(No Model.) 3 Sheets—Sheet 1.

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Fig. 1.

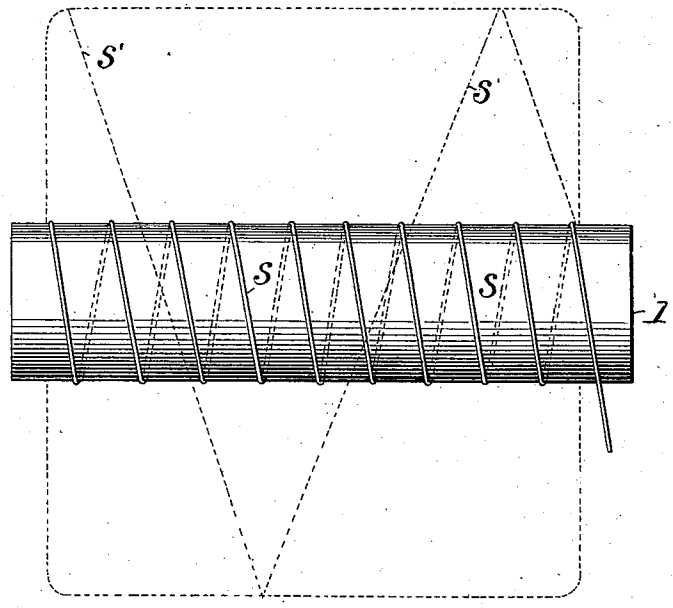
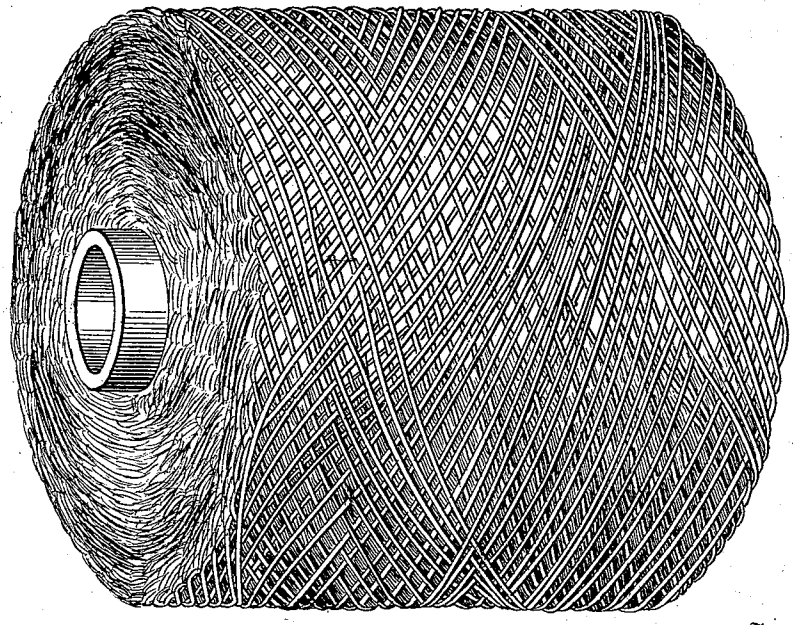


Fig. 2.



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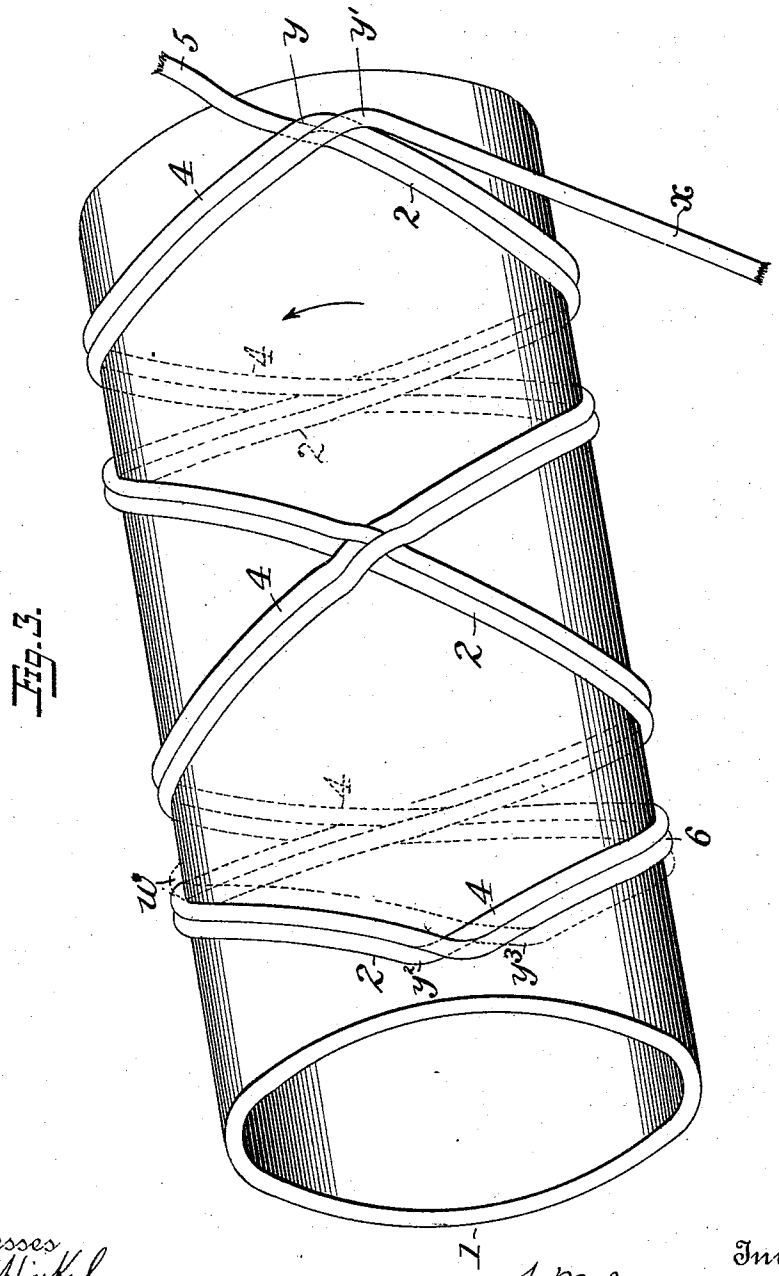

Fig. 1.

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Fig. 5.

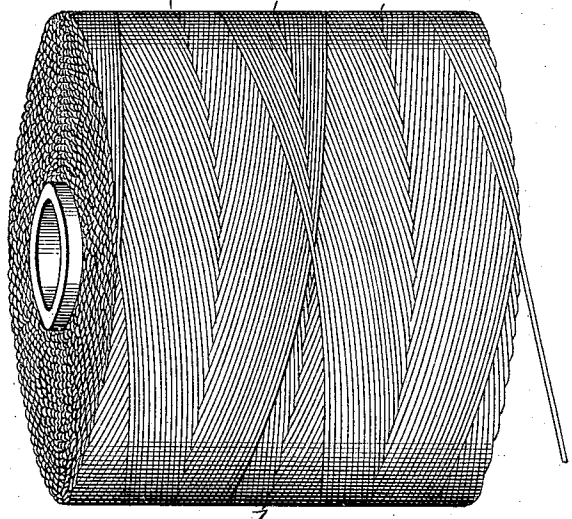
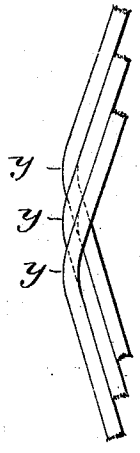


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SPECIFICATION forming part of Letters Patent No. 486,745, dated November 22, 1892.

Application filed December 19, 1891. Serial No. 415,648. (No model.)

To all whom it may concern:

Be it known that I, SIMON W. WARDWELL, Jr., a citizen of the United States, residing in Boston, Suffolk county, Massachusetts, have invented certain new and useful Improvements in Cops, of which the following is a specification.

My invention relates to balls or cops of yarn, thread, cord, or rope of fibers or other materials; and it consists of a ball or cop wound, as fully set forth hereinafter, so as to have greater uniformity, density, and compactness, and so as to facilitate the unwinding and prevent tangling, and insuring other advantages, all as fully set forth hereinafter, and as illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the winding in an ordinary cop. Fig. 2 is a perspective view illustrating an ordinary cop. Fig. 3 is a diagrammatic view illustrating the winding in my improved cop. Fig. 4 is a view illustrating the position of the successive layers of thread at the ends of the cop. Fig. 5 is a perspective view of my improved cop.

In the ordinary winding of balls or cops of yarn, thread, cord, or rope it is common to take a spool, spindle, or hollow tube 1, Fig. 1, and to wind the thread in spirals upon the tube, substantially as shown. No attempt is made to place the successive coils of thread in contact with each other upon the tube at the first winding nor thereafter, nor to arrange them with any precision so as to preserve their parallelism throughout the winding, and when the winding, as is usually the case, is effected mechanically the thread is carried in coils along the length of the tube during its revolution in such a manner that the number of coils to each revolution decreases as the diameter of the cop increases, as illustrated in Fig. 1, in which the lines s indicate the winding upon the tube and the dotted lines s' the winding upon the exterior of a cop several inches in diameter. As a consequence the winding is irregular, the threads are not parallel in the successive coils, the cop is open or loose and lacks firmness and solidity, the thread is not evenly laid, and there are other objections, which will be hereinafter more fully referred to.

In winding my improved cop I make use of a tube, spindle, or cylinder 1, of any suitable character, and I wind the thread x thereon with any suitable number of turns or coils to the length of the tube. In Fig. 3 I show two turns of the thread to the length of the tube. In winding mechanically the thread is applied to the tube by means of a guide having such a reciprocating lateral motion in respect to the tube that the same number of coils or turns are applied upon the tube and upon each layer of the cop whatever may be the diameter that the latter attains. Instead, however, of reversing the traverse or motion of the guide at each lay as soon as the cop completes its revolution, as heretofore, I so operate either the tube or the guide that the thread of each coil as it is laid at the extreme end of the cop is carried across and to the outside of the preceding thread upon that end and laid against or parallel to the outer or inner side of that thread, and is then reversed in its winding and carried toward the opposite end. Thus, as shown in Fig. 3, 2 represents the first coil of thread x applied to the tube 1, and 4 represents the succeeding coil. Assuming the cylinder to be turning in the direction of the arrow, the thread x before it reaches the turn y will be laid upon the inside of one of the coils 4, which holds down the loose end 5, and will then cross the said thread at a point back of the bend y of the latter, and will then be bent back at the point y', and upon the further revolution of the tube will be laid on the outside of the thread of the coil 4 and will follow the said thread throughout its convolutions to the opposite end of the tube, and will finally be laid on the inside of the said thread 4 at the left hand, as indicated by the dotted lines w, and will then cross the coil to the outside of the same, and will be bent back at y^8 and laid upon the outside of the thread 6. This is the course of each coil of thread in each layer of the cop, so that each coil in each layer lies throughout its length parallel to coils previously laid upon the spool. While it is not absolutely necessary, it is preferable in many cases that each coil of thread shall be laid in actual contact with that of one of

the preceding coils, so as to bring the windings into as close proximity as possible and secure a ball of minimum size and maximum density. As a consequence of this construction the threads are laid at each edge of the cop, as illustrated in Fig. 4, in which it will be seen that each thread reverses its direction at a point *y* in the plane of the side or end of the cop, and that the succeeding coil of thread is carried over the preceding coil to such an extent as is necessary to bring such thread to the outside of the preceding thread and to the extreme end of the cop, and then the winding of the succeeding thread is reversed at its point *y* beyond the preceding point *y*, and so on. The threads, therefore, are laid uniformly, evenly, and regularly at each end or edge of the cop and in each of the successive layers or windings upon the cop, and as each coil starts at the edge of the cop at a point beyond that where the underlying thread started from the said edge it is laid alongside of and, if desired, in close contact with the preceding coil throughout the whole extent of the surface of the cop, and there is secured a regularity and uniformity of winding which is absolutely impracticable in any of the windings heretofore adopted. At the points where the different windings of successive layers cross each other the thread last laid is of course carried above that previously laid, so that at each point of intersection they overlap first in one direction and then in the other, as will be understood, and as illustrated at the lines *t*, Fig. 5.

It will be seen that in order to effect the result above described it is necessary either to continue each revolution of the cop a little farther than the preceding revolution before reversing the direction of the guide or to delay the beginning of the reverse motion of the guide, and that this may be effected by any skilled mechanic in different ways, or even, if desired, the winding may be effected by hand, although, of course, it will be understood that in the manufacture of commercial products a machine will be employed for laying the thread. I wish it, however, to be understood that so far as the improved product is concerned I do not limit myself to any particular means or mechanism for winding.

The advantages of a ball or cop wound as above described are as follows: In the first place the same amount of thread may be condensed into a much smaller space, thus securing economy in packing, storage, and transportation. Again, in consequence of the regularity of winding the thread may be unwound from the cop without danger of entanglement, and loss is thus prevented. In consequence of the density and firmness of the cop it will maintain its shape and integrity until the thread is completely wound off, and in shipping the cops do not get crushed out of shape and the coils of thread tangled together. In consequence of the regularity and solidity of the cop, especially such as are used in sewing-machines and other machines of like character, it is practicable to apply the tension directly to the cop itself, which cannot be done with those of ordinary windings. In consequence of the close winding, the thread retains the moisture absorbed during the process of manufacture, which is a matter of much importance, as in ordinary windings the admission of air to the interstices of the cop causes evaporation, which dries and rots the thread and is otherwise detrimental.

In the case of linen thread and fine cotton the open winding causes each thread to have isolated supports upon the coils beneath, and any pressure tends to force these supports into the threads above and to indent or abrade the same to a very detrimental extent. The improved winding in which the coils are all brought close together affords such a multiplicity and close juxtaposition of supports that no such abrading or cutting can result, and the same pressure that would mar the thread of an ordinarily-wound cop has no detrimental effect upon one wound in the improved way. As distinguished from ordinary cops each portion of thread extends from one end to the other of the improved cop in each layer and has the same number of turns in each layer throughout the entire cop. Ordinarily in drawing the thread from cops wound in the ordinary manner they are set upon transverse shafts or supports and are unwound by drawing the thread tangentially. Very frequently, in consequence of the irregularity of the winding, when the thread reaches the end of the cop it slips down or crosses the end of the cop, so as to either increase the friction or sometimes get entangled and break. This will also occur with such cops when set vertically. This cannot occur with my winding, inasmuch as each thread the moment it reaches the edge or end of the cop takes another direction across the face of the cop to throw it back, so that it cannot under any circumstances fall down or under and across the end of the cop and become entangled or afford any additional friction.

The appearance of the cop is a matter which is commercially of great importance. The ordinarily loosely-wound cop is by no means attractive, while it impresses the holder with the idea of entanglement and incapacity to maintain its shape. The cop wound in the manner above set forth presents a solid substantial appearance, is symmetrical and artistic in its general shape, and attractive commercially.

I have referred to the fact that in my improved cop the thread that in each layer extends from one end to the other of the cop in that layer has the same number of turns or coils as every other thread in the other layers, which is a desirable and practically an essential arrangement. I, however, recognize the fact that it would be practicable to make a cop having many of the characteristics and advantages fully hereinbefore described

in which the number of turns in the successive layers might vary to a slight extent—as, for instance, beginning with two coils to each portion of thread, extending from end to end upon the first layer or winding the number of turns or coils of each portion of thread on the last layer or winding on the surface of the cop might be, say, one and a half turns with a very general appearance to that formed with an absolute uniformity of windings. I therefore, in referring to the cop as having the threads with the same number of turns or coils in each layer, do not limit myself to exact and mathematical precision in the number; but such precision is practically desirable, and just in proportion as it is secured the cop is more perfect.

I claim as a new article of manufacture—

1. A cylindrical cop or ball of thread consisting of successive layers in each of which the coiled portions of thread extending from end to end of the cop have the same number of windings and in which each coil of thread is parallel throughout its extent to one of the preceding coils and the ends of the coils at each side are substantially in the same plane, substantially as described.

2. A cylindrical cop in which the coiled thread in each layer extends to the extreme ends of the cop and is there reversed and in which the point where each thread in each coil is reversed is beyond the point at the end of the cop where the thread is reversed in the preceding coil and in which the ends are in substantially the same plane, substantially as described.

3. The cop in which the thread is in successive layers and in which each coil of thread of each layer extends to the end of the cop and the winding is then reversed and in which the thread of each coil is parallel to that of a preceding coil, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SIMON W. WARDWELL, JR.

Witnesses:
CHARLES E. FOSTER,
MYER COHEN.