 1, 5, 25-pound spools.

Tinned wire is charged at an advance of 10%. Special packages of ¼ to ½ pound in coils, 10% is added to net price. When put up on spools, 20% is added to price. No charge, however, is made for the spool.

If special packages are required, other than noted above, advise and we will quote prices on application.

Waterbury Music Wire for strength, uniformity, tone, quality and every known requisite for a perfect wire is without a superior. Aside from its use for musical instruments, it will be found most satisfactory for electrical work, extension and compression springs, helical and spiral springs, knitting and weaving machinery, carpet sweepers, toys, calculation machines, automatic machines of all kinds and divers other uses. Uniformity of stock, temper and accurate drawing make Waterbury Wire—the peer of music spring wire. See list on succeeding page.

STEEL MUSIC WIRE

Music Wire Gauge No.	Decimal Diameter	Sectional Area	No. of Feet in 1 Pound	Weight Pounds Per 100 Feet
45	.160	.0201062	14.2	7.01
44	.153	.0183854	16.6	6.41
43	.146	.0167415	17	5.84
42	.139	.0151747	18.5	5.29
41	.132	.0136848	21	4.77
40	.125	.0122718	23	4.28
39	.118	.0109359	26	3.81
38	.112	.0098520	29	3.43
37	.106	.0088250	32	3.07
36	.102	.0081710	35	2.85
35	.098	.0075430	38	2.63
34	.094	.0069398	41	2.42
33	.090	.0063617	45	2.22
32	.086	.0054106	49	2.02
31	.082	.0052810	54	1.84
30	.078	.0047784	60	1.66
29	.074	.0043009	66	1.5
28	.071	.0039592	72	1.38
27	.067	.0035257	81	1.23
26	.063	.0031173	.92	1.08
25	.059	.0027340	105	.95
24	.055	.0023758	121	.82
23	.051	.0020428	140	.71
22	.048	.0018095	158	.63
21	.046	.0016619	172	.58
20	.044	.0015205	188	.53
19	.042	.0013854	208	.48
18	.040	.0012566	232	.43
17	.038	.0011341	256	.39
16	.036	.0010179	285	.35
15	.034	.0009079	322	.31
14	.032	.0008042	357	.28
13	.030	.0007069	406	.246
12	.028	.0006158	467	.214
11	.026	.0005309	540	.185
10	.024	.0004524	636	.157
9	.022	.0003801	757	.132
8	.020	.0003142	917	.109
7	.018	.0002545	1136	.088
6	.016	.0002011	1428	.070
5	014	.0001539	1886	.053
4	.013	.0001327	2170	.046
3	.012	.0001131	2560	.039
2	.011	.0000950	3033	.033
1	.010	.0000785	3700	.027
1/0	.009	.0000636	4545	.022
2/0	.0085	.0000567	5263	.019
3/0	.008	.0000503	5714	.0175
4/0	.0075	.0000442	6493	.0154
5/0	.007	.0000385	7462	.0134
6/0	.0065	.0000332	8697	.0115
7/0	.006	.0000283	10204	.0098
8/0	.0055	.0000237	12048	.0083
9/0	.005	.0000196	14705	.0069

METRIC DENOMINATIONS AND EQUIVALENTS

One (1) Millimetre equals..... 0.03937 inch
One (1) Metre equals.....39.37 inches
One (1) Metre equals..... 3.28083 Feet
One (1) Metre equals..... 1.093611 Yards
One (1) Kilometre equals..... 0.62137 Mile
One (1) Inch equals..... 2.54 Centimetres
One (1) Foot equals..... 0.304801 Metre
One (1) Yard equals..... 0.914402 Metre
One (1) Mile equals..... 1.60935 Kilometres
One (1) Square Centimetre equals..... 0.155 Square Inch
One (1) Square Metre equals....10.764 Square Feet
One (1) Square Metre equals.... 1.196 Square Yards
One (1) Cubic Metre equals....35.314 Cubic Feet
One (1) Cubic Foot equals..... 0.02832 Cubic Metre
One (1) Square Inch equals..... 6.452 Square Centimetres
One (1) Cubic Inch equals.....16.39 Cubic Centimetres
One (1) Square Foot equals..... 0.0929 Square Metre
One (1) Square Yard equals.... 0.836 Square Metre
One (1) Kilogram (Kilo) equals.. 2.20462 Pounds Avoirdupois
One (1) Kilogram (Kilo) equals..35.274 Ounces Avoirdupois
One (1) Centigram equals..... 0.1543 Grain
One (1) Metric Ton equals..... 0.9842 Long Ton
One (1) Long Ton, 2240 lbs., equals 1.0161 Metric Tons
One (1) Ton, 2000 lbs., equals .. 0.9072 Metric Ton
One (1) Grain equals..... 6.4799 Centigrams
One (1) Ounce equals.....28.3495 Grams
One (1) Pound Avoirdupois equals..... 0.45359 Kilogram
One (1) Gram equals.....15.432 Grains

Cubic Measure, 1728 Cubic Inches equals 1 Cubic Foot

Cubic Measure, 27 Cubic Feet equals 1 Cubic Yard

Square Measure, 144 Square Inches equals 1 Square Foot

Square Measure, 9 Square Feet equals 1 Square Yard

Kilograms (Kilo) per Square M/M x 1422.31 equals pounds per Square Inch

Kilograms (Kilo) per Square Centimetre x 14.2231 equals pounds per Square Inch

Square Millimetre x .00155 Square Inches

Millimeters ÷ 25.4 equals Inches

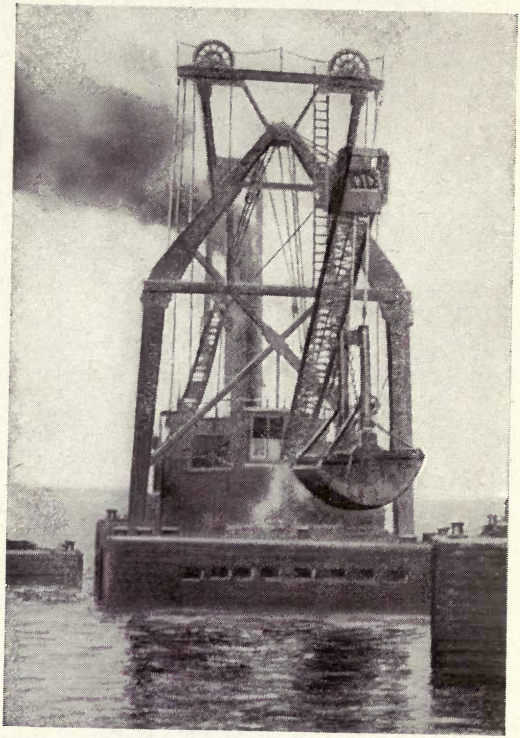
Kilometres x 3280.7 equals Feet

One (1) Kilogram equals 0.001102 Ton (2000 lbs.)

WATERBURY
ARMORED ROPE

GORE PATENT, MARCH 14, 1911

Trade Mark
Reg. U. S. Pat. Office

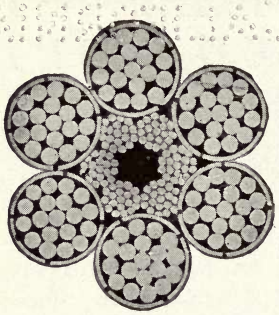


This great Dredge of the Packard Company, the largest operating in New York Harbor, is equipped throughout with Waterbury Armored Rope.

WATERBURY ARMORED ROPE

THE tensile strength of wire rope of standard construction begins to decrease immediately it is put into service. This deterioration is frequently quite rapid, especially when the ropes are used on outdoor work where they are subjected to sudden changes in atmospheric conditions and to the abrasive action of gritty substances, such as sand, pulverized rock, coal dust, etc.

Waterbury Armored Rope (Gore Patent) embodies the first radical and important improvement in wire rope construction in many years. Each strand of the rope is wound with flat steel wire having convex edges and this forms a protective armor

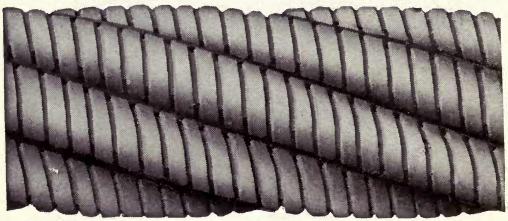


End showing wire center

which relieves the tensile strength wires of all abrasive wear and retains intact the strength of the rope until after these flat wires have been worn completely through.

The experience of many users of Waterbury Armored Rope in various lines of work has demonstrated that its life is from two to three times that of similar quality rope of standard construction.

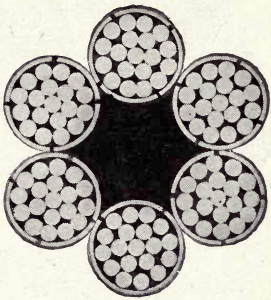
The detail of Waterbury Armored Rope construction which makes it a practical rope for hoisting and haulage is the convex edges of the armor wires. These convex edges permit the flexing of the rope without



Cut shows serving of flat wires having convex edges.

any creeping of the armor wires.

For severe usage in hoisting and haulage equipments, dredging, steam shovel service and other general uses, it is far superior to the ordinary rope of bare wire construction.

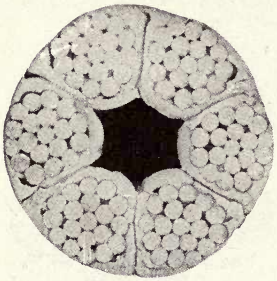


End showing hemp center.

Composed of 6 strands, 19 wires to the strand; 6 strands, 37 wires to each strand, or 6 strands, 61 wires to each strand, with hemp center or wire center as the conditions may demand, each strand being covered or wound with flat wires having convex edges. (Other constructions can be made to order.)

The object of flat wire serving is to take abrasion on crown of strands from the tensile strength wires, also at the point the strand adjoins and wires converge and chafe during flexing movement.

The life of this rope is materially lengthened, this increase ranging from 50 to 150 per cent according to conditions. The working life of the sheave grooves is main-



End view of worn rope.
No broken wires.

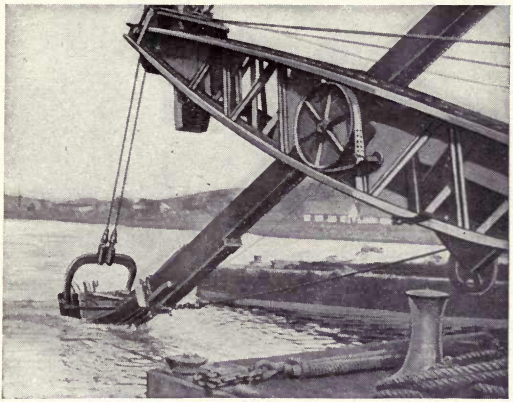
tained longer as the rope wearing to a smooth surface does not change the score of the sheaves or drums.

The flat wires when worn through do not project, but are pushed down into the interstices of the rope, thus giving a greater wearing surface than is ordinarily obtained.

Note in the illustration that the flat wires are held transversely to the axis of rope so that the same do not affect its flexibility.

The initial factor of safety is maintained longer in Waterbury Armored Wire Rope (Gore Patent), than in any other construc-

Side view of worn rope.

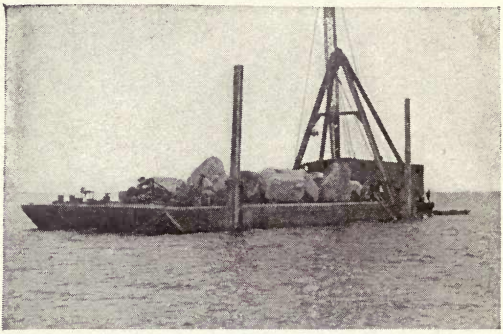


This big Dipper Dredge in service on the Pacific Coast is equipped with Waterbury Armored Rope.

tion. The strands are intended to take all the strains to which the rope is ordinarily subjected, and the flat wire covering is merely for the purpose of protecting the tensile strength wires from abrasion and exposure and to assist the strands in retaining grease for internal lubrication.

An important factor is the lack of internal friction between the strands themselves, for in bending, it is impossible for the flat wires to interlock, which is the failing of the ordinary construction.

Another advantage is found in the fact that it is possible to use a wire rope core, or,



On Floating Derricks and similar apparatus, Waterbury Armored Rope will be found exceedingly economical.

in other words, a wire rope within a wire rope as chafing between the inner rope and the outer or covering rope is absolutely prevented by the flat wires.

The extraordinary flexibility to be had from this construction, taking the breaking strain into consideration, has to be seen and tried to be appreciated.

The flat wires are rolled from a special cold drawn acid open hearth round wire which leaves the edges convex and prevents the wire crowding during the bending of the rope.

Waterbury Armored Rope is especially suited for Steam Shovel Work. On machines of the kind shown above, it shows superior wearing qualities.

Users of this rope find that after outlasting the ordinary rope the flat wires are then just beginning to pack into the interstices, thereby greatly increasing the outside wearing surface. It is from this point on to its total destruction that the Waterbury Armored Wire Rope (Gore Patent) shows its fine wearing qualities.

Where extra flexibility is required in the larger sizes of rope, we are prepared to furnish rope with a greater number of wires to each strand. The score of sheaves should be based on the outside diameter of rope.

This Bucyrus Drag Line Steam Caterpillar is equipped with Waterbury Armored Rope. For machines of this kind no other rope will give equal service.

In splicing Waterbury Armored Wire Rope (Gore Patent), follow the same rule as you would in splicing rope of Standard Construction. Bind the ends and tuck them in as you would following splicing of ordinary wire rope.

Lubricate ropes frequently. A suitable lubricant will add life to rope, will prevent internal and external rust, will keep rope pliable.

A few of the many kinds of work in which Waterbury Armored Rope has been used with great success.

Hoisting

Haulage

Logging

Dredging

Shovel Work

Pile Drivers

Saw Mill Carriages

Coal Hoists

Quarry Work

Sand Handling Equipment

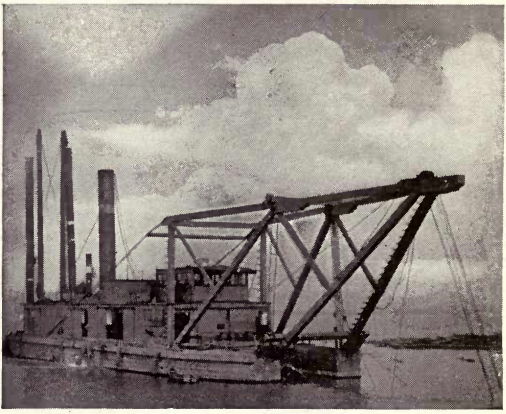
Derricks

Drag Line Excavators

Tower Scrapers

Excavators

Reclamation Work



IN RIVER AND HARBOR WORK

THE experience of the American Dredging Company, of California, with Waterbury Armored Rope is given below:

"The Waterbury Armored Wire Rope that we purchased from you last year, has proven everything you claimed for it, and we are more than satisfied with the service we have gotten out of it.

Since ordering the first piece, we have equipped all of our dredges with the Waterbury Armored Rope and although we have given it the severest kinds of tests, it has stood up beyond our expectations.

We have decided to specify Waterbury Armored Rope on all our future orders, and—to borrow the expression—'We won't be happy until we get it.'"

CRUCIBLE CAST STEEL

WATERBURY ARMORED WIRE ROPE

Gore Patent, March 14, 1911

6 Strands, 19 Wires to Strand, 1 Hemp Core

The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B–S in Net Tons	App. Wkg. Load in Net Tons	List Price Per Ft.
½	x ⅝	.64	8.4	1.68	**$0.26**
⅝	x ¾	1.05	12.5	2.5	**.30**
¾	x ⅞	1.40	17.5	3.5	**.36**
⅞	x 1	1.66	23	4.6	**.41**
1	x 1⅛	2.23	30	6	**.49**
1⅛	x 1¼	2.75	38	7.6	**.57**
1¼	x 1⅜	3.35	47	9.4	**.67**
1⅜	x 1½	3.99	56	11.2	**.78**
1½	x 1⅝	4.66	64	12.8	**.89**
1⅝	x 1¾	5.39	72	14.4	**1.01**
1¾	x 1⅞	6.05	85	17	**1.16**
1⅞	x 2	7.01	96	19	**1.29**
2	x 2¼	7.82	106	21.2	**1.56**

Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

SIZES NOT LISTED or other constructions for special conditions can be made to order.

Consult us in your efforts to solve Rope problems.

IN RECLAMATION SERVICE

STERNBERG BROTHERS, of Pine Bluff, Ark., contractors, making a specialty of swamp land reclamation have used Waterbury Armored Rope in this work, and their opinion of it follows:

"With reference to your 1⅛-inch Waterbury Armored rope which was used on our 2½-yard Marion dredge the results obtained have more than met with our expectations.

Your first rope was put in service February 10th, and was used continuously until April 21st, having excavated sixty-eight stations with fifty-five foot bottom width, some of which was twenty-four feet deep and approximately one hundred and sixty thousand yards of hard material.

This is more than double the service of other ropes we have used under exactly the same conditions, and we are satisfied that you have made good your guarantee of service in every respect."

EXTRA STRONG CRUCIBLE CAST STEEL

WATERBURY ARMORED WIRE ROPE

Gore Patent, March 14, 1911

6 Strands, 19 Wires to Strand, 1 Hemp Core

The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B–S in Net Tons	App. Wkg. Load in Net Tons	List Price Per Ft.
1/2	x 5/8	.64	9.2	1.84	**$0.27**
5/8	x 3/4	1.05	14	2.80	**.32**
3/4	x 7/8	1.40	20.2	4.04	**.39**
7/8	x 1	1.66	26	5.20	**.46**
1	x 1 1/8	2.23	34	6.80	**.55**
1 1/8	x 1 1/4	2.75	43	8.60	**.65**
1 1/4	x 1 3/8	3.35	53	10.60	**.77**
1 3/8	x 1 1/2	3.99	64	12.80	**.90**
1 1/2	x 1 5/8	4.66	73	14.60	**1.03**
1 5/8	x 1 3/4	5.39	83	16.60	**1.18**
1 3/4	x 1 7/8	6.05	99	19.80	**1.36**
1 7/8	x 2	7.01	112	22.4	**1.52**
2	x 2 1/4	7.82	123	24.6	**1.74**

Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

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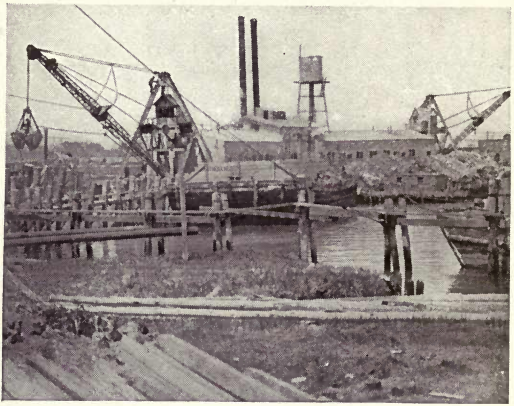
Consult us in your efforts to solve Rope problems.



IN EXCAVATING WORK

ON Skid Excavators, Dredges and other types of machines using digging buckets Waterbury Armored Rope has given remarkable service. As shown in the following testimonial, the Borough Development Company of New York specify it for their work.

"We are about to construct in the City of Boston a large ash destructing plant and a garbage plant, and we take pleasure in informing you that we have included in our specification that all wire rope to be used in these plants must be Waterbury Armor Clad Rope.

We take this action because your rope has given us excellent satisfaction."

PLOW STEEL

WATERBURY ARMORED WIRE ROPE

Gore Patent, March 14, 1911

6 Strands, 19 Wires to Strand, 1 Hemp Core

The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B–S in Net Tons	App. Wkg. Load in Net Tons	List Price Per Ft.
1/2	5/8	.64	10	2	**$0.29**
5/8	3/4	1.05	15.5	3.1	**.35**
3/4	7/8	1.40	23	4.6	**.43**
7/8	1	1.66	29	5.8	**.51**
1	1 1/8	2.23	38	7.6	**.61**
1 1/8	1 1/4	2.75	47	9.4	**.73**
1 1/4	1 3/8	3.35	58	12	**.86**
1 3/8	1 1/2	3.99	72	14	**1.01**
1 1/2	1 5/8	4.66	82	16	**1.16**
1 5/8	1 3/4	5.39	94	19	**1.32**
1 3/4	1 7/8	6.05	112	22	**1.56**
1 7/8	2	7.01	127	25	**1.73**
2	2 1/4	7.82	140	28	**1.98**

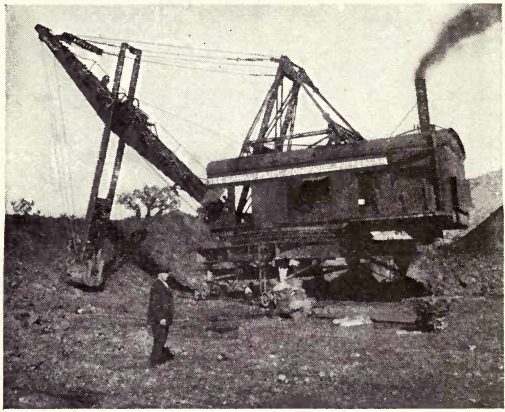
Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

SIZES NOT LISTED or other constructions for special conditions can be made to order.

Consult us in your efforts to solve Rope problems.



IN STRIPPING COAL LAND

IN this severe service the Oak Ridge Coal Company, M. E. Mogg, President, testify in the following letter to the satisfaction they have obtained from Waterbury Armored Rope:

"We have been using your Gore Patent Armored Rope on our 175-B for the past four or five months and will say that it is giving us excellent satisfaction. We have been able to get twice as many hours out of this rope on our large Bucyrus shovel as any other cable we have been able to obtain."

GIANT IMPROVED PLOW STEEL

WATERBURY ARMORED WIRE ROPE

Gore Patent, March 14, 1911

6 Strands, 19 Wires to Strand, 1 Hemp Core

The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B-S in Net Tons	App. Wkg. Load in Net Tons	List Price Per Ft.
1/2	x 5/8	.64	12.1	2.4	**$0.32**
5/8	x 3/4	1.05	19	3.8	**.38**
3/4	x 7/8	1.40	26.3	5.3	**.48**
7/8	x 1	1.66	35	7	**.56**
1	x 1 1/8	2.23	45	9	**.68**
1 1/8	x 1 1/4	2.75	56	11	**.81**
1 1/4	x 1 3/8	3.35	69	14	**.96**
1 3/8	x 1 1/2	3.99	84	17	**1.12**
1 1/2	x 1 5/8	4.66	98	20	**1.33**
1 5/8	x 1 3/4	5.39	110	22	**1.54**
1 3/4	x 1 7/8	6.05	133	27	**1.86**
1 7/8	x 2	7.01	150	30	**2.02**
2	x 2 1/4	7.82	166	33	**2.25**

Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

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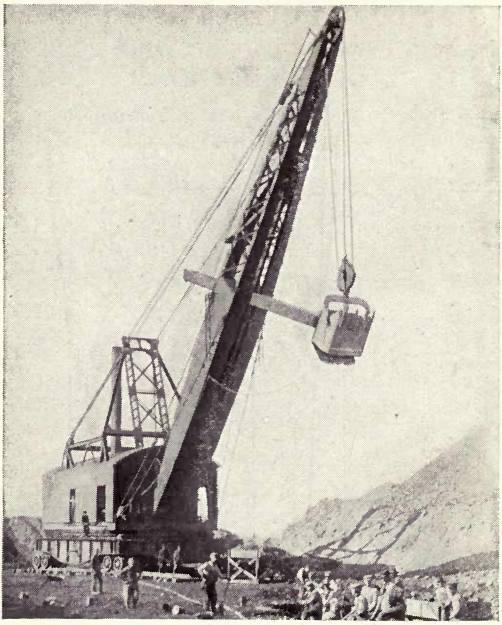


IN DIGGING HARD SHALE

THE Whitmer Contracting Company, Pittsburg, Kan., write of the Waterbury Armored Rope used on their Marion Shovel:

"It has beaten the best records in this field on both yardage and length of service. Another make of cable was put on October 1st, and broke November 19th. It moved 54,000 cu. yds. of material. The Waterbury Armored Rope was put on November 19th, and up to the middle of December handled 151,000 cu. yds. This is equivalent to at least three times the yardage in any other strip pit in this vicinity."

CRUCIBLE CAST STEEL

WATERBURY ARMORED WIRE ROPE

Gore Patent, March 14, 1911

6 Strands, 37 Wires to Strand, 1 Hemp Core

The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B–S in Net Tons	App. Wkg. Load in Net Tons	List Price Per Ft.
7/8	x 1	1.66	23	5	**$0.45**
1	x 1 1/8	2.23	29	6	**.55**
1 1/8	x 1 1/4	2.75	34	7	**.65**
1 1/4	x 1 3/8	3.35	45	9	**.76**
1 3/8	x 1 1/2	3.99	55	11	**.87**
1 1/2	x 1 5/8	4.66	63	12	**1.02**
1 5/8	x 1 3/4	5.39	71	14	**1.13**
1 3/4	x 1 7/8	6.05	84	19	**1.31**
1 7/8	x 2	7.01	95	21	**1.47**
2	x 2 1/4	7.82	105	21	**1.75**
2 1/4	x 2 1/2	10.03	125	25	**2.10**

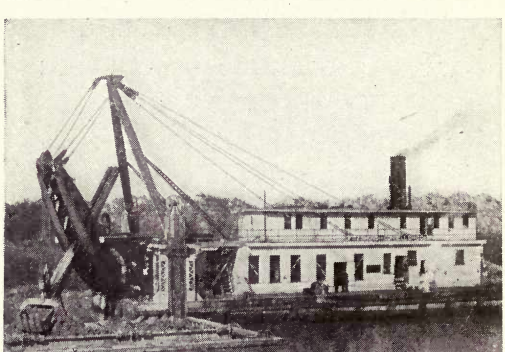
Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

SIZES NOT LISTED or other constructions for special conditions can be made to order.

Consult us in your efforts to solve Rope problems.



IN DIPPER DREDGE WORK

EVERY engineer and contractor who has had experience in this class of work knows that it is a severe test of rope quality. The Fitz Simons & Connell Dredge & Dock Company of Chicago operate many large dipper dredges, and the following is their statement in regard to Waterbury Armored Rope:

"We have been using on our No. 6 dredge during the season of 1914 one of your 'Gore' construction 1¾ inch hoisting cables. This rope has been in service for about 867 actual working hours and during that time has handled about 165,000 cu. yds. of material. At this writing the rope is still in use.

We write this to give you an idea of the service we are getting from Waterbury Armored Wire Rope."

EXTRA STRONG CRUCIBLE CAST STEEL

WATERBURY ARMORED WIRE ROPE

Gore Patent, March 14, 1911

6 Strands, 37 Wires to Strand, 1 Hemp Core

The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B–S in Net Tons	App. Wkg. Load in Net Tons	List Price Per Ft.
7/8	x 1	1.66	25	5	**$0.51**
1	x 1 1/8	2.23	32	6.4	**.62**
1 1/8	x 1 1/4	2.75	39	8	**.74**
1 1/4	x 1 3/8	3.35	50	10	**.86**
1 3/8	x 1 1/2	3.99	61	12	**1.00**
1 1/2	x 1 5/8	4.66	71	14	**1.18**
1 5/8	x 1 3/4	5.39	79	16	**1.31**
1 3/4	x 1 7/8	6.05	95	19	**1.54**
1 7/8	x 2	7.01	106	21	**1.68**
2	x 2 1/4	7.82	117	23	**1.95**
2 1/4	x 2 1/2	10.03	150	30	**2.40**

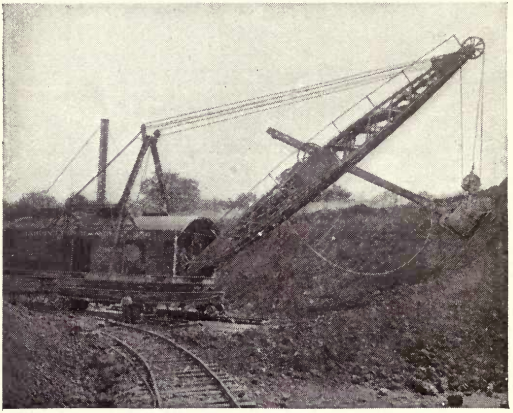
Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

SIZES NOT LISTED or other constructions for special conditions can be made to order.

Consult us in your efforts to solve Rope problems.



IN STEAM SHOVEL WORK

THIS is another service in which wire ropes are subjected to unusual strains and wear. The dust and grit raised in digging operations of this character is exceptionally hard on ropes. The Clay Products Company of Brazil, Indiana, is using Waterbury Armored Rope on their shovels with the result described by them, as follows:

"Referring to your favor of November 22d. Please be advised that your 1 x 1⅛ Gore Construction Rope is giving us about 120 days' service against 60 to 80 days' service from an ordinary wire cable. We find it a very satisfactory cable and are using the same construction of rope on our smaller shovels to as good an advantage as the larger rope is giving."

PLOW STEEL

WATERBURY ARMORED WIRE ROPE

Gore Patent, March 14, 1911

6 Strands, 37 Wires to Strand, 1 Hemp Core

The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B-S in Net Tons	App. Wkg. Load in Net Tons	List Price Per Ft.
7/8	x 1	1.66	27	5	**$0.57**
1	x 1 1/8	2.23	35	7	**.69**
1 1/8	x 1 1/4	2.75	44	9	**.83**
1 1/4	x 1 3/8	3.35	55	11	**.96**
1 3/8	x 1 1/2	3.99	68	14	**1.13**
1 1/2	x 1 5/8	4.66	80	16	**1.33**
1 5/8	x 1 3/4	5.39	90	18	**1.49**
1 3/4	x 1 7/8	6.05	108	22	**1.76**
1 7/8	x 2	7.01	119	24	**1.92**
2	x 2 1/4	7.82	130	26	**2.20**
2 1/4	x 2 1/2	10.03	175	35	**2.70**

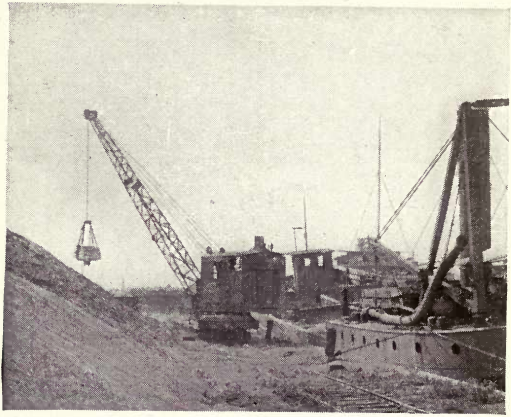
Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

SIZES NOT LISTED or other constructions for special conditions can be made to order.

Consult us in your efforts to solve Rope problems.



IN SAND HANDLING WORK

THE abrasive wear upon ropes used with machines for handling this class of material is probably as great, if not greater, than with any other. The Lake Sand Company of Chicago have installed Waterbury Armored Rope on all of their shovels, and the following is a statement of their experience with it:

"It gives us great pleasure in recommending this rope, as we have found it greatly superior to all other ropes used by us, having performed more work than any two, and sometimes three, of the best ropes previously used."

GIANT IMPROVED PLOW STEEL

WATERBURY ARMORED WIRE ROPE

Gore Patent, March 14, 1911

6 Strands, 37 Wires to Strand, 1 Hemp Core

The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B–S in Net Tons	App.Wkg. Load in Net Tons	List Price Per Ft.
7/8	x 1	1.66	29	5.8	**$0.63**
1	x 1 1/8	2.23	37	7.4	**.77**
1 1/8	x 1 1/4	2.75	46	9.2	**.94**
1 1/4	x 1 3/8	3.35	58	11	**1.07**
1 3/8	x 1 1/2	3.99	71	14	**1.27**
1 1/2	x 1 5/8	4.66	84	17	**1.48**
1 5/8	x 1 3/4	5.39	95	19	**1.69**
1 3/4	x 1 7/8	6.05	113	23	**2.01**
1 7/8	x 2	7.01	125	25	**2.19**
2	x 2 1/4	7.82	137	27	**2.50**
2 1/4	x 2 1/2	10.03	184	37	**3.00**

Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

SIZES NOT LISTED or other constructions for special conditions can be made to order.

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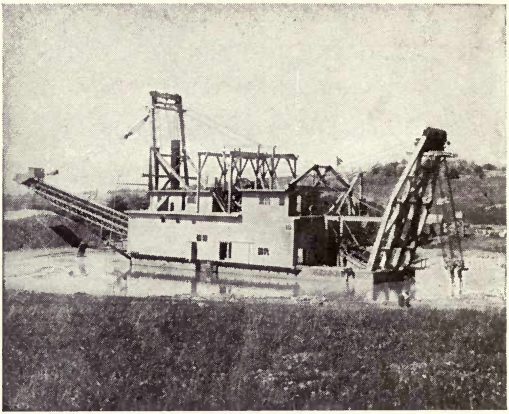


IN GOLD DREDGE WORK

THE following experience of the El Oro Dredging Company with Waterbury Armored Rope requires no additional comment:

"We used as a side-line on a large dredge 650 feet of 7/8-inch rope of high grade and from one of the large manufacturers, which lasted 183 days. We replaced this with 650 feet of 3/4-inch crucible steel Waterbury Armored Rope furnished by you, and at this writing it has been in service 254 days and we have no present intention of taking it out.

"In other words, it has already given us twice the service of the other rope for each dollar of cost and we are not through with it."

SPECIAL FLEXIBLE
WATERBURY ARMORED WIRE ROPE
Gore Patent, March 14, 1911
CRUCIBLE CAST STEEL
6 Strands, 61 Wires to Strand, 1 Hemp Core
The Score of Sheaves should be based on the outside diameter of Rope

Diameter Inside	Diameter Outside	Approx. Weight Per Ft.	Approx. B–S in Net Tons	App. Wkg. Load in Net Tons	List Price Per Ft.
2½	x 2¾	11.73	170	34	**$2.71**
2⅝	x 2⅞	13.17	190	38	....
2¾	x 3	14.23	215	43	**3.23**
2⅞	x 3⅛	15.48	243	48	....
3	x 3¼	16.81	270	54	**3.90**
EXTRA STRONG CRUCIBLE CAST STEEL					
2½	x 2¾	11.73	200	40	**$3.18**
2⅝	x 2⅞	13.17	220	44	....
2¾	x 3	14.23	243	48.6	**3.78**
2⅞	x 3⅛	15.48	274	54.8	....
3	x 3¼	16.81	305	61	**4.55**
PLOW STEEL					
2½	x 2¾	11.73	229	45.8	**$3.62**
2⅝	x 2⅞	13.17	250	50	....
2¾	x 3	14.23	275	55	**4.33**
2⅞	x 3⅛	15.48	305	61	....
3	x 3¼	16.81	340	68	**5.10**

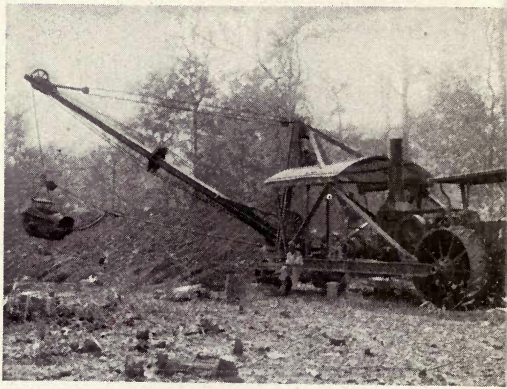
Add 10 per cent to above list prices for Wire Center.

When ordering, always state inside and outside diameter of rope. Inside being diameter of bare rope and denotes the strength of rope, while outside diameter represents the finished rope, after all strands are served.

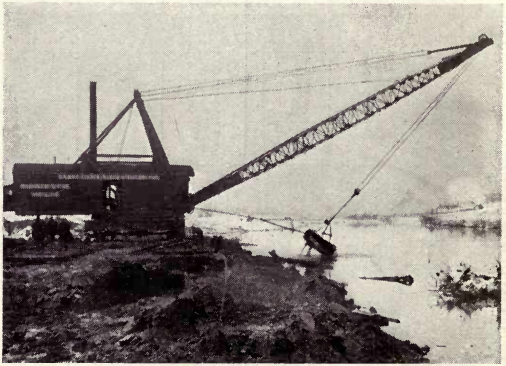
The finished, i. e., outside diameter of Waterbury Armored Rope should always be used when considering size of grooves in sheaves or drum.

SIZES NOT LISTED or other constructions for special conditions can be made to order.

Consult us in your efforts to solve Rope problems.



This Turner Traction Drag Line Ditcher is provided with Waterbury Armored Rope, in which service it has given perfect satisfaction.

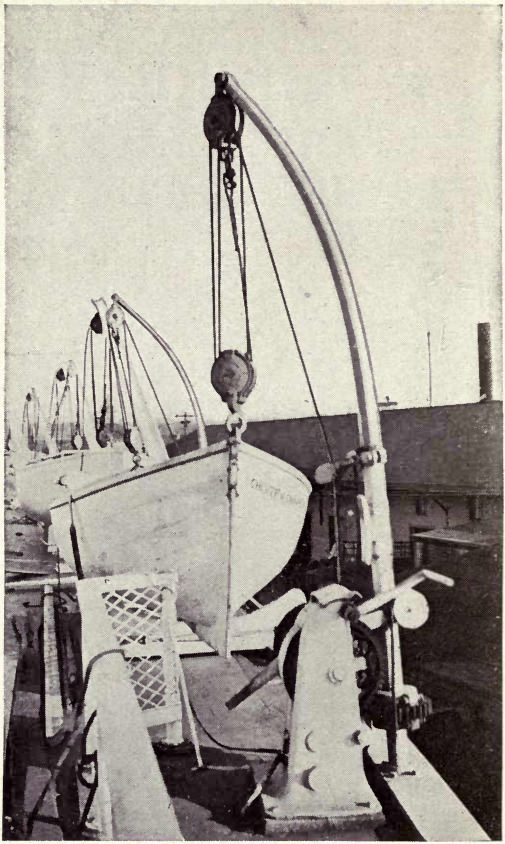


Waterbury Armored Rope is well adapted for excavating machines such as the Marion Excavator shown above.

WATERBURY
FIBRECLAD
WIRE ROPE

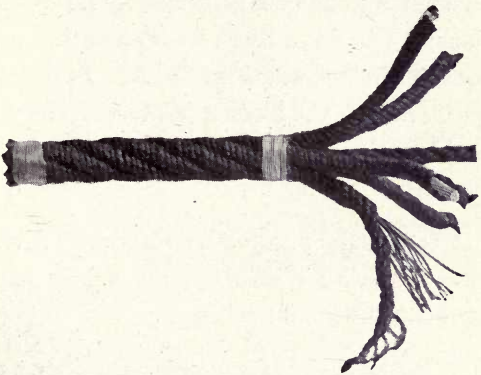
WATERBURY
FOUNDED
1816

Trade Mark
Reg. U. S. Pat. Office



The boat falls of the New England Steamship Company's vessels are provided with Waterbury Fibreclad Rope

WATERBURY
FIBRECLAD WIRE ROPE



WATERBURY Fibreclad Wire Rope is a wire rope each strand of which is served with the best grade of tarred Russian Hemp Marline. This fibre covering prevents the chafing and wear of the wire strands during flexing movements, and after being in service a short time this fibre covering packs into the interstices of the strands resulting in a rope having a smooth cylindrical surface.

The tarred Marline covering also protects the wire strands of the rope from moisture or water, eliminating the possibility of rust and also preventing foreign matter such as coal or cement, dust, gases and fumes, etc., from working through to the wire strands.

Unlike Manila Rope, Fibreclad is unaffected by changes in atmospheric conditions; it will not stretch in dry weather nor contract in wet weather. Manila Rope will swell and jam the blocks. Waterbury Fibreclad Rope will not swell or jam nor ice up in freezing weather.

A few of the many advantages of Waterbury Fibreclad Wire Rope are briefly enumerated on the following page.

STRENGTH is far greater than that of Manila Rope of the same size. Fibreclad is about ⅓ the diameter of Manila Rope of the same strength, permitting the use of smaller blocks, reducing expense and improving appearance.

WEIGHT is 50 per cent less than that of Manila of the same strength.

FLEXIBILITY — Fibreclad will coil down as readily as Manila Rope.

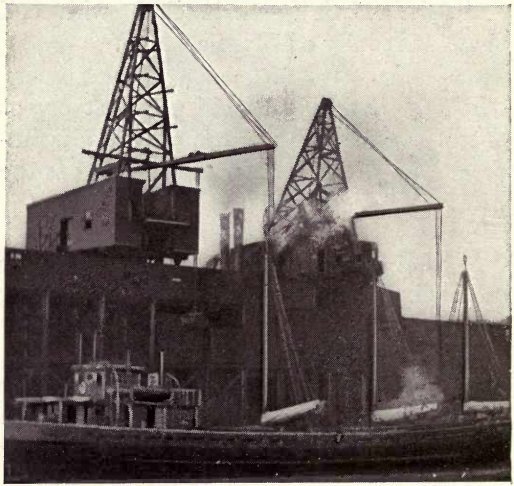
RUST-PROOF—It will not rust or rot out in service as the fibre covering is impregnated with lubricant and preserves the wire.

WEAR—It will outwear either bare wire or Manila Rope under all ordinary working conditions.

HANDLING—As the wires are fibre covered it is more easily handled than wire rope of standard construction and it is less cumbersome than Manila.

SPLICING—A Fibreclad wire rope may be spliced in the same manner as a bare wire rope except that the ends of the strands should be served with hard cotton of small diameter or bound with tape to prevent the Marline covering from stripping or coming off.

The same process should be followed in splicing 5 strand as in the case of 6 strand bare wire rope, keeping in mind, however, that it is necessary that the ends be firmly bound or served to prevent stripping.

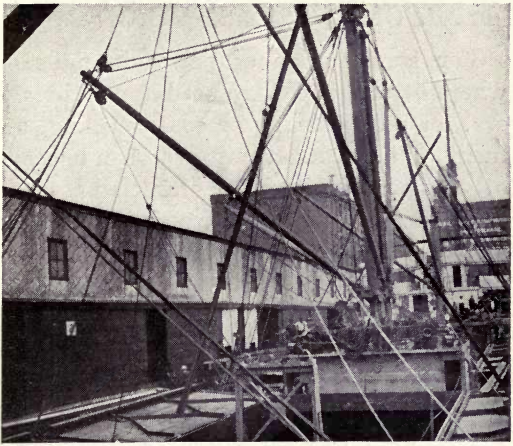


In hoisting work of every character Waterbury Fibreclad Wire Rope gives unusually long service.

GRADES—It is made in all grades of iron and steel.

COST—As it wears longer the ultimate cost is lower than that of either plain wire or Manila rope.

During years of service Waterbury Fibreclad Wire Rope has proven superior for many rope purposes including: cargo falls, boom lifts, topping lifts, boat falls, whips, pennants, breast lines, tiller ropes, anchor



The 9000 ton sistherships "Atlantic" and "Pacific" are equipped throughout with Waterbury Fibreclad Wire Rope

ropes, hawsers, vangs, slings, towing lines, guys and rigging in general, coal breakers, coal washing machinery, pile drivers, oyster dredges, crane falls on wrecking cars, hoisting and power transmission.

It is now being used extensively by the U. S. Government, shipbuilders, power plants, stevedoring, towing and transportation companies. If you will advise us of your requirements we will gladly submit samples and full information.

FIBRECLAD TRANSMISSION ROPE

For transmission of power in mills or where driving ropes are used in coal breakers, for coal washing or coal crushing, cement mills, cotton mills and numerous other places, Waterbury Fibreclad Rope is superior to either bare wire or manila rope as it combines the advantages of both and has none of their disadvantages. This rope is also particularly desirable for hoisting and other general uses.

It will work admirably on either English or American systems; sheaves need not be changed; is not affected by weather or moisture; will not rust as the Marline covering affords perfect protection. The Marline also retains a sufficient amount of lubrication to preserve wires for a long period of time. Fibreclad has great flexibility and high efficiency, unlimited capacity and the maximum of strength. The coefficient of friction of Fibreclad is such that V-shaped grooves are not essential, although more lasting results follow when ample contact is allowed (without pinching) or when the grooves fit closely the curvature of the rope's cross section.

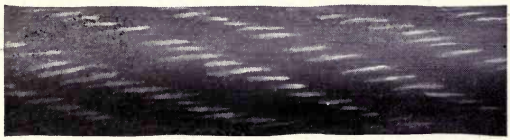
Fibreclad reduces the cost of installation, fewer wraps, hence less rope is required to

transmit the same amount of power. It does not require packed or filled sheaves, works most satisfactory without them.

Upon receipt of template of grooves of present sheaves and advice as to whether system employed is American or English, we will be glad to make recommendations.

Fibreclad wire rope will replace several manila ropes and at an ultimate less cost, hence, it is our earnest recommendation that you at least investigate the many advantages of the covered wire rope.

Cut showing Waterbury Fibreclad Rope after use



Cut showing Waterbury Fibreclad Rope after constant service and after covering has worn to the strands

INFORMATION REQUIRED

For making recommendations and submitting prices for Fibreclad Rope Drives

A. Maximum horse-power drive is to transmit.

B. Distance between centers of driving and driven shafts.

C. Speed of driving shaft (R.P.M.). Speed of driven shaft (R.P.M.).

D. Is the driving side of the rope to be top or bottom?

E. Do all shafts rotate in the same direction?

F. Are all shafts parallel? If not, give angles between them.

G. Are shafts on same level? If not, which is higher and how much?

H. Are shafts horizontal or vertical?

I. If there are any obstructions preventing direct lead from driving to driven shafts, please describe them, giving distances.

J. If power is to be taken from more than ONE SHAFT, state amount of power to be taken from EACH SHAFT.

K. How large a diameter (from face to face) sheave may be placed on driving shaft?

L. How large a diameter (from face to face) sheave may be placed on driven shaft?

M. Are solid or split sheaves desired?

N. Will rope be exposed or entirely protected?

O. Where may take-up and track be most conveniently placed?

P. If new rope only is wanted, in addition to above questions SEND TEMPLATE OF GROOVE IN PRESENT SHEAVES and kindly answer the following questions:

Size of driver sheave?
Number of grooves?
Size of driven sheave?
Number of grooves?
Size of idler sheave, if any?
Is there a loose sheave used?
Length of take-up track?
If English or American system?
Size and kind of rope now used?
Number of wraps now used?

FIBRECLAD TRANSMISSION ROPE

Crucible Cast Steel

Composed of five strands and a hemp center.
Nineteen wires to the strand.

Price per Foot	Outside Diameter in Inches	Minimum Size of Sheaves in Feet	Approximate Breaking Strain in Pounds	Average Diameter of Manila which Fibreclad Replaces in same Grooves	Average Size of Plain Wire Rope which Fibreclad Replaces
$0.22	1/2	1	4,400	3/4	3/8
.27	5/8	2	8,000	1	1/2
.34	3/4	3	14,000	1 1/4	5/8
.38	7/8	3 1/2	16,700	1 3/8	11/16
.42	1	4	20,800	1 1/2	3/4
.55	1 1/8	5	29,200	1 3/4	7/8
.66	1 1/4	6	38,300	2	1
	1 3/8	6 1/2	50,000	2 1/8	1 1/8

For price of six strand add 20 per cent to the above prices.

Following are comparative tables giving the sizes of Fibreclad which will replace manila or wire rope, and horse-power transmitted at equal velocity

TABLE OF HORSE-POWER OF FIBRECLAD TRANSMISSION ROPE, PROTECTED DRIVES

American System

Diameter of Rope in Inches	Speed of Rope in Feet per Minute									Approximate Weight per Foot	Minimum Diameter of Sheaves in Feet
	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000		
1/2	5	8	9	10	12	13	14	15	15	.27	1
5/8	9	13	18	22	25	28	31	33	35	.40	2
3/4	16	24	31	38	45	52	58	62	67	.54	3
7/8	20	30	40	49	58	66	74	80	86	.70	3 1/2
1	24	36	48	59	70	80	90	97	105	.80	4
1 1/8	35	53	69	84	100	114	128	138	148	1.12	5
1 1/4	46	69	92	114	135	159	173	188	204	1.29	6
1 3/8	...	80	105	130	160	182	205	230	250	1.66	6 1/2

To find Horse-Power which can safely be transmitted when ropes are exposed to the weather, multiply above values by .666. Rain or application of water reduces the coefficient of friction, but in no other way affects the rope.

TABLE OF HORSE-POWER OF MANILA TRANSMISSION ROPE AT VARIOUS SPEEDS

Diameter of Rope in Inches	Speed of Rope in Feet per Minute								Approximate Weight per Foot	Smallest Diameter of Sheaves in Feet
	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000		
5/8	2.3	3.2	3.6	4.2	4.6	5.0	5.3	5.3	.16	1½
3/4	3.3	4.3	5.2	5.8	6.7	7.2	7.7	7.7	.20	2½
7/8	4.5	5.9	7.0	8.2	9.1	9.8	10.8	10.7	.33	3
1	5.8	7.7	9.2	10.7	11.9	12.8	13.6	13.7	.42	3½
1 1/8	7.5	9.9	11.7	13.7	15.4	16.4	17.4	17.7	.47	4
1 1/4	9.2	12.1	14.3	16.8	18.6	20.0	21.2	21.4	.60	4½
1 3/8	11.2	15.0	17.5	19.9	22.7	24.4	25.9	26.1	.70	5
1½	13.1	17.4	20.7	23.1	26.8	28.8	30.6	30.8	.80	5
1¾	18.0	23.7	28.2	32.8	36.4	39.2	41.5	41.8	1.15	6
2	23.1	30.8	36.8	42.8	47.6	51.2	54.4	54.8	1.35	7

FIBRECLAD WIRE HOISTING ROPE

Crucible Cast Steel

Composed of five strands and a hemp center.
Nineteen wires to the strand.

Price per Foot	Diameter in Inches Before Serving	Approximate Diameter After Serving with Marline	Approximate Circumference After Serving with Marline	Approximate Breaking Strain in Tons of 2,000 Pounds	Allowable Working Strain in Tons of 2,000 Pounds	Minimum Size of Drum or Sheave in Feet	Approximate Weight per Foot in Pounds
$0.22	1/4	1/2	1 1/2	2.2	0.44	1/2	.21
	5/16	9/16	1 3/4	3.1	0.62	2/3	.26
.27	3/8	5/8	2	4.8	0.96	1	.36
	7/16	11/16	2 1/4	6.5	1.30	1 1/4	.40
.34	1/2	3/4	2 3/8	8.4	1.68	1 1/2	.49
.38	9/16	7/8	2 3/4	10.0	2.00	1 3/4	.60
.42	5/8	1	3 1/8	12.5	2.50	2 1/4	.80
.55	3/4	1 1/8	3 1/2	17.5	3.50	3	1.12
.66	7/8	1 1/4	3 7/8	23	4.60	3 1/2	1.29
.75	1	1 3/8	4 5/16	30	6.00	4	1.66
.85	1 1/8	1 1/2	4 3/4	38	7.60	4 1/2	2.07
1.04	1 1/4	1 5/8	5 1/8	47	9.4	5	2.52
1.24	1 3/8	1 3/4	5 1/2	56	11.6	5 1/2	3.06
1.45	1 1/2	1 7/8	5 7/8	64	12.8	5 3/4	3.60
1.62	1 5/8	2	6 1/4	72	14.4	6 1/4	4.19
1.85	1 3/4	2 1/8	6 5/8	85	17.0	7 1/4	4.88

For price of six strand or wire heart add 20 per cent to the above list.

For Galvanized Wire add 10 per cent to above prices.

FIBRECLAD WIRE HOISTING ROPE

Extra Strong Crucible Cast Steel

Composed of five strands and a hemp center.
Nineteen wires to the strand.

Price per Foot	Diameter in Inches Before Serving	Approximate Diameter After Serving with Marline	Approximate Circumference After Serving with Marline	Approximate Breaking Strain in Tons of 2,000 Pounds	Allowable Working Strain in Tons of 2,000 Pounds	Minimum Size of Drum or Sheave in Feet	Approximate Weight per Foot in Pounds
$0.24	1/4	1/2	1 1/2	2.43	0.49	1/2	.21
	5/16	9/16	1 3/4	3.50	0.70	2/3	.26
.30	3/8	5/8	2	5.30	1.06	1	.36
	7/16	11/16	2 1/4	7.25	1.45	1 1/4	.40
.36	1/2	3/4	2 3/8	9.2	1.84	1 1/2	.49
.42	9/16	7/8	2 3/4	11.2	2.24	1 3/4	.60
.47	5/8	1	3 1/8	14.0	2.80	2 1/4	.80
.61	3/4	1 1/8	3 1/2	20.2	4.04	3	1.12
.73	7/8	1 1/4	3 7/8	26	5.20	3 1/2	1.29
.83	1	1 3/8	4 5/16	34	6.80	4	1.66
.95	1 1/8	1 1/2	4 3/4	43	8.60	4 1/2	2.07
1.15	1 1/4	1 5/8	5 1/8	53	1.06	5	2.52
1.36	1 3/8	1 3/4	5 1/2	64	13.0	5 1/2	3.06
1.60	1 1/2	1 7/8	5 7/8	73	14.6	5 3/4	3.60
1.78	1 5/8	2	6 1/4	83	16.6	6 1/4	4.19
2.04	1 3/4	2 1/8	6 5/8	99	19.8	7 1/4	4.88

For price of six strand or wire heart add 20 per cent to the above list.

For galvanized wire add 10 per cent to above prices.

FIBRECLAD WIRE HOISTING ROPE

Plow Steel

Composed of five strands and a hemp center.
Nineteen wires to the strand.

Price per Foot	Diameter in Inches Before Serving	Approximate Diameter After Serving with Marline	Approximate Circumference After Serving with Marline	Approximate Breaking Strain in Tons of 2,000 Pounds	Allowable Working Strain in Tons of 2,000 Pounds	Minimum Size of Drum or Sheave in Feet	Approximate Weight per Foot in Pounds
$0.26	1/4	1/2	1 1/2	2.65	0.53	2/3	.21
	5/16	9/16	1 3/4	3.80	0.76	7/8	.26
.32	3/8	5/8	2	5.75	1.15	1	.36
	7/16	11/16	2 1/4	8	1.60	1 1/2	.40
.38	1/2	3/4	2 3/8	10	2.00	2	.49
.45	9/16	7/8	2 3/4	12.3	2.40	2 1/2	.60
.51	5/8	1	3 1/8	15.5	3.10	3	.80
.66	3/4	1 1/8	3 1/2	23	4.60	3 1/2	1.12
.79	7/8	1 1/4	3 7/8	29	5.80	3 3/4	1.29
.89	1	1 3/8	4 5/16	38	7.60	4 1/4	1.66
1.02	1 1/8	1 1/2	4 3/4	47	9.50	4 1/2	2.07
1.22	1 1/4	1 5/8	5 1/8	58	12	5	2.52
1.46	1 3/8	1 3/4	5 1/2	72	14	5 1/4	3.06
1.70	1 1/2	1 7/8	5 7/8	82	16	5 1/2	3.60
1.90	1 5/8	2	6 1/4	94	19	6	4.19
2.20	1 3/4	2 1/8	6 5/8	112	22	7 1/2	4.88

For price of six strand or wire heart add 20 per cent to the above list.

For galvanized wire add 10 per cent to above prices.

FIBRECLAD WIRE CABLE LAID HAWSER

Composed of five ropes, with hemp centres. Five strands to the rope, seven wires to the strand.

Crucible Cast Steel

Price per Foot	Diameter of Each Rope in Inches Before Serving	Approximate Outside Diameter of Hawser After Serving with Marline	Approximate Outside Circumference After Serving	Approximate Breaking Strain in Pounds	Approximate Weight per Foot in Pounds
$1.45	3/8	1 13/16	5 3/4	38,000	2.12
1.60	7/16	1 7/8	6	50,000	2.30
1.80	1/2	2	6 1/4	60,000	2.59
	9/16	2 5/16	7 1/4	80,000	3.20
2.45	5/8	2 5/8	8 1/4	103,000	3.80

Extra Strong Crucible Cast Steel

$1.55	3/8	1 13/16	5 3/4	42,000	2.12
1.80	7/16	1 7/8	6	56,000	2.30
2.00	1/2	2	6 1/4	67,000	2.59
	9/16	2 5/16	7 1/4	92,000	3.20
2.70	5/8	2 5/8	8 1/4	115,000	3.80

Plow Steel

$1.70	3/8	1 13/16	5 3/4	48,000	2.12
1.90	7/16	1 7/8	6	64,000	2.30
2.15	1/2	2	6 1/4	76,000	2.59
	9/16	2 5/16	7 1/4	105,000	3.20
2.90	5/8	2 5/8	8 1/4	128,000	3.80

Other constructions furnished to order.

For galvanized wire add 10 per cent to above prices.

FIBRECLAD WIRE CABLE LAID HAWSER

Composed of five ropes, with hemp centres. Five strands to the rope, nineteen wires to the strand.

Crucible Cast Steel

Price per Foot	Diameter of Each Rope in Inches Before Serving	Approximate Outside Diameter of Hawser After Serving with Marline	Approximate Outside Circumference After Serving	Approximate Breaking Strain in Pounds	Approximate Weight per Foot in Pounds
	3/8	1 13/16	5 3/4	39,000	2.12
	7/16	1 7/8	6	52,000	2.30
	1/2	2	6 1/4	62,000	2.59
	9/16	2 5/16	7 1/4	83,000	3.20
	5/8	2 5/8	8 1/4	104,000	3.80

Extra Strong Crucible Cast Steel

	3/8	1 13/16	5 3/4	43,000	2.12
	7/16	1 7/8	6	59,000	2.30
	1/2	2	6 1/4	70,000	2.59
	9/16	2 5/16	7 1/4	95,000	3.20
	5/8	2 5/8	8 1/4	119,000	3.80

Plow Steel

	3/8	1 13/16	5 3/4	49,000	2.12
	7/16	1 7/8	6	66,000	2.30
	1/2	2	6 1/4	79,000	2.59
	9/16	2 5/16	7 1/4	108,000	3.20
	5/8	2 5/8	8 1/4	135,000	3.80

Other constructions furnished to order.

For galvanized wire add 10 per cent to above prices

FIBRECLAD WIRE ROPE

Crucible Cast Steel

Composed of five strands and a hemp centre. Seven wires to the strand.

Price per Foot	Diameter in Inches Before Serving	Approximate Diameter After Serving with Marline	Approximate Circumference After Serving with Marline	Approximate Breaking Strain in Tons of 2,000 Pounds	Allowable Working Strain in Tons of 2,000 Pounds	Minimum Size of Drum or Sheave in Feet	Approximate Weight per Foot in Pounds
$0.25	3/8	5/8	2	4.6	0.92	2	.36
.30	1/2	3/4	2 3/8	7.7	1.50	2 1/2	.49
.38	5/8	1	3 1/8	13.0	2.60	3 1/2	.80
.50	3/4	1 1/8	3 1/2	18.6	3.70	4 1/2	1.12
.60	7/8	1 1/4	3 7/8	24	4.80	5	1.29
.68	1	1 3/8	4 5/16	31	6.20	5 3/4	1.66

FIBRECLAD WIRE TILLER ROPE

Composed of five strands and a hemp centre. Nineteen wires to the strand.

$0.26	1/4	9/16	1 3/4	. . .	. . .	2/3	.21
.32	3/8	5/8	2	. . .	. . .	1	.36
.38	1/2	3/4	2 3/8	. . .	. . .	2	.49
.51	5/8	1	3 1/8	. . .	. . .	3	.80
.66	3/4	1 1/8	3 1/2	. . .	. . .	3 1/2	1.12
.79	7/8	1 1/4	3 7/8	. . .	. . .	3 3/4	1.29
.89	1	1 3/8	4 5/16	. . .	. . .	4 1/4	1.66

For price of six strand or wire heart add 20 per cent to the above list.

For galvanized wire add 10 per cent to above prices.

FIBRECLAD ROPE FOR GRAIN ELEVATOR SERVICE

WE make a Fibreclad Rope known as Grain Shovel and Shipper Rope—construction 19 wires to strand in 3, 4 or 6 strands as desired (3 strand rope being known as Shipper Rope) with hemp core.

This class of Rope is particularly well-adapted to Grain Elevators, being most economical for that purpose.

Is pliable and strong, and withstands the abrasion which under ordinary working conditions is so hard on Manila. Its ultimate cost is less than Manila as it gives far greater service.

The Marline serving acts as a safeguard against external and internal wear, keeps strands lubricated; hence preserves and increases the working life of rope many times beyond that of bare wire rope.

For strength, lightness, flexibility and final results Fibreclad Grain Shovel and Shipper Ropes are unequaled and those who have heretofore used Manila Rope and Bare Wire Rope will quickly recognize the superiority of Fibreclad.

FIBRECLAD GRAIN SHOVEL ROPE

Special Extra Strong

Composed of six strands and a hemp centre.
Nineteen wires to the strand.

Price per Foot	Diameter in Inches Before Serving	Approximate Diameter After Serving with Marline	Approximate Circumference After Serving with Marline	Approximate Breaking Strain in Tons of 2,000 Pounds	Allowable Working Strain in Tons of 2,000 Pounds	Minimum Size of Drum or Sheave in Feet	Approximate Weight per Foot in Pounds
$0.28	1/4	5/8	2	2.91	0.58	3/4	.27
.34	3/8	3/4	2 3/8	6.36	1.25	1	.45

FIBRECLAD WIRE SHIPPER ROPE

Crucible Cast Steel

Composed of four strands and a hemp centre.
Nineteen wires to the strand.

$0.17	1/4	7/16	1 3/8	1.76	0.35	1/2	.16

FIBRECLAD WIRE SHIPPER ROPE

Extra Strong Crucible Cast Steel

Composed of three strands.
Nineteen wires to the strand.

$0.15	1/4	3/8	1 3/16	1.47	0.29	1/4	.11

APPROXIMATE SCALE OF

Comparison of Strength

MANILA ROPE			FIBRECLAD WIRE ROPE, Diameter			
Circumference	Diameter	Approximate Breaking Strain	Iron	Crucible Steel	Extra Strong Crucible Steel	Plow Steel
1¾	9/16	2,250	¼	...	...	...
2	5/8	3,000	...	...	...	...
2¼	¾	4,000	⅜	¼	...	...
2½	13/16	5,000	...	...	¼	...
2¾	⅞	5,800	...	5/16	...	¼
3	1	7,000	...	...	5/16	...
3¼	1 1/16	8,000	½	...	...	5/16
3½	1⅛	9,200	...	⅜	...	...
3¾	1¼	11,000	...	...	⅜	...
4	1 5/16	12,000	5/8	...	...	⅜
4¼	1⅜	13,500	...	7/16	...	...
4½	1½	15,500	...	...	7/16	...
4¾	1 9/16	17,000	¾	½	...	7/16
5	1⅝	19,000	...	9/16	½	...
5½	1¾	23,500	⅞	...	9/16	½
6	2	27,000	...	5/8	...	...
6½	2⅛	31,500	1	...	5/8	5/8
7	2¼	37,000	1⅛	¾	...	...
7½	2½	42,000	...	...	¾	...
8	2⅝	48,000	1¼	⅞	...	¾
8½	2⅞	54,000	...	...	⅞	...
9	3	61,000	1⅜	1	...	⅞
9½	3⅛	67,000	1½	...	1	...
10	3⅜	75,000	...	1⅛	...	1

WATERBURY CORDAGE

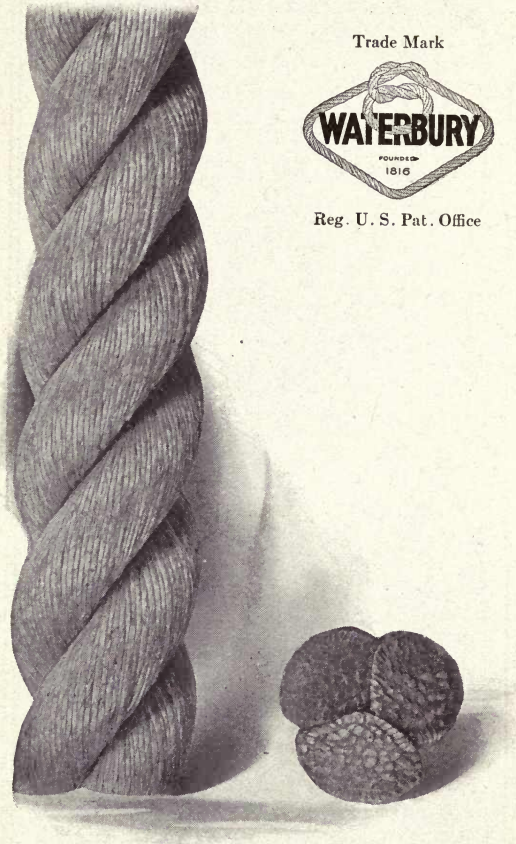
TRANSMISSION ROPE
DRILLING CABLES

Trade Mark
Reg. U. S. Pat. Office

Trade Mark

WATERBURY
FOUNDED 1816

Reg. U. S. Pat. Office



Waterbury 3-Strand Manila Rope

FOREWORD

ONE hundred years ago, in the City of New York, was founded the Waterbury Cordage business, now conducted under the name of the Waterbury Company.

The very fact that a product has been manufactured for such a long period, by the founder of an industry and his successors, is evidence of maintained high quality and continuous fair dealing.

A Waterbury "Brand" when marked on a package is a guarantee of the quality of the contents. The grades represented by the several Brands are listed on the following pages.

WATERBURY COMPANY

WATERBURY BRANDS

Reg. U. S. Pat. Off.

"Waterbury" Manila—Pure Manila First Quality.
"Waterbury" Bolt Rope.
"Waterbury" Reliance Transmission Rope.

Reg. Applied For

"Waterbury" "Drillwell" Cables
(for oil, water, and gas wells).

Reg. U.S. Patent Office

Rex Brand Rope—our Second Grade.
"B" or Hardware—our Third Grade.
"Waterbury" Sisal—First Quality.
"Commercial" Sisal—our Second Grade.

STOCK PACKAGES

Manila and Sisal Rope are carried in stock in full and half coils.

Full lengths in sizes ½ inch and larger, coils contain 1200 feet, half coils 600 feet.

Stock coils of 3/16 inch, 35 pounds; ¼ inch, 50 pounds; 5/16 inch, 55 pounds; 3/8 inch, 60 pounds; 7/16 inch, 70 pounds per coil, approximate.

Hay and Bale Rope ordinarily put up in 50 and 100 lb. coils, single end, also 50 and 100 lb. reels. Hay Rope should be ordered on reels.

Bale Rope, 50 or 100 pound coils, unless otherwise specified.

Hide Rope, 100 pound coil, stranded.

Tarred Lath Yarn and Fodder Yarn, 100 pound coils.

PRICE LIST

All quotations are basis and subject to the differentials as they apply.

Basis is ¾" dia. (2¼" circumference) or larger.

Diameter Inches	Circumference Inches	Thread	Per lb. Above Basis
3/16	½	6	2½c.
¼	¾	6	2 c.
5/16	1	9	2 c.
3/8	1⅛	12	1½c.
7/16	1¼	15	1 c.
7/16 full	1⅜	18	1 c.
½	1½	21	1 c.
½ full	1⅝	24	1 c.
9/16	1¾	27	1 c.
9/16 full	1 7/8	30	1 c.
⅝	2	..	½c.
¾	2¼ and larger	..	Basis Price

Bolt Rope either 3 or 4-Strand, 5 cents per pound extra.

Transmission Rope, 5 cents per pound extra.

All Manila and Sisal goods sold, marked and billed at Gross Weight.

All quotations based on Gross Weight unless specifically stated.

All prices per pound basis unless otherwise stated.

All cut lengths of rope of less than 600 feet or 100 fathoms, excepting only Drilling Cables, and Transmission Rope, 1 cent per pound extra.

All rope unoiled, 1 cent per pound extra.

All 4-Strand Rope except Bolt and Transmission, 1 cent per pound extra.

All rope in balls, ¼ cent per pound extra.

All rope to order with colored yarns, 1200 feet or less, 25 cents per colored yarn.

All rope to order with colored yarns, over 1200 feet, 50 cents per colored yarn.

All quotations subject to change in price without notice.

All deliveries subject to fires, strikes, breakage of machinery or other causes beyond our control.

PRICE DIFFERENTIALS

Balling, ¼c per pound extra.
Binder Twine, special.
Bolt Rope, 3 or 4 strand, 5c above basis.
Bull Ropes, special.
Canal or Tow Lines—If Bolt Stock, 5c above basis. If Regular Stock, basis.
Coal Falls, if Bolt Stock, 5c above basis.
Coal Falls, if made of Transmission Stock, 5c above basis.
Colored Yarns in Rope, each coil of 1200 feet or less, 25c per yarn.
Colored Yarns in Rope, coils over 1200 feet in length, 50c per yarn.
Cut Lengths, except Transmission Rope and Drilling Cable, 1c per pound extra.
Double Lath Yarn, special.
Drilling Cables, Sand, Tubing, Sucker Rod Lines, special.
Four Strand Rope, except Bolt and Transmission Rope, 1c per pound extra.
Halter Rope, basis.
Hawser Laid Rope, same price as Drilling Cables, special.
Hay Hide and Bale Rope, medium and coarse, ½c above basis.
Hay Hide and Bale Rope, fine, 1c above basis.
Hay Hide and Bale Rope, unoiled, 1c per pound extra.
Hoisting or Fall Rope, either Tallow or Graphite Laid, made from selected Transmission Stock, 5c above basis.
Lariat Rope, Hard Laid, 3 strand, 4c above basis.
Lariat Rope, Hard Laid, 4 strand, 5c above basis.
Mill Carriage Rope, if Bolt Stock, 5c above basis. If Transmission Stock, 5c above basis.
Paper Makers' Twine, any ply, medium and coarse, ½c above basis.
Paper Makers' Twine, any ply, fine, 1c above basis.
Paper Makers' Twine, unoiled, 1c per pound extra.
Raft Ropes, 6, 9, 12 or 15 thread, special.
Ring Yarn, medium and coarse, basis.
Ring Yarn, fine, ½c above basis.
Shingle Yarn, same as Lath Yarn.
Single End (1 ply) Lath Yarn or Ring Yarn, medium, ½c above basis.
Single End (1 ply) Lath Yarn or Ring Yarn, fine, 1c above basis.
Spun Yarn, medium and coarse, single end or many end, ½c above basis.
Spun Yarn, fine, single end or many end, 1c above basis.
Spun Yarn, unoiled, 1c per pound extra.
Steamboat Lines—If Bolt Stock, 5c above basis. If Regular Stock, basis.
Tallow Laid Rope, basis.
Tarred Rope, except Lath and Fodder Yarn, basis.
Tarred Lath and Fodder Yarn, medium and coarse, basis.
Tarred Lath and Fodder Yarn, fine, ½c above basis.
Tent Rope, basis.
Transmission Rope, Tallow Laid, 5c above basis.
Transmission Rope, Graphite Laid, 5c above basis.
Unoiled Rope, 1c per pound extra.
Untarred Lath Yarn, same as Ring Yarn.
Wheel Rope, if Bolt Stock, 5c above basis.
Wheel Rope, if made of Transmission Stock, 5c above basis.
Yacht Lariat Rope, 3 or 4 strand, special.

When ordering always state whether sizes desired are diameter or circumference.

EXAMPLES

Wanted—Cost of 325 feet, ½ inch 4 strand unoiled Manila Rope, when basis is 20c.

	Per Pound
Basis price	20 c
Extra for ½ inch	1 c
Extra for 4 strand	1 c
Extra for unoiled	1 c
Extra for cut length, being less than 600 feet	1 c
Net cost	24 c

Wanted—Cost of 200 thread Sisal Ring Yarn unoiled, when basis is 10c.

	Per Pound.
Basis	10 c
Extra for 200 end	½c
Extra for unoiled	1 c
Net cost	11½c

Wanted—Cost of 3 ply fine unoiled Sisal Hay Rope in 5 pound balls, when basis price of Sisal is 10c.

	Per Pound.
Basis price	10 c
Extra for fine size	1 c
Extra for unoiled	1 c
Extra for balling	¼c
Net cost	12¼c

Wanted—Cost of 1200 feet of 7/16 inch diameter 4 strand Manila Rope, when the basis price of Manila is 20c.

	Per Pound.
Basis price	20 c
Extra for 4 strand	1 c
Extra for 7/16 inch diameter	1 c
Net cost	22 c

APPROXIMATE WEIGHT AND STRENGTH OF WATERBURY COMPANY'S STANDARD QUALITY MANILA ROPE

Diam. Inches	Diam. m/m	Cir. Inches	Cir. m/m	Approx. Length of Manila Rope in 1 Pound		Approx. Weight and Length of Coil		Approx. B/S Borne by New Manila Rope Pounds
				Feet	In.	Lbs.	Feet	
3/16	4.8	1/2	12.7	60	....	35	2100	550
1/4	6.3	3/4	19	55	....	50	2750	620
5/16	8	1	25.4	41	....	55	2250	1,000
3/8	10	1 1/8	28.5	27	....	60	1620	1,275
7/16	11	1 1/4	32	18	....	70	1260	1,875
1/2	12.7	1 1/2	38	13	4	90	1200	2,400
9/16	14	1 3/4	44.4	9	7	125	1200	3,300
5/8	16	2	50.8	7	6	160	1200	4,000
3/4	19	2 1/4	57	6	1	198	1200	4,700
13/16	20.6	2 1/2	63.5	5	1	234	1200	5,600
7/8	22	2 3/4	70	4	5	270	1200	6,500
1	25.4	3	76	3	8	324	1200	7,500
1 1/16	27	3 1/4	82.5	3	2	378	1200	8,900
1 1/8	28.5	3 1/2	88.9	2	9	432	1200	10,500
1 1/4	31.7	3 3/4	95	2	5	504	1200	12,500
1 5/16	33	4	101.6	2	1	576	1200	14,000
1 3/8	35	4 1/4	108	1	10	648	1200	15,400
1 1/2	38	4 1/2	114	1	8	720	1200	17,000
1 9/16	39.6	4 3/4	120.6	1	6	810	1200	18,400
1 5/8	41	5	127	1	4	900	1200	20,000
1 3/4	44	5 1/2	140	1	1	1080	1200	25,000
2	50.8	6	152	....	11	1296	1200	30,000
2 1/8	54	6 1/2	165	....	9 1/2	1512	1200	33,000
2 1/4	57	7	178	....	8	1764	1200	37,000
2 1/2	63.5	7 1/2	190.5	....	7	2016	1200	43,000
2 5/8	66.7	8	203	....	6 1/4	2304	1200	50,000
2 7/8	73	8 1/2	216	....	5 1/2	2590	1200	56,000
3	76	9	228.6	....	5 1/4	2915	1200	62,000
3 1/8	79	9 1/2	241	....	4 1/2	3240	1200	68,000
3 1/4	82.5	10	254	....	4	3600	1200	75,000

The weight and strength of Manila rope per table, is approximate and may vary slightly either way. Manila and Sisal Standard Rope will weigh about alike. In the lower grades of Manila and Sisal there are greater variations in weight and strength, according to quality. Four (4) strand rope weighs from 5 per cent to 7 per cent heavier than three (3) strand plain laid rope. Manila rope runs approximately 25 per cent stronger than Sisal.

WEIGHTS AND METRIC EQUIVALENTS

Diameter Inches	Weight per Foot Pounds	Weight per Fathom Pounds	Approximate Kilos per Foot	Approximate Kilos per Coil	Approximate Kilos per Metre
3/16	.0166	.0996	.00753	15.8	.02469
1/4	.0181	.1086	.00824	22.7	.02694
5/16	.0244	.1464	.01107	24.5	.0354
3/8	.037	.222	.01678	27.2	.055
7/16	.055	.33	.0249	31.4	.0818
1/2	.075	.45	.034	41	.112
9/16	.104	.624	.047	56.7	.155
5/8	.133	.798	.060	72.5	.198
3/4	.165	.99	.075	90	.246
13/16	.195	1.17	.088	106	.29
7/8	.225	1.35	.102	122.5	.335
1	.27	1.62	.122	147	.40
1 1/16	.315	1.89	.143	172	.47
1 1/8	.36	2.16	.163	196	.535
1 1/4	.42	2.52	.19	229	.625
1 5/16	.48	2.88	.218	262	.715
1 3/8	.54	3.24	.245	294	.804
1 1/2	.60	3.60	.272	326	.892
1 9/16	.675	4.05	.306	368	1.0
1 5/8	.75	4.5	.340	408	1.12
1 3/4	.90	5.4	.408	491	1.34
2	1.08	6.48	.49	589	1.61
2 1/8	1.26	7.56	.572	688	1.88
2 1/4	1.47	8.82	.667	800	2.19
2 1/2	1.68	10.08	.762	916	2.50
2 5/8	1.92	11.52	.871	1046	2.86
2 7/8	2.158	12.95	.979	1175	3.21
3	2.43	14.58	1.10	1324	3.62
3 1/8	2.7	16.20	1.225	1470	4.02
3 1/4	3	18	1.36	1632	4.46

The working strain should not be greater than one-third the breaking strain. We recommend a larger factor of safety, as the greater the factor, the longer the life of rope.

Indicate when ordering whether diameter or circumference is wanted. Unless specified it is understood that diameter measurement governs.

Unless otherwise stated all quotations are made basis and subject to market changes in price, without notice.

UNCOILING ROPE

To open a coil of rope, loosen the burlap wrapping, lay the coil on the flat side with the inside end nearest the floor. Then reach down through the center and grasp the end of the rope, drawing it up and out through the center of the coil. Do not uncoil from the outside as extra turns are put in the rope and kinks are apt to form.

CORDAGE

THE word "cordage" is used in a comprehensive sense to include all sizes and varieties of the articles from binder twine to a cable 15 inches in circumference, though strictly speaking the term is hardly applicable to a rope that is less than half an inch in diameter.

The materials employed for rope making are Manila, Sisal and other vegetable fibres. Sisal from Yucatan is largely used for the manufacture of cheaper grades of rope and for binder twine.

MANILA HEMP

is more extensively used in the manufacture of cordage than any other material, as its great pliancy and strength adapt it to a multitude of uses. Manila hemp is obtained from a species of wild plantain belonging to the banana family and is a native of the Philippine Islands. Its stem has a height of from 15 to 20 feet, is of a dark-green color and very smooth on the surface. The fibre is round, silky-looking, white, lustrous, easily separated, stiff, very tenacious, and very light. Although not in itself very large, the fibre is composed of very fine and much elongated bast-cells. The length of the cells is about a quarter of an inch, and they are not, as commonly supposed, held together by an intercellular tissue or mucilaginous substance. The characteristic roughness possessed by manila fibre is due

entirely to mechanical causes, such as for instance, the laceration of a cell in the separation from the leaf-stalk, or the subsequent opening out of the ends of the cells. While the fibres are weak transversely, they have great strength in the direction of their length. The tensile strength of manila fibres will average over 30,000 pounds per square inch of section.

SISAL

Sisal as a fibre is a substitute for Manila. The length of Manila is usually from 6 feet to 10 feet, while Sisal will average 2 feet to 4 feet. The tensile strength is not more than three-quarters that of Manila. The color of Sisal, a yellowish white, sometimes with green tinge. It lacks the gloss and brilliancy of Manila of good grades. Manila is smooth and pliable, Sisal stiff and harsh and easily injured by exposure to moisture and the elements—far more so than Manila. Sisal is used for tying purposes such as Lath Yarn, Tie Rope, bundling Laths, Shingles, Lumber, Kindlingwood, Cooperage Stock, Hides, Leather, Nursery Stock, Grain Sacks, Baling Cloth in textile mills, and other uses. Sisal Ropes and Yarns are made in two grades; pure, i.e., Waterbury Brand, and Common, i.e., Commercial or Mixed, being made oiled or dry as desired.

TREATMENT

The preliminary treatment of Fibre, after it reaches the Cordage Mill, is practically the same whether it be Manila or Sisal.

BOLT ROPE

Bolt Rope means a rope of extra fine quality Manila Fibre, superior to standard or Commercial Manila Rope as used by the trade in general. The yarns in the rope are also spun finer although the size of the yarns or thread depends on the size of the rope. It commands a higher price than ordinary pure Manila Rope, being five cents per pound above the basis of regular Manila. It is materially lighter, size for size, than regular Manila of all sizes, and will range 10 to 15 per cent stronger. It is longer lived, easier to handle and good appearing, being whiter than Commercial Rope.

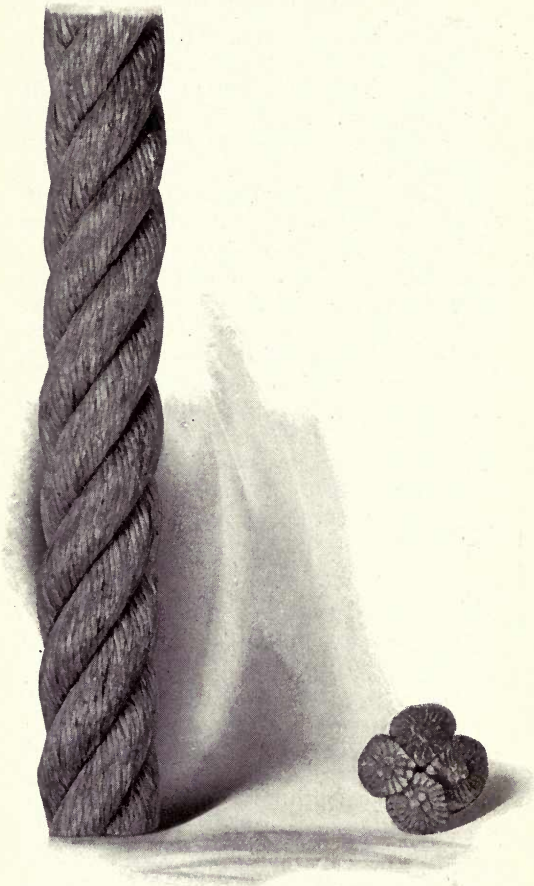
In the use of Bolt Rope the operator will secure the same service from the smaller sizes, thus effecting a saving in both weight and ultimate cost.

WATERBURY HOISTING OR FALL ROPE

This type of rope is generally 4 strand, with heart made of harder lay than ordinary 4 strand rope, the object being to make the rope firm and to hold its shape under stress or pressure.

For use on Coal Docks, Grain Elevators, Cargo and Quarry Hoists, Pile-Driver and Hammer Lines. Sizes run 2¼ inch to 6 inch circumference. Stock used, selected Fibre Transmission Rope stock, although some users specify Bolt Rope stock.

If made of Transmission stock or



Waterbury 4 Strand Manila Rope (Without Heart)

Bolt stock, 5 cents per pound advance. Transmission stock advised.

When ordering, state grade wanted, i.e., Bolt or Transmission stock.

WATERBURY STANDARD MANILA ROPE

Waterbury Standard Manila Rope is in either 3 or 4 strand, the latter with or without heart. This grade of rope is most suitable for general work, is most commonly called for, and is most extensively sold by dealers and distributors.

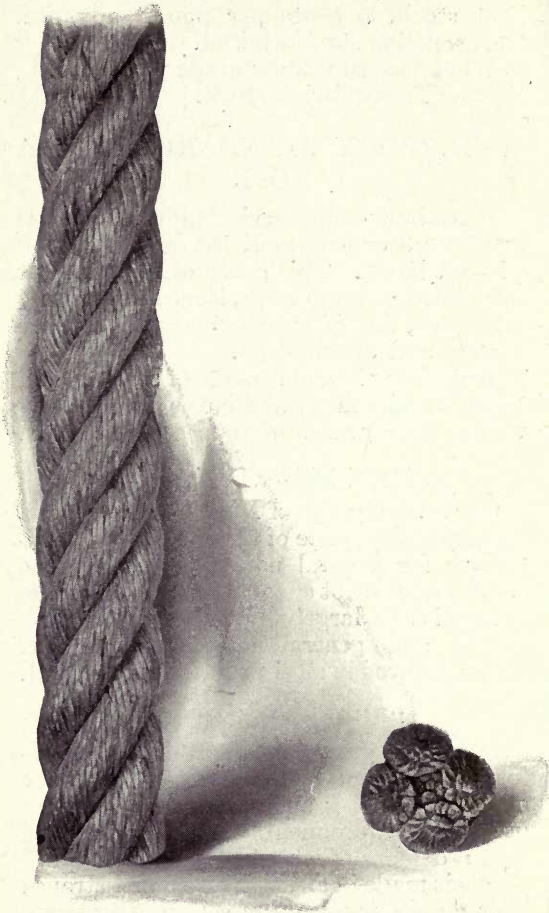
Waterbury Brand is made of selected and tough Manila fibre, and is the standard by which other grades of rope are measured.

REX BRAND ROPE

Our second grade of Rope is made from a less expensive grade of fibre, but most satisfactory for general use, where hazardous conditions are not encountered. This grade of rope is sold largely by the hardware merchants and general merchandise trade. Manufactured in all sizes, also 3 or 4 strand.

"B" GRADE ROPE

Our third grade Rope, well made, uniform and strong; made to meet the demands of trade wanting an inexpensive rope; for use where requirements are not so exacting as to demand first quality stock. "B" Grade is made in all sizes; also 3 or 4 strand. This grade is also known as Hardware Brand.



Waterbury 4 Strand Manila Rope
(With Heart)

TOWING LINES OR CANAL LINES

Towing Lines, or Canal Lines, are generally Bolt Rope Stock, although in some cases users specify a pure good grade of Manila Rope known as standard first quality (our Waterbury Brand). Towing Lines are medium soft lay, i. e., with slightly less twist than generally put in standard ropes. Buyers should specify grade wanted.

STEAMBOAT LINES

Steamboat Lines for docking vessels are generally medium soft laid Bolt stock or Pure Standard Grade. When made medium soft lay they are easier to handle and withstand sudden strains. Always specify whether Bolt Stock or regular Standard Stock is wanted.

WHEEL ROPE

Wheel Rope for Steering Gear is made 4 strand with heart. The lay is not quite so hard as Hoisting Rope, being made flexible for use over wheel drums on Boats, Barges, Tugs, Dredges and similar outfits. Made in both Transmission and Bolt Rope Stock. Transmission stock 5 cents per pound over Basis; Bolt stock 5 cents per pound over Basis.

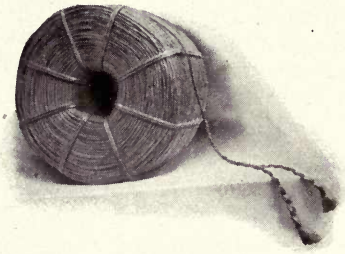
MILL CARRIAGE ROPE

Mill Carriage Rope for Saw Mill use. To operate the carriage holding the log the best grade of rope is required as in the operation it is subjected to sudden jerks and severe service. The rope is 4 strand with heart, Transmission Rope stock, but in many

instances Bolt Rope is called for. Buyers should specify grade wanted.

MANILA HAY ROPE
BALE ROPE

HIDE ROPE
SPUN YARNS

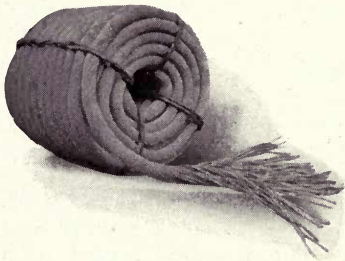


HAY ROPE, also called Papermaker's Twine, is made to wit:

Two thread regular, coarse, medium and fine.

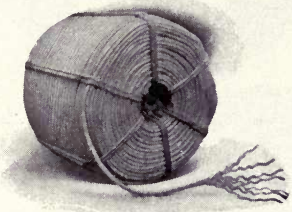
Three thread regular, coarse, medium and fine.

Four thread regular, coarse, medium and fine.



Hide Rope

HIDE ROPE corresponds in size with Hay Rope. It is put up many ends, i. e., with a number of lengths twisted loosely together in strand shape. The *Three Thread* Coarse Hide Rope is most commonly used in tying bundles of leather.



BALE ROPE is a single end product running in size from 5 to 9 threads. It is largely used for tying up bales of finished goods.

SPUN YARNS are made with two or more right hand threads put together with left hand twist.

DIFFERENTIALS

Coarse, ½ cent above Rope basis.
Medium, ½ cent above Rope basis.
Fine, 1 cent above Rope basis.
If made without oil, 1 cent per pound extra.
If balled, ¼ cent per pound extra.
See remarks—Sisal Hay, Hide and Bale Ropes.

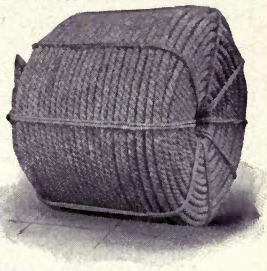
DRILLWELL CABLE

Trade-mark
Reg. Applied For

Waterbury "Drillwell" Drilling Cable

"DRILLWELL" BRAND DRILLING CABLES

Drilling Cables are made from carefully chosen grades of fibre, graded for toughness and general wearing quality. Every care is taken in the manufacture of cables as to spinning the yarns, the lay of the strand, lubrication, etc., in order to get strength and wearing quality so necessary. Drilling Cables are made *three ropes laid into one* (or 9 strands), so formed to be thoroughly uniform, of correct lay and tension in each of the three ropes (or thirds) forming the finished product. Drilling Cables are referred to as Hawser Laid Rope, i. e., three ropes twisted together, the twist being in opposite directions to the twist of the ropes, and is usually left hand, the advantage being that a properly made Hawser Laid Rope over other types of rope has greater elasticity or springiness and greater wearing surface. Sizes range from 1¼-inch to 2½-inch diameter.



All of our Drilling Cables are especially lubricated to prevent internal fricton—also to keep the fibre from becoming very dry, thus preventing disintegration.

SAND LINES (Manila) are similar in construction to Drilling Cable, but smaller in size, ranging from 5/8 inch to 1 1/4 inch diameter, generally 5/8 inch, 7/8 inch, and 1 inch.

TUBING LINES AND SUCKER ROD LINES, as used in oil drilling, carry the same prices as drilling lines, construction being similar.

Manila Tubing Lines range from 1 3/4 inch to 2 1/2 inch diameter. Manila Sucker Rod Lines usually range from 1 1/4 inch to 1 3/4 inch diameter.

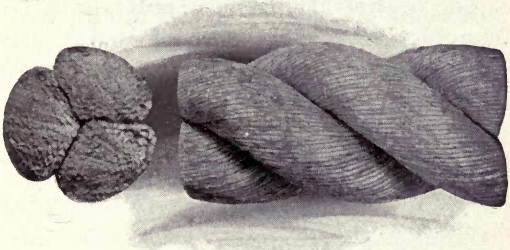
Cables also furnished made of fine yarns termed Bolted Drilling Cables. Owing to increased cost of spinning the fine yarn, in addition to the specially selected fibre, this type of cable is sold at an advance over the regular cable. Price on application.

APPROXIMATE WEIGHT OF "DRILLWELL" CABLES

Diameter	*Pounds per 1000 Feet*
2 1/4 inch	1937
2 1/8 inch	1688
2 inch	1438
1 7/8 inch	1375
1 3/4 inch	1250
1 5/8 inch	1000
1 1/2 inch	875

The above weights are approximate, and may vary slightly over or under the figures given.

BULL ROPES



BULL ROPES for drilling purposes, for use on the Bull Wheel, are made 3 strands. The sizes usually range 2⅛ inch to 2½ inch diameter, and in lengths, 85, 90 and 95 feet per Bull Rope.

Small Bull Ropes are at times called Calf Ropes.

We make Bull and Calf Ropes in two grades, Pure and Special, the latter being made to meet the demand for an inexpensive rope.

APPROXIMATE WEIGHTS

Diameter	85 *Feet*, Pounds	90 *Feet*, Pounds	95 *Feet*, Pounds
2⅛ inch . . .	115	124	133
2¼ inch . . .	130	140	149
2½ inch . . .	160	169	180

The above weights may vary slightly over or under the figures given.

MANILA YACHT ROPE

The best of Manila fibre enters into the manufacture of this type of rope. The hemp being selected for the purpose, color and texture being considered, as well as strength and durability. This class of rope is used for Yacht Rigging, is of medium soft lay for easy handling, and made 3 or 4 strands, as desired.

Price on application.

MANILA YACHT LARIAT ROPE

A very hard laid rope, made 3 or 4 strands, for use in the cattle country. The popular sizes are 3/8 inch and 7/16 inch diameter. The quality of hemp is the finest, being selected for texture, whiteness and strength.

Price on application.

MANILA LARIAT ROPE

Manila Lariat Rope of Standard Quality of fibre, is hard laid, made 3 or 4 strand. Popular sizes, 3/8 inch and 7/16 inch.

We also manufacture Lariat Rope in Bolt Rope stock, the base being Bolt Rope price plus the differential for size.

Buyers should state whether Lariat Ropes are to be furnished oiled or dry. Dry stock most commonly called for.

SISAL ROPE

Waterbury Brand No. 1 Sisal Rope for divers general uses. Where work is such not to require great strength and durability, this grade will be found most satisfactory. Pure Sisal has about 25 per cent less strength than Manila, is less flexible than Manila, and is not specially desirable for hand service owing to so-called splinters. It is also affected by exposure to moisture. Made in all sizes, 3 or 4 strand, oiled or unoiled. Is made of Pure Sisal, and suitable for most every purpose where great strength is not required.

SISAL ROPE COMMERCIAL BRAND

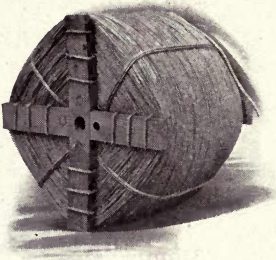
Sisal Rope Commercial Brand—our second grade or Commercial Sisal, made in all sizes, oiled or unoiled. Also in 3 or 4 strands. It is a well made rope for ordinary use and most satisfactory where an inexpensive rope is desired.

SISAL LARIAT ROPE

Sisal Lariat Rope for cattle roping, made of Pure Sisal, oiled or unoiled, 3 or 4 strand, as desired, made extra hard lay. The most popular sizes are $\frac{3}{8}$ inch and $\frac{7}{16}$ inch.

SISAL HAY ROPE HIDE ROPE
BALE ROPE SPUN YARN

are made in No. 1 and mixed stock, the same construction as if made of Manila stock. See differential card for basis and advances. The uses are referred to in remarks under "Manila Hay and Bale Rope."



HAY ROPE—Paper Twine, Spun Yarn, untarred Sisal, 2, 3, and 4 ply. Single end furnished either in coils or on reels, 50 or 100 pounds. A single yarn put up as above is termed 1-ply Hay Rope. When made of 4, 5, or more ply it is generally designated as *Bale Rope*.

Medium and Coarse Hay and Bale Rope, any ply, ½ cent over Rope Base.

Fine Hay and Bale Rope, any ply, 1 cent over Rope Base.

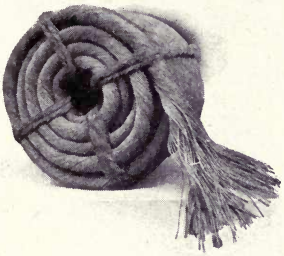
When furnished in Balls, ¼ cent per pound extra.

If made without oil, 1 cent per pound extra.

HIDE ROPE is similar to Hay Rope, made in a strand of many ends, generally 2 or 3 ply, in coils or reels, generally coils of 100 or 200 pounds. The same prices and differentials apply as in the case of Hay and Bale Ropes.

SPUN YARN is a single end product of which the common sizes are two yarn or three yarn, oiled stock.

LATH AND FODDER YARN
RING YARN



LATH YARN is a strand of many ends of tarred yarns, generally Sisal. A strand of medium or No. 130 Lath Yarn contains 130 yarns of medium size, No. 200 or fine contains 200 small yarns, while coarse or No. 110 contains 110 large yarns in the strand.

Coils are usually made up 50, 100 or 200 pounds each.

Fodder Yarn and Wood Yarn are special forms of tarred yarns of many ends.

Lath Yarn, tarred, any size, can be furnished special in single ends, i. e., Hay Rope style.

RING YARN is untarred Lath Yarn but similar to Lath Yarn in form. It is composed of many ends of untarred yarns, generally Sisal. It is furnished in coarse or No. 110, medium or No. 130, and fine or No. 200. When furnished without oil, 1 cent extra is charged.

In some localities Lath Yarn is designated as B. C. D. "B" is regularly coarse yarn put up 110 ends in a ready. This yarn, when made up 100 ends in a ready, is known as 27-ounce Fodder Yarn.

"C" is regular medium yarn made up 130 ends in a ready. When sold as Fodder Yarn, made up 100 ends in a ready, is known as 24-ounce Fodder Yarn.

"D" is regular fine yarn, made up 200 ends in a ready. When sold as Fodder

Yarn of 100 ends is known as 18-ounce Fodder Yarn.

Medium and coarse Tarred Yarn, in either Lath or Fodder Yarn form, is sold at the basis price of Rope.

Fine, i. e., 200-end Lath Yarn, or Fodder Yarn, carries ½ cent per pound advance. Double Lath Yarn—Price on application.

LATH YARN AND SHINGLE YARN DIFFERENTIAL

Coarse or B, 100, Tarred, rope basis.
Medium or C, 130, Tarred, rope basis.
Fine or D, 200 Tarred, ½c per pound over rope basis.
Double yarn, price on application.
Coils generally called for, 50, 100, or 200 pounds.

FODDER YARN

Coarse or B, 110, Tarred, rope basis.
Medium or C, 130, Tarred, rope basis.
Fine or D, 200, Tarred, ½c per pound over rope basis.
Also furnished:
27 ounce, 100 ends, Tarred, rope basis.
24 ounce, 100 ends, Tarred, rope basis.
21 ounce, 100 ends, Tarred, rope basis.
18 ounce, 100 ends, Tarred, ½c per pound over rope basis.
Coils generally called for in 50 and 100 pounds.

RING YARN

(Also termed Untarred Lath Yarn)

Coarse or B, 110, rope basis.
Medium or C, 130, rope basis.
Fine or D, 200 ½c per pound over rope basis.
Unoiled, 1c per pound extra.
For single end Ring Yarn see below; also under Hay Rope.
The size of Ring Yarn is the same as Lath Yarn.
Single end 1 ply Lath Yarn or Ring Yarn.
Medium, coils or reels, ½c over basis.
Fine, coils or reels, 1c over basis.

HAYING ROPES

HAYING ROPES, standard grade rope of either 3 or 4 strand, ranging in sizes from ¾ inch to 1 inch.

Our Waterbury Brand of Manila has a wide sale, although Rex Brand is called for by some.

We furnish the 4 strand rope with or without heart, as preferred. Where surface wear is the factor, the 4 strand rope is to be preferred, being more cylindrical, and wears rounder and smoother.

Waterbury Brand is made of selected and tough Manila fibre and is the standard by which other grades of rope are measured.

TENT ROPE

TENT ROPE is extra soft lay to permit of being opened up for sewing. It is used to line the edge of tent canvas and for guy lines. Made in Manila and Sisal (Pure), generally unoiled.

HALTER ROPE

HALTER ROPE is soft laid made, both oiled and unoiled, also 4 strand if desired. Sizes usually run ⅜ inch to ¾ inch diameter, made both of Manila and Sisal.

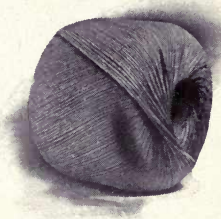
RAFT ROPE

RAFT ROPE is for binding logs. It is made soft lay, i. e., less twist than Tow Line. The demand is principally for Manila 6 and 9 thread, although sold in 12 and 15 thread.

Sisal is also used, but Manila is preferred owing to greater tensile strength.

BINDER TWINE

For self-harvesting grain and corn binders, made in spinning known as "Standard" Pure Sisal.



Put up in Flat Bales 5-pound balls and packed 10 balls to the bale.

We claim our twine to be as perfect as close inspection and best machinery can spin from best fibre.

Price on application.

TO MAKE A SHORT SPLICE

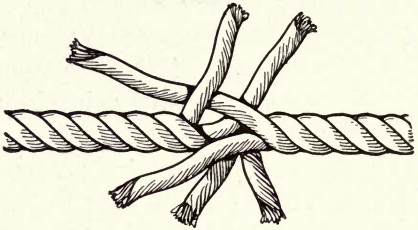


Figure 1

Figure 2

Figure 3

To make a short splice, Figs. 1, 2 and 3, unlay the strands of each rope for a convenient length. Bring the rope ends together so that each strand of one rope lies between the two consecutive strands of the other rope. Draw the strands of the first rope along the second, and grasp with one hand. Then work a free strand of the second rope over the nearest strand of the

first rope and under the second strand, working in a direction opposite to the twist of the rope. The same operation applied to all the strands will give the result shown by Fig. 2. The splicing may be continued in the same manner to any extent (Fig. 3) and the free ends of the strands may be cut off when desired. The splice may be neatly tapered by cutting out a few fibres from each every time it is passed through the rope. Rolling under a board or the foot will make the splice compact.

TO MAKE A LONG SPLICE

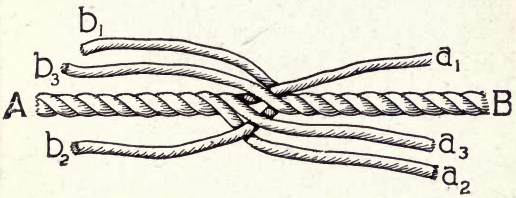


Figure 4

To make a long splice, Figs. 4 and 5, the rope should be unlaid for a greater distance than for a short splice, and the ends brought together, with strands interlacing. Instead of tucking at once, unlay a1 (one of the strands of A) for a considerable distance, and in place of it lay up b1 (the adjoining strand of B), thus working a strand of B

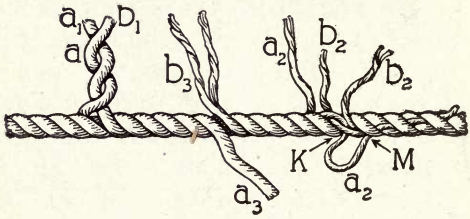


Figure 5

into A, for about a foot and a half or two feet. For convenience, twist up a1 and b1 together temporarily, as in Fig. 5. Turn the rope end for end, unlay b2 (one of the strands of B), and in place of it lay up a2 (the adjoining strand of A), a3 and b3 left lying beside each other without being unlaid. We now have three pairs of strands at different points of the rope. Beginning with a2 and b2 (for example) separate each of these strands into two parts, and taking one-half of each strand, overhand knot these together (K, Fig. 5), and tuck them as in a short splice, over one and under one of the full remaining strands of the rope (Fig. 5).

The other pairs of strands (a1, b1) (a2, b2) are similarly reduced, knotted, and tucked. The spare half of each strand is trimmed off smooth, likewise the ends of the other halves after they have been tucked.

TO MAKE AN EYE SPLICE

Figure 6

Figure 7

Figure 8


Figure 9

To make an eye splice, Figs. 6, 7, 8, and 9, unlay a convenient length of rope. Pass one loose strand (a) under one strand of the rope, as shown in Fig. 6, forming an eye of the proper size. Pass a second loose strand (b) under the strand of the rope next to the strand, which secures (a) (Fig. 7). Pass the third strand (c) under the strand next to that which secures (b) (Fig. 8). Draw all taut and continue and complete as for a short splice.

SPLICE FOR TRANSMISSION ROPE*

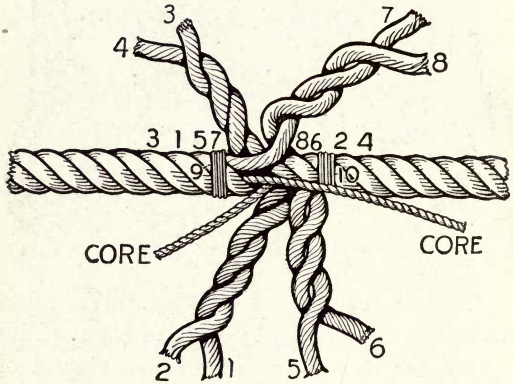


Figure 10

1. Tie a piece of twine (9 and 10, Fig. 10) around the rope to be spliced, about six (6) feet from each end. Then unlay the strands of each end back to the twine.

2. Butt the ropes together and twist each corresponding pair of strands loosely, to keep them from being tangled, as shown at (a).

3. The twine (10) is now cut, and the strand (8) unlaid and strand 7 carefully laid in its place for a distance of four and a half feet from the junction.

4. The stand 6 is next unlaid about one and a half feet and strand 5 laid in its place.

* From Flather's "Rope Driving."

5. The ends of the cores are now cut off so they just meet.

6. Unlay strand 1 four and a half feet, laying strand 2 in its place.

7. Unlay strand 3 one and a half feet, laying in strand 4.

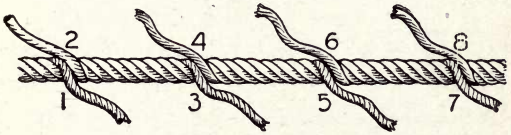


Figure 11

8. Cut all the strands off to a length of about 20 inches, for convenience in manipulation. The rope now assumes the form shown in Fig. 11, with the meeting-points of the strands three feet apart.

Each pair of strands is now successively subjected to the following operations:

9. From the point of meeting of the strands 8 and 7 unlay each one three turns; split both the strand 8 and the strand 7 in halves, as far back as they are now unlaid, and the end of each half-strand "whipped" with a small piece of twine.

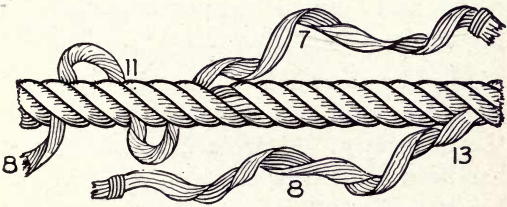


Figure 12

10. The half of the strand 7 is now laid in three turns and the half of 8 also laid in three turns. The half strands now meet and are tied in a simple knot 11 (Fig. 12), making the rope at this point its original size.

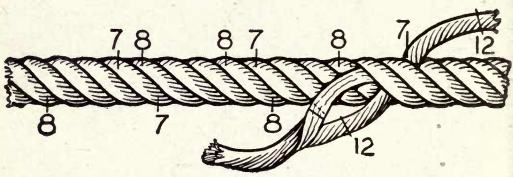


Figure 13

11. The rope is now opened with a marlinspike, and the half strand of 7 worked around the half strand of 8 by passing the end of the half strand through the rope, as shown, drawn taut, and again worked around this half strand until it reaches the half strand 13 that was not laid in. This half strand 13 is now split, and the half strand 7 drawn through the opening thus made, and then tucked under the two adjacent strands, as shown in Fig. 13.

12. The other half of the strand 8 is now wound around the other half-strand 7 in the same way. After each pair of strands has been treated in this manner, the ends are cut off at 12, leaving them about four

inches long. After a few days' wear they will draw into the body of the rope or wear off, so that the locality of the splice can scarcely be detected.

For a three-strand rope of the same size, the foregoing method is slightly modified. After tying the twine 9 and 10 around the rope about 6 feet from each end, unlay the strands back to the twine, bring the butts together, and twist the corresponding strands loosely together. Now cut twine 10, and unlay strand 8 for a distance of four and a half feet from the junction, and lay in strand 7. Unlay strand 1, four and a half feet; lay in strand 2, and cut all the strands off to a length of about 20 inches, as before explained for convenience in handling. The splice now assumes an appearance similar to Fig. 11, with the exception that there are only three meeting points of the strands, and these are four and a half feet apart.

Each pair of strands is now subjected to the series of operations described for the 4-strand splice, in steps 9 to 12, inclusive.

Waterbury Transmission Rope

WATERBURY TRANSMISSION ROPE

WE make a rope especially prepared for the transmission of power. This rope is made from the best selected Manila Hemp. For transmission of power, Waterbury Transmission Rope is made with four strands, unless otherwise ordered. The yarns of this rope are each coated with a special composition, so that when twisted into strands the coating lodges among the fibres, and thoroughly lubricates the strands and individual fibres composing the rope, thus making it practically as near waterproof as possible.

In placing these ropes on the market we offer a Manila Rope made as nearly perfect as the best machinery, superior quality of material, and good workmanship can produce.

We make and guarantee every coil of Transmission Rope we sell.

We cannot furnish this rope at the same price as common rope, but guarantee our Transmission Rope, and know it will outwear several common ropes for transmission purposes.

When desired, we furnish Transmission Rope Tallow Laid, or Graphite Laid. Orders, however, should so specify, as our stock rope is made with our special compound referred to above.

ROPE TRANSMISSION

It is most important that great care be exercised in the selection of Transmission Rope, which should be uniform in diameter and weight throughout its entire length to secure even alignment where a number of laps of ropes are used and durability is desired. It is also necessary to have the rope well lubricated so as to preserve it.

There are many advantages in rope transmission; i. e.—

1. The amount of power and the distance over which it can be transmitted.
2. Runs in any direction and location and will operate successfully in the vertical as well as the horizontal position.
3. Has high mechanical efficiency; its loss of power slippage is practically eliminated.
4. Is positive, quiet and steady in operation, regardless of the amount of power transmitted.
5. Economy in space as compared with belts, and eliminates electrical disturbance so frequently incident to the use of belts.
6. Can be operated with long or short shaft centers.
7. Low cost, economy in maintenance.

As each installation presents a different problem it would be well for buyers contemplating the adoption of rope transmission to submit their problems to us for further information. Two systems are in common use, one known as the continuous or American, the other, multiple or English system.

The American system consists of one endless rope wrapped around the driving and driven sheaves, and a loop of the rope carried by means of the winder sheave around a traveling tension sheave, so as to transfer the rope from an outside groove of the driving sheave to the opposite outside groove of the driven sheave; only one splice in the rope is necessary.

The English system requires larger shaft centers and larger diameter of ropes, so as to provide the necessary amount of tension to prevent slippage. These large ropes also require larger diameter of sheaves. Under the English or multiple system a slack or loose rope will vibrate to a certain extent, which means it is necessary to use deeper grooves, with higher crests to prevent ropes jumping over grooves. Under the English system one or more of the ropes may be broken and taken off without impairing the service, as each rope operates independently. In an outdoor drive, however, the English system is somewhat at a disadvantage, as there is no provision made, as in the American drive system, to compensate for the shortening and lengthening of the ropes to the varying effects of the weather.

When using Transmission Rope, avoid contact with anything stationary—chafing injures rope quickly. If necessary to use small pulleys, use small ropes; increase the number as resistance to bending decreases with the smaller ropes.

Economical speed is rated at 4,500 feet per minute; slow speed increases durability.

Avoid overloading; either use larger ropes, if grooves permit, or add additional ropes.

Avoid having ropes rub against each other between pulleys.

Put only enough weight on tension carriage to allow rope to run without vibration and slippage in grooves.

Dressing applied to rope when damp will cause mildew and rot.

Life will be taken from rope stretched on blocks for several days. Ease up the stretch.

Rope sheaves should have the same pitch line in every groove, otherwise rope will creep. Any roughness in the surface of grooves will rapidly injure the rope.

Every care should be taken in making splice for Transmission Rope.

Lubrication of splice should be given special attention. Failure of rope generally occurs at splice, hence this part of rope should be kept pliable and soft.

For splicing 3 strand Transmission Rope, allow two-thirds of lengths noted in table.

Jumping ropes may be due to poor splicing or sudden variations in the load; hence steadiness in speed is an essential feature.

Sheave diameters for average conditions and good life of rope should be 40 times the diameter of rope, but never less than 36 times, although 50 times is advised for un-

hampered conditions and long life of rope. Sixty times would increase the efficiency of drive very materially, as the larger the sheave the longer the life of rope.

Rope wear is aggravated by the use of small sheaves due to frequent bending and straightening of the rope.

ORDERING

When sending orders state number of ropes wanted, the diameter and length of each piece; also whether 3 or 4 strand. In ordering ropes to be spliced by the purchaser, include allowance for splice (see table), otherwise length as specified will be sent.

Unless otherwise specified, we will fill all orders for Transmission Rope made 4 strands with a core.

INFORMATION REQUIRED

FOR MAKING RECOMMENDATIONS AND SUBMITTING PRICES FOR ROPE DRIVES

A. Maximum horse-power drive is to transmit.

B. Distance between centers of driving and driven shafts.

C. Speed of driving shaft (R. P. M.).
Speed of driven shaft (R. P. M.).

D. Is the driving side of the rope to be top or bottom?

E. Do all shafts rotate in the same direction?

F. Are all shafts parallel? If not, give angles between them.

G. Are shafts on same level? If not, which is higher and how much?

H. Are shafts horizontal or vertical?

I. If there are any obstructions preventing direct lead from driving to driven shafts, please describe them, giving distances.

J. If power is to be taken from more than ONE SHAFT state amount of power to be taken from EACH SHAFT.

K. How large a diameter (from face to face) sheave may be placed on driving shaft?

L. How large a diameter (from face to face) sheave may be placed on driven shaft?

M. Are solid or split sheaves desired?

N. Will rope be exposed or entirely protected?

O. Where may take-up and track be most conveniently placed?

P. If new rope only is wanted, in addition to above questions, SEND TEMPLATE OF GROOVE IN PRESENT SHEAVES and kindly answer the following questions:

Size of driver sheave?
Number of grooves?
Size of driven sheave?
Number of grooves?
Size of idler sheave, if any?
Is there a loose sheave used?
Length of take-up track?
If English or American system?
Size and kind of rope now used?
Number of wraps now used?

LUBRICATION OF ROPES

WHEN ropes are used for transmission of power, the lubrication of the fibres is of great importance, for with the fibres properly lubricated the rope, under the same conditions, will outlast several ropes which are allowed to run dry. By some, lubrication is considered of more importance than the actual breaking strength of the rope.

The wear of a rope is both internal and external. The internal wear is due to the bending of the fibres and their sliding upon one another, producing a grating together, which action is very much increased when the strands are not lubricated or when a hard twist is given to the rope, thus preventing the greater compression of the fibres one upon another, which is so essential to the life of the rope.

Rope should not become dry or fuzzy. More lubrication, i. e., dressing is required where ropes are used out of doors. A rope with the fibre properly lubricated will, under the same conditions, outlast several dry ropes. Manila fibre, while naturally tough and strong, when dry is rough and harsh, but when lubricated becomes smooth and silky.

SLINGS

SLINGS for Cranes, Derricks or ships' use, made with either long or short splice to meet conditions. We are also prepared to splice any kind of fitting into Manila rope.

MANILA TRANSMISSION ROPE

Circumference of Rope Inches	Diameter Inches	Approximate Weight per Foot 4-Strand Pounds	Approximate Breaking Strength Pounds	Largest Working Tension Pounds	Length of Splice Feet	Diameter of Smallest Sheave Inches	Maximum R. P. M. for 5000 ft. per min.	Approx. Tension Weight Pounds
2¼	¾	0.20	4,200	112	7	30	650	95
2¾	⅞	0.26	5,700	153	8	35	550	125
3	1	0.34	7,500	200	10	40	475	175
3½	1⅛	0.42	8,900	250	10	45	425	225
3¾	1¼	0.52	11,700	310	10	50	400	275
4¼	1⅜	0.65	13,200	380	12	55	350	325
4½	1½	0.76	16,700	450	12	60	320	375
5	1⅝	0.87	18,500	530	12	65	290	425
5½	1¾	1.04	23,000	610	12	70	270	550
6	2	1.34	30,000	800	14	80	240	650

Weight per foot = 0.34 × Diameter². Breaking Strength = 7500 × Diameter². Maximum Tension taken at 200 × Diameter². Diameter smallest Sheave advised = 40 × Diameter.

HORSE-POWER TRANSMITTED BY ROPES AT VARIOUS SPEEDS

Diam. Rope Inches	Velocity, Feet Per Minute										
	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000
¾	2.3	3.5	4.3	5.2	6.0	6.5	7.2	7.3	7.4	7.0	6.5
⅞	3.0	4.5	5.75	7.0	8.0	9.0	9.5	9.8	10.0	9.5	9.0
1	4.0	5.75	7.5	9.2	10.5	11.5	12.5	12.9	13.0	12.5	11.5
1⅛	5.0	7.5	9.7	11.6	13.5	14.9	16.0	16.3	16.7	16.5	15.3
1¼	6.3	9.2	12.0	14.3	16.5	18.5	20.0	20.2	20.7	20.1	18.9
1⅜	7.5	10.8	14.4	17.4	20.0	22.1	23.7	24.5	24.6	24.0	22.3
1½	9.0	13.5	17.0	20.5	23.0	26.3	28.0	29.0	29.5	28.6	26.7
1⅝	10.5	15.5	20.1	24.3	27.9	30.8	32.9	34.1	34.3	33.3	31.0
1¾	12.3	18.0	23.6	28.0	32.7	36.4	38.5	39.4	40.5	38.7	36.0
2	16.0	23.5	30.6	36.8	42.5	46.7	50.0	51.7	52.8	50.6	47.3

ROPES AND YARNS UNDER OTHER NAMES

Artesian Well Ropes, same as Hawser Laid Rope.
Bag Strings, same as Lath or Fodder Yarn.
Banana Twine, same as Sisal Hide Rope.
Box Shook Twine, same as Sisal Hay Rope on Reels.
Lath Yarn, Ring Yarn, Spun Yarn, Sisal Hide Rope.
Casing Lines, same as Hawser Laid Rope.
Cat Lines, same as 3 strand Manila Ropes.
Calf Rope, same as small Bull Ropes.
Cement Bag Twine, same as Tarred Sisal Yarns.
Coal Ropes, same as Transmission Rope.
Core Rope, same as Manila or Sisal Centre Ropes.
Cowboy Rope, same as Lariat Rope.
Dock Ties, same as Manila Bolt Rope.
Drilling Ropes, same as Hawser Laid Ropes.
Dry Lath Yarn, same as Ring Yarn Oiled or Dry.
Elevator Rope Grain, same as Transmission Rope.
Elevator Rope Governor, same as Hawser Laid Small Size.
Grapevine Twine, same as Sisal Spun Yarn in Balls.
Fish Twine, same as Sisal Hide Rope.
Kindling Wood Yarn, same as Tarred Sisal Lath Yarn.
Papermakers' Twine, same as Sisal Hay Rope.
Pile Driving Rope, may be Standard Manila Rope, Bolt Rope, Transmission Rope.
Shingle Yarn, same as Tarred Lath Yarn.
Sand Lines, same as Hawser Laid Rope.
Towing Lines, same as Manila Bolt Rope.
Tubing Lines, same as Hawser Laid Rope.
Untarred Lath Yarn, same as Ring Yarn.
Warping Lines, same as Manila Bolt Rope.

CORDAGE TERMS

YARN OR THREAD—A number of fibres twisted together.

STRAND—Two or more yarns twisted together in opposite direction to the twist in yarns.

COMMON LAID ROPE—Three or more strands twisted together in the opposite direction to the twist in the strands.

HAWSER LAID OR CABLE LAID—Three common laid 3 strand ropes, twisted together in the opposite direction to the twist in the rope.

HAWSER—A large common laid rope used for towing, generally soft. Do not confuse with Hawser Laid Rope as previously described.

WORDS AND PHRASES RELATING TO CORDAGE

STRING.....The same as a thread, but a little larger yarn.
CORD.....Several threads twisted together.
ROPE.....Several strands twisted together.
SHROUD LAID..A rope of four strands.
YARNS.....Are laid up left-handed into strands.
STRANDS.....Are laid up right-handed into rope.
HAWSERS.....Are laid up left-handed into a cable.
HAUL.....To pull on rope.
TAUT.....Drawn tight or strained.
BIGHT.....A loop in the rope.
KNOT.....A loop or fastening with a rope.
HITCH.....Attaching a rope to an object.
BEND.....Attaching two ropes together or to an object.
TACKLE.....An assemblage of ropes and blocks.
YARDAGE.....Is understood to be the length per pound.

A ROPE IS:

LAID.....By twisting strands together in making the rope.
SPLICED.....By joining to another rope by interweaving the strands.
WHIPPED.....By winding a string around the end to prevent untwisting.
SERVED.....When covered by winding a yarn continuously and tightly around it.
PARCELED.....By wrapping with canvas.
PAYED.....When painted, tarred, or greased to resist wet.
SEIZED.....When two parts are bound together by a yarn, thread, or string.

The lay of rope is the degree of twist, i. e., the number of turns to the foot.

Lays are known to the buyer as Regular, Medium, Soft or Hard. Occasionally call is made for Extra Hard or Extra Soft.

NOTES ON USE AND CARE OF ROPE

DETERIORATION in rope is both mechanical and chemical, first, due to surface wear or from friction between fibres, secondly, from exposure to weather and acids. Surface wear on ropes likewise follows where worked through blocks or where sheave holes are too small for easy clearance or where blocks become fouled, causing improper alignment, the result of which is chafing of the rope.

Ropes swell to some extent after being wet. Blocks with large enough sheave grooves should be used to take care of swell. Unlike metal and other similar substances, fibre rope has not a permanent elastic limit in which it may be worked indefinitely without injury. Owing to the tendency of the fibres to slip one upon another, the rope gradually loses its cohesion under the repetition of very moderate tension, and may be seriously weakened by constantly working. If fibre rope is subjected to a sudden stress or even to a stress approaching that of breaking its strength is permanently reduced, and it may be expected to give way under a very moderate pull. Hence it is advisable to allow for liberal factors of safety, both as to working and breaking strains.

Internal friction between the fibres increases to some extent when the rope is worked over a sheave. This ultimately has a tendency to break up the fibres, which also suffer a loss of vitality through heat caused by friction. The smaller the

diameter of sheave in this connection the greater the friction. The use of sheaves of the largest diameter permissible is advisable, likewise rope, as the ultimate results will justify.

All rope should be kept clean and free from sand, mud, or other matter containing grit. Chemical deterioration from rotting, or termed by some "dry rot," generally increases through rope becoming water logged and not given an opportunity to dry out in the open air. Allow the rope to dry naturally. Do not cover or prevent drainage as it retards the drying out process.

When dragging rope over the ground it weakens the rope, and dirt and grit is picked up which grinds in when the rope is used again. Unnecessary surface wear often occurs with hoisting machinery by contact against iron beams or the edges of pulley blocks. In transmission the surface friction rope against the sheave also wears it, but the wear is inappreciable as compared with that of a poor installation.

Be careful in storing your rope to prevent contact with commercial acids which have a particularly injurious effect on the fibre.

Always use the largest rope permissible as the limit of safety on small rope is reached quickly. Inspect ropes frequently and replace before the limit of safety is reached. Loss of strength from heat or rotting is difficult to note except following test of fibre. Internal wear can only be judged after careful inspection. Large ropes do

not lose strength through rotting as quickly as the small ones.

Extreme tension occurs frequently in slings bending over sharp corners while under load. This breaks the fibres on the outer side while the sharp corners cut the ones on the inner side. To secure the best service from slings, sharp bends over unyielding surfaces must be avoided and the load should be considerably less than the tensile strength of the rope.

Running rope should never be allowed to touch anything but the wheels or sheaves upon which it works, neither should the rope chafe against the side of grooves of the wheels. Avoid vibration and slipping of ropes so far as possible.

Be careful to have sheaves accurately balanced and in perfect alignment, otherwise rope is liable to jerk, chafe, and destroy itself.

Manila, when dry, contains a small per cent of moisture, but will absorb as much as 30 to 40 per cent in a damp atmosphere. Moisture does not tend to promote decay. In hot, dry weather an occasional wetting of the rope will aid it. A freezing temperature renders the fibres brittle.

Four strand rope will weigh from 5 to 7 per cent heavier than 3 strand rope of medium lay.

Rope is known as Right Lay or Left Lay. In Left Lay Rope all turns are reversed from those of the ordinary Right Lay Rope, the yarn being spun to the left.

Small sizes of rope from 1/8 inch to about 1/2 inch diameter is called Thread Rope (see differential table), though generally ordered by size, i. e., diameter of circumference.

Lay of rope designated as Hard, Medium, or Soft. The Soft Lay is generally used for marine purposes, while the Hard Laid Rope is used for Hammer Falls or where subjected to considerable pressure. Medium Lay for general uses. Buyers should state purpose for which the rope is to be used.

Twisting of Hoisting Rope may be lessened by soaking rope in water, then allowing it to dry out thoroughly.

A common factor for hoisting load is 5 to 1 or one-fifth of the breaking strain, although greater factors should be used according to the hazardous nature of the work.

Rope should be kept in a dry room. Before installation it would be well to keep it in a warm, airy place so as to allow evaporation of any excessive moisture absorbed during transportation.

Small sheaves waste power and increase wear on ropes.

Rope is weakened in a sharp nip of any kind, whether due to a splice, a bad lead, a hitch or a bend around a pin or a post, due to tension upon the layers of fibre from the inside to outside bend, the outer layers being subject to tension, while the inner layers are compressed. As a result, the outer layers wear, followed by others in succession toward the inside.

KINKS—Rope will break when kinked under a very moderate pull or slight jerk.

PRACTICAL RULES FOR ROPES, BLOCKS, AND TACKLE*

1. To find the safe working load of a Manila Rope of given size, square the circumference in inches and divide by 7 for the load in tons.

2. To find the size of a rope for a given working load, multiply the load in tons by 7 and take the square root of the product for the circumference of the rope in inches.

3. To find the size of a rope when rove as a tackle to lift a given weight, add to the weight one-tenth of its value for every sheave to be used in hoisting. This gives the total resistance including friction; divide this by the number of parts at the movable block for the maximum tension on the fall. Reave the fall of a size to stand this tension as a safe working load.

Example—To lift 10 tons with a three-fold purchase, the fall of which, coming from the upper block, is taken through an extra sheave on deck for a fair lead. Required: the size of the fall needed.

Total resistance, including friction, equals

$$10 + 7 \times \frac{10}{10} = 17 \text{ tons}$$

Maximum tension on fall equals $\frac{17}{6} = 2.8$ tons.

Size of fall, note 2, equals $\sqrt{7 \times 2.8} = 4.4$ inches.

4. To find the weight which a given purchase will lift with safety, find the safe working load for the rope to be used. Note 1, multiply this by the number of parts at the movable block. This gives the total resistance including friction. Multiply the total resistance by 10 and divide by 10 plus the number of sheaves used. The result is the weight that may be lifted.

Example—To find the weight which may be lifted by a fall of 4½-inch Manila rope as a three-fold purchase, the fall of which leads from the upper block through an extra leader on deck:

Safe working load $\frac{4.5^2}{7} = 2.9$ tons.

Total resistance, including friction, $6 \times 2.9 = 17.4$ tons.

Weight to be lifted $\frac{17.4 \times 10}{10+7} = \frac{174}{17} = 10.2$ tons.

* From "Knight's Modern Seamanship." ©

METRIC DENOMINATIONS AND EQUIVALENTS

Following factors applying in the reduction of—

One (1) Pound per Foot x 1.48816 equals Kilograms per Metre.

One (1) Kilogram per Metre x .67197 equals Pounds per Foot.

One (1) Foot x .30480 equals Metres.

One (1) Metre x 3.2808 equals Feet.

One (1) Gram x .03527 equals Avoirdupois Ounces.

One (1) Gram x 15.432 equals Grains.

One (1) Avoirdupois Ounce x 28.3495 equals Grams.

One (1) Avoirdupois Pound x .45359 equals Kilograms.

One (1) Yard x .914402 equals Metres.

One (1) Metre x 1.09361 equals Yards.

One (1) Kilogram (Kilo) x 2.20462 equals Pounds.

One (1) Kilogram (Kilo) x 35.274 equals Ounces.

One (1) Metric Ton x .9842 equals Long Ton (2240 lbs.)

One (1) Long Ton x 1.0161 equals Metric Ton.

One (1) Short Ton (2000 lbs.) x .9072 equals Metric Ton.

One (1) Fathom x 1.8287 equals Metres.

One (1) Metre x .5468 equals Fathom.

One (1) Millimetre x .03937 equals Inches.

One (1) Metre x 39.37 equals Inches.

Cubic Measure 1728 Cubic Inches equals 1 Cubic Foot.

Cubic Measure 27 Cubic Feet equals 1 Cubic Yard.

Square Measure 144 Square Inches equals 1 Square Foot.

Square Measure 9 Square Feet equals 1 Square Yard.

Kilograms (Kilo) per Square M/M x 1422.31 equals Pounds per Square Inch.

Millimetre ÷ 25.4 equals Inches.

WEIGHTS AND MEASURES FOR EXPORT SHIPMENTS

(Approximate)

Stock Packages Full Coils (See page 154)

Diameter Inches	Circumference Inches	Approx. Weight Pound	Cubic Measure Inches	Cubic Feet
3/16	1/2	38	13 x 13 x 11	1.076
1/4	3/4	55	14 x 14 x 10 1/2	1.191
5/16	1	60	15 x 15 x 12 1/2	1.627
3/8	1 1/8	65	17 x 17 x 13	2.174
7/16	1 1/4	75	17 1/2 x 17 1/2 x 13 1/4	2.348
1/2	1 1/2	90	18 x 18 x 14 1/2	2.719
9/16	1 3/4	130	19 1/2 x 19 1/2 x 15	3.300
5/8	2	166	21 x 21 x 18	4.594
3/4	2 1/4	205	24 x 24 x 20	6.667
13/16	2 1/2	241	25 x 25 x 21	7.596
7/8	2 3/4	278	27 x 27 x 22	9.281
1	3	335	28 x 28 x 24	10.888
1 1/8	3 1/2	445	33 x 33 x 27	17.016
1 1/4	3 3/4	520	35 x 35 x 29	20.558
1 3/8	4 1/4	663	36 x 36 x 31	23.25
1 1/2	4 3/4	735	37 x 37 x 34	26.936
1 5/8	5	920	42 x 42 x 32	33
1 3/4	5 1/2	1105	42 x 42 x 35	36
2	6	1321	42 x 42 x 41	42
2 1/2	7 1/2	2045	55 x 55 x 46	81
3	9	2950	60 x 60 x 51	106

NOTE—Weights may vary under or over, according to packing

WEIGHTS AND MEASURES FOR EXPORT SHIPMENTS

(Approximate)

Coils of 720 feet each for 120 fathoms

Diameter Inches	Circumference Inches	Approx. Weight Pounds	Cubic Measure Inches	Cubic Feet
3/16	1/2	13	12 x 12 x 8 1/2	.709
1/4	3/4	15	13 x 13 x 11	1.076
5/16	1	20	13 1/2 x 13 1/2 x 11	1.16
3/8	1 1/8	30	14 x 14 x 11	1.248
7/16	1 1/4	45	14 x 14 x 11 1/4	1.276
1/2	1 1/2	55	14 1/4 x 14 1/4 x 11 1/2	1.351
9/16	1 3/4	80	16 x 16 x 14 1/2	2.148
5/8	2	100	18 x 18 x 15	2.812
3/4	2 1/4	125	20 1/2 x 20 1/2 x 19	4.621
13/16	2 1/2	145	21 x 21 x 19	4.849
7/8	2 3/4	165	22 x 22 x 19 1/2	5.462
1	3	200	24 x 24 x 20	6.667
1 1/8	3 1/2	267	28 x 28 x 23	10.435
1 1/4	3 3/4	312	29 x 29 x 23	11.193
1 3/8	4 1/4	400	31 x 31 x 25	13.903
1 1/2	4 3/4	441	33 x 33 x 28	17.646

NOTE—Weights may vary under or over, according to packing

METRES EQUIVALENT TO FEET

1 foot =	.3048 metre	51 feet =	15.5448 metres
2 feet =	.6096 metre	52 feet =	15.8496 metres
3 feet =	.9144 metre	53 feet =	16.1544 metres
4 feet =	1.2192 metres	54 feet =	16.4592 metres
5 feet =	1.5240 metres	55 feet =	16.7640 metres
6 feet =	1.8288 metres	56 feet =	17.0688 metres
7 feet =	2.1336 metres	57 feet =	17.3736 metres
8 feet =	2.4384 metres	58 feet =	17.6784 metres
9 feet =	2.7432 metres	59 feet =	17.9832 metres
10 feet =	3.0480 metres	60 feet =	18.2880 metres
11 feet =	3.3528 metres	61 feet =	18.5928 metres
12 feet =	3.6576 metres	62 feet =	18.8976 metres
13 feet =	3.9624 metres	63 feet =	19.2024 metres
14 feet =	4.2672 metres	64 feet =	19.5072 metres
15 feet =	4.5720 metres	65 feet =	19.8120 metres
16 feet =	4.8768 metres	66 feet =	20.1168 metres
17 feet =	5.1816 metres	67 feet =	20.4216 metres
18 feet =	5.4864 metres	68 feet =	20.7264 metres
19 feet =	5.7912 metres	69 feet =	21.0312 metres
20 feet =	6.0960 metres	70 feet =	21.3360 metres
21 feet =	6.4008 metres	71 feet =	21.6408 metres
22 feet =	6.7056 metres	72 feet =	21.9456 metres
23 feet =	7.0104 metres	73 feet =	22.2504 metres
24 feet =	7.3152 metres	74 feet =	22.5552 metres
25 feet =	7.6200 metres	75 feet =	22.8600 metres
26 feet =	7.9248 metres	76 feet =	23.1648 metres
27 feet =	8.2296 metres	77 feet =	23.4696 metres
28 feet =	8.5344 metres	78 feet =	23.7744 metres
29 feet =	8.8392 metres	79 feet =	24.0792 metres
30 feet =	9.1440 metres	80 feet =	24.3840 metres
31 feet =	9.4488 metres	81 feet =	24.6888 metres
32 feet =	9.7536 metres	82 feet =	24.9936 metres
33 feet =	10.0584 metres	83 feet =	25.2984 metres
34 feet =	10.3632 metres	84 feet =	25.6032 metres
35 feet =	10.6680 metres	85 feet =	25.9080 metres
36 feet =	10.9728 metres	86 feet =	26.2128 metres
37 feet =	11.2776 metres	87 feet =	26.5176 metres
38 feet =	11.5824 metres	88 feet =	26.8224 metres
39 feet =	11.8872 metres	89 feet =	27.1272 metres
40 feet =	12.1920 metres	90 feet =	27.4320 metres
41 feet =	12.4968 metres	91 feet =	27.7368 metres
42 feet =	12.8016 metres	92 feet =	28.0416 metres
43 feet =	13.1064 metres	93 feet =	28.3464 metres
44 feet =	13.4112 metres	94 feet =	28.6512 metres
45 feet =	13.7160 metres	95 feet =	28.9560 metres
46 feet =	14.0208 metres	96 feet =	29.2608 metres
47 feet =	14.3256 metres	97 feet =	29.5656 metres
48 feet =	14.6304 metres	98 feet =	29.8704 metres
49 feet =	14.9352 metres	99 feet =	30.1752 metres
50 feet =	15.2400 metres		

Example — 44 feet = 13.4112 metres = 134.112 decimetres = 1341.12 centimetres = 13411.2 millimetres.

FEET EQUIVALENT TO METRES

1 metre	= 3.281 feet	51 metres	= 167.323 feet
2 metres	= 6.562 feet	52 metres	= 170.604 feet
3 metres	= 9.843 feet	53 metres	= 173.885 feet
4 metres	= 13.123 feet	54 metres	= 177.166 feet
5 metres	= 16.404 feet	55 metres	= 180.446 feet
6 metres	= 19.685 feet	56 metres	= 183.727 feet
7 metres	= 22.966 feet	57 metres	= 187.008 feet
8 metres	= 26.247 feet	58 metres	= 190.289 feet
9 metres	= 29.528 feet	59 metres	= 193.570 feet
10 metres	= 32.808 feet	60 metres	= 196.851 feet
11 metres	= 36.089 feet	61 metres	= 200.131 feet
12 metres	= 39.370 feet	62 metres	= 203.412 feet
13 metres	= 42.651 feet	63 metres	= 206.693 feet
14 metres	= 45.932 feet	64 metres	= 209.974 feet
15 metres	= 49.213 feet	65 metres	= 213.255 feet
16 metres	= 52.493 feet	66 metres	= 216.536 feet
17 metres	= 55.774 feet	67 metres	= 219.816 feet
18 metres	= 59.055 feet	68 metres	= 223.097 feet
19 metres	= 62.336 feet	69 metres	= 226.378 feet
20 metres	= 65.617 feet	70 metres	= 229.659 feet
21 metres	= 68.898 feet	71 metres	= 232.940 feet
22 metres	= 72.179 feet	72 metres	= 236.221 feet
23 metres	= 74.459 feet	73 metres	= 239.502 feet
24 metres	= 78.740 feet	74 metres	= 242.782 feet
25 metres	= 82.021 feet	75 metres	= 246.063 feet
26 metres	= 85.302 feet	76 metres	= 249.344 feet
27 metres	= 88.583 feet	77 metres	= 252.625 feet
28 metres	= 91.864 feet	78 metres	= 255.906 feet
29 metres	= 95.144 feet	79 metres	= 259.187 feet
30 metres	= 98.425 feet	80 metres	= 262.467 feet
31 metres	= 101.706 feet	81 metres	= 265.748 feet
32 metres	= 104.987 feet	82 metres	= 269.029 feet
33 metres	= 108.268 feet	83 metres	= 272.310 feet
34 metres	= 111.549 feet	84 metres	= 275.591 feet
35 metres	= 114.829 feet	85 metres	= 278.872 feet
36 metres	= 118.110 feet	86 metres	= 282.152 feet
37 metres	= 121.391 feet	87 metres	= 285.433 feet
38 metres	= 124.672 feet	88 metres	= 288.714 feet
39 metres	= 127.953 feet	89 metres	= 291.995 feet
40 metres	= 131.234 feet	90 metres	= 295.276 feet
41 metres	= 134.515 feet	91 metres	= 298.557 feet
42 metres	= 137.795 feet	92 metres	= 301.838 feet
43 metres	= 141.076 feet	93 metres	= 305.118 feet
44 metres	= 144.357 feet	94 metres	= 308.399 feet
45 metres	= 147.638 feet	95 metres	= 311.680 feet
46 metres	= 150.919 feet	96 metres	= 314.961 feet
47 metres	= 154.200 feet	97 metres	= 318.242 feet
48 metres	= 157.480 feet	98 metres	= 321.523 feet
49 metres	= 160.761 feet	99 metres	= 324.803 feet
50 metres	= 164.042 feet		

Example — 45 metres = 147.638 feet; 45 decimetres = 14.7638 feet; 45 centimetres = 1.4764 feet; 45 millimetres = 0.1476 foot.

COMPARATIVE TABLE

POUNDS AND KILOGRAMS

Lbs.	Kilos.	Pounds	Kilos.	Pounds	Kilos.	Pounds	Kilos.
1	.453	31	14.05	61	27.66	91	41.27
2	.907	32	14.50	62	28.11	92	41.72
3	1.360	33	14.96	63	28.57	93	42.18
4	1.814	34	15.41	64	29.02	94	42.63
5	2.267	35	15.86	65	29.47	95	43.08
6	2.721	36	16.32	66	29.93	96	43.54
7	3.175	37	16.87	67	30.38	97	43.99
8	3.628	38	17.22	68	30.83	98	44.44
9	4.082	39	17.68	69	31.29	99	44.90
10	4.535	40	18.14	70	31.75	100	45.35
11	4.988	41	18.59	71	32.20	200	90.70
12	5.442	42	19.04	72	32.65	300	136.00
13	5.895	43	19.50	73	33.11	400	181.40
14	6.349	44	19.95	74	33.55	500	226.70
15	6.802	45	20.40	75	34.00	600	272.10
16	7.256	46	20.86	76	34.46	700	317.50
17	7.710	47	21.31	77	34.91	800	362.80
18	8.163	48	21.76	78	35.36	900	408.20
19	8.617	49	22.22	79	35.82	1000	453.50
20	9.070	50	22.67	80	36.28	2000	907.00
21	9.523	51	23.12	81	36.73	3000	1360.00
22	9.977	52	23.57	82	37.18	4000	1814.00
23	10.43	53	24.03	83	37.64	5000	2267.00
24	10.88	54	24.48	84	38.09	6000	2721.00
25	11.33	55	24.93	85	38.54	7000	3175.00
26	11.79	56	25.39	86	39.00	8000	3628.00
27	12.24	57	25.84	87	39.45	9000	4082.00
28	12.69	58	26.29	88	39.90	10000	4535.00
29	13.15	59	26.75	89	40.36	15000	6802.00
30	13.60	60	27.21	90	40.82	20000	9070.00

1 Kilogram—2⅕ Pounds (approximately).

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(INCLUDING ARMORED AND FIBRECLAD WIRE ROPES)

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Suspension Bridge Cables, Galvanized	..	..	64	..	..	..	..	
Stone Sawing Strand	..	66	..	..	..	..	..	
Special Wire Rope	6x61	..	52	52	..	52	52	
Siemens-Martin Strand	..	..	68	..	..	..	..	
Seizing Strand, Galvanized	..	..	67	..	..	..	..	
Transmission Rope	6x 7	30	31	32	..	33	34	15
Tiller Rope	6x42	53	53	..	..	..	..	18
Yacht Rigging Rope, Galvanized	6x 7	..	59	..	..	..	..	20
Yacht Rope, Galvanized	6x19	..	59	..	..	..	..	21

FIBRE ROPE INDEX

FIBRE ROPE INDEX

Continued

WATERBURY PRODUCTS

MANILA AND SISAL CORDAGE

STANDARD WIRE ROPE

ARMORED WIRE ROPE
(GORE PATENT)

FIBRECLAD WIRE ROPE

MUSIC WIRE

BINDER TWINE

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