

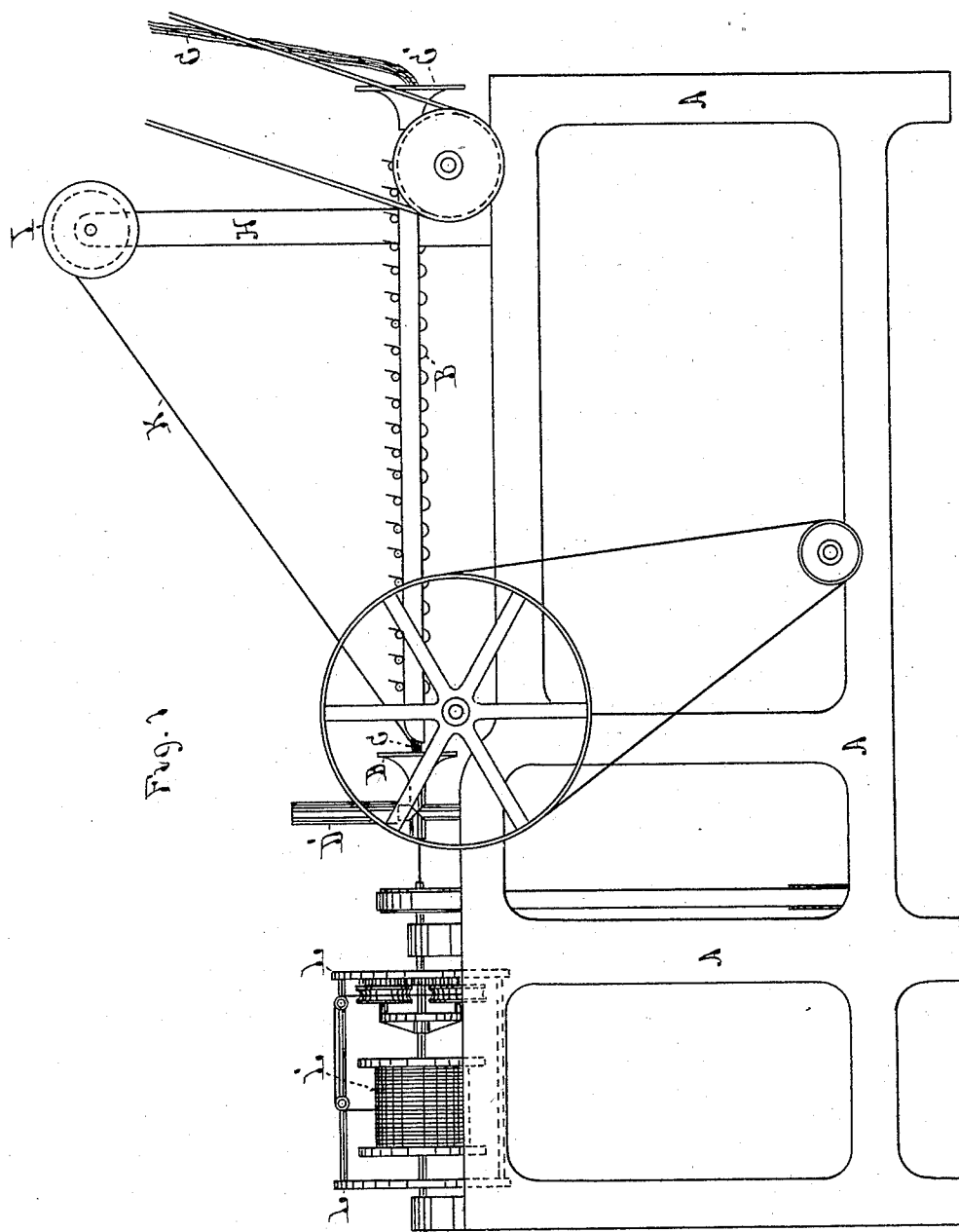
(Specimens.)

2 Sheets—Sheet 1.

B. P. CLARK.
TWINE.

No. 416,052.

Patented Nov. 26, 1889.



Witnesses
Wm. C. Brown
A. E. Thompson

Inventor
B. P. Clark

(Specimens.)

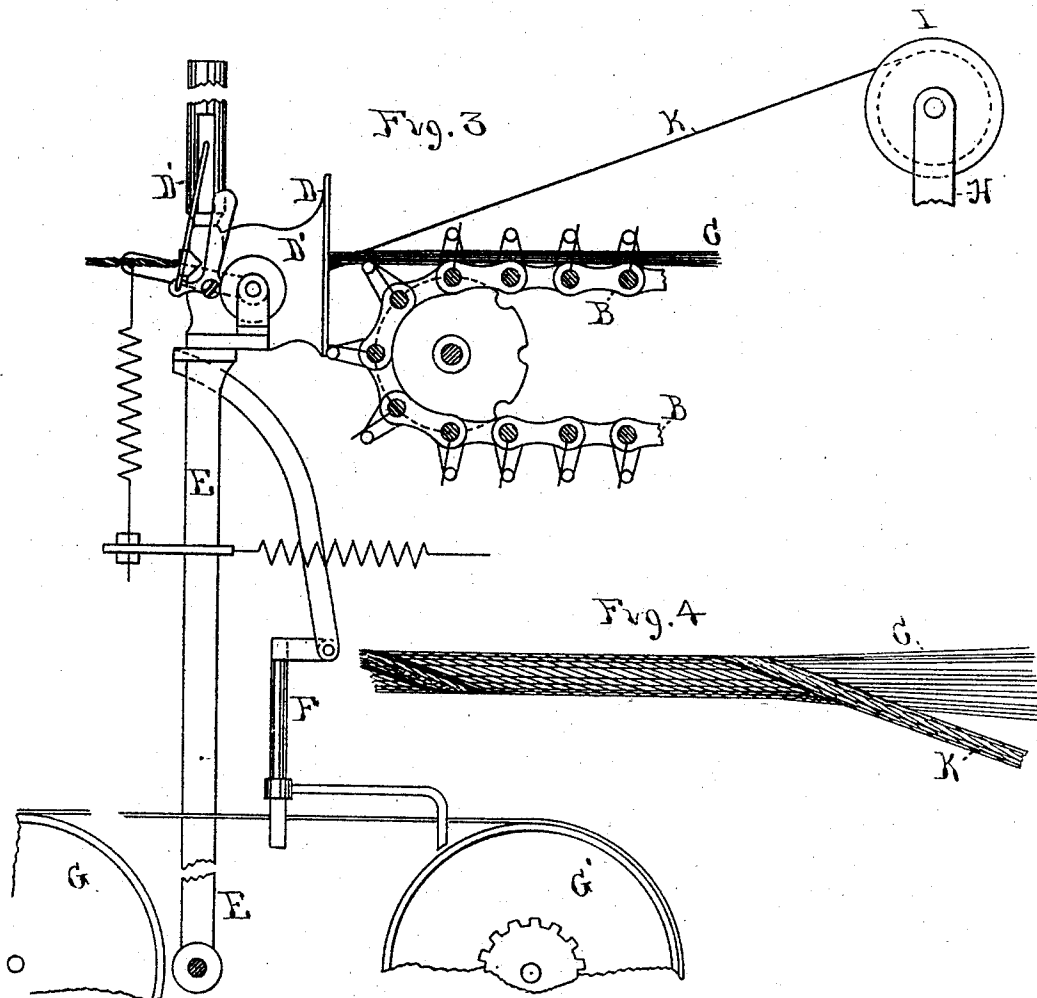
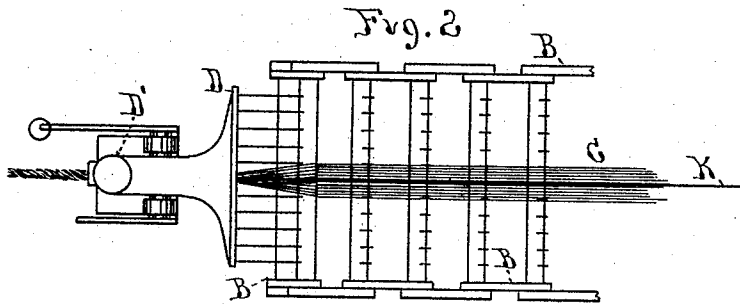
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UNITED STATES PATENT OFFICE.

BENJAMIN PRESTON CLARK, OF BOSTON, MASSACHUSETTS.

TWINE.

SPECIFICATION forming part of Letters Patent No. 416,052, dated November 26, 1889.

Application filed September 21, 1888. Serial No. 286,024. (Specimens.)

To all whom it may concern:

Be it known that I, BENJAMIN PRESTON CLARK, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Twine, of which the following is a specification.

My invention has for its object to provide a twine of practically uniform thickness and strength throughout its length, and yet sufficiently soft to insure that it shall not kink, and that, owing to the compressibility of its fibers, a knot tied therein shall not slip or break in the tying operation, and formed in such manner also that the liability to strip or bunch up and clog in passing through the various guides and eyes of the binding-machine shall be reduced to a minimum, the necessary flexibility being considered, and especially adapted for use in the modern grain-binders employing twine as the binding material, where these qualities, owing to exigencies of the machine and to the expansion of the sheaf after being bound and to the rough handling to which it is subjected, are of special importance; and to this end I propose to form such a twine of a yarn of jute or equivalent soft and flexible material and a sliver of manila or sisal or like stiff and hard material twisted therewith, so that the two shall have practically the same spiral, neither forming a core for the other and both being exposed in regular spirals on the surface.

Whenever a twine is formed from a thread of jute or of waste or other material as a core, wrapped with manila, sisal, or other similar material, it has been necessary, in order to have the covering material remain together when in a single strand, to wrap it so snugly about the core as to form a cord too hard for grain-binding and similar purposes, and even then the entire twine would kink or cockle, and the surface wrapping strip or bunch up and clog, and, moreover, the center cord forming the core, which would be substantially straight, would be the first to receive any strain, while the spiral covering would tend to yield and unwind whenever the other was stretched or broken; but if, instead of soft flexible material, like jute, the core or one of the strands were formed of a yarn of hard stiff material—as, for instance, manila

with a sisal wrapping or sisal with a manila wrapping—there has been such a tendency to kink or cockle or to strip and bunch up as to totally unfit the twine for automatic grain-binding purposes; but I have found that when a soft yarn of jute or like material is used and the same spiral is given to both the jute-thread and the manila or sisal sliver in the spinning operation, and the jute yarn exposed on the surface throughout its spirals, the strain or tension will be equally distributed through them, while the tendency to kink or cockle will be reduced to an appreciable minimum, the thickness will be practically uniform throughout the entire length, and all the beneficial features of both jute and manila will be retained.

Jute twine alone, it is well known, is weak and liable to rot, and in damp weather becomes soft, while even its normal condition, after an exposure of a few months, is soft and flexible with a tendency to cling. Manila and sisal, on the other hand, are tenacious and hard and well adapted to meet all conditions of climate and weather, but are stiff and apt to have knots and lumps, which cause them by themselves to produce a twine that readily kinks and is of uneven thickness and undesirable for use in grain-binding machinery or where any tension device or eye is to be passed through, and, being invariably spun, for grain-binding purposes, of a single strand, they are liable to strip throughout nearly the whole length of the individual fiber until a sufficient bunch accumulates in the binder to prevent their passing through one of the eyes or other instrumentalities, and then they must break, the binder be stopped, and the attendant get down to rethread the machine. Besides this, in the spinning operation small loose or broken fibers are combed off in passing along the feed-chain, over which the sliver is drawn with a greater speed than the chain itself moves until they accumulate in a little lump, which is fed into the nipper and through that into the twister, where it is embodied in the strand of twine, forming a nodule or enlargement, destroying its evenness and unfitting it for passing through the tension devices, eyes, and other parts of a binder; but when twisted with a yarn of jute or equivalent material, as herein proposed,

the manila or sisal sinks its lumps, knots, and enlargements into the yarn at either side, so that the two become uniform and the clinging quality of the jute is utilized or taken up by the manila or sisal and serves to unite the two more tenaciously together, while the firmness of the manila or sisal neutralizes the undue softness of the jute and the softness or flexibility of the jute neutralizes the tendency of the harder material to kink, and, furthermore, the jute yarn, having its surface exposed in regular spirals and at regular intervals throughout the whole length of the twine, serves to "cut" the stripping tendency of the manila sliver and to limit it to substantially the space between each jute spiral, practically an inch or less, and so prevent combing and bunching up in the binder itself, while its soft exposed surface permits the twine to pass through the guides all the more readily and with far less friction.

Still a further advantage is this: The knoter and ejector in a grain-binder, as well as the holder itself, all act with a sudden and violent energy, tending to break or sever the twine wherever a sharp bend is formed. Such bends are formed at the knoter immediately following its initial operating movement, but particularly in the knot itself where the ends of the bands surrounding the gavel pass into the embracing-loop. Experience has shown that the twine is particularly liable to snap or be severed at this point before the sheaf has passed from the machine, and in this case the gavel is spilled upon the ground to be gathered up and tied by the shocker, and the machine has to be stopped and rethreaded, and in doing this a second gavel is generally wasted, because it is necessary, for the purpose of guiding the cord into the holder, that the latter should be moved, and this can only be done by starting the whole binding mechanism for a second or false binding operation. When a shop-boy or salesman has bound a bundle, he twists the twine around his fingers in such manner that one strand shall cross the other at a sharp angle, and with a sudden jerk he severs the latter. The harder the twine, strength being equal, the more readily it will cut. The fact that the twine in a binder severs so frequently at the angle formed with the knot in the sharp impulsive movement of the machine is due to the same principle, and the employment of the yarn of jute or other soft material, combined with the sliver of hard manila, effectively modifies this tendency, since it forms a cushion, into which the harder manila fibers sink and flatten out when the jerk comes upon them, so that no practical knife-edge is permitted to come against the opposing strain, and therefore the liability to break is materially lessened.

Although it is possible that other twine-spinning machinery may be employed with beneficial results in the process of making my improved twine, provided the jute yarn

and the manila sliver are twisted together as if two independent strands, but without one serving as a core for the other, I have found the most efficacious results to ensue from the use of a machine of the John Good type, and therefore for the purpose of illustration have represented it in the accompanying drawings, in which—

Figure 1 is a side elevation of said machine from the feed-mouth for the sliver to the flier. Fig. 2 is a top plan view of this machine, showing a portion of the feed-chain and the nipper; Fig. 3, a side elevation of Fig. 2, partly in section; and Fig. 4, a perspective view of the twine itself, one end of which has the manila sliver removed to show the position of the jute yarn in the process of manufacture, and the other end being completed.

A represents the frame of the machine, and B the feed-chain, which draws the manila or sisal sliver C through the mouth or funnel C', and carries it onward with its fibers spread out flatwise and parallel, side by side, toward the nipper-trumpet D and the nipper D', which latter, by means of a pivoted arm E, belt-shifter F, driving-pulley G, change-speed pulleys G', and intermediate auxiliary mechanism, control the speed with which the chain feeds the sliver to the nipper according to the quantity of material that the latter receives, all as usual on this type of machine.

On a standard H, rising from the frame of the machine, or in any other suitable bearing above the feed-chain, is mounted a bobbin I, which carries a supply of jute yarn K, that runs from said bobbin down into the nippers, and is there brought alongside of the sliver of manila or sisal. The bobbin should be elevated a sufficient distance above the feed-chains to insure that the jute shall run direct to the nippers and not be prematurely brought in contact with the sliver while yet on the chain. The strand of jute yarn, as above stated, should be guided into the trumpet alongside of or side by side with the sliver of manila or sisal, the yarn and sliver passing through the trumpet without the former being entirely covered by the latter, the yarn and the sliver thus forming, as it were, separate strands or separate portions of the completed twine, having substantially the same twist, and both appearing uniformly on the surface. The jute yarn itself should be appreciably soft—that is, it should not be spun to such an extent as to become hard and wiry. I have found a range of from seventy to eighty turns to the yard most desirable, and in practice use about seventy-two, spun in the same direction as the ultimate twist given to the twine. As a general rule, it may be stated that the yarn should be spun of such a number of twists and of such consequent softness as to have a practically-exact correlation to the stiff sliver, so as to twist with it in uniform or nearly uniform spirals, and impart and gain all the advantages of flexi-

bility, freedom from kinkiness due thereto, and of strength due to the frictional and binding contact of fibers and strands caused by the twist, both that originally in the yarn and that imparted by the flier when spinning sliver and yarn into twine.

From the nipper the thread and the sliver pass as independent strands to the flier L and winding-bobbin L', by which they are twisted together in the direction of the twist of the jute into a single twine or cord in which, while the manila, owing to its spread and previously-unspun condition, partly covers and protects the jute and shields it from external contact, yet each strand—that of jute and that of manila—has substantially the same twist or spiral, and therefore receives strains alike. There is a limit, however, to the number of turns that can be given twine for use in automatic grain-binders in a measured length. If the twine is wholly of hard material, like manila or sisal, a very few turns in a foot will cause it to kink, so that it cannot possibly pass through the tension devices or the eye of the needle, or be acted upon successfully by the knotter. Twine composed of soft jute yarn and a manila or sisal sliver combats this tendency while gaining increased strength up to a higher number of turns a foot, and this number is most advantageous from about thirteen to fifteen in the foot. A materially-increased number or materially-greater original twist in the yarn will disturb these conditions and cause the finished twine to kink, so as to be unfit for use in grain-binders. The twine thus formed will have, as intimated in the preamble, uniform strength, since the strain will come on the jute and the manila, share and share alike, and will be resisted by their uniform spirals. It will have the toughness and smoothness of manila or sisal, freedom from undue kinkiness, and withal a certain softness of character necessary, as before intimated, to the forming of a durable knot, while the jute strand, being practically enveloped by the manila or sisal strand, will be sufficiently protected from contact with external objects and shielded from the effects of dampness, or this effect will be taken up and neutralized by the manila or sisal itself.

The twine herein differs essentially from double-ply twines formed of two strands or

threads twisted together, whether of manila or sisal and jute or hemp, or other materials, in that such twines are composed of separate and distinct strands or yarns twisted upon each other and lying spirally in the twine, while in this invention, wherein the twine is formed of a sliver of manila or sisal and a yarn of jute, or some relatively soft and yielding material, the sliver conforms itself to and partially envelops the yarn, yet allowing it to appear uniformly on the surface of the completed twine.

The advantages resulting from combination of the jute yarn and the manila sliver do not exist in double-ply twines formed of similar strands or yarns of the same or different material twisted spirally together.

While I have referred in the foregoing description to jute yarn as my present preference, I desire to be understood that any soft yarn having a similar correlation with jute yarn, spun as stated, to the manila, sisal, or other fiber, is intended to be embraced as an equivalent in my invention; and

Therefore I claim as my invention—

1. A twine designed especially for use in binding grain, consisting of a yarn of a soft flexible material having substantially the twist described, and a sliver of fibers of a stiff hard material, twisted together so that the two shall have practically the same spiral, neither forming a core for the other, but both appearing in regular spirals on the surface.

2. A twine designed especially for use in binding grain, consisting of a yarn of jute having practically the twist described and a sliver of manila, twisted together so that the two shall have substantially the same spiral, neither forming a core for the other, but both appearing in regular spirals on the surface.

3. As a new article of manufacture, twine for binding grain, consisting of a strand of jute yarn of about the twist described, combined with a sliver of manila or sisal, both uniformly twisted together to about the extent stated, so as to have practically the same spiral.

B. PRESTON CLARK.

Witnesses:

THOMAS H. ARMSTRONG,
THOMAS H. WAKEFIELD.