No. 719,330. PATENTED JAN. 27, 1903.

T. HANSEN.

THREAD WINDING MACHINE.

APPLICATION FILED NOV. 20, 1900.

NO MODEL. 3 SHEETS—SHEET 1.

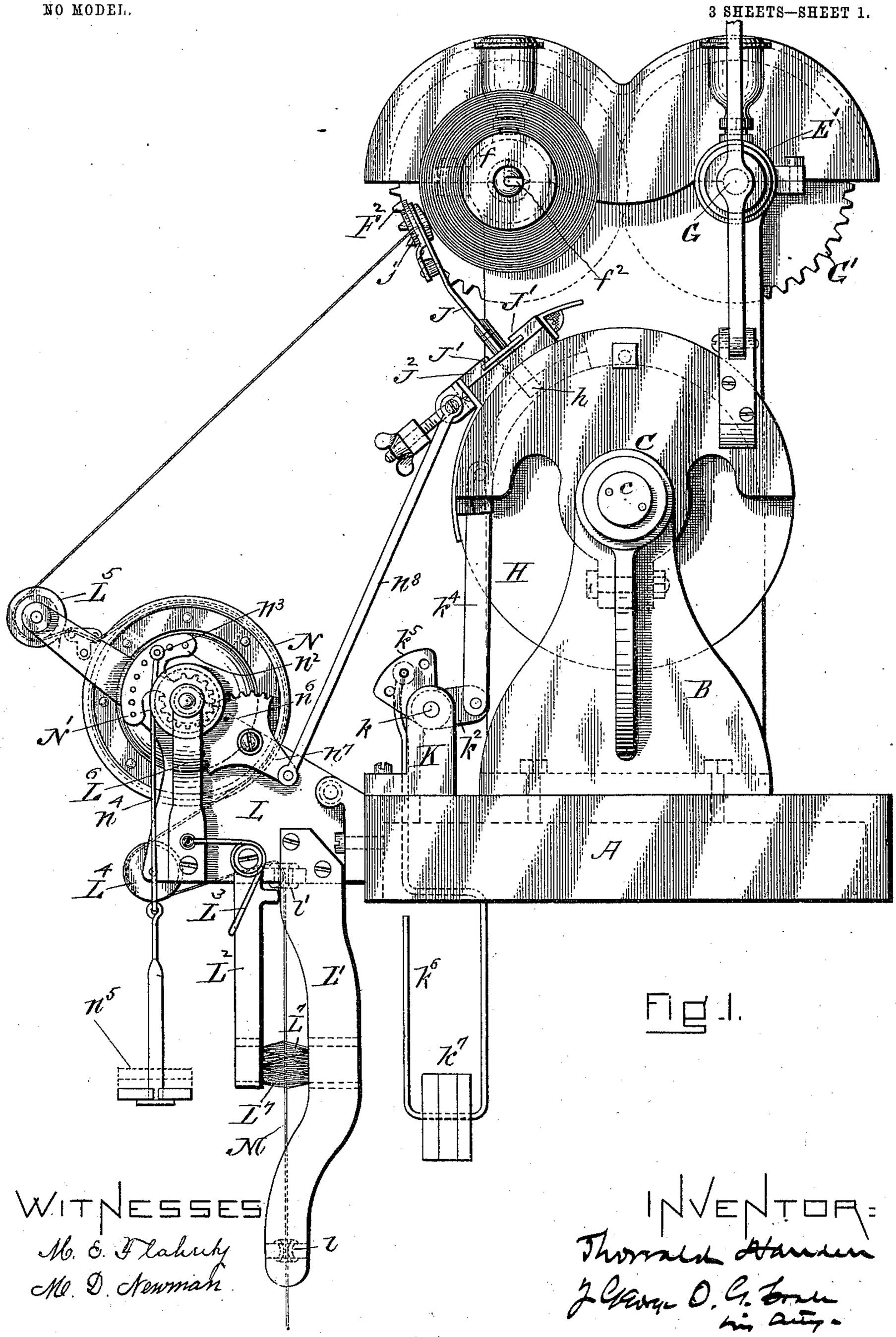

Fig. 1.

WITNESSES:
M. E. Flaherty
M. D. Newman

INVENTOR:
Thorvald Hansen
by George O. G. Lowe
his Atty.

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NO MODEL. 3 SHEETS—SHEET 2.

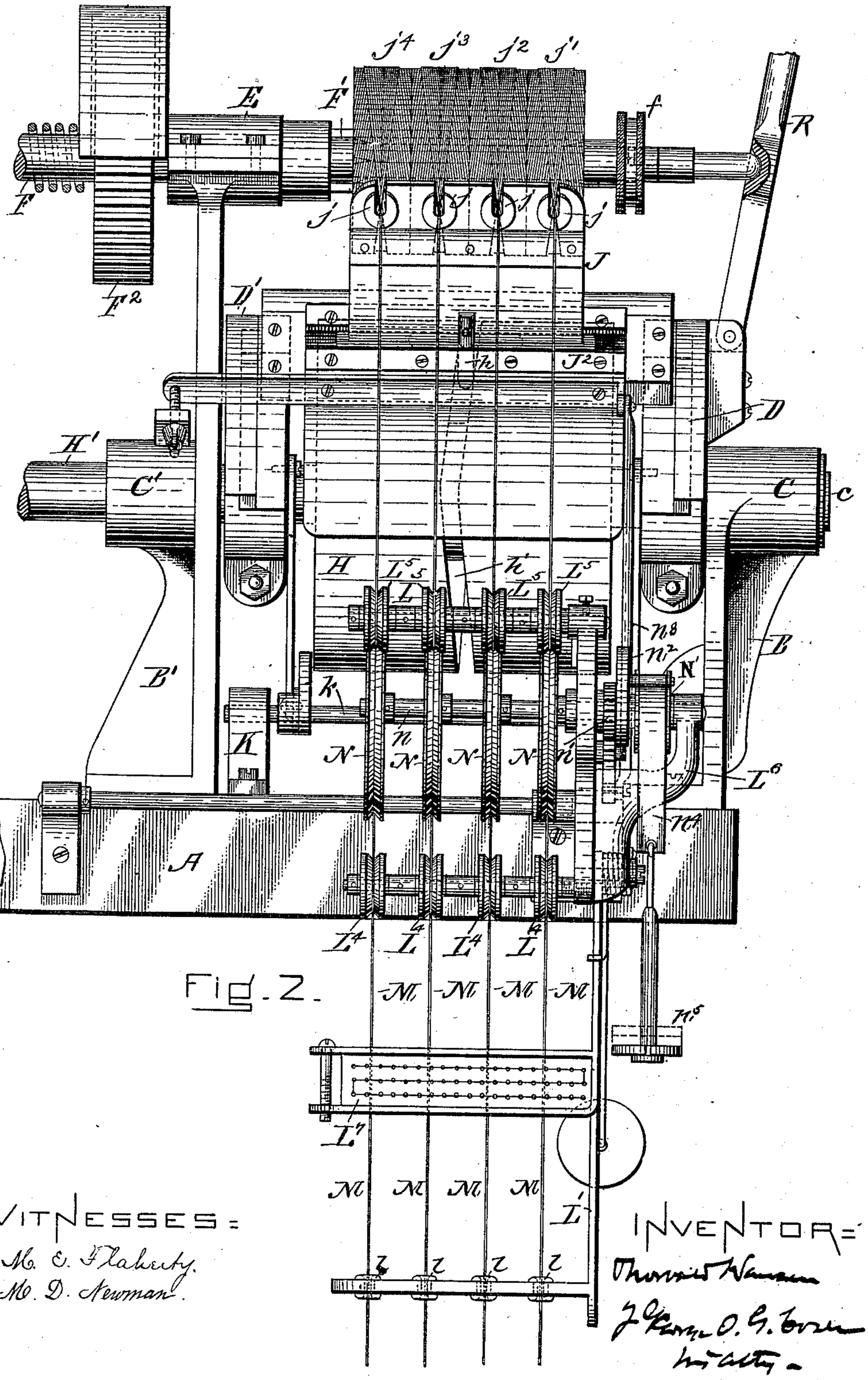

Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 3.

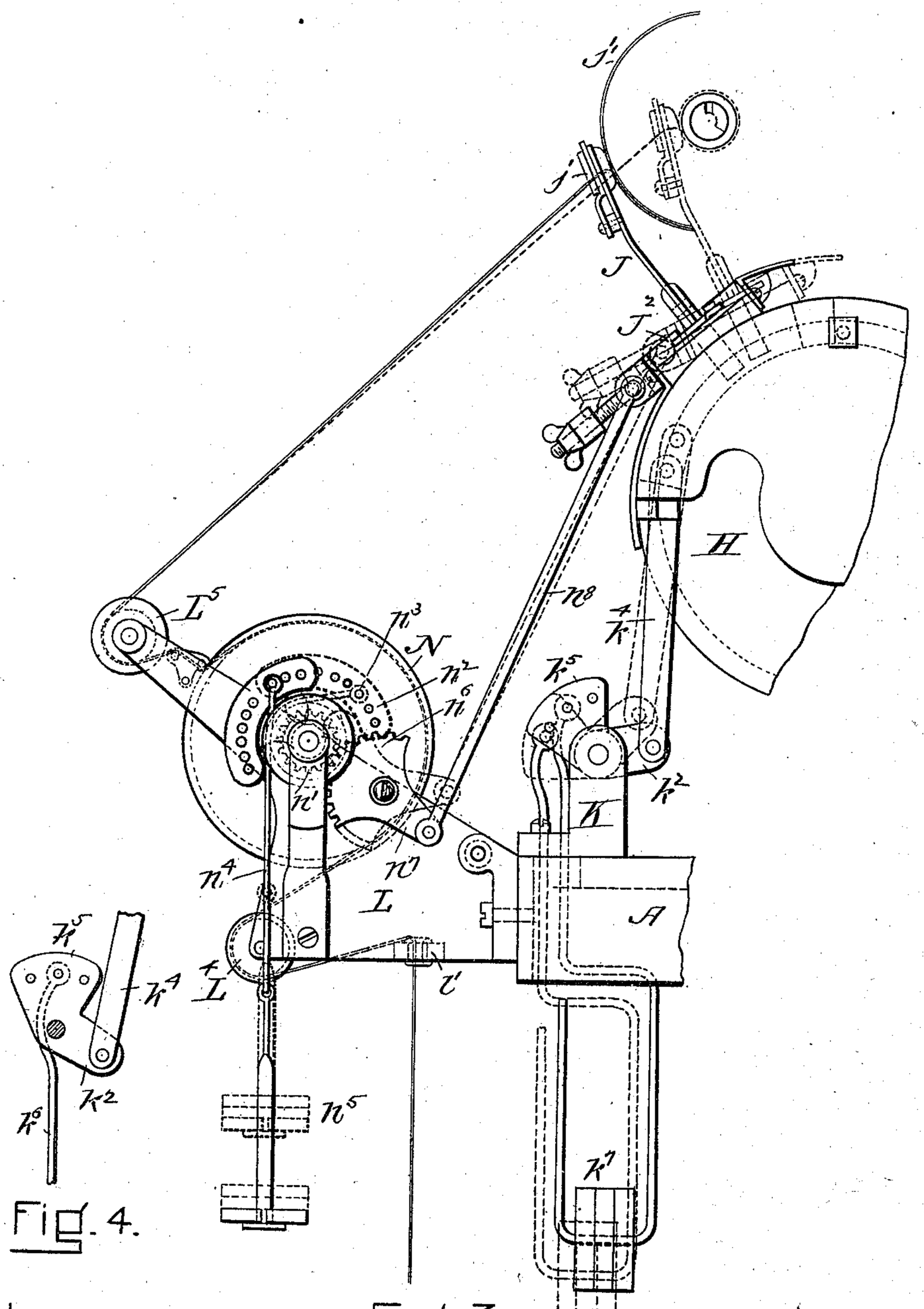

Fig. 4.

Fig. 3.

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UNITED STATES PATENT OFFICE.

THORVALD HANSEN, OF EVERETT, MASSACHUSETTS.

THREAD-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 719,330, dated January 27, 1903.

Application filed November 20, 1900. Serial No. 37,131. (No model.)

To all whom it may concern:

Be it known that I, THORVALD HANSEN, of Everett, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Thread-Winding Machines, of which the following is a specification.

In all thread-winding machines of that class in which the thread-guide lies against the growing cop as the periphery of the cop increases in size, and consequently travels faster and faster, it draws the thread from the source of supply with greater and greater rapidity, so that more and more friction is caused by the thread reeving through the various guides, and consequently there is an apparent increase in the tension, so that the outer layers of thread are usually wound tighter than the inner layers. As a result with some kinds of thread the ends of the cop are inclined to bulge and the cop as a whole is not as sightly nor is it as smooth and well built up as it should be.

My invention is intended to overcome these faults; and it relates, broadly speaking, to certain mechanism described below, which is connected directly to the guide for relieving the cop from increasing pressure as it increases in size, this relieving of pressure being accomplished by decreasing the tension and at the same time by decreasing materially the pressure by means of which the guide is laid against the cop. It will be obvious that while both these means coöperate for this purpose either of these means may be used without the other when thought best.

My invention therefore consists, first, in an improved means for controlling the pressure with which the guide bears upon the cop; second, to means for relieving the tension upon the thread as the cop increases in size.

I have shown my improvements applied to a machine similar to that described in Letters Patent No. 594,530, granted to me November 30, 1897; but it will appear that they may be applied equally well to other winding-machines. In the drawings I have not shown means for applying power to the various shafts, as those means are fully shown and described in the said Letters Patent, and by comparison of the drawings of said Letters Patent with the drawings forming a part of this specification the similarity of arrangement of the several shafts in the two machines will be fully understood.

In the drawings forming part of this specification I have shown the invention in the best form now known to me.

Figure 1 is an end elevation, and Fig. 2 a front elevation, of so much of the machine as embodies my present invention, Fig. 3 being a diagrammatic detail showing the parts in their various positions, as described below. Fig. 4 is a detail illustrative of the yielding guide-support.

A is the base, which may be suitably supported upon a post or in any other convenient way. Upon this are mounted two uprights B B′. The upright B carries at its upper end a journal-box C and also a substantially semicircular frame D. The upright B′ also carries a journal-box C′, opposite the journal-box C in the frame D, and a substantially semicircular frame D′, corresponding to the frame D upon the upright B. These frames D and D′ contain semicircular guideways in which slide the sliding carriage J^2, as described below. The upright B′, however, extends above the frame D′ and carries two journal-boxes E E′, in which are mounted shafts F G, one of which, F, carries the winding-spindle F′. The other shaft, G, as shown, carries a cutting mechanism which forms no part of this invention, and hence is not herein described. These two shafts F G are geared together by gears F^2 G′, the shaft F being a continuation of the shaft carrying the clutch in my patent above referred to, the gears being the same as those shown in my prior patent, and the mechanism to the left of the gear F^2 (shown in Fig. 2) being for the purpose of applying power to the various spindles and being similar to that shown in said patent.

H is the traverse-cam, also as shown in my said patent, which cam is mounted upon the shaft H′, which passes through the journal-boxes C C′, *c* being an adjusting-screw which closes in the end of the journal-box C, thus preventing end movement of the shaft H′. Power may be applied to this shaft as in my previous patent.

J is the guide, which, as shown, is provided with four guide-eyes *j*, each of which carries

a thread M, the machine as shown being adapted to wind four separate cops upon the same tube, the four cops being marked j' j^2 j^3 j^4 and the cop-tube j^5.

The guide J is mounted in ways J′ in a sliding carriage J^2. mounted to slide in ways formed in the opposing sides of the semicircular frames D D′, these ways being located slightly above the cam-roll H. The ways J′ enable the guide to traverse parallel with the axis of the spindle F′, and the guide is caused to travel by means of a pin h, which runs in the cam-groove h' of the cam H. The rotation of the cam, therefore, causes the guide to traverse longitudinally of the spindle, and the ways d enable the carriage J^2 to travel away from the spindle, taking with it the guide. In order that the guide may be held up to its work, I have shown the following means: Upon the table A are mounted two upright supports K, in which is mounted a rock-shaft k, carrying a rocker-arm k', which is connected by a connecting-rod with one side of the sliding carriage J^2. Upon the other end of the rock-shaft k is mounted an angle-lever one arm of which, k^2, is connected by a connecting-rod k^4 with the other side of the sliding carriage J^2. From the other arm k^5 of this angle-lever depends a hanger k^6, carrying weights k^7. The point of connection between the hanger k^6 and the arm k^5 is made adjustable, so as to adjust the position of this hanger upon its arm, and so adjust the leverage, which may be desirable in certain cases.

It will be seen from Fig. 3, where the position of the guide and the mechanism connected with it when the winding begins is shown in dotted lines and the position of the guide against the cop when it is wound is shown in full lines, that in the first instance, owing to the shape of the angle-arm, the weight k^7 acts with extreme efficiency to hold the guide against the cop. When, however, the cop has been filled, the position of the hanger with relation to the fulcrum k of the lever has changed, so that its effectiveness is reduced to a minimum, this being desirable for the reasons stated above.

I prefer to curve the upper end of the hanger, as is shown, in order that under certain circumstances its point of connection with the angle-lever may move above the rock-shaft, as shown in Fig. 4, so that the weight will be absolutely neutralized.

The tension mechanism will now be described. It consists, generally speaking, of a brake which is applied to a shaft turned by the running thread and so controlled by the position of the guide that when the guide lies against the spindle or cop-tube the brake is applied with its maximum force and when the guide is pushed away from the spindle as the cop grows the brake is relieved either wholly or entirely, according to circumstances. I have shown the brake in the form of a weighted strap hanging over the brake-wheel mounted on a shaft turned by the running thread, the position of the brake being controlled by suitable connecting mechanism with the sliding carriage which carries the guide, this being a convenient and simple method of construction; but other methods of construction embodying this same idea will suggest themselves to those skilled in the art. I have shown it constructed for four threads; but it may be used for a greater or less number, as will be understood by any mechanic, the same brake, however, serving for all the tension-disks. The special description of this mechanism is as follows: L is a bracket attached to the front of the table A and having hanging therefrom a fixed arm L′, carrying one of a pair of brushes L^7, the other brush being attached to a hinged arm L^2, the position of which is controlled by a spring L^3, which causes it to hold the two brushes in contact. From the bottom of the arm L′ projects laterally a second arm carrying a series of eyes l, one for each thread, through each of which the thread M passes up from the spool or other source of supply, and above the brushes is a second series of eyes l', through each of which a thread again passes after passing between the brushes. Upon the bracket L are also mounted two idler-rolls L^4 L^5 for each thread, the one located to take the thread from the upper eye L′ and the other to deliver the thread to its guide-eye j. Between each pair of idler-rolls runs a large grooved tension-wheel N. These tension-wheels N are mounted on a shaft n, on which is mounted also the brake-wheel N′, the shaft being carried in journals, one of which is formed in the bracket L and the other in an arm L^6, projecting from the bracket. There is also mounted on the shaft n, free to turn thereon, a hub having on one side of it gear-teeth n' and on the opposite side a fan-shaped arm n^2, from which projects a pin n^3, from which hangs a strap n^4, carrying at its lower end a weight n^5. The gear-teeth n' mesh with the gear-teeth of a segment-arm n^6, which is pivoted to the bracket L, forming a lever the farther end of which, n^7, is connected by a connecting-rod n^8 with the sliding carriage J^2. These parts are arranged together, as shown in Figs. 1 and 3. (See especially Fig. 3, where the two positions of the sliding carriage J^2, carrying the guide J, are indicated in dotted and full lines, as explained above.) It will be seen from examination of this view and also from an examination of Fig. 1, in which the cop is practically wound, that while the guide J is in close proximity to the spindle F′ the position of the pin n^3, which carries the strap n^4, is such that the strap lies over the brake-wheel N′; but as the guide is forced out by the enlargement of the cop the position of the arm n^2, carrying the pin n^3 and strap n^4, is so changed that the brake-wheel N′ is nearly or perhaps entirely free from engagement with the strap. It is desirable that this arm n^2 shall be provided with a series of holes in order that the

position of the pin n^3 may be changed to adjust the brake according to the kind of thread to be wound, this adjustment being one easily made and easily understood by those skilled in the art of winding. Each thread M, therefore, after passing through eyes $l\,l'$ and around a lower idler L^4 passes around a tension-wheel N and then around a second idler L^5 and from it to the guide J. The shaft n, which carries both the tension-wheels N and the brake-wheel N', is caused to rotate by the draft of the thread or threads, the resistance to rotation—that is to say, the drag or tension on the thread—being controlled by the strap which passes over the brake-wheel, this strength diminishing, as will be understood from the above description, as the guide J moves away from the cop. It will thus be understood that as the cop grows both the tension on the thread decreases and the pressure of the upper end of the thread-guide J upon the cop decreases, so that if, for example, the thread is soft as the cop is built up it is not squeezed by the outer layers; but these layers are all laid with only sufficient tension to keep them in place and wind a hard cop, but without enough tension to cause the ends of the cops to bulge.

As shown in the drawings, one brake-wheel and strap is shown to control the tension of four threads, each of which passes through its own eyes, around its own idlers and its own tension-disk, the tension-disks all being mounted on the one shaft, and it is obvious that the number of tension-disks, eyes, &c., may be increased or diminished according to the number of threads to be wound or according to the number of guide-eyes of the guide J, and other brakes may be added, if necessary.

The cop-tube may be held in place on its spindle in any desired way—as, for example, by a collar f, which slides over the end of the spindle and is provided with a bayonet-joint of ordinary construction to hold it in place. A similar winding operation may take place upon the shaft G, in which case the machine should be provided with a second set of tension devices, through which the thread should be fed to the cop-tube upon that spindle or shaft. As shown in the drawings, however, that shaft is provided with a mechanism for cutting the tube after it has been wound, which mechanism, however, I will not describe here, as it will form a part of another application.

It is believed that the general operation of these improvements will be understood from what has been said above. The tube being placed upon the spindle F' and the threads being properly arranged each about its own tension-wheel and through its own guide-eye in the manner described above, the machine is started, and as the cop builds up the guide is held against it with less and less power and the tension is gradually decreased, the weights being adjusted according to the requirements of the thread to be wound. The cop with its four threads, more or less, being finished may then be cut into four cops by any desired means. I have found that it is simpler to wind small cops in this way—namely, winding them first upon a long tube and then cutting the tube—for the reason that the short tubes are much more difficult to handle without injury than one long tube.

I have not specified the weights to be used either upon the brake or upon the hanger, as this can easily be done by experience. The weight upon the brake should be about half an ounce and that upon the hanger which controls the position of the guide perhaps two or three ounces, according to the thread. The shape of the cam-grooves h may of course be varied according to the traverse to be given to the guide.

What I claim as my invention is—

1. In a winding-machine, in combination with a rotary spindle a pair of opposing frames, each having a curved guideway, the axis of curvature of which is parallel with the axis of said spindle, a carriage mounted to slide in said guideways, a guide mounted to slide in said carriage, and means whereby said guide is held against said spindle, said means comprising a rock-shaft carrying rocker-arms projecting therefrom at an angle to each other, a connecting-rod connecting one of said rocker-arms with said carriage, the other rocker-arm being weighted, as described.

2. In a winding-machine, in combination with a rotary spindle, a pair of opposing frames, each having a curved guideway, the axis of curvature of which is parallel with the axis of said spindle, a carriage mounted to slide in said guideways, a guide mounted to slide on said carriage, one or more connecting-rods each connected at one end to said carriage, and a rock-shaft carrying rocker-arms, one of said arms carrying a weight, its unweighted arm or arms being connected to said connecting-rod, as described.

3. In a winding-machine, in combination with a rotary spindle a pair of opposing frames, each having a curved guideway, the axis of curvature of said guideway being parallel with the axis of said spindle, a carriage mounted to slide in said guideways, a guide mounted to slide on said carriage, and carrying a plurality of guide-eyes, a single cam and means connecting said cam with said guide, whereby said guide and its guide-eyes are reciprocated, and means whereby said plurality of guide-eyes are held against said spindle, said means comprising a single rock-shaft having a weighted rocker-arm projecting therefrom and two or more rocker-arms also projecting therefrom at an angle to said weighted rocker-arm and one or more connecting-rods connecting said carriage with said second-named rocker-arms, as described.

4. In a winding-machine, in combination with a rotary spindle, a pair of opposing

frames, each having a curved guideway, a carriage mounted to slide in said guideways, a guide mounted to travel on said carriage, and means whereby said guide is held against said spindle, comprising a rock-shaft carrying rocker-arms projecting therefrom at an angle to each other, one of said rocker-arms being weighted, and connecting-rods connecting said remaining rocker-arms with said carriage, said carriage-connected rocker-arms lying normally above a horizontal position, and said weight-carrying rocker-arm being at an obtuse angle thereto, as described, whereby a comparatively slight depression of said carriage-connected arm caused by the pushing of the guide from the spindle as the spindle grows will shorten the weighted arm materially and reduce the pressure of the guide on the growing cop, as described.

5. In a winding-machine, a rotary spindle, a carriage mounted to move toward and from said spindle, a guide mounted thereon to move parallel with said spindle, and a tension mechanism comprising a shaft, a tension-wheel mounted thereon, a brake-wheel mounted to rotate therewith, and a freely-moving hub located on said tension-wheel shaft and provided with gear-teeth, and a brake-strap connected to said hub, in combination with a segment-lever free to move on said tension-shaft adapted to engage said gear-teeth, and a connecting-rod connecting said lever with the carriage, as described.

6. In combination, a rotary spindle, a pair of opposing frames each having a curved guideway, the axis of curvature of which is parallel with the axis of said spindle, a carriage mounted to slide in said guideways, a guide mounted upon said carriage and having a plurality of guide-eyes, a shaft, a series of tension-wheels mounted thereon, a brake-wheel mounted on said shaft, a freely-running hub provided with gear-teeth also carried by said shaft, a lever provided with gear-teeth engaging with the teeth on said hub, a connecting-rod connecting said lever with said sliding carriage, and a brake-strap one end of which is mounted on said hub, the other end being provided with a suitable weight, an intermediate portion of said strap being adapted to lie against said brake-wheel, whereby the tension of the threads running through said plurality of guide-eyes will all be regulated by the same brake, as set forth.

7. In a winding-machine in combination with a rotary spindle, a guide, means for supporting said guide whereby it may be reciprocated in a line parallel with the axis of said spindle and may swing to and from said spindle, and means whereby said guide is held against said spindle, said means comprising a rock-shaft carrying rocker-arms projecting therefrom at an angle to each other, a connecting-rod connecting one of said rocker-arms with said guide-supporting means, the other rocker-arm being weighted, as described.

8. In a winding-machine in combination with a rotary spindle, a guide, means for supporting said guide whereby it may be reciprocated in a line parallel with the axis of said spindle and swing toward and from said spindle, said guide carrying a plurality of guide-eyes, and means whereby said plurality of guide-eyes are held against said spindle, said means comprising a single rock-shaft having a weighted rocker-arm projecting therefrom and two or more rocker-arms also projecting therefrom at an angle to said weighted rocker-arm, and one or more connecting-rods connecting said guide-supporting means with said second-named rocker-arms, as described.

9. In a winding-machine a rotary spindle, a guide and means for supporting said guide whereby it may move toward and from said spindle and also be reciprocated in a line parallel with said spindle, and a tension mechanism comprising a shaft, a tension-wheel mounted thereon, a brake-wheel mounted to rotate therewith, and a freely-moving hub located on said tension-wheel shaft, and provided with gear-teeth, and a brake-strap connected to said hub, in combination with a segment-lever free to move on said tension-shaft and adapted to engage said gear-teeth, and a connecting-rod connecting said segment-lever with said guide-supporting means, as described.

10. In combination a rotary spindle, a guide, means for supporting said guide whereby it may be reciprocated parallel with the axis of said spindle, and also may move toward and from said spindle, said guide having a plurality of guide-eyes, a shaft, a series of tension-wheels mounted on said shaft, a brake-wheel mounted on said shaft, a freely-running hub provided with gear-teeth also carried by said shaft, a lever provided with gear-teeth engaging with the said teeth on said hub, a connecting-rod connecting said lever with said guide-supporting means, and a strap, one end of which is mounted on said hub, the other end being provided with a suitable weight, an intermediate portion of said strap being adapted to lie against said brake-wheel, whereby the tension of the threads running through said plurality of guide-eyes will all be regulated by the same brake, as set forth.

In testimony whereof I hereunto set my name this 12th day of November, 1900.

THORVALD HANSEN.

Witnesses:
A. HUN SURY,
GEORGE O. G. COALE.