No. 682,641. Patented Sept. 17, 1901.

H. RYDER.

MANILA ROPE.

(Application filed Sept. 27, 1900.)

(No Model.)

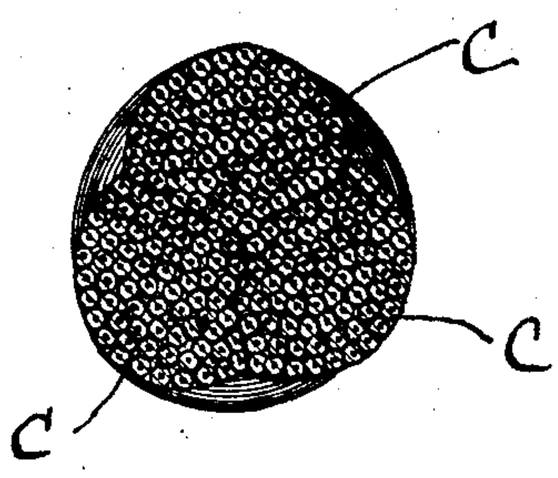

Fig. 1.

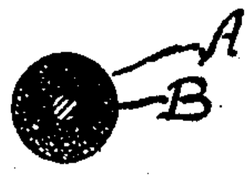

Fig. 3.

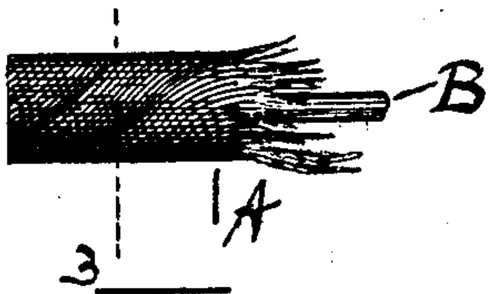

Fig. 2.

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UNITED STATES PATENT OFFICE.

HENRY RYDER, OF BOSTON, MASSACHUSETTS.

MANILA ROPE.

SPECIFICATION forming part of Letters Patent No. 682,641, dated September 17, 1901.

Application filed September 27, 1900. Serial No. 31,338. (No specimens.)

To all whom it may concern:

Be it known that I, HENRY RYDER, of Boston, county of Suffolk, State of Massachusetts, have made certain new and useful Improvements in Manila Rope, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a cross-section of my improved rope enlarged; Fig. 2, a side elevation, enlarged many times, of one of the yarns; and Fig. 3, a section on line 3 3 in Fig. 2.

Like letters of reference indicate corresponding parts in the different figures of the drawings.

As is well known, in making Manila rope the yarns are spun from a cylinder containing or holding the raw material. Then ordinarily thirty of these yarns are laid spirally, ten on the inside and twenty on the outside, forming a strand. Three strands thus constructed are twisted together, forming the rope, or in case of what is known as "cable laid" four strands are employed. Such rope is much used at present for power transmission, replacing the expensive leather belting. It is also well known that Manila rope subjected to high strains as in such transmission or in what is known as "stevedore rope" does not wear from the outside. The inside yarns are known to be the first to give way and the rope breaks before its weakness can be discovered and remedied. By this method of spinning, moreover, the fibers of the manila come in irregularly—that is, the fibers in the sliver cross each other, and each yarn thus spun or formed is solid and twisted in substantially the same manner as is a shoemaker's thread when rolled on the knee by hand.

My invention is designed to overcome all these objections and to provide a rope which while immaterially increased in diameter is substantially doubled in tensile strength and yet loses no material degree of its flexibility. The salient feature of my improvement whereby this result is obtained consists in incorporating a fine metallic wire in each yarn as it is spun from the hemp. This apparently might be considered impracticable from the fact that the wire would have to be held firmly with the hemp ends in the clamp of the spinning-jenny and that thus a torsional twist would be imparted to the wire, which would have the effect when tensile strains were exerted to so weaken the wires that they would snap, and thus instead of adding strength to the rope would detract and act to cut it.

I am aware that wire has been incorporated in the yarns of a rope before. In approximately the year 1853 in England one Wilkinson disclosed an invention wherein an iron or a copper wire was incorporated in a yarn. This was accomplished by swiveling such a wire. Then the operator with a coil of stock or hemp around his body rotated or twisted such wire and picking the hemp into slivers "walked" and fed the sliver to the wire, which was thus spun or accumulated on it. While this leaves the wire without torsional twist and in straight condition, the fibers of the slivers are crossed and the resulting yarn is nothing more than an ordinary "coated" or insulated wire. Now when longitudinal strain is imparted to this it is substantially borne entirely by the wire. More than this, the so disposing of the manila on the wire increases the size of the yarn at least threefold. Now at the time this disclosure was made steel wire or what is now known as "plough-steel" was unknown. The Manila fiber acted solely as an insulator. It bore no part of the strain. It could not from the arrangement of parts, because the stronger the lengthwise strain the more the wire resisted it and only just before the breaking-point of such wire would the hemp receive or be compelled to resist the work. I have discovered, however, in the more modern methods of weaving rope, particularly in the form known as a "bolt" rope, the following principles: The fibers in the slivers of hemp in such ropes are "carded" or laid until they are parallel or in the nature of a tape. Now when this is spun such fibers do not cross. They lie more in the manner of a long curled wood-shaving that has been "drawn out." Thus in longitudinal strain each fiber of a sliver bears an

equal amount, and when such strain is applied to the fullest extent I discover (and I think it is new in the art) that the core of a thread thus formed is hollow. Therefore to effect my invention I simply fill this hollow heart with a wire untwisted and of such tensile strength as shall equal the strength of the Manila hemp in the yarn. By so doing it will at once be seen that I do not materially increase the diameter of the yarn employed, but that I do practically double the strength of such a yarn. In accomplishing this the wire is fed from a reel to the spinning-machine with the hemp from the cylinder. This reel is mounted to rotate longitudinally of its own axis or transversely of the direction of its own rotation while unreeling. This transverse rotation is timed to coincide exactly with the rotation of the spinning-machine that twists the hemp. By this means all torsional action on the wire from the movement of the spinning of the hemp is neutralized, and such wire is thus laid in as a core of the yarn around which the hemp is twisted, as shown at A in Fig. 2 of the drawings. The machine which applies the hemp in tapes or parallel slivers, as described, has been described in my current application for Letters Patent.

As will be best seen in Fig. 3 of the drawings, the hemp of the yarn A entirely covers or incloses the wire B, and when these yarns are laid in the ordinary manner to form strands C and said strands twisted together to form the rope shown in Fig. 1 no wire contacts with an adjacent one. The twisting is so tight that no moisture can reach any wire and oxidization is prevented; but, more than that, "crystallization" of the wires is also prevented because they do not come into rubbing contact with each other. I employ what is known in commerce as a "No. 24 Brown & Sharpe gage-plow steel wire" for the purposes described; but a finer gage may be employed.

As stated, a Manila rope begins to wear first in the heart. With my improved rope the worn yarns are held together by the wires, increasing very largely the life of such rope. It will be particularly noted that by preparing the hemp fiber in the manner described, so that with its fibers substantially parallel it is applied in almost the manner of a tape, and thus not making a thread or yarn of substantially greater diameter than the ordinary rope yarn of this class, each fiber of each sliver is made to bear equal strain. The combined fibers of a sliver are estimated and they bear equal strain with the wire heart. Thus the strength of each yarn of the rope is doubled at least without material increase of diameter.

I wish to specifically disclaim anything connected with the Wilkinson device, as it is impossible for the manila in such device to bear any material portion of the strain.

What I do claim, and desire to secure by Letters Patent, is—

A rope composed of a series of yarns each yarn comprising a core of untwisted fine-gage steel wire covered with hemp spun thereon in the form substantially of a tape, the hemp fibers composing the slivers of said tape being substantially parallel whereby when the yarn with its wire core is completed said core and its covering are so arranged as to resist substantially equal tensile strain without the diameter of said yarns being materially increased and thereby practically doubling the tensile strength resistance of the completed rope.

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