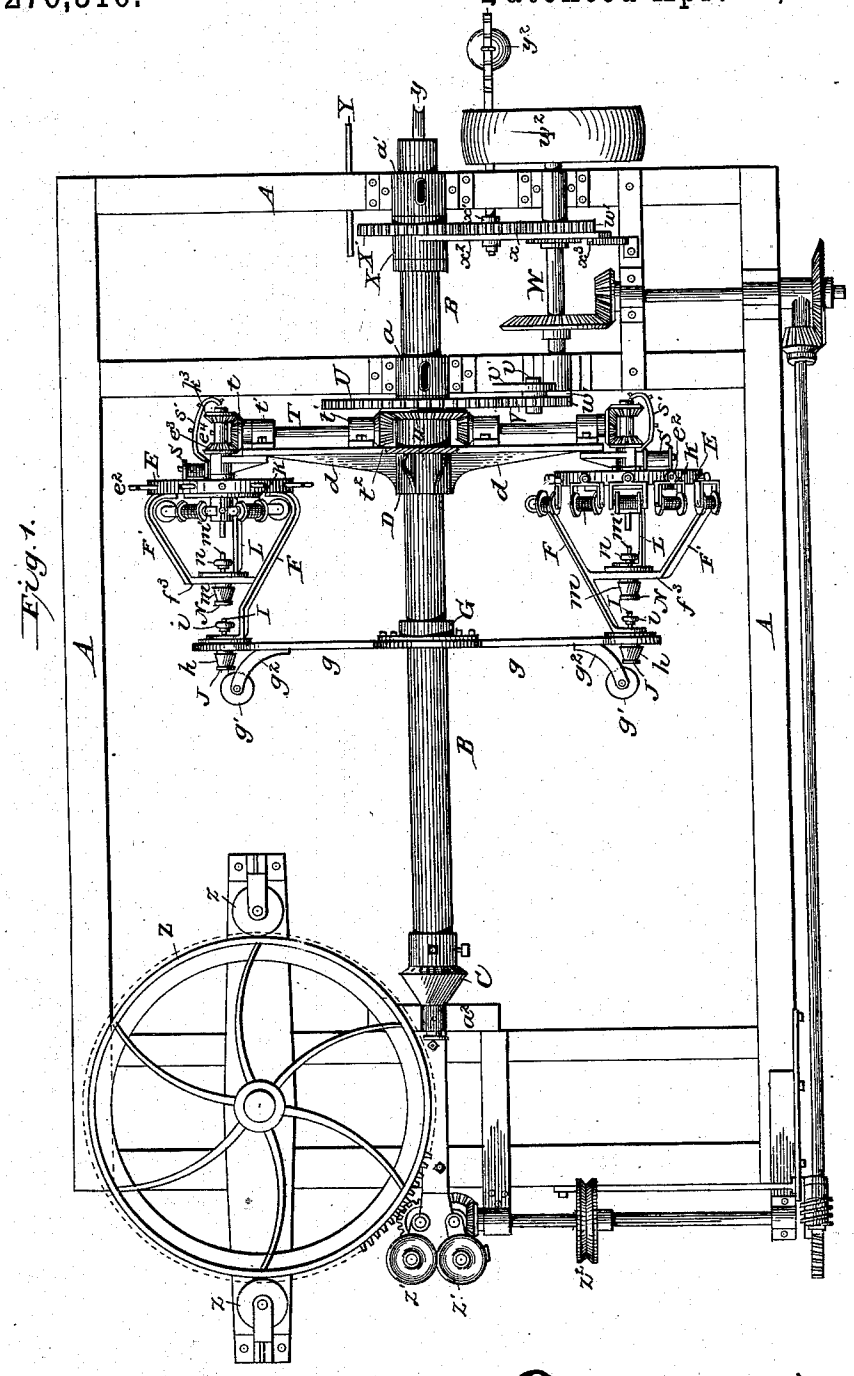
(No Model.) 3 Sheets—Sheet 1.

F. A. WISWELL.

ART OF MANUFACTURING WIRE ROPE.

No. 276,316. Patented Apr. 24, 1883.

Fig. 1.



Witnesses:
A. M. Long.
E. F. Wacker

Frederick A. Wiswell,
Inventor
per Wiswell & Langs.
Attys.

N. PETERS. Photo-Lithographer. Washington, D. C.

(No Model.) 3 Sheets—Sheet 2.

F. A. WISWELL.

ART OF MANUFACTURING WIRE ROPE.

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Fig. 2.

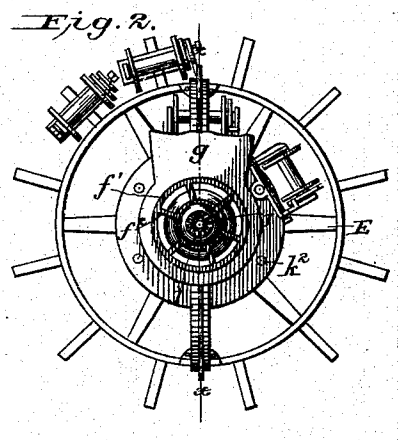


Fig. 3.

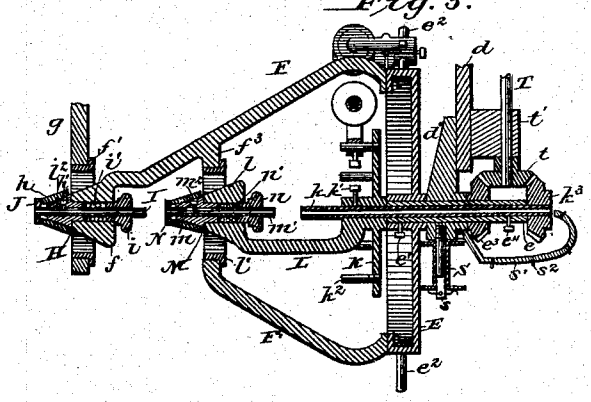


Fig. 4.

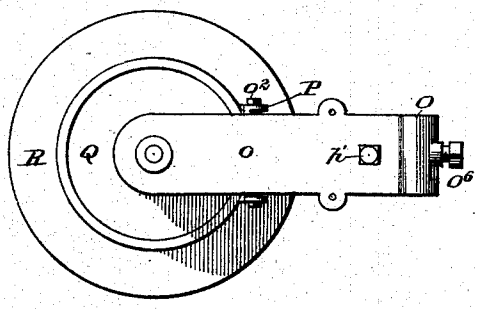


Fig. 5.

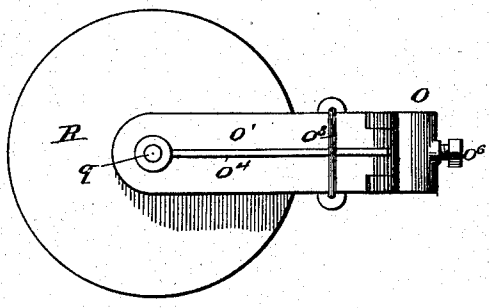
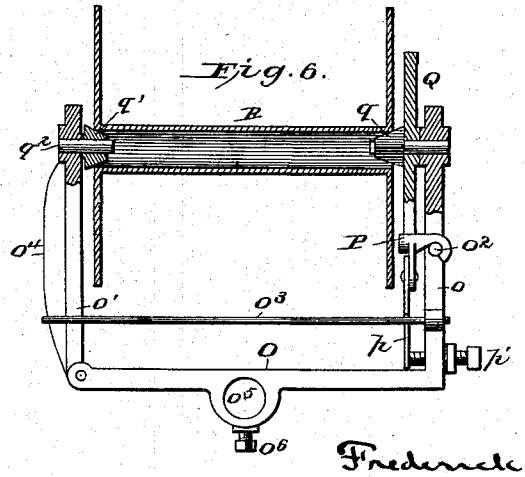


Fig. 6.



Witnesses:
A. M. Long.
E. F. Walker.

Frederick A. Wiswell
Inventor
per Wiswell & Lange.
Attys.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 3.

F. A. WISWELL.

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Fig. 7.

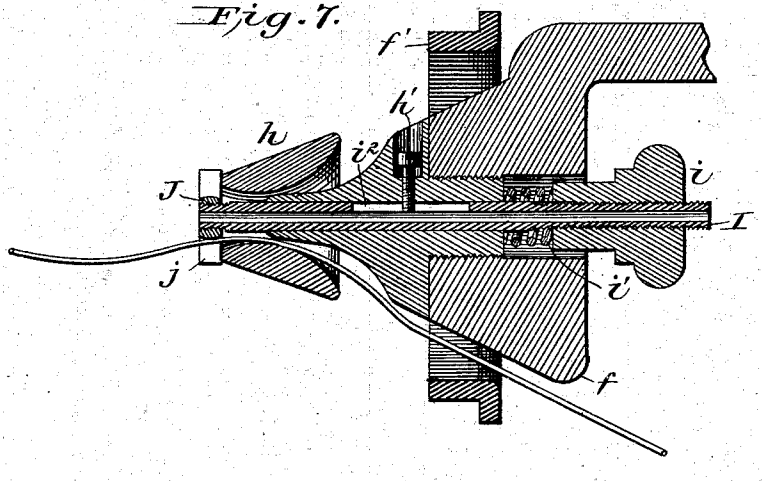


Fig. 8.

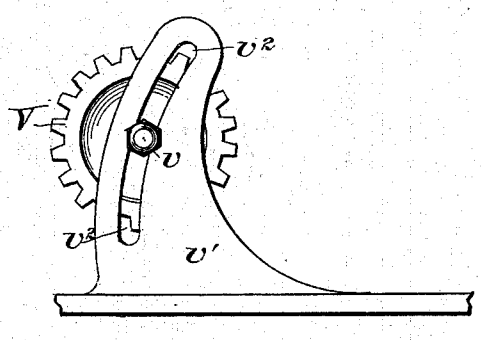
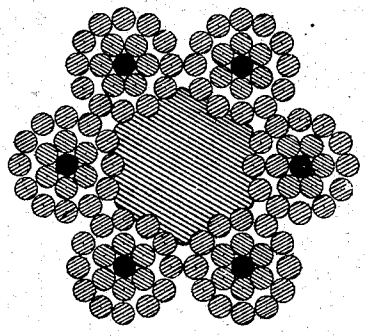


Fig. 9.



Witnesses:
A. W. Long.
E. G. Walker

Frederick A. Wiswell
Inventor.
per Wiswell & Lange.
Attys.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

FREDERICK A. WISWELL, OF BEEBE PLAIN, ASSIGNOR TO CHARLES C. COLBY, OF STANSTEAD, QUEBEC, CANADA.

ART OF MANUFACTURING WIRE ROPE.

SPECIFICATION forming part of Letters Patent No. 276,316, dated April 24, 1883.

Application filed December 15, 1882. (No model.)

To all whom it may concern:

Be it known that I, F. A. WISWELL, a citizen of the Dominion of Canada, residing at Beebe Plain, in the county of Stanstead and Province of Quebec, Canada, have invented certain new and useful Improvements in Art of Manufacturing Wire Rope; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the art of manufacturing wire rope and cables, and has for its purpose, first, to obtain a rope or cable in which the strain applied thereto will be borne by all the wires composing the same; and, secondly, to obtain a cheaper and superior working rope. To effect these results I lay individual wires around cores to form strand-cores; secondly, lay individual wires around the strand-cores to form strands; and, lastly, lay the strands around a main or rope core to form the rope, all in one continuous operation.

For a full understanding of my improvement, reference is made to the following description and claims.

Referring to the drawings, Figure 1, Sheet 1, represents a plan view of a machine adapted to carry out my improved process, in which some of the parts are broken away and others removed to more clearly illustrate the principal working portion of the same. Fig. 2, Sheet 2, is a front elevation of one of the general heads or groups of mechanism with a number of the spool-carriers removed and the arm *g* broken away. Fig. 3 is a longitudinal vertical section thereof, taken on the line *x x*, Fig. 2. Fig. 4 is an end view of one of the spool-carriers. Fig. 5 is a similar view, illustrating the end opposite to that shown in Fig. 4. Fig. 6 is a front elevation, partly in section, of a spool-carrier. Fig. 7, Sheet 3, is an enlarged sectional view of the strand-laying-head mechanism. Fig. 8 is an elevation of the slotted sector which supports the gear V, located between the driving and main shafts; and Fig. 9 is a transverse section of a hoisting-rope.

Corresponding parts in the several figures are indicated by similar characters of reference.

In the accompanying drawings, A marks a frame adapted to support the operating mechanism, and B the central hollow shaft, supported at its rear end in bearings *a a'*, secured to the frame A, and at its forward end in the rope-laying head C, which is held in bearings a^2 to said frame A. This rope-laying head C may be of any known form or construction suitable for the purpose, though I have shown that form which is fully described in an application filed by me July 11, 1882, numbered 66,359, to which reference is made.

Two hubs, D G, are secured to the main shaft B at a suitable distance apart, and are respectively provided with six radiating arms, *d g*, whose extremities support six general heads or groups of mechanism, which are designed to manufacture the strand-cores and strands; and since said heads are alike in construction and operation, I confine myself to a specific description of one of them, as illustrated in Figs. 2 and 3 of the drawings. Referring, then, to said figures, *d* marks one of the arms of the hub D, partly broken away and having the sleeve *d'* secured to its end, said sleeve receiving and supporting the hollow shaft *e*. Secured with a set-screw, *e'*, to the hollow shaft *e*, in front of the sleeve *d'*, is the head E, provided with a number of arms, e^2, projecting from its rim, said arms designed to receive the spool-carriers to be presently described. Secured to the head E, opposite each other, are two arms, F F', which project forward and inward, and at the extremity of the shorter arm, F', form an annular bearing, f^3, (shown in Fig. 1,) for the strand-core-laying head, which will be presently set forth. The outer arm, F, extends forward of the strand-core-laying head and ends in the hub *f*, which has a rim, *f'*, connected to said hub by means of the spokes f^2, (shown in Fig. 2,) the said arm F, hub *f*, rim *f'*, and spokes f^2 formed, in the present instance, in one piece. The rim *f'* has a bearing in the end of the arm *g*, as shown. The base H of the strand-laying head is screwed into the hub *f*, and is curved and tapered, as shown, to receive the sleeve *h*, which has its inner surface curved in such manner as to fit the curved surface of the base, as more fully indicated in Fig. 7. The sleeve *h* is held on the base H by means of the tube I, which

passes through base H and receives at its forward end the spider J, which in turn bears against the sleeve *h*. The tube I receives a thumb-nut, *i*, at its rear end, which presses against a coiled spring, *i'*, encircling said tube between said thumb-nut and the end of the base H, as clearly shown in Fig. 7. A set-screw, *h'*, passes partly through the base H and into a slot, i^2, in the tube I, to prevent a rotation of the tube, while permitting longitudinal motion thereof. By means of the thumb-nut *i* and coiled spring *i'* the sleeve *h* can be properly adjusted on its base, yet not so rigidly but that there will be sufficient play or yielding of parts to permit wire having irregular surfaces to pass between the sleeve and its base to prevent breakage of wires. As shown in Fig. 2, the spider J has a number of slots, *j*, in its periphery, to contain each an individual wire, whereby entanglement of the wires with one another will be prevented and their proper laying into the strand facilitated. I provide the concaved surface in the base H and the contiguous convexed surface in the sleeve *h*, to cause said base and sleeve and the spider J to act as a wire-straightener.

It will be seen by referring to Fig. 7, which shows sleeve *h* removed from close contact with base H to permit the passage of a wire between them, that said wire bears against the parts at three points—namely, against base H at its largest diameter, against the central part of the curved surface of the sleeve *h*, and against the spider J in one of its slots. Further, it will be observed that the portion of the curved surface of sleeve *h* against which the wire bears is at a point below a right line drawn from the bearing-points of the base and spider. This construction is provided so that upon drawing the wire through the parts it will be bent to a curve which shall approximate the curve otherwise given to a wire when laid into a strand. By this operation of parts all bends or curves that may be in the wire as it leaves a spool will be removed, and the curvature or bend given to it by the described mechanism will only remain. Further, by reason of this operation of parts and the fact that said parts are adjustable, a complete and thorough tension mechanism is provided, which is capable of imparting an unvarying tension on all the individual wires passing between said parts, the said tensile strain being applied near the point of lay. By this construction the parts act in a threefold capacity, thus dispensing with independent tension and straightening mechanism and greatly simplifying the construction of the machine. *k* marks a hollow shaft partly inclosed by the shaft *e*, but extending in either direction beyond it, and having the disk K secured to it in front of the head E with a set-screw, *k'*. This disk is provided with a number of arms, k^2, projecting from its face, to economize space, instead of from its periphery, as in the case of the head E, said arms k^2 designed to carry spool-carriers containing wire-bearing spools. Formed in one piece with the hub of the disk K, and extending forward therefrom in a curved manner, as shown, is an arm, L, which ends in the hub *l* and rim *l'*, formed in one piece therewith, said parts supporting the strand-core-laying head composed of the curved base M, sleeve *m*, spider N, slotted tube *m'*, set-screw m^2, thumb-nut *n*, and coiled spring *n'*, all of which are constructed in manner similar to the parts composing the strand-laying head, with the single exception that the spider N has a less number of slots than the spider J, because of the less number of wires used in the construction of the strand-core. The strand-core-laying head has all the capabilities incident to the strand-laying head, as described hereinbefore.

Referring to one of the spool-carriers illustrated in Figs. 4, 5, and 6 that are secured to the arms e^2 of the strand-head E and the arms k^2 of the disk K, O marks the base; *o*, the rigid arm disposed at right angles to said base, and *o'* the swinging arm pivoted to the opposite end thereof. Engaging with the pair of lugs o^2, formed one on each side of the rigid arm *o*, is a friction-block, P, held in frictional contact with the friction-wheel Q, journaled in the upper end of the arm *o* by means of the spring *p*, abutting against the adjusting-screw *p'*, working in the lower part of said arm *o*. Cast on the inner face of the friction-wheel is a corrugated or ribbed stud, *q*, which partly projects into the hub of the spool R, and by reason of the corrugations or ribs causes the spool and friction-wheel to be revolved together when the spool is rotated. The swinging arm is provided at its end with a smooth or, if desired, corrugated stud, *q'*, working on the pin q^2, and partially inserted in the contiguous end of the hub of the spool R, and is held in such position to retain said spool in the spool-carrier by means of the bent retaining-wire o^3, which is passed around the swinging arm *o'*, engages with the cam-web o^4 on said arm, and has its ends secured to the arm *o*, as clearly shown in Fig. 6. By this construction of parts it will be seen that the spool R can be readily removed from the spool-carrier by pressing or forcing the retaining-wire o^3 away from the cam-web o^4 and toward the base O, to permit arm *o'* to be swung outward to release the spool, and, further, that the friction between wheel Q and block P can be increased or diminished by means of the adjusting-screw *p'*. This frictional mechanism is designed to prevent the spool revolving by reason of the "spring" of the wire coiled thereon. The base O is provided with a projection having an annular opening, o^5, and set-screw o^6, to enable the spool-carrier to be placed and retained on an arm, e^2 or k^2, of the head E or disk K.

It will be noticed from the drawings that the head E is capable of carrying twelve spool-carriers containing each a wire-bearing spool,

R, and that the disk K is adapted to carry six spool-carriers, which also contain wire-bearing spools.

S marks a core-spool suitably held on an arm, *s*, screwed into the sleeve *d'*, to which also is held the shield *s'*, having retaining-studs s^2, said shield extending in an outward and then inward curved direction to the rear end of shaft *k*, by which means a core for the strand-core may be passed from the core-spool S to and into the hollow shaft *k*, and thence to and into the tube *m'* of the strand-core-laying head, to become incorporated into the strand-core at the spider N.

The spaces between the spokes f^2, rim *f'*, and base *f* permit wires from the spools on the head E to be passed to the strand-laying head, and the same provision is made with reference to the wires passing from the spools on the disk K to the strand-core-laying head.

As shown in Fig. 3, the shaft *e* is provided in rear of the sleeve *d'* with a bevel-gear, e^3, and the shaft *k* has a similar gear, k^3, at its rear end, both of which mesh with the bevel-gear *t* on the outer end of shaft T, held in bearings *t'*, secured to the back of the arm *d*.

As shown in Fig. 1, the inner end of shaft T has a bevel gear, t^2, engaging with the bevel-gear *u*, cast in one piece with or secured to the spur-gear U, to form a double gear-wheel, which is free to turn on the main shaft B.

Meshing with the spur-gear U of the double gear-wheel is an idle wheel, V, adjustably held by means of a journal-bolt, *v*, in the slotted sector *v'*, secured to the frame A. The idle gear V engages in turn with the pinion *w* on the shaft W, held in bearings to the frame A. Larger or smaller pinions may be placed on the shaft W in lieu of the pinion *w*. The slot v^2 in the sector *v'* is concentric with the periphery of the main shaft B, so that when a larger or smaller pinion is placed on the shaft W, instead of the pinion shown, the idle-gear V may be adjusted in the slotted standard to cause it to mesh with the spur-gear U and said pinion, whereby an increased or diminished speed will be transmitted from shaft W to said double gear-wheel, from which motion is communicated to the strand-head E through shaft T, its gears *t* t^2, bevel-gear e^3, and shaft *e*, and to disk K through said shaft T, its gears, the bevel-gear k^3, and shaft *k*.

Keyed to the shaft W is a spur-gear, *w'*, meshing with the idle-gear *x*, held by a journal-bolt, *x'*, to the arm x^2, forming part of the sleeve X, which is free to turn on main shaft B. The arm x^2 is removably held to the standard x^3 to insure the proper meshing of idle-gear *x* with gear *w'* and spur-gear X', keyed to the main shaft B. w^2 marks a band-wheel keyed to shaft W, through which motion may be imparted to said shaft from a suitable motor.

Y marks a reel, held in bearings to the frame A below the main shaft, from which a suitable rope-core may be passed to and through the main shaft B to the rope-laying head C. *y* indicates a shield to guide the rope-core to the shaft B, and *y'* a pivoted lever, which rests on one of the disks of the reel, and is provided with a weight, y^2, whereby the rope-core will be drawn from the reel under tension to prevent a too rapid unwinding thereof.

With the exception of the slotted sector *v'*, with its gear V, and the fact that one idle-gear instead of two is interposed between gear *w'* on shaft W and gear X' on main shaft B, the foregoing-described drive and reel mechanism, including shaft T, are identical with those described in the application hereinbefore mentioned, to which reference is made for a more specific description.

The drawing-off mechanism shown in Fig. 1 is also identical with that shown and described in the application above referred to, and, without entering into a detailed description thereof, it is sufficient to say that as the rope leaves the rope-laying head C it is passed one or more times around the rotating drawing-off wheel Z, is prevented from lapping on itself by means of the inverted cones *z*, and is taken from the drawing-wheel Z, as it is drawn thereon, by the oppositely-revolving rolls *z'*, whence it may be passed to a suitable reeling device, to which motion may be given through a belt engaging with the pulley z^2.

It will be seen from the foregoing that the main shaft receives motion through gear X', keyed thereto, while the groups of mechanism which are designed to form the strands and strand-cores receive motion from the double gear-wheel *u* U, loose on said main shaft B.

Assuming that the six groups of mechanism contain the required number of spools R filled with wire, the core-spools S are filled with the required cores, the reel Y contains the proper rope-core, the machine is properly "threaded," and the wires are drawn forward around the drawing-wheel Z and through the drawing-rolls *z'*, the operation of the parts to carry out my improved method of laying individual wires around cores to form strand-cores, next laying individual wires around the strand-cores to form strands, and lastly laying the strands around a main or rope core to form the rope in one continuous operation will be as follows: Upon giving motion to the described drive mechanism the disks K are rotated on their axes, the individual wires are drawn from the spools R in the spool-carriers on said disks, and, passing between the base M and sleeve *m* of the strand-core-laying heads, are bent, subjected to tensile strain, and laid around the core-wires passing from the core-spools S to and into the shafts *k* and tubes *m'* to the spiders N to form the strand-cores, which pass to and through the tubes I to the spiders J of the strand-laying heads. During this operation of parts the heads E revolve in an opposite direction to that of the disks K, the individual wires are drawn from the spools R in the spool-carriers on said heads, and, passing between the sleeve *h* and base H of the strand-

laying heads, are bent, subjected to tensile strain, and laid around the strand-cores to form strands, which, six in number, pass over the grooved rollers g', having bearings in the brackets g^2, secured to the arms g, to and into the rope-laying head C, and are laid, in a reverse direction to the lay of the wires around the strand-cores, around the rope-core, passing from the reel Y to and into the hollow main shaft B to said rope-laying head C to form the rope, said rope thence passing around the wheel Z and through the drawing-rolls z' to a suitable reeling device.

If desired, the disks K may be caused to revolve in the same direction as that of the heads E by removing the shields s' from the sleeves d' to permit the bevel-gears k^3 to be removed from the shafts k, then tightening the set-screws e^4, to cause the shafts e and k to move together, and replacing the shields s'.

It will be observed that the strand-core-laying heads rotate with the disks K, while the strand-laying heads rotate with the heads E; further, that the groups of mechanism are carried around the axis of the main shaft B by means of the radiating arms d g.

When the heads E and disks K are filled with spool-carriers containing wire-bearing spools, the hoisting-rope shown in Fig. 9 will be manufactured upon putting the machine in motion.

A variety of ropes may be made by the machine herein disclosed, differing from that shown in Fig. 9 in the arrangement and number of wires, though involving in their manufacture all the steps of the process herein set forth.

No claim is herein set up for the machine shown and described for carrying out my improved process, as such machine forms the subject-matter of an application filed by me on the 12th day of August, 1882, numbered 69,225.

It will be noticed that in the foregoing operation of parts to carry out my improved method or process the strand-cores, after being formed, are drawn without being bent directly to the strand-laying heads, where individual wires are laid around them to form the strands, and that said strands are then drawn to the main laying-head in an oblique direction and, without being bent in any other manner, are laid around the rope-core to form the rope.

As is well known in the art, the strand-cores, instead of being formed of a number of wires laid around a core or center, may be made of several wires laid together or around one another, in which event said core or center is dispensed with. This feature is one so well known to those skilled in the art of manufacturing wire rope as not to require further explanation in order to be fully understood.

Having thus described my invention, what I claim is—

1. The improvement in the art of manufacturing wire rope, which consists in first laying individual wires around cores to form strand-cores, next laying individual wires around the strand-cores to form strands, and lastly laying the strands around a rope-core to form the rope, all in one continuous operation, substantially as set forth.

2. The improvement in the art of manufacturing wire rope, which consists in first laying individual wires subjected to tension applied directly thereto around cores to form strand-cores, next laying individual wires subjected to tension applied directly thereto around the strand-cores to form strands, and lastly laying the strands around a main core to form the rope all in one continuous operation, substantially as set forth.

3. The improvement in the art of manufacturing wire rope, which consists in first laying individual wires around cores to form strand-cores, next laying individual wires around the strand-cores to form strands, and lastly laying the strands directly around a rope-core in substantially the same line of draft as that in which the wires are laid around the strand-cores to form the rope, substantially as set forth.

4. The improvement in the art of manufacturing wire rope, which consists in first laying individual wires subjected to tension applied directly thereto around cores to form strand-wires, next laying individual wires subjected to tension applied directly thereto around the strand-cores to form strands, and lastly laying the strands directly around a rope-core in substantially the same line of draft as that in which the wires are laid around the strand-cores to form the rope, all in one continuous operation, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK A. WISWELL.

Witnesses:
W. GRIFFIN,
F. GRIFFIN.