S. W. WARDWELL.

WINDING MACHINE.

APPLICATION FILED DEC. 7, 1908.

940,489

Patented Nov. 16, 1909.

2 SHEETS—SHEET 1.

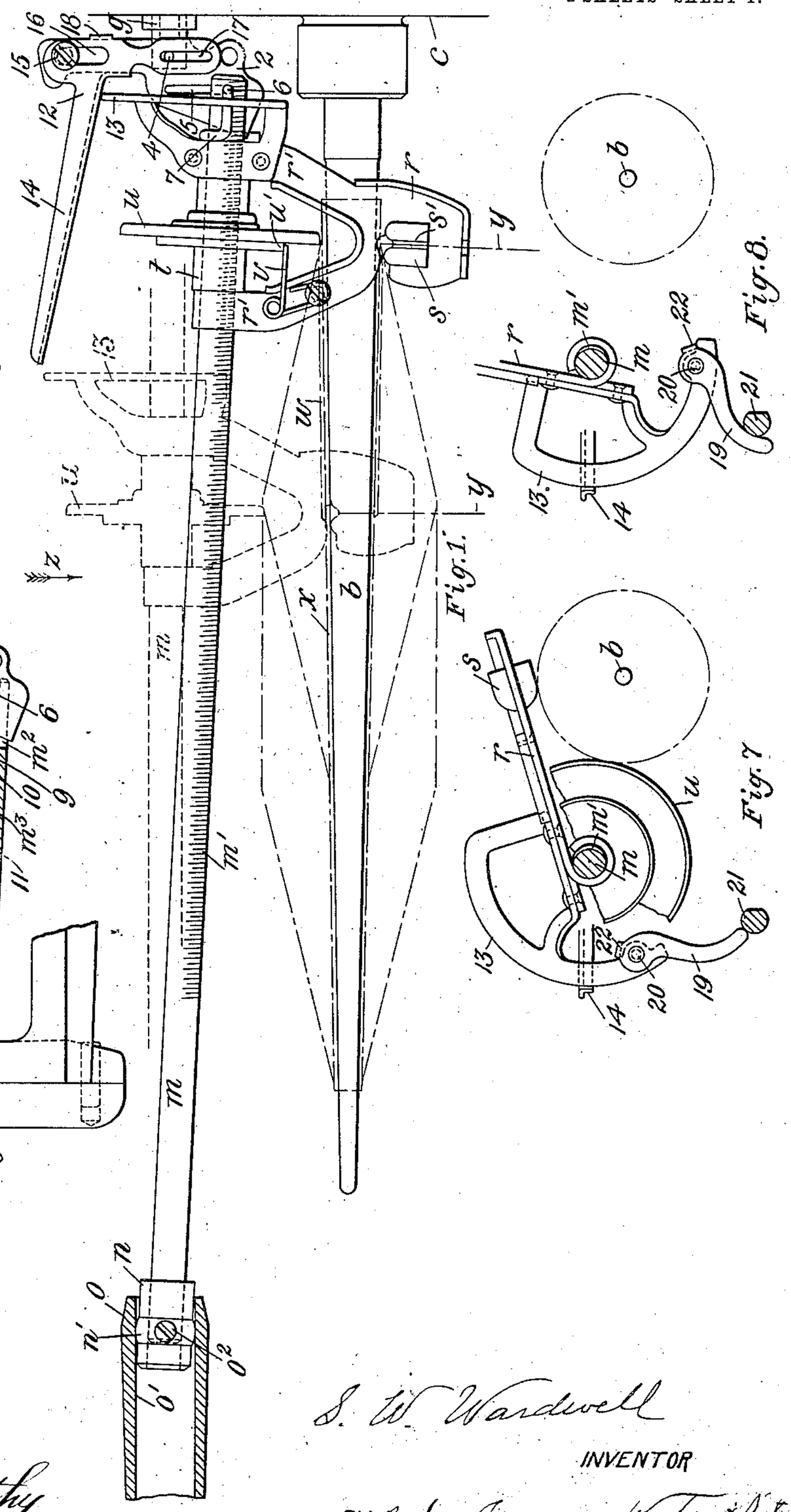

Fig. 1.

Fig. 8.

Fig. 7.

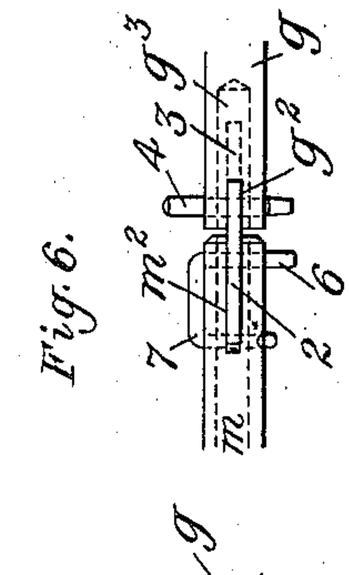

Fig. 6.

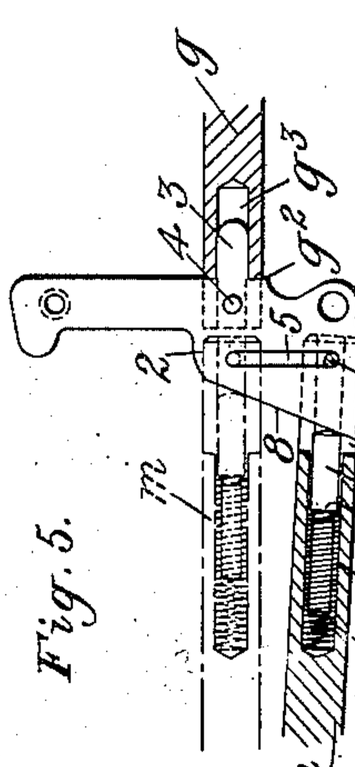

Fig. 5.

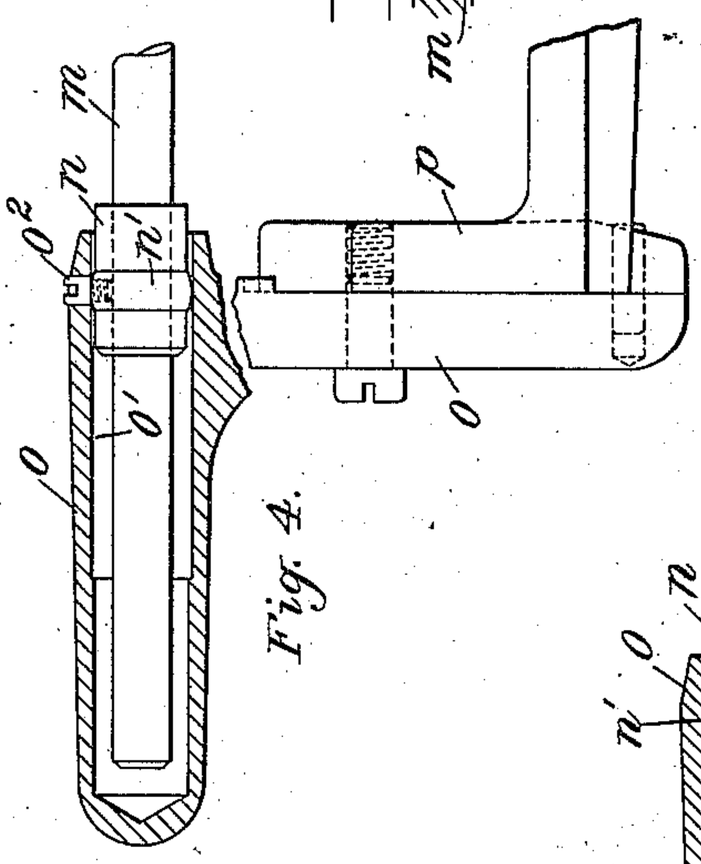

Fig. 4.

WITNESSES

J. J. McCarthy

C. L. Taylor.

S. W. Wardwell

INVENTOR

BY Foster, Freeman, Watson & Coit

ATTORNEYS

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2 SHEETS—SHEET 2.

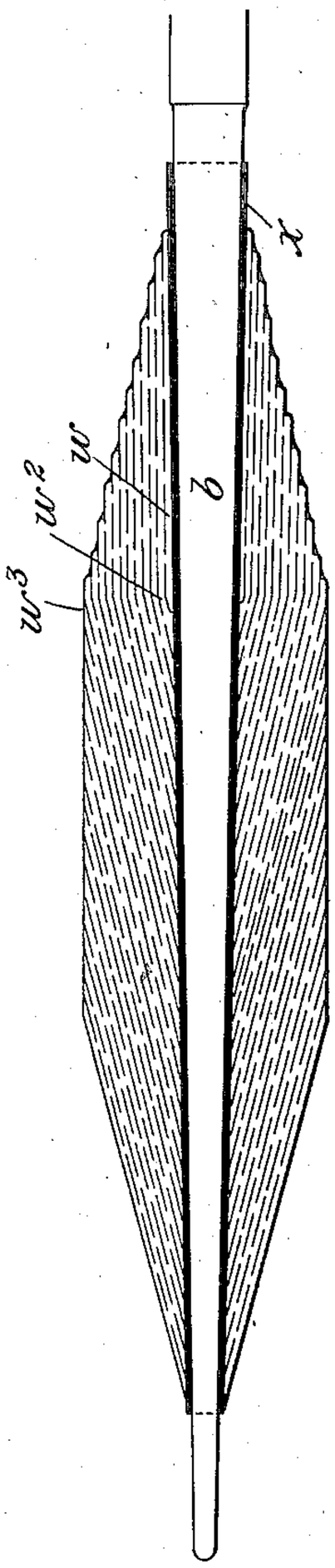

Fig. 2.

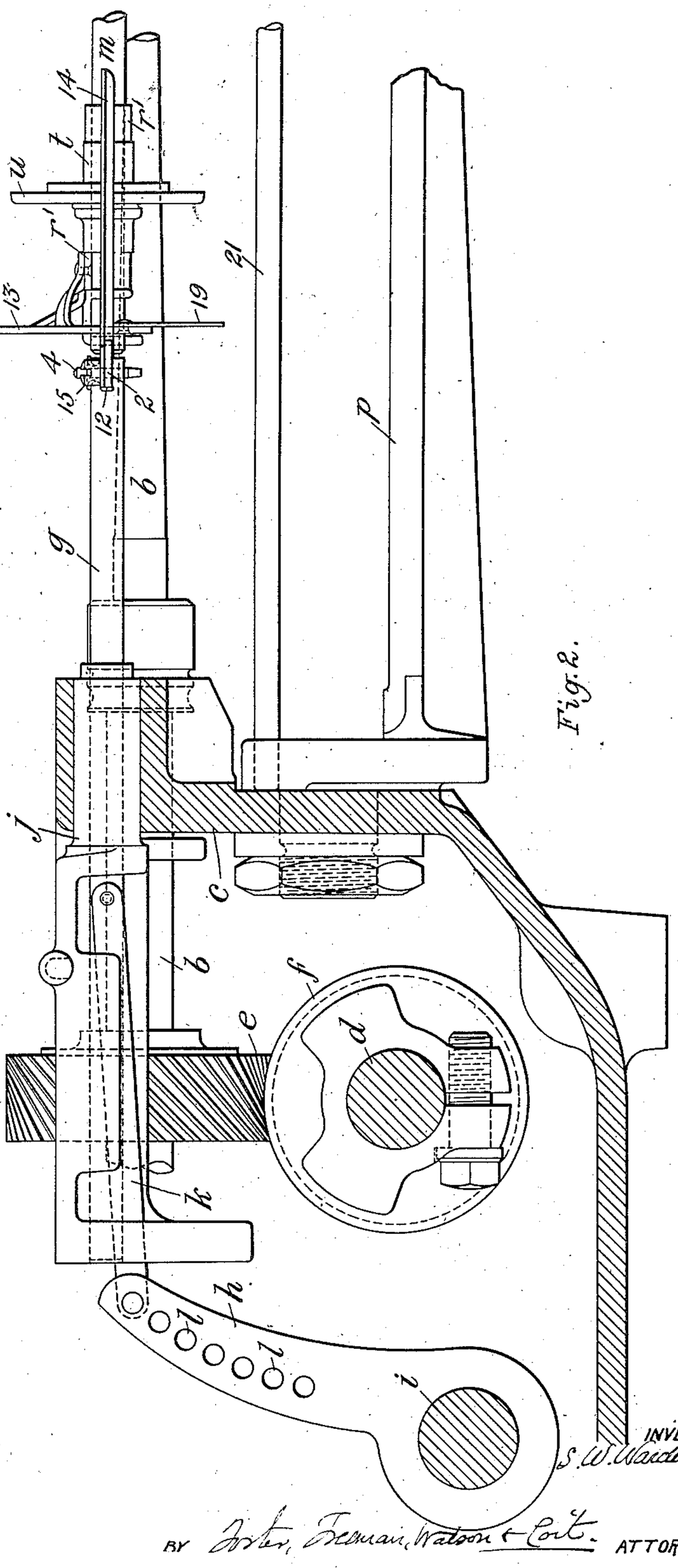

Fig. 3.

WITNESSES

J. J. McCarthy

C. N. Taylor

INVENTOR

S. W. Wardwell

BY Foster, Freeman, Watson & Coit. ATTORNEYS

UNITED STATES PATENT OFFICE.

SIMON W. WARDWELL, OF PROVIDENCE, RHODE ISLAND.

WINDING-MACHINE.

940,489. Specification of Letters Patent. Patented Nov. 16, 1909.

Application filed December 7, 1908. Serial No. 466,399.

To all whom it may concern:

Be it known that I, SIMON W. WARDWELL, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Winding-Machines, of which the following is a specification.

The subject of my invention is a winding machine for producing taper-ended cops for use in loom shuttles.

The invention belongs to that class of machines in which the cop is wound on a paper tube and built up with pointed ends and cylindrical body. The winding is initiated in substantially cylindrical layers which gradually progress forward and overlap each other to build up a conical face, upon which, subsequent layers are wound to form the cylindrical body of the cop. The progression of the layers is effected through the gradual feeding of the thread-guide along its traverse bar as the winding proceeds.

The object of my invention is to simplify and improve this class of machines by providing for the progression wheel to feed the thread-guide from beginning to end of the winding without the use of a separate heel-building or base-forming device.

The accompanying drawings represent respectively:—Figure 1, a plan view showing the relation of the thread-guide and traverse-bar to the winding spindle; Fig. 2, a longitudinal elevation of the same, looking in the direction indicated by the arrow *z*, Fig. 1, and showing the traverse mechanism and the driving gears for the winding spindle; Fig. 3, a sectional view of the cop, showing the disposition of the layers of winding; Figs. 4, 5, 6, 7 and 8, details of construction.

Referring to Figs. 1 and 2, *b* is the winding spindle adapted to rotate in bearings in the frame *c* of the machine and preferably tapered throughout its length extending outward from the frame to adapt it to receive the cop tube *x*, represented by dot-and-dash lines in Fig. 1. The spindle *b* is driven from the main driving shaft *d* of the machine through suitable connections such, for instance, as the skew gears *e* and *f*. The main portion of the traverse-bar *g* is arranged to reciprocate on a line parallel to the axis of the winding spindle and is driven from a rocker-arm *h* which is held by suitable clutch-devices on the oscillating shaft *i*. The main portion of the traverse-bar *g* slides in a bearing *j* secured to the frame *c* and is connected to the rocker-arm *h* by a link *k*. The rocker-arm *h* has a plurality of holes *l*, *l*, etc. arranged at varying distances from the axis of the shaft *i* to provide for connecting the link *k* at different points on the arm to vary the effect of the throw of the latter and change the extent of reciprocation of the traverse-bar. This allows for the adjustment of the traverse of the thread-guide to change the formation of the nose of the cop according as a long or a short taper is required.

In my application for patent, Serial No. 418,998, filed March 3rd, 1908, I have shown mechanism for rotating the winding spindle and traversing the thread-guide similar to that above described, but in my previous invention the machine is adapted to wind on bobbins or tubes having conical butts or heads which support the first layers of yarn. In this style of machine the progression wheel which feeds the thread-guide along its traverse-bar is arranged to contact with the surface of the cop or bobbin at the end of each backward stroke or traverse, where the winding reaches its maximum diameter. Since the first layers of winding are built up on a conical former or butt all of the layers will have the same outside diameter and it is only necessary to provide for reciprocating the progression or contact wheel in a straight line parallel to the axis of the winding spindle. Each time the contact wheel is carried back its periphery comes into contact with the surface of the winding at the point of greatest diameter of the latter, and the wheel is given a slight impetus to rotation which feeds the thread-guide along the threaded traverse-bar and provides for the longitudinal increase in the growth of the cop. In the present invention, however, the initial layers of the cop are wound on a thin paper tube, the butt being dispensed with, so that the first layers are of comparatively small diameter. It is therefore necessary to provide means for swinging the traverse-bar into closer proximity to the winding spindle at the beginning of the winding to maintain the progression wheel in position to contact with the first formation layers of the cop. The automatic devices for securing this adjust-

ment of the contact wheel in proportion to the diameter of the layers of winding form the essential feature of the present invention and will now be described.

The traverse-bar which carries the thread-guide is made in two sections, the main portion g being adapted to reciprocate in a straight line parallel to the axis of the winding spindle, as before explained, and the part m connected to the main portion by a pin and slot arrangement which allows the inner end of the bar m to be moved laterally toward the winding spindle. The outer end of the bar m slides in a bushing n which is swiveled in an outward bearing o fastened to the end of an outrigger bracket p secured to the main frame, see Figs. 1, 2 and 4. Referring to Fig. 4, the bushing n has an annular enlargement n^1 fitted to the bore o^1 of the bearing o. This allows the bushing to swing in the bore, as shown in Fig. 1, and a stud o^2 is screwed into the bushing with its end engaging a hole in the bearing o to retain the bushing from displacement. The bearing o is bored to a depth sufficient to allow the bar m to slide through the bushing its full extent of traverse, as represented in Fig. 4.

Mounted on the traverse-bar extension m is the thread-guide-holder r, of bifurcated form with two legs r^1, r^1, the extremities of which surround the bar to form bearings thereon. The opposite end of the thread-guide-holder is adapted to receive and hold the thread-guide s which is formed with the usual slot s^1, serving as a passage for the thread or yarn y. The arrangement of the bearings of the thread-guide-holder on the traverse-bar allows the thread-guide s to oscillate to and from the winding spindle to adapt it to follow the taper of the winding on the nose of the cop. The bar m is formed with partial screw threads m^1 cut into the surface eccentric to its axis, see Figs. 7 and 8. Located between the two legs r^1, r^1 of the thread-guide-holder r is a nut t having its bore internally threaded, but of sufficient diameter to slide freely over the threads on the bar m when concentric with the latter. Secured to the nut t is a disk or wheel u which has been termed the progression or contact wheel because it acts to contact with the rotating cop to turn the nut t and feed the thread-guide-holder along the traverse-bar. As before stated, the nut t is free to slide over the threads on the traverse-bar when concentric with the bar, but to maintain the nut normally in engagement with the threads m^1 I provide a spring v secured to the thread-guide-holder r and arranged with its free end bearing on a flange u^1 on the wheel u. During the winding, when the thread-guide s bears against the cop, as shown in Fig. 7, the effect of the spring v will be to keep the nut t engaged with the threads on the bar m, but, by swinging the thread-guide-holder t upward, as shown in Fig. 8, this effect of the spring v will be annulled and the nut will return to a position concentric with the bar. In this way the nut can be disengaged from the threads on the traverse-bar so that the thread-guide may be returned to its initial position at the end of the spindle, after one cop is completed, to start the winding of a new cop. The means for maintaining the periphery of the progression wheel u in close proximity to the winding spindle at the beginning of the winding will next be described.

As before stated, the two adjacent ends of the sections g and m of the traverse-bar are joined with a pin-and-slot connection. The end of the bar g is slotted at g^2 and also bored with the axial hole g^3, see Figs. 5 and 6. Inserted in the slot g^2 is a plate 2 formed with a tongue 3 projecting into the bore g^3. A pin 4 is driven down through the rod and the plate to secure the latter in its position in the slot g^2 and the tongue 3 acts to steady the plate to prevent play. A slot 5 is provided in the plate 3, extending perpendicular to the rod g. The end of the rod m is also slotted at m^2 to receive the plate 2 and drilled with a transverse hole through which the pin or wire 6 projects down into the slot 5. The opposite end of the wire is preferably coiled partly around the rod at 7 to hold the pin in place. The outer edge of the plate 2 is formed as a cam face 8 arranged at an angle to the axis of the rod g. The end of the rod m has an axial bore m^3 and a plunger 9 is fitted to slide therein with its end adapted to bear on the cam face 8. The plunger 9 is turned down throughout a portion of its length to form the shoulder 10 and surrounding this reduced portion is a coiled spring 11. The spring 11 is held under tension between the bottom of the bore m^3 and the shoulder 10 and acts to force the end of the plunger against the cam face 8. Preferably, this end is slightly rounded to adapt it to slide smoothly on the cam. The effect of this arrangement is to normally maintain the bar m in axial alinement with the bar g, as illustrated by dot-and-dash lines, Fig. 5, with the pin 6 at the back end of the slot 5. The rear end of the bar m can be swung in toward the winding spindle against the action of the spring pressed plunger on the cam, but when the lateral pressure at the end of the bar is released the plunger 9 acts on the incline of the cam 8 to return the bar to its normal position.

The means for swinging the end of the bar m toward the winding spindle consists of a guide or former 12 having an arm 14 adapted to bear on an extension 13 of the thread-guide-holder r. The former 12 is preferably attached to the plate 2 in such

a way as to be easily removed, so that other formers of different shapes may be substituted when it is required to change the form of the cop. The arm 14 on the former 12 extends in the same plane as the axis of the traverse-bar, at a slight angle thereto, and the angle at which the arm 14 is formed determines the angle of taper at the end of the cop, as hereafter more fully explained. The former 12 is secured to the plate 2 by means of a screw 15 extending through a slot 16 and screwed into the plate. A second slot 17 is adapted to receive the end of the pin 4 which secures the plate 2 in the end of the bar *g*. The two slots 16 and 17 provide for adjustment of the arm 14 toward or away from the spindle *b* so that the progression wheel *u* may be set for tubes of different diameters. An ear 18 is turned down from the main portion of the former 12 and abuts the edge of the plate 2 to locate the former on the plate. The arm 14 is bent down in angle form along the edge which is engaged by the member 13, see Figs. 7 and 8, to provide a more extended bearing surface for the rim of said member.

The member 13 is attached to the leg r^1 of the thread-guide-holder *r* and takes the shape of a quadrant, its outer edge forming an arc concentric to the axis of the bar *m*. The arcal form of the member 13 allows the thread-guide-holder *r* to be turned upward, as shown in Fig. 8, without releasing it from the action of the arm 14. At the lower end of the member 13 is suspended a finger 19, pivoted at 20. The finger 19 is adapted to contact with a rod 21 which extends outward from the frame of the machine parallel with the winding spindle, see Fig. 2. A lug 22 on the upper end of the finger engages the member 13 when the thread-guide-holder is swung upward to the position shown in Fig. 8, and acts as a stop to prevent further movement of the thread-guide away from the winding spindle. This provides against accidental turning of the member 13 out of range of the arm 14.

The operation of the whole machine is as follows: The tube *x* is forced on to the tapered spindle *b* and the end of the thread or yarn *y* secured at the inner end of the tube. At the start of the winding the thread-guide *s* will be in the position indicated by full lines in Fig. 1, with the thread-guide-holder *r* at the inner end of the bar *m*. The member 13 will bear on the arm 14 at the inner end of the latter and the traverse-bar-extension *m* will be held in the position illustrated by full lines in Fig. 1 with its axis extending at an angle to the axis of the bar *g*. The progression wheel *u* will be held in the position shown, with its periphery just clear of the outside of the tube *x* at the latter's larger end. Referring to Fig. 2, the link *k* is connected to one of the holes 1, 1, etc. in the arm *h*, according to the extent of traverse of the thread-guide required. As here shown the link is connected at the end of the arm *h* to give the maximum extent of traverse so that the cop will have a comparatively long nose. With some varieties of material, such as silk or hard-twisted thread, it is necessary to form the ends of the cop with a very slight taper so that there will be no tendency of the coils to slip off or become misplaced; but with soft yarn the coils have more of a clinging tendency and the cop can be wound with a comparatively steep taper at its ends. When the machine is started the winding spindle *b* is rotated from the shaft *d*, through the gears *e* and *f*, and the oscillating arm *h*, through the link *k*, causes the traverse-bar *g* to reciprocate. The thread-guide-holder *r* is traversed in a line substantially parallel to the axis of the winding spindle and the thread-guide *s* follows the surface on which the winding is being performed, being held close to the winding under influence of the tension on the running yarn *y* which draws down through the groove s^1. The first layer of winding, indicated by *w*, will be disposed on the tube *x* in a plane conforming to the surface of the tube. This layer will be tapered only to a slight extent, equal to the taper of the tube *x*, but the rear end of the layer will be slightly larger in diameter than the forward end. This provides that as the progression wheel *u* traverses along the winding spindle substantially parallel to the axis of the latter it will make contact with the winding only at the rear end of its traverse. In other words, it will contact with the winding only at the base or point of largest diameter of the layer. When enough coils have been wound on to the tube to effect this contact of the wheel at the base of the cop the wheel will be rotated from the rotation of the spindle *b* and the nut *t* will advance along the traverse-bar *m*, carrying with it the thread-guide-holder *r* and thread-guide *s*. The length of traverse of the thread-guide remains constant throughout the winding of the whole cop, so that as the thread-guide feeds along the traverse-bar the layers of winding will gradually overlap each other at their outer ends. Fig. 3 shows the second layer w^2 overlapping the layer *w* and the next layer overlaps still farther, and so on, with the overlapping portions building up on a taper until the extreme diameter of the cop is reached. As the wheel *u* feeds along the bar *m* the member 13 rides out on the arm 14, allowing the end of the bar *m* to move laterally away from the spindle *b* under influence of the plunger 9 pressing against the cam face 8. This provides that the wheel *u* shall be kept in proper relation to the spindle *b* to be in position to contact with the base end of each

layer of winding as the heel of the cop increases in diameter. The heel of the cop will take the form indicated in Fig. 3, with a taper corresponding to the angle of the face of the arm 14. The winding reaches the maximum diameter when the bar *m* has been carried out to a position with its axis alining with the axis of the bar *g* and the pin 6 will then be at the end of the slot 5 to limit the bar *m* from further movement. At this point the member 13 rides off the end of the arm 14, as illustrated by dotted lines Fig. 1, and the two portions of the traverse-bar *m* and *g* remain in alinement and form practically one straight, continuous bar during the rest of the winding. From the point w^3, Fig. 3, the winding continues in conical layers wound on to the tapered surface formed by the overlapping of the ends of the first, formation layers in the heel of the cop. As the thread-guide advances along the traverse bar at each reciprocation, the base ends of the layers will all be of uniform diameter, or, in other words these ends will aline to form the cylindrical periphery of the body portion of the cop. The thread-guide *s* oscillates to and from the winding spindle at each reciprocation to adapt it to follow up and down the taper of the winding so that the laying of the coils is accurately and precisely controlled. When the traverse of the thread-guide reaches the end of the cop tube *x* the machine is stopped and the completed cop removed. To prepare the machine for winding a new cop the thread-guide-holder *r* is swung upward away from the winding spindle until the spring *v* is removed from the position where it engages the nut *t* with the threads m^1 on the traverse-bar *m*. The thread-guide-holder *r* is then pushed back along the bar *m* to its initial position at the inner end of the winding spindle. As the thread-guide-holder *r* is slid back the member 13 rides along the incline of the arm 14 and forces the end of the bar *m* laterally in toward the spindle *b* so that the wheel *u* will be in proper position to contact with the first layer of winding. The winding is then started as before described.

It will be understood that by substituting progression wheels of different diameters the diameter of the cop may be varied as desired, and by altering the angle of the former arm 14 and changing the traverse of the thread-guide the formation of the tapered ends of the cop may be controlled.

It will be obvious that my invention is susceptible of modifications in structure and arrangement and therefore I do not limit myself to the exact form shown and described, but

What I claim is:

1. In a winding machine, the combination with the winding spindle, traverse-bar, thread-guide and means to reciprocate the traverse-bar and thread-guide, of means to feed the guide along the bar and means on the traverse-bar to regulate the feeding of the guide to determine the taper of the base of the package wound.

2. In a winding machine, the combination of a rotating spindle, a reciprocating traverse-bar, means to rotate the spindle and means to reciprocate the bar, a thread-guide mounted on the bar, a wheel to feed the thread-guide along the bar and means to adjust the wheel in lateral relation to the winding spindle as the winding increases in diameter.

3. In a winding machine, the combination of a rotating spindle, a reciprocating traverse-bar, means to rotate the spindle and means to reciprocate the bar, a thread-guide mounted on the bar, a wheel to feed the guide along the bar, and means to hold the wheel in close proximity to the winding spindle at the beginning of the winding and to adjust the wheel away from the winding spindle as the cop increases in diameter.

4. In a winding machine, the combination of a rotating spindle, a reciprocating traverse-bar formed with eccentric screw threads, means to rotate the spindle and means to reciprocate the bar, a thread-guide mounted on the traverse-bar, a nut adapted to engage the threads on the bar, a wheel adapted to contact with the cop to turn the nut to feed the latter and propel the thread-guide along the bar, and means to adjust the wheel in lateral relation to the winding spindle according to the growing diameter of the cop being wound.

5. In a winding machine, the combination of a rotating spindle, a traverse-bar arranged to reciprocate longitudinally of the spindle, means to rotate the spindle and means to reciprocate the bar, a thread-guide mounted on the bar, means to feed the guide along the bar, including a progression wheel adapted to contact with the winding, and means to move the bar laterally to adjust the progression wheel toward or away from the winding spindle according to the diameter of the winding.

6. In a winding machine, the combination of a rotating spindle, a reciprocating traverse-bar, means to rotate the spindle and means to reciprocate the bar, a thread-guide mounted on the traverse-bar, a nut to propel the guide along the bar, a wheel adapted to contact with the winding to feed the nut, and means to swing the bar to adjust the wheel in relation to the winding spindle during the winding of the first layers of the cop.

7. In a winding machine, the combination of a rotating spindle, a reciprocating traverse-bar, means to rotate the spindle and means to reciprocate the bar, a thread-guide

mounted to travel along the bar, a wheel adapted to contact with the cop to feed the guide along the bar, means to swing one end of the bar toward the winding spindle to bring the wheel in close proximity thereto at the beginning of the winding, and means to return the bar to its normal position as the cop increases in diameter.

8. In a winding machine, the combination with a rotating spindle and a reciprocating thread-guide, means to rotate the spindle and means to reciprocate the thread-guide, of means engaged by the cop to feed the guide progressively along the spindle from beginning to end of the winding, said means being movable laterally away from the winding spindle to shape the base end of the cop.

9. In a winding machine, the combination with a rotating spindle, of a reciprocating traverse-bar formed of two sections *g* and *m*, the section *g* arranged to slide in fixed bearings and the section *m* arranged to slide in a swiveled bearing, means to rotate the spindle, means to reciprocate the bar, and means to connect the two bars to allow one end of the bar *m* to swing toward the winding spindle, a thread-guide mounted on the bar *m* and a wheel adapted to propel the guide along the bar.

10. In a winding machine, the combination with a rotating spindle, of a reciprocating traverse-bar formed of two sections, means to rotate the spindle and means to reciprocate the bar, and means to so connect the ends of the sections as to normally hold the latter in alinement parallel to the axis of the spindle, but to allow the connected end of one of the sections to swing in toward the spindle.

11. In a winding machine, the combination with a rotating spindle and means to rotate the spindle, of a reciprocating traverse-bar with means to reciprocate the bar, said bar formed of two sections *g* and *m*, the section *g* sliding in bearings parallel to the axis of the winding spindle and the section *m* sliding in a swiveled bearing allowing one end to swing laterally toward the winding spindle, and connecting means between the two sections to permit the section *m* to swing, including yielding devices that act to normally hold the two sections in alinement.

12. In a winding machine, the combination with a rotating spindle and means to rotate the spindle, of a threaded traverse-bar adapted to slide in a swiveled bearing, means connected to reciprocate the bar, means to move one end of the bar laterally toward the winding spindle at the beginning of the winding, means to move the end of the bar laterally away from the spindle during the winding, a thread-guide mounted on the bar and means engaging the threads on the bar and adapted to contact with the winding to feed the thread-guide along the bar.

13. In a winding machine, the combination with a rotating spindle and a reciprocating traverse-bar, means to rotate the spindle and means to reciprocate the bar, of a thread-guide mounted on the bar, a progression wheel adapted to contact with the winding at the rear end of each traverse of the bar to feed the thread-guide along the bar, means to hold the progression wheel closely adjacent the winding spindle at the beginning of the winding, and means to move the progression wheel gradually away from the winding spindle as each layer of yarn is wound on the cop until the latter reaches its predetermined diameter.

14. In a winding machine, the combination with a winding spindle, a reciprocating traverse-bar ,and means to reciprocate the bar, of a thread-guide mounted on the bar to oscillate to and from the winding spindle, a progression wheel adapted to be turned to feed the thread-guide along the bar, and means to automatically adjust the wheel laterally toward and away from the winding spindle to contact with the largest diameter of each layer of winding.

15. In a winding machine, the combination with a rotating spindle and means to rotate the spindle, of a swiveling traverse-bar, a thread-guide-holder mounted on the bar, a progression wheel adapted to contact with the cop to feed the guide-holder along the bar, a former 12 having an arm 14, a member 13 on the thread-guide-holder adapted to contact with the former-arm to swing the traverse-bar and hold the progression wheel in position to contact with the first layers of winding, and means acting to return the traverse-bar to a position parallel with the axis of the winding spindle as the member 13 rides out along the former-arm.

16. In a winding machine, the combination with a rotating spindle and means to rotate the spindle, of a reciprocating traverse-bar means to reciprocate the bar, said bar composed of two sections *g* and *m*, one section *g* sliding in fixed bearings arranged parallel to the axis of the winding spindle, a swiveled bearing for the other section *m* to adapt it to swing laterally toward the winding spindle, a plate 2 having a transverse slot 5 at the end of the section *g*, and a pin 6 in the adjacent end of the section *m*, said pin adapted to engage the slot 5 to connect the two sections.

17. In a winding machine, the combination with a winding spindle, of a traverse-bar and means to reciprocate the bar, said bar composed of two sections *g* and *m*, the section *g* sliding in fixed bearings parallel to the axis of the winding spindle, a swiveled bearing for the section *m* to adapt it to swing laterally toward the winding spindle,

a plate 2 secured to the end of the section *g* and formed with a transverse slot 5 and a cam face 8, a pin 6 in the end of the section *m* adapted to engage the slot 5 to connect the two sections, a plunger 9 sliding in a bore in the section *m*, and a spring 11 adapted to engage the end of the plunger 9 with the cam face 8 to maintain the two sections of the bar normally in axial alinement.

18. In a winding machine, the combination with a rotating spindle *b* and means to rotate the spindle, of a reciprocating traverse-bar means to reciprocate the bar, said bar comprising two sections *g* and *m*, means to connect the two sections of the bar comprising a plate 2 secured in the slot in the bar *g* and formed with a transverse slot 5 and a cam face 8 disposed at an angle to the axis of the bar, the bar *g* formed with a slot adapted to receive the plate 2, a pin 6 extending through the bar *m* and slot 5, and means to maintain the two sections of the bar normally in alinement comprising a plunger 9 adapted to slide in an axial bore at the end of the bar *m* and formed with a shoulder 10, and a spring 11 engaging the bottom of the bore and the shoulder 10 to force the end of the plunger against the cam face 8.

19. In a winding machine, the combination of a winding spindle *b*, a traverse-bar means to reciprocate the bar, said bar composed of two sections *g* and *m*, the section *g* arranged to slide in bearings parallel to the axis of the spindle *b*, a bearing *o* for the section *m* having a bushing *n* arranged to swivel in the bearing, means to connect one end of the section *m* with the section *g* to allow the end of the section *m* to swing laterally toward the winding spindle, a former 12 secured to the end of the section *g* with an arm 14 extending in the plane of the axis of said section at an angle thereto, a thread-guide-holder *r* hinged on the section *m* and carrying a thread-guide *s*, a progression wheel *u* adapted to feed the thread-guide-holder along the section *m*, a quadrant member 13 on the thread-guide-holder *r* formed with an arcal rim adapted to bear on the arm 14, and means to hold the member 13 in engagement with the arm 14 during the winding of the first layers of the cop.

20. In a winding machine, the combination with a rotating spindle *b*, and means to rotate the spindle of a traverse-bar comprising two sections *g* and *m*, with the bar *m* arranged to swing laterally toward the spindle *b* means to reciprocate the bar, a thread-guide-holder *r* hinged on the bar *m*, a progression wheel *u* adapted to contact with the winding to feed the thread-guide-holder along the bar, and a former-arm 14 on the bar *g* adapted to engage the thread-guide-holder to control the position of the progression wheel to permit it to move outward from the winding spindle during the winding of the first layers of the cop.

21. In a winding machine, the combination with a winding spindle *l*, of a traverse-bar *m* sliding in a swiveled bearing to adapt it to swing laterally toward the winding spindle means to reciprocate the bar, a thread-guide adapted to be propelled longitudinally of the traverse-bar, a progression wheel *u* to feed the guide along the bar, and means to control the lateral movement of the bar *m* to cause the progression wheel to move in a path at an angle to the axis of the winding spindle throughout a certain proportion of its progressive movement and to then continue its progression in a path parallel with said axis.

22. In a winding machine, the combination with a reciprocating traverse-bar having eccentrically formed screw threads and means to reciprocate the bar, of a nut having an internally threaded bore of a diameter to adapt it to slide over the threads, a thread-guide-holder hinged to swing on the bar, a wheel on the nut, a spring on the holder engaging the wheel to press the nut into engagement with the threads on the bar when the holder is in one position and to press the nut out of engagement with the threads when the holder is swung to another position, and means on the thread-guide-holder to limit the range of its swinging movement.

23. In a winding machine, the combination with a winding spindle, of a reciprocating traverse-bar, means to reciprocate the bar, a thread-guide-holder hinged to swing on the traverse-bar away from the winding spindle, a rod 21 extending parallel to the axis of the winding spindle, and a finger 19 pivoted on the thread-guide-holder to adapt it to contact with the rod 21 when the holder is swung away from the spindle and formed with a detent 22 to contact with the holder and limit the swinging movement of the latter.

24. The combination of the spindle, guide, guide carrier, a swinging and reciprocating bar supporting the guide carrier, means to swing the bar, means to reciprocate the bar, and means for automatically feeding the guide carrier on the bar.

25. The combination of the spindle, guide, guide carrier, a swinging and reciprocating bar supporting the guide carrier, means to swing the bar, means to reciprocate the bar, means for automatically feeding the guide carrier on the bar, and a former controlling the swinging movement of the bar.

26. The combination of a spindle, a bar and means for reciprocating it longitudinally opposite said spindle, means for swinging the bar to and from the spindle, a guide and a guide carrier supported by said bar,

and means for automatically feeding the guide carrier on the bar.

27. The combination of a spindle, a bar and means for reciprocating it longitudinally opposite said spindle, means for swinging the bar to and from the spindle, a guide and a guide carrier supported by said bar, means for automatically feeding the guide carrier on the bar, and a former for controlling the swinging movement of the bar.

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

SIMON W. WARDWELL.

Witnesses:

ARTHUR I. HARVEY,

CHAS. A. EDDY.