No. 611,627. Patented Oct. 4, 1898.

T. HANSEN.

THREAD WINDING MACHINE.

(Application filed Oct. 16, 1895.)

(No Model.) 2 Sheets—Sheet 1.

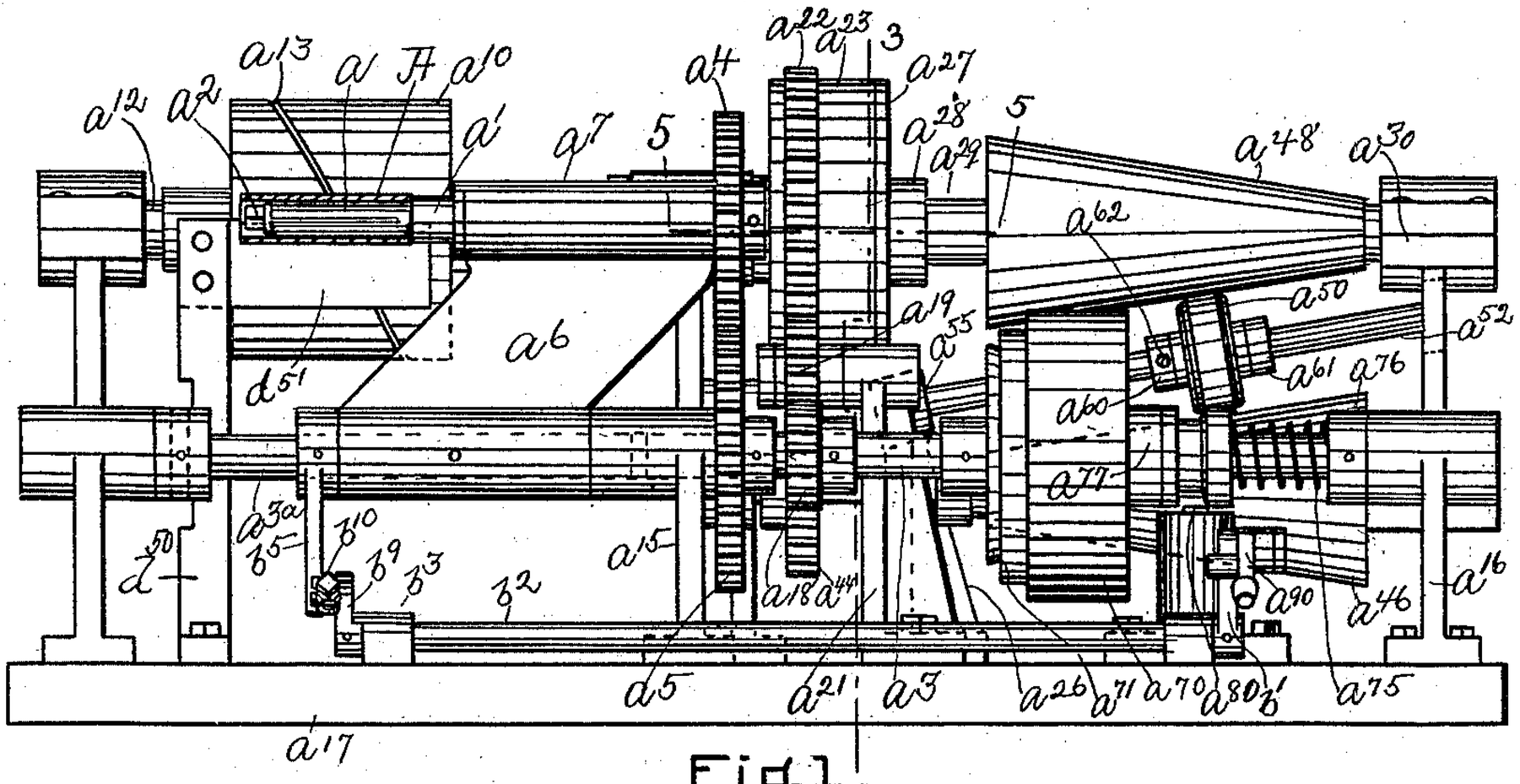

Fig. 1.

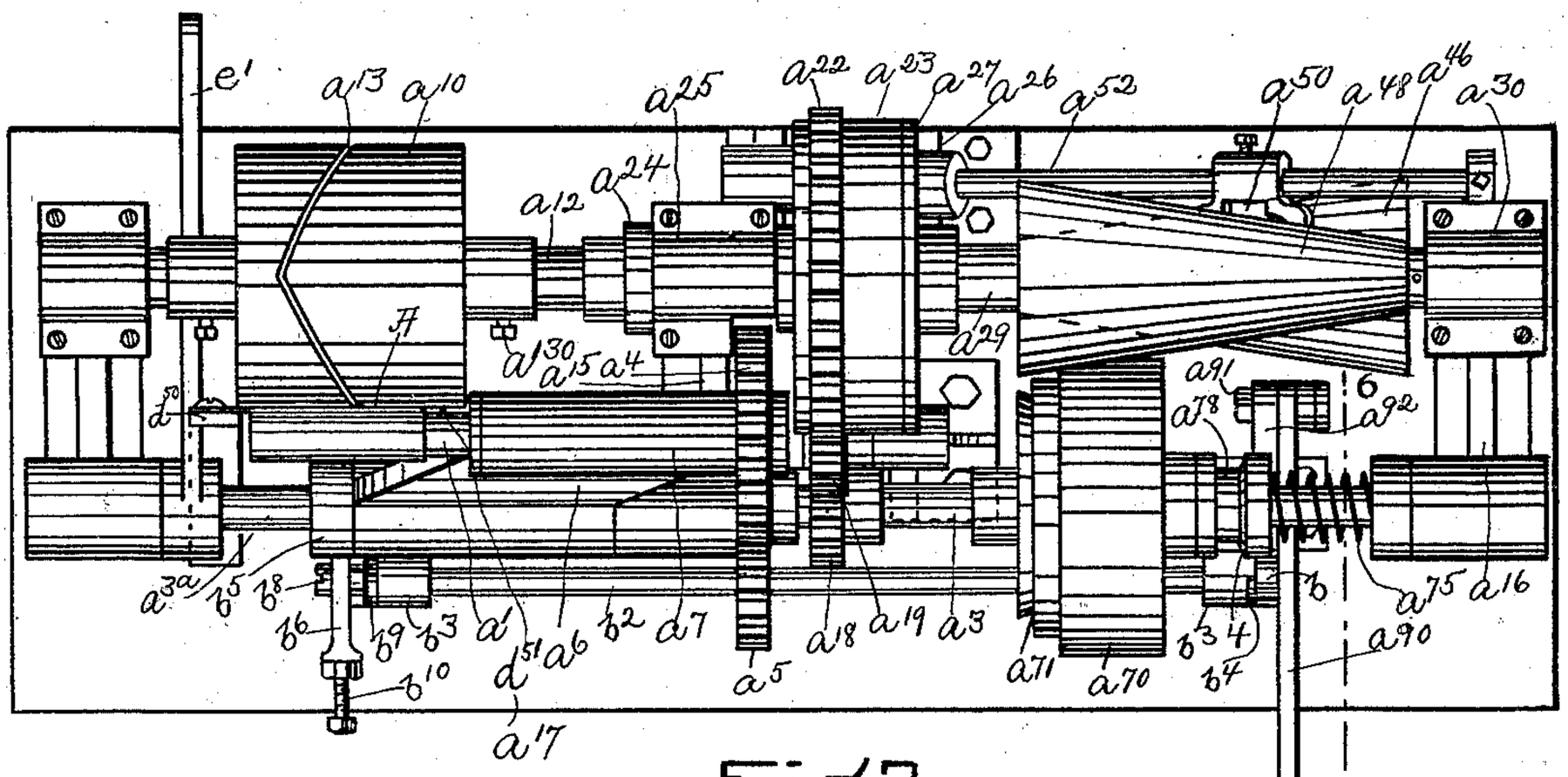

Fig. 2.

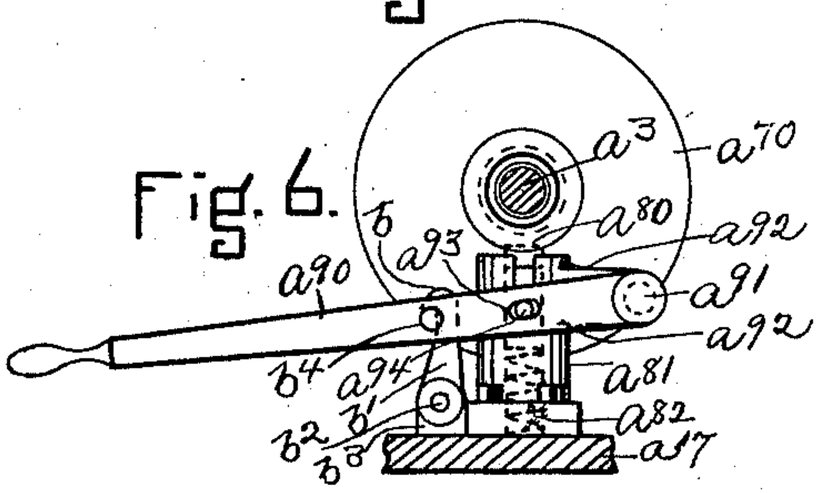

Fig. 6.

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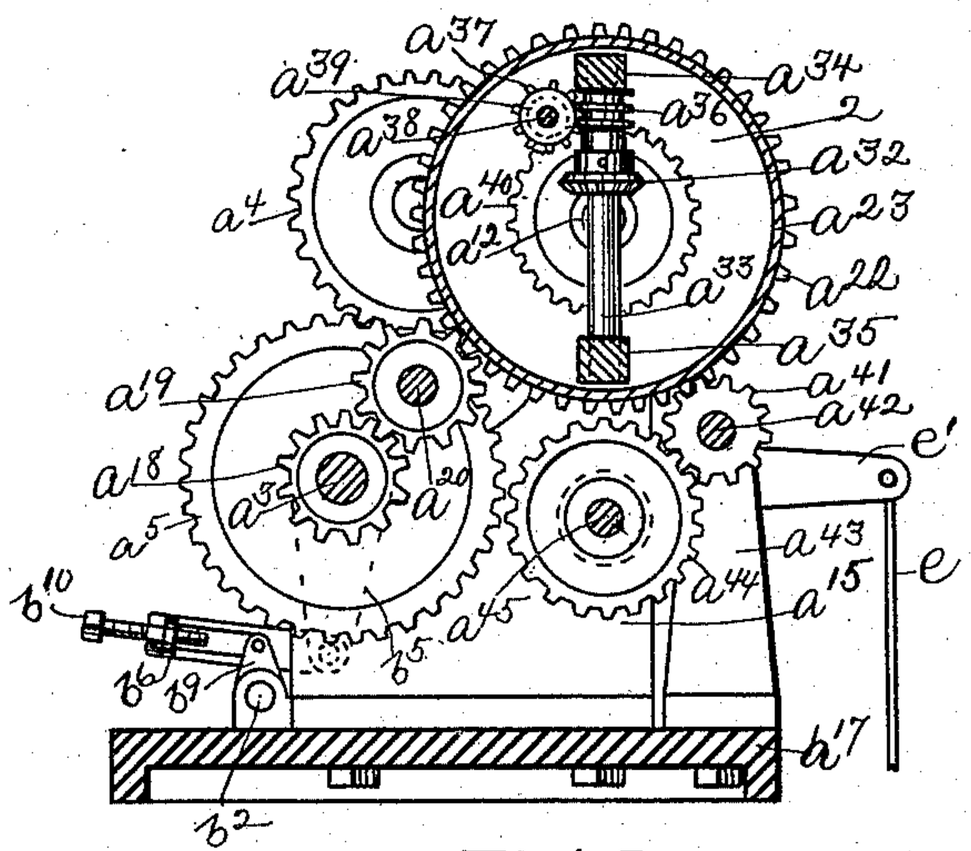

Fig. 3.

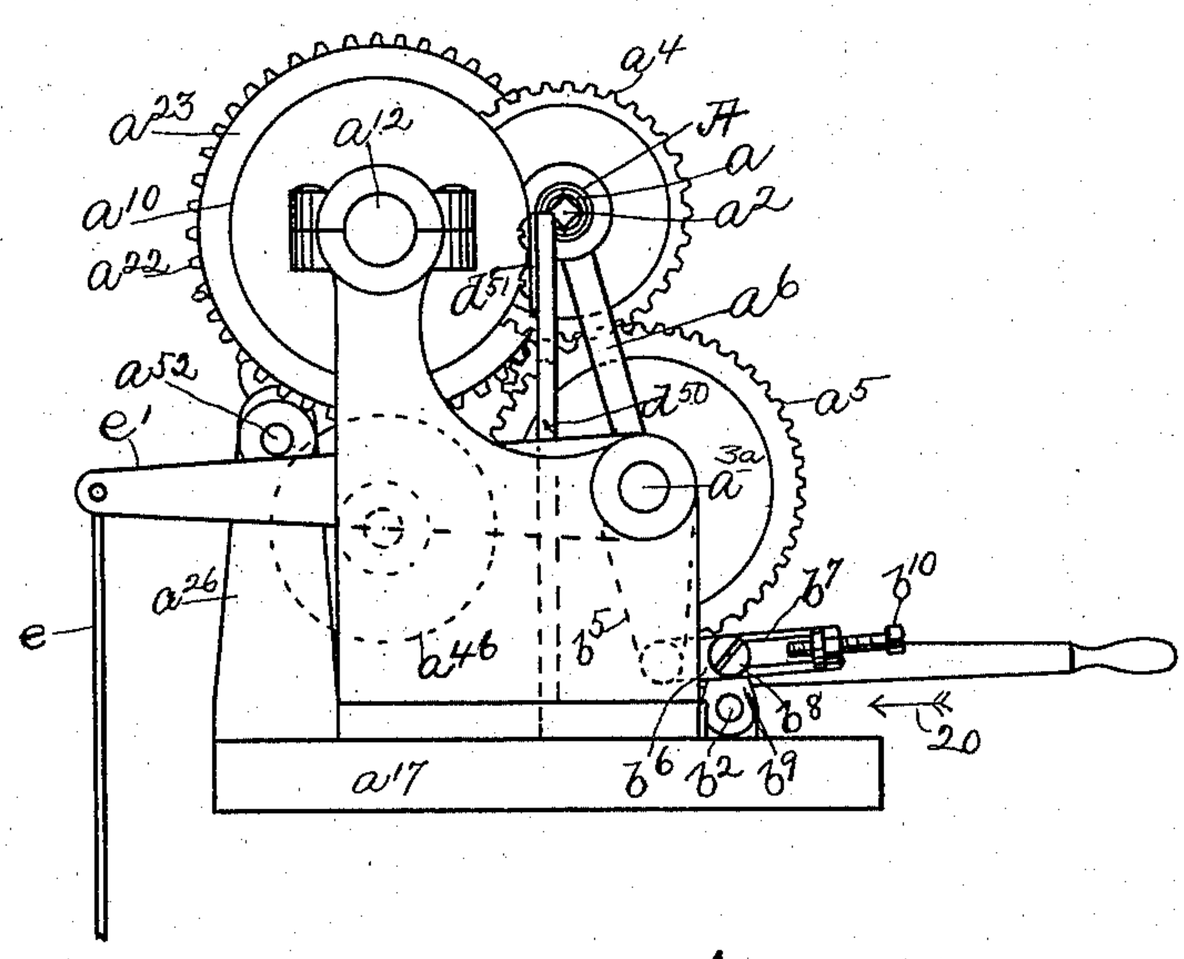

Fig. 4.

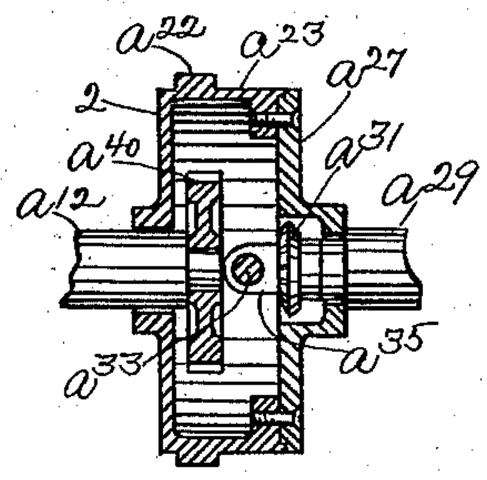

Fig. 5.

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UNITED STATES PATENT OFFICE.

THORVALD HANSEN, OF EVERETT, MASSACHUSETTS.

THREAD-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 611,627, dated October 4, 1898.

Application filed October 16, 1895. Serial No. 565,835. (No model.)

To all whom it may concern:

Be it known that I, THORVALD HANSEN, residing in Everett, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Thread-Winding Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to a winding machine or apparatus especially designed and adapted for winding thread, yarn, or like material upon a cop or cylinder, and has for its object to provide a simple, efficient, and rapid machine for the purpose specified.

In accordance with this invention the machine is provided with a rotatable cop or cylinder upon which the thread is wound and with a rotary thread-guide which coöperates with the said cop and effects a traverse of the thread longitudinally of the cop in opposite directions to thereby wind or lay the thread thereon in successive layers. The rotary thread-guide is driven, preferably, by a mechanism, as will be described, which preferably includes a frictional speed-changing device, as will be described, whereby the speed of rotation of the rotary thread-guide may be varied according to the size of the thread to be wound. These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a front elevation of a winding apparatus embodying this invention, the cop being shown in section; Fig. 2, a top or plan view of the apparatus shown in Fig. 1; Fig. 3, a transverse section of the machine shown in Fig. 1 on the line 3 3, looking toward the left; Fig. 4, an end elevation of the machine shown in Fig. 1, looking toward the right; Fig. 5, a sectional detail to be referred to, the section being taken on the line 5 5, Fig. 1; and Fig. 6, a sectional detail, to be referred to, on the line 6 6, Fig. 2, looking toward the left.

Referring to Figs. 1 and 2, A represents a cop tube or cylinder upon which the thread is wound, the said tube or cylinder being mounted upon a cop-holder a, which may be of any suitable or desired construction and which in the present instance is represented at the longitudinally-split end of a shaft a', the split end of the said shaft being made hollow for the reception of a threaded rod or expander a^2, by means of which the end of the shaft a' may be expanded and contracted to fit cop-tubes of varying diameters.

The cop-shaft a' is driven directly from a main shaft a^3, as herein shown, by means of a gear a^4, fast on the said cop-shaft, meshing with a gear a^5, fast on the main shaft a^3, the said cop-shaft being capable of an oscillatory movement, for a purpose as will be described, by means of a rocking frame or arm a^6, fast on a rock-shaft a^3, and provided at its upper end with a bearing sleeve or hub a^7, through which the cop-shaft is extended.

In accordance with this invention the cop-holder a, secured to or forming part of the cop-shaft a', has coöperating with it a rotary thread-guide, preferably of the construction herein shown, and consisting of a cylinder or drum a^{10}, fast on a shaft a^{12} and provided on its periphery with a cam-slot a^{13}, into which the thread or other cord is placed and by which it is guided and carried longitudinally along the cop-tube in opposite directions to lay the thread on the said tube in successive layers. In the present instance the rotary thread-guide a^{10} is made fast on the shaft a^{12} by a set-screw a^{130}. (See Fig. 2.) The shaft a^{12} is driven from the main shaft a^3 by gearing, as will now be described.

The main shaft a^3, supported at its ends in suitable standards or uprights a^{15} a^{16}, erected upon a base-plate a^{17}, has fast on it, substantially near one end, a pinion a^{18}, (see Figs. 1, 2, and 3,) in mesh with an intermediate pinion a^{19} on a stud or shaft a^{20}, having bearings in an upright a^{21}, (see Fig. 1,) the said intermediate pinion meshing with a gear a^{22} on the periphery of a hollow cylinder or drum a^{23}, loosely mounted on the shaft a^{12}, as will be described, the said drum having extended from one of its faces an elongated hub a^{24}, having bearings in a suitable box a^{25}, supported by the upright a^{15}, the opposite side or face a^{27} of the said drum being removable and provided with a hub a^{28}, the said removable face being secured to the periphery of the said drum in any suitable manner and having extended through it a shaft a^{29}, the said shaft extending into but not through the drum a^{23},

as clearly shown in Fig. 5, and having its opposite end supported in a journal-box a^{30} on the upright a^{16}.

The shaft a^{29} within the hollow drum a^{23} has fast on it a bevel-pinion a^{31}, (see Fig. 5,) which meshes with a like pinion or gear a^{32}, (see Fig. 3,) fast on a shaft a^{33}, located within the drum a^{23} and having bearings in arms or lugs a^{34} a^{35}, secured to or forming part of the face 2 of the drum.

The shaft a^{33} is provided, as shown, with a worm a^{36}, which meshes with a worm-gear a^{37} (see Fig. 3) on a stud or arbor a^{38}, having bearings in the face 2 of the drum, the said stud or arbor having fast on it a pinion a^{39}, (see dotted lines, Fig. 3,) which meshes with a gear a^{40}, fast on the end of the shaft a^{12}. (See Figs. 3 and 5.)

The shaft a^{12} is also driven from the drum-gear a^{22}, preferably by a friction speed-changing device, as will now be described, by which the rotation of the thread-guide may be differentiated from that of the cop-shaft.

The drum-gear a^{22} meshes with an intermediate gear a^{41}, (see Fig. 3,) loose on a stud or arbor a^{42}, supported in an upright or standard a^{43}, located at what may be regarded as the rear side of the machine, the said intermediate gear meshing with a gear a^{44}, fast on the shaft a^{45} of a cone a^{46}, the said cone-shaft having bearings in the uprights a^{16} a^{26}. The cone a^{46} coöperates with a cone a^{48} on the shaft a^{29}, located substantially above the shaft a^{45}, the cone a^{46} being extended in the opposite direction from the cone a^{48} and frictionally connected therewith, and in the present instance this frictional connection is effected by means of a friction roller or wheel a^{50}, interposed between and making frictional contact with the said cones.

The friction wheel or roller a^{50} is frictionally driven by the cone a^{46} and in turn frictionally drives the cone a^{48} and is adjustable longitudinally on its shaft or supporting-rod a^{52} to vary the speed of rotation of the driven cone a^{48} and thereby vary the speed of the rotary thread-guide, as will be described.

The shaft a^{52} is supported, as shown, in the upright a^{16} and in an upright a^{26}, and the friction-wheel a^{50} may be secured on the said shaft or rod in any suitable manner, as by means of collars a^{60} a^{61} on opposite sides of the wheel, which are secured on the rod by set-screws a^{62}, only one of which is shown in Fig. 1.

The main driving-shaft a^{3} may be driven in any suitable manner and is herein shown as provided with a pulley a^{70}, normally loose thereon and adapted to be rendered fast on the said shaft by engagement of the said loose pulley with a friction-disk a^{71}, keyed or otherwise secured to the shaft a^{3} to rotate therewith. This engagement of the loose pulley a^{70} with the friction-disk a^{71} may be effected in any suitable manner, and in the present instance it is effected by means of a spring a^{75}, encircling the shaft a^{3} between a collar a^{76} fast thereon and the hub a^{77} of the loose pulley.

The loose pulley a^{70} is automatically disengaged from the friction-disk a^{71} preferably as herein shown, the hub a^{77} of the said pulley having an annular groove a^{78}, provided with a beveled or inclined wall 4, with which cooperates the end of a plunger or rod a^{80}, movable vertically in a suitable socket in an upright post a^{81}, secured to the bed-plate a^{17} in any suitable manner, the said rod being acted upon by a spring a^{82}, (see dotted lines, Fig. 6,) located in a socket in the post a^{81} below the rod a^{80}, when the said rod is free to move, as will be described. The rod a^{80} is normally held down in its socket by a lever a^{90}, pivoted, as at a^{91}, to an arm a^{92}, extended from the post a^{81}, the said lever, as shown, having a slot a^{93}, into which projects a rod, bar, or arm a^{94}, secured to the plunger-rod a^{80} and extended through a vertical slot in the post a^{81}, the rod a^{94} being extended into the slot in the lever, so that when the lever is turned downward the plunger is forced down into its socket against the action of the spring therein. This downward movement of the lever and the plunger withdraws the latter from the groove in the hub a^{77}, thereby leaving the loose pulley free to be acted upon by the spring a^{75}, which throws it into engagement with the friction-disk a^{71} and starts the machine in operation. The lever a^{90} is locked in its lowered position, as herein shown, by means of a latch or finger b on the end of a crank or arm b' on a rock-shaft b^{2}, having bearings in suitable lugs b^{3}, erected upon the base-plate a^{17}, the said latch or finger being carried over a pin or projection b^{4} on the lever, when the arm a^{6}, carrying the cop-shaft, is rocked to bring the cop toward and preferably in contact with the rotary thread-guide. The rocking of the shaft b^{2} from the shaft a^{3a} is effected, as herein shown, by means of a crank or arm b^{5}, depending from the shaft a^{3a} and having pivotally connected to it a link b^{6}, provided with a slot b^{7}, into which is extended a pin or projection, represented in Fig. 4 as a screw b^{8}, carried by a crank b^{9} on the rock-shaft b^{2}. The link b^{6} is provided at its end, as shown, with an adjusting-screw b^{10}, which is adapted to be brought into engagement with the screw b^{8} when the link b^{6} is moved in the direction of the arrow 20, Fig. 4, which movement takes place as the diameter of the ball wound on the cop increases, for by reference to Figs. 1 and 2 it will be seen that as the ball increases in diameter the rocking support a^{6} for the cop-shaft is turned in the direction opposite to that indicated by the arrow 20, Fig. 4, by reason of the ball bearing against a substantially thin arm d^{51}, horizontally extended from an upright d^{50}, secured to the base a^{17}, and the crank-arm b^{5} is moved in the direction of said arrow, which crank-arm carries the link b^{6} in the same direction and

moves the stop b^{10} toward the screw b^8, and when the said ball has attained the desired diameter the stop b^{10} at such time engages the screw b^8 and rocks the shaft b^2 in the direction indicated by the arrow 20 and withdraws the latch b from engagement with the pin b^4, thereby permitting the plunger-rod a^{80} to be thrown upward into engagement with the beveled wall 4 of the groove a^{78} and thereby move the pulley a^{70} out of contact with the friction-disk a^{71}.

The apparatus may and preferably will be provided with a tension device of any suitable or desired construction to keep the thread supplied to the cop under proper or desired tension.

In operation the thread or other material to be wound on the cop tube or cylinder A is first secured on the cop-tube by winding it upon the same for one or two turns, and it is then placed in the cam or inclined slot a^{13} in the periphery of the rotary thread-guide a^{10}, after which the machine is started in motion, the main shaft a^3 rotating the gears or pinions a^{18} a^{19} and the drum-gear a^{22}. The drum-gear a^{22} rotates the gears or pinions a^{41} a^{44} and thereby rotates the driving-cone a^{46}, which rotates the driven cone a^{48} and its shaft a^{29} through the friction wheel or roller a^{50}. The driven-cone shaft a^{29} produces a differential rotation of the rotary thread-guide in the following manner, namely: The bevel-pinion a^{31} on the shaft a^{29} drives the bevel-gear a^{32}, its shaft a^{33}, the worm a^{36}, the worm-gear a^{37}, its shaft a^{38}, the pinion a^{39}, the gear a^{40}, and the shaft a^{12}, on which the rotary thread-guide is fast. The rotary thread-guide by means of the cam-slot a^{13} carries the thread along the rotary cop-tube longitudinally in opposite directions and lays the said thread on the said holder in successive layers, thereby obtaining a close and firm wind, and owing to the fact that the thread-guide rotates the winding of the thread on the cop is very rapid and the ball is built up or wound to the desired diameter or size very quickly, thereby largely increasing the output of the machine in a given time.

By adjusting the friction roll or wheel longitudinally on its shaft or rod the speed of the driven cone a^{48}, its shaft a^{29}, and the parts driven by it may be regulated according to the size of thread to be wound on the cop. With the present arrangement a fast speed of the thread-guide may be obtained by moving the wheel to the right in Fig. 1—that is, so as to engage it with the large diameter of the driving-cone a^{46} and with the small diameter of the driven cone a^{48}—and a slow speed of the thread-guide may be obtained by moving the said wheel into contact with the small diameter of the driving-cone and into contact with the large diameter of the driven cone.

I have herein shown one form of friction speed-changing mechanism for effecting a change in the speed of rotation of the rotary thread-guide; but I do not desire to limit my invention to the particular construction herein shown.

The cop tube and shaft are normally held toward the rotary thread-guide by means of a weight, (not shown,) which is fastened to the lower end of a rod, cord, or chain e, (see Fig. 4,) secured to a crank or arm e', fast to the rock-shaft a^{3a}. The arm d^{51} is located in close proximity to the rotary thread-guide, with its upper edge substantially in a horizontal line through the rotary thread-guide, which acts as a support for the thread in the cam-slot a^{13}.

I claim—

1. In a thread-winding machine, the combination of the following instrumentalities, viz: a rotary cop-shaft, a rotary thread-guide having a cam-slot coöperating with the said cop-shaft, a main or driving shaft, gearing to connect the said cop and thread-guide shafts with the main or driving shaft, and a stop mechanism for said rotary cop-shaft and thread-guide, substantially as described.

2. In a thread-winding machine, the combination of the following instrumentalities, viz: a rotary cop-shaft, mechanism to produce positive rotation of the said cop-shaft, and a rotary thread-guide coöperating with said cop-shaft and having a peripheral cam-slot in which the thread to be wound on the said cop-shaft is placed to effect a traverse of the thread longitudinally of the cop in opposite directions, and a speed-changing mechanism to vary the speed of rotation of the rotary thread-guide, substantially as described.

3. In a thread-winding machine, the combination of the following instrumentalities, viz: a main or driving shaft, a rotary cop-shaft, a gear fast thereon, a rocking support for said cop-shaft, a gear on the main or driving shaft in mesh with the gear on the cop-shaft and about which the gear on the cop-shaft is movable bodily, a rotary thread-guide coöperating with said rotary cop-shaft, gearing to produce rotation of the said thread-guide, and a frictional speed-changing device to vary the speed of rotation of the rotary thread-guide, substantially as described.

4. In a thread-winding machine, the combination of the following instrumentalities, viz: a main or driving-shaft, a rotary cop-shaft driven thereby, a rotary thread-guide having a cam-slot coöperating with said cop-shaft, means to rotate said thread-guide, and a friction speed-changing mechanism to vary the speed of rotation of the rotary thread-guide, substantially as described.

5. In a thread-winding machine, the combination of the following instrumentalities, viz: a main or driving shaft, a rotary cop-shaft, gearing connecting the said cop-shaft with the main or driving shaft, a rotary thread-guide having a cam-slot, a shaft on which said thread-guide is mounted, a friction mechanism connected to the main shaft to be driven

therefrom and to the rotary-thread-guide shaft to drive the latter, substantially as described.

6. In a thread-winding machine, the combination of the following instrumentalities, viz: a main or driving shaft, a rotary cop-shaft geared therewith, a rotary thread-guide, its shaft, a hollow drum provided with a circumferential gear, gearing connecting the said drum-gear with the main shaft, a speed-changing mechanism comprising a cone geared with the said drum-gear, and a second cone driven from the first cone, and gearing connecting the driven cone with the shaft of the rotary thread-guide, substantially as and for the purpose specified.

7. In a thread-winding machine, the combination of the following instrumentalities, viz: a main or driving shaft, a rotary cop-shaft, a rocking support for said cop-shaft, gearing connecting the cop-shaft with the main or driving shaft, a hollow drum provided with a circumferential gear, gearing connecting the said drum-gear with the main shaft, a speed-changing mechanism comprising a cone geared with the said drum-gear, and a second cone driven from the first cone, a rotary thread-guide, its shaft, and gearing connecting the driven cone with the shaft of the rotary thread-guide, substantially as and for the purpose specified.

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

THORVALD HANSEN.

Witnesses:
JAS. H. CHURCHILL,
J. MURPHY.