No. 652,449. Patented June 26, 1900.

# D. G. BAKER.

## WINDING MACHINE.

(Application filed Feb. 9, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

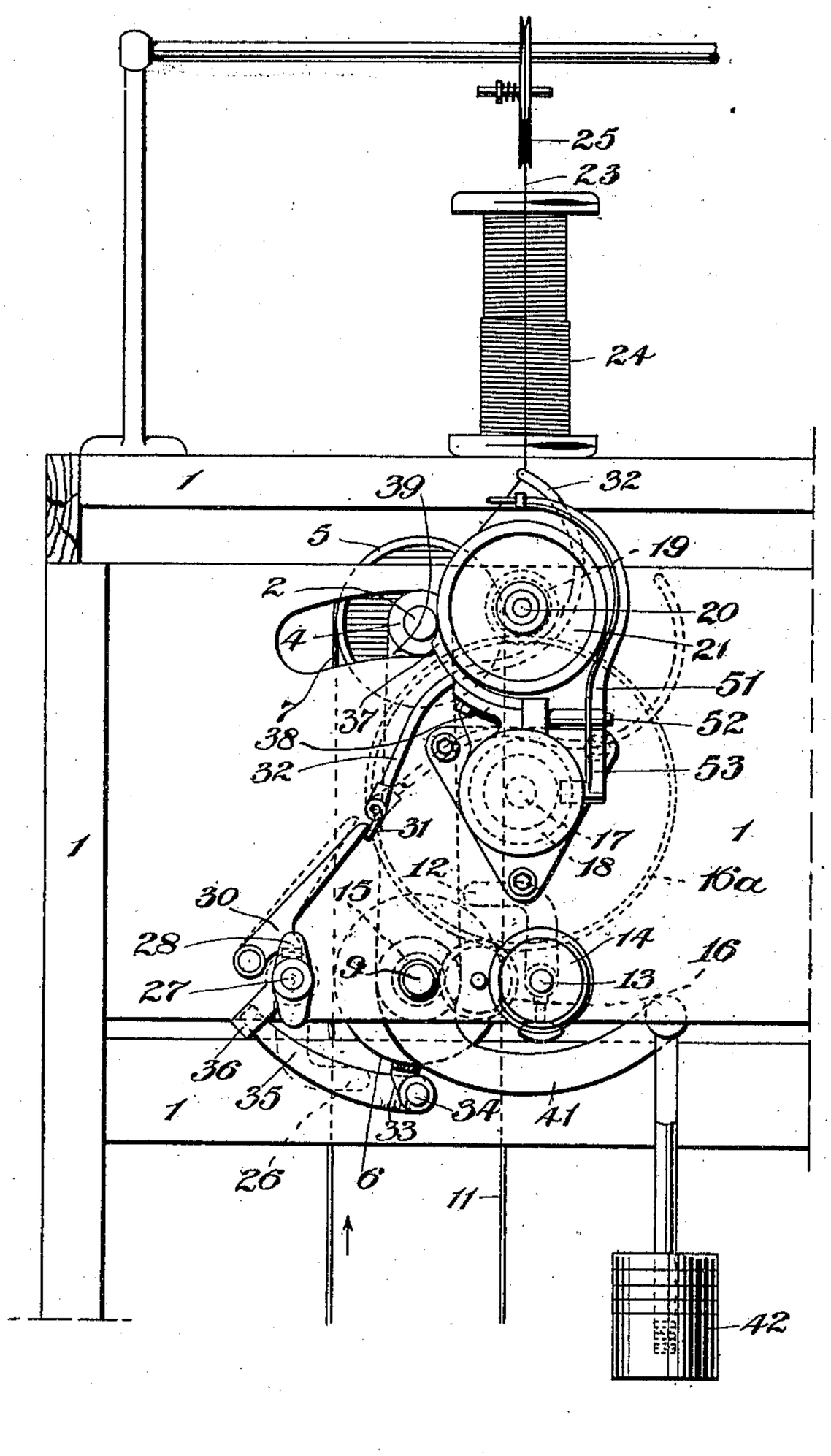


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Fig. 2.

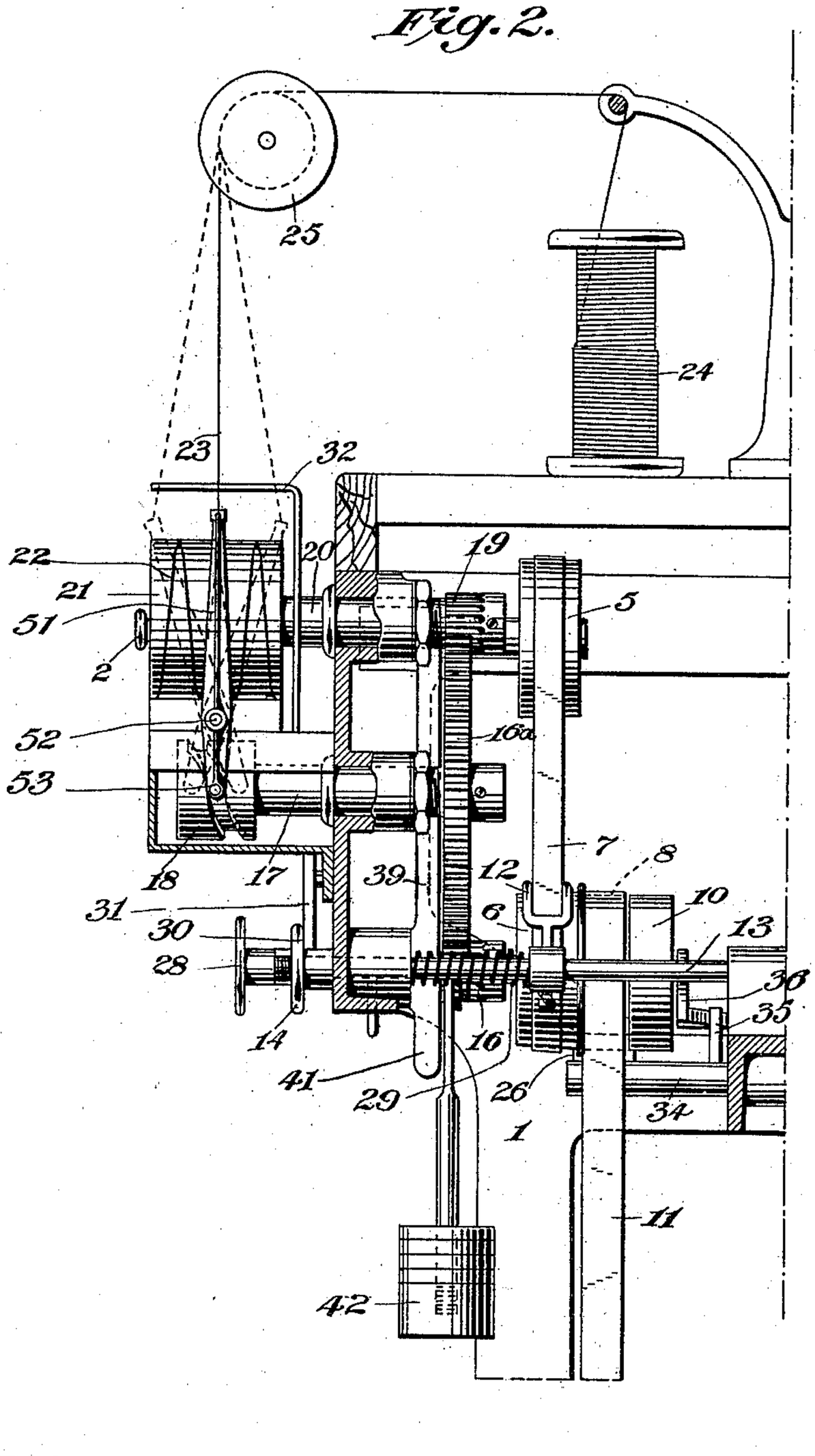


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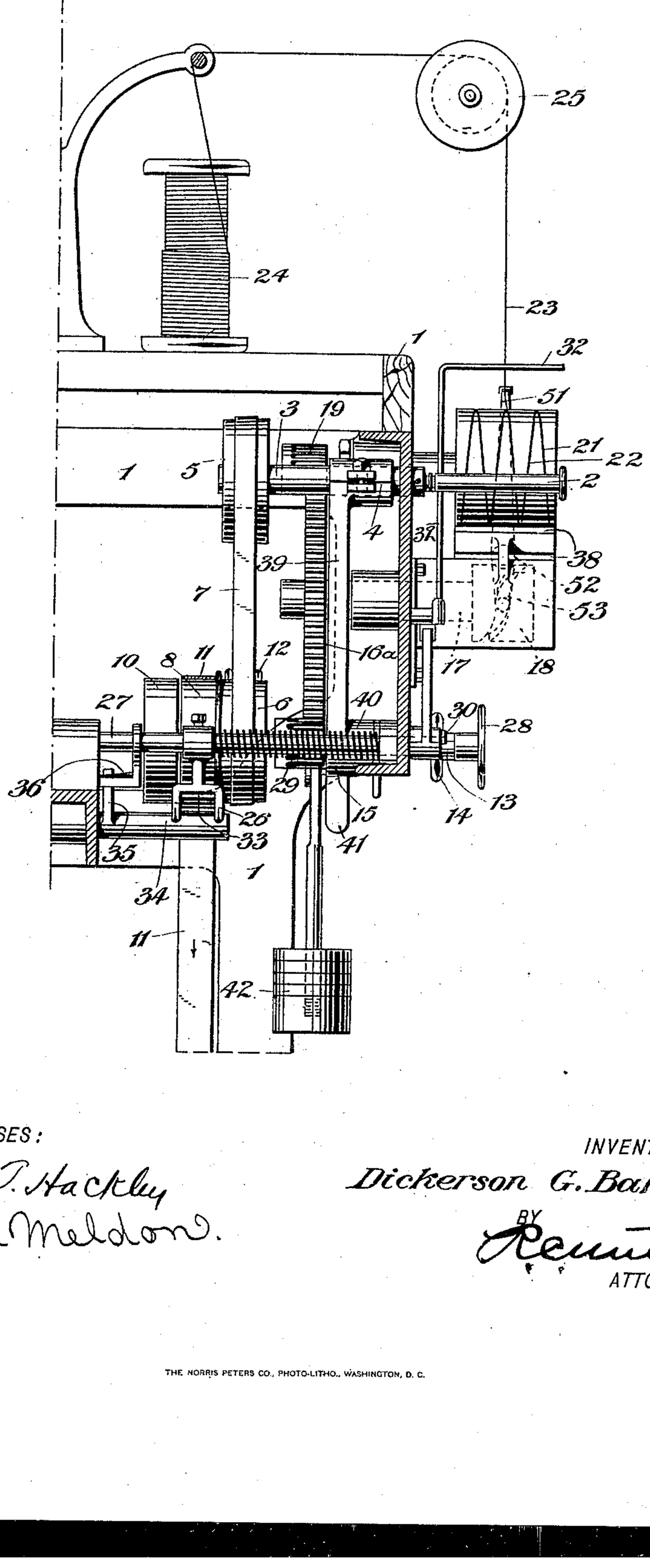
Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

Fig. 4.

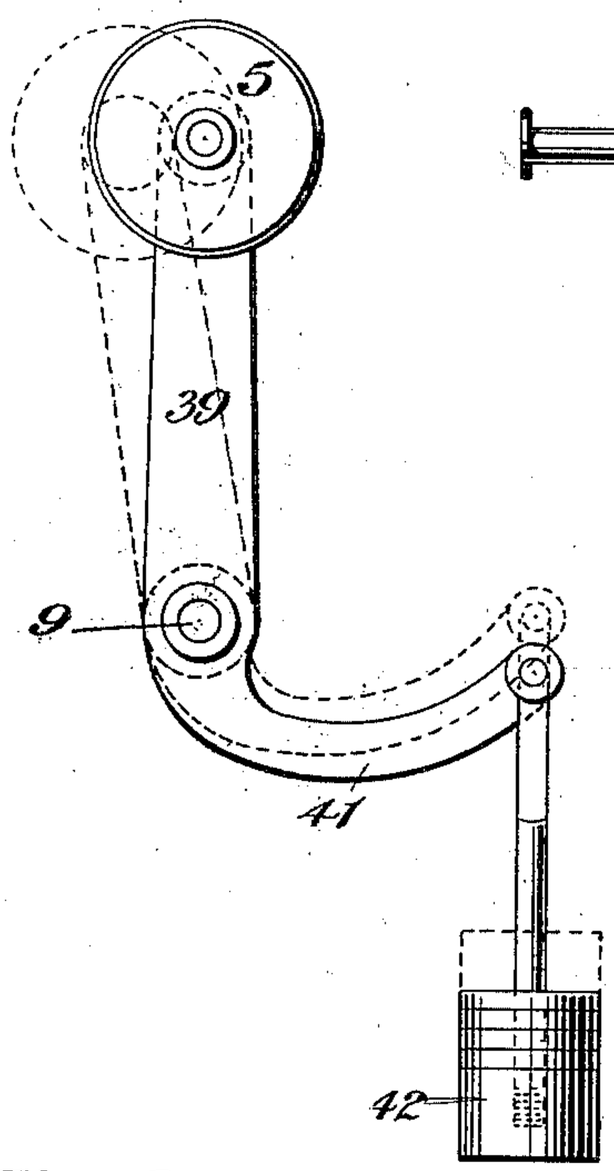



Fig. 5.

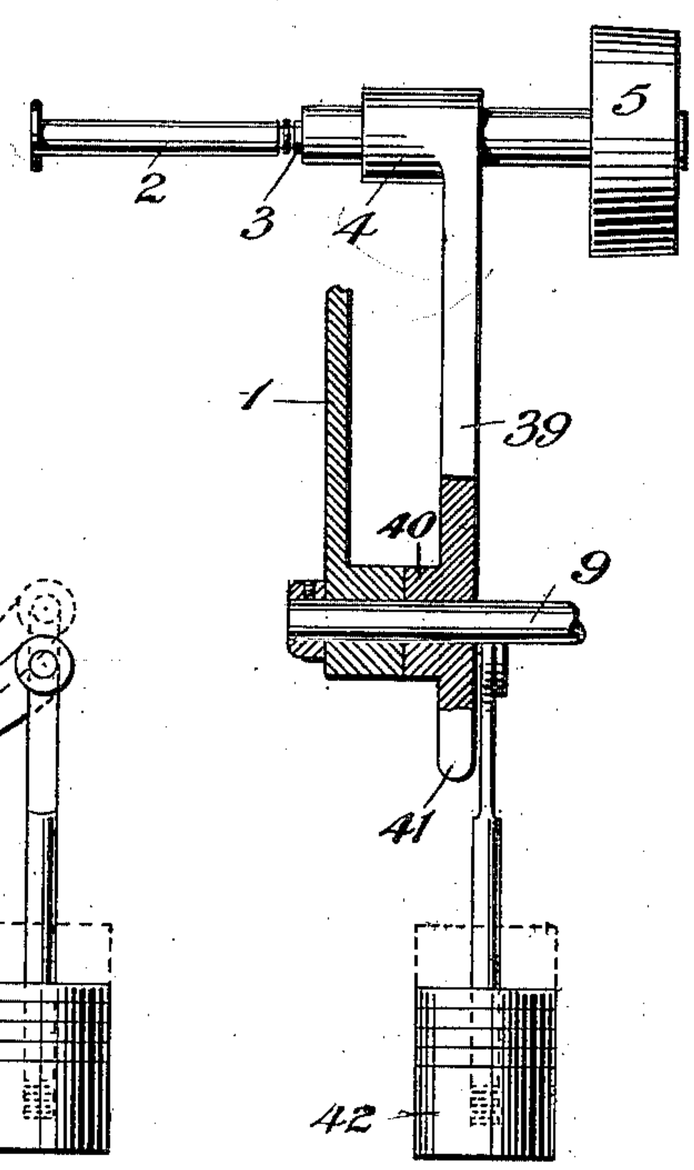



Fig. 6.

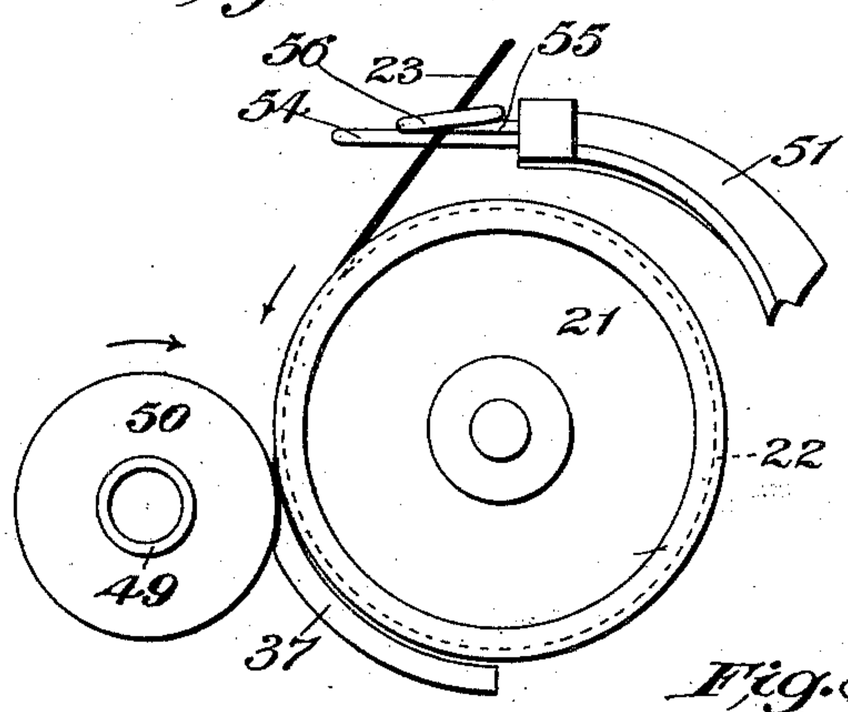



Fig. 7.

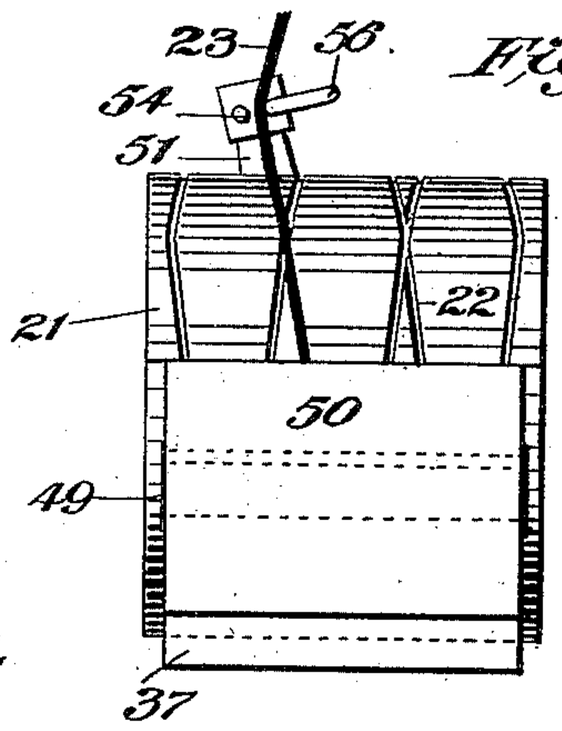
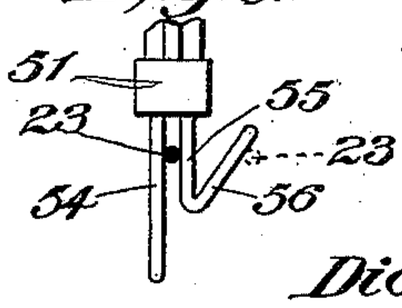



Fig. 8.

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# UNITED STATES PATENT OFFICE.

DICKERSON G. BAKER, OF WILLIMANTIC, CONNECTICUT, ASSIGNOR TO THE AMERICAN THREAD COMPANY, OF NEW YORK, N. Y.

## WINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 652,449, dated June 26, 1900.

Application filed February 9, 1900. Serial No. 4,583. (No model.)

*To all whom it may concern:*

Be it known that I, DICKERSON G. BAKER, a citizen of the United States, residing at Willimantic, county of Windham, State of Connecticut, have invented certain new and useful Improvements in Winding-Machines, of which the following is a full, clear, and exact description.

My invention relates to winding machinery. Among the objects are simplicity of construction, speed, effectiveness, and durability in operation and economy of space and economy of power.

Referring to the drawings, Figure 1 is a front elevation. Fig. 2 is a side elevation of Fig. 1 looking in the direction of the arrow. Fig. 3 is an elevation of the opposite side of Fig. 1. Fig. 4 is a detached view of a portion of the apparatus. Fig. 5 is a side elevation of Fig. 4. Fig. 6 is a detached view of other portions of the apparatus slightly enlarged. Fig. 7 is a side elevation of Fig. 6. Fig. 8 is a relatively-enlarged detached view of a detail of construction.

1 is a frame upon which the parts of the winding-machine are suitably mounted.

2 is a positively power-driven cop-spindle which extends from a shaft 3, rotatably mounted in a suitable bushing 4, said shaft carrying a cone-pulley 5.

6 is a second cone-pulley coupled to the cone-pulley 5 by means of a belt 7. The cone-pulley 6 has fixed thereto a driving-belt pulley 8. The pulleys 6 and 8 are rigidly mounted upon a rotatable shaft 9. (See Fig. 1.) Carried by this shaft 9 is a loose pulley 10.

11 is a driving-belt. By shipping the driving-belt 11 from the loose pulley 10 to the pulley 8 the machine is started. In Fig. 3 the belt is positioned upon the pulley 8. The rotation of cone-pulley 5 rotates the cop-spindle 2. The speed relation of the pulleys 5 and 6 may be varied in the well-known manner by shifting the position of the belt 7 upon said pulleys. The shifting of the position of this belt 7 is accomplished as follows: 12 is a belt-guide mounted upon a longitudinally-adjustble rod 13. The longitudinal position of this rod may be varied, as desired, in either direction—for example, by means of a hand-wheel 14 and the well-known screw-thread adjustment. (Not shown.)

As above stated, the pulleys 6 and 8 are attached rigidly to the shaft 9, so that when said pulleys are driven by belt 11 said shaft 9 will be rotated therewith. Carried by shaft 9 is a pinion 15, which meshes with a pinion 16, which in turn meshes with a gear $16^a$, mounted upon the shaft 17, which may carry a cam 18 for a purpose hereinafter described. The gear $16^a$ meshes with a pinion 19, carried by a shaft 20, which in turn carries a rotary thread-guide 21. The form of this thread-guide may be cylindrical, as shown, or the periphery thereof may taper like a cone. The rotation of the shaft 9 will therefore cause the rotation of the thread-guide 21. In the periphery of the thread-guide 21 is a shallow spiral groove 22 of any suitable pitch or angle, which groove may cross and recross, if desired. This groove 22 does not extend entirely through the shell of the guide 21, but is preferably slightly deeper than the thickness of the thread or cord to be wound and is also of slightly-greater width than the thickness of said thread.

23 is a thread or cord to be wound. In Figs. 6 and 7 the thread 23 is illustrated by a heavy black line; but no attempt is made in these drawings to show the relative size of the thread 23 to the groove 22. The thread 23 is taken from a suitable spool 24 and may pass over a suitable tension device 25 and from thence to the winding-machine, as hereinafter described.

The apparatus may include any mechanism for automatically shifting the driving-belt 11 from the fixed pulley 8. One means comprises a shipper 26 for the driving-belt 11. This shipper 26 is carried on a suitable slide-rod 27, the outer end of which may be provided with a handle 28. Any suitable spring, as 29, may be provided to normally cause the belt-shipper 26 to position the belt 11 upon the loose pulley 10. When it is desired to start the machine, the belt-shipper is moved, for example, by the handle 28 in a direction to convey the belt 11 onto the fixed pulley 8 in opposition to the normal tendency of the spring 29. This latter position is indicated

in the drawings, Figs. 1, 2, and 3. The rod 27, which carries the shipper 26, may be engaged in this position by means of a latch 30, which may be dropped by gravity or otherwise into a notch or against a suitable retaining-shoulder upon the rod 27. (See Fig. 1.) In this position the rod is temporarily held and the apparatus will be driven by the belt 11. As soon as the latch 30 is freed from the belt-shipper the normal tendency of the spring is to move the belt 11 from the tight pulley 8 to the loose pulley 10, and the machine will stop of its own accord. The latch 30 may be tripped by means of a finger 31, which is moved by what may be termed a "drop-wire" 32, under which the thread 23 may pass and by which it may be supported, as shown in Figs. 1, 2, and 3. It is obvious that if the thread breaks the wire 32 will drop from the position shown in solid lines in Fig. 1 to the position shown in dotted lines, and will thus by its finger 31 trip the latch 30, freeing it from the shipper-rod 27, which will then be thrown in such manner as to move the drive-belt 11 onto the loose pulley 10. In practice it has been found that the machine will very quickly stop; but this stopping may be hastened by means of a brake, which brake comprises a shoe adjacent a portion of the moving mechanism—for example, the pulley 8. This brake-shoe 33 may be carried by a rod or quill 34, suitably mounted to have slight rotative movement. From this rod 34 projects a lever-arm 35. Carried by the shipper-rod 27 is an inclined-faced projection 36.

Referring to Fig. 3, the parts are there shown in the moving position. The inclined face of the projection 36 is adjacent the lever-arm 35. When the shipper-rod 27 moves in a direction to convey the belt 11 to the loose pulley, the lever-arm 35 is engaged by the inclined face of the projection 36, and the rod 34 is rocked in a direction to cause the brake-shoe 33 to press against the pulley 8. Thus simultaneously with the shifting of the belt 11 from the tight to the loose pulley the brake-shoe 33 is pressed into firm engagement with the pulley 8, quickly stopping the machine.

From the foregoing it will be observed that both the cop-spindle 2 and the rotary thread-guide 21 are positively and independently driven. The relative speed at which the said parts 2 and 21 are rotated may be varied as desired by the shifting of the belt 7 upon the cone-pulleys 5 and 6. The angular speed of these parts, respectively, when once determined is uniform. Therefore as the cop is built up by the successive layers of thread the peripheral speed of the latter is gradually increased. It is desirable in order to get the most effective results to have as little space as practicable between the periphery of the cop being wound and the surface of the rotary thread-guide 21. To accomplish this, therefore, a device which may be termed a "knife-edge" 37 may be provided, which may be delicately adjusted in close proximity to the periphery of the thread-guide 21. This knife-edge also performs the useful function of lifting the thread 23 from the slot 22. The cop as it is being wound may bear against the outside of said knife-edge and be separated from the thread-guide 21 thereby. In the drawings the knife-edge is shown as adjustably mounted upon a suitable frame extension 38; but the particular arrangement to secure adjustability may be varied as desired.

Since the diameter of the cop increases during the winding of the same, a device is employed whereby the surface of the cop will remain at substantially the same distance from the surface of the thread-guide 21. Hence the journal 4 for the shaft 3 is carried by a swinging arm 39, which in turn is loosely journaled concentric with the axis of rotation of the pulley 6. This may be accomplished by means of a sleeve 40, loosely surrounding the shaft 9. By this means the tension of the belt 7 is uniformly maintained while the size of the cop is being built up. Projecting from the sleeve 40 is an arm 41, which, if desired, may carry a suitable weight 42. This weight 42 causes the cop to press against the outer side of the knife-edge 37.

In operation the thread 23 is passed through a suitable tension device—for example, 25—and under the drop-wire 32, which is lifted to the position shown in Fig. 1, and thence to the cop-tube, such as 49, Fig. 6, which tube is firmly secured upon the cop-spindle 2. The thread in its course drops into the groove 22 in the rotary guide—for example, as shown in Figs. 6 and 7. The handle 28 is then pulled out and latched by 30, shifting the driving-belt from loose pulley 10 to tight pulley 8 and starting the machine, whereupon the cop-spindle 2 and the rotary guide 21 commence to rotate. As the thread is drawn onto the cop-tube 49 by the rotation of the spindle 2 the former is moved back and forth by the side walls of the groove 22 in the rotary guide 21. Thus as the cop is being built up the lay of the thread is accurately determined. The thread may be wound upon the cop at any desired angle—that is, it may traverse the entire width of the cop at one rotation thereof, or it may require several rotations to traverse the entire width of the cop, in which latter event the thread will cross and recross several times. In this style of wind, which has been termed the "Fiji" wind, the crossing-point of the thread in one helix or coil is slightly in advance or slightly to the rear of the crossing-points of the thread in the next adjacent preceding or succeeding helix or coil. Consequently the cop is built up uniformly, and each successive overlying layer serves to lock on the next underlying layer. The crossing-points of each successive helix or coil are determined by the relative speed of the cop-spindle 2 and the rotary guide 21, which, as before referred to, may be accurately determined by the adjustment of the belt 7 upon the cone-pulleys 5 and 6. The

traverse of the thread across the cop is determined partially by the angle of the groove 22 in the rotary guide 21 and partially by the peripheral speed of said rotary guide. For example, as shown in Fig. 7, substantially three rotations of the rotary guide 21 would move the thread the length of the cop 50. If the speed of the rotary guide 21 were doubled and the speed of the cop 50 remained the same, the thread would traverse the length of the cop in substantially one-half the time. It is desirable that the thread 23 should rest lightly in the groove 22, because the speed of the thread being variable and the peripheral speed of the rotary guide being constant it is necessary that there shall be a slip of the thread 23 through the groove 22. The angle of the groove, as before suggested, may be varied as desired within reasonable limits; but by using a low-pitch groove the thread 23 may hold in the groove and follow its sinuosities.

When the groove in the guide-thread is so arranged as to cross and recross, it is desirable to provide a means to insure against the switching of the thread from its proper course, as might occur at the crossings of the groove, and to prevent this I provide what may be termed a "traverse-arm," which may be caused to rock back and forth and lead the thread to the groove slightly ahead of the desired contact-point therein, in this way preventing any tendency of the thread to jump back at the crossing-points of the groove 22. The traverse-arm gives only a general positioning of the thread prior to its engagement or contact with the thread-guide 21 and simply for the purpose above stated. This traverse-arm comprises a lever 51, (see Figs. 1, 2, and 3,) pivoted at 52 and carrying an extension 53, which engages with the cam 18, previously referred to, so that as said cam is rotated the free end of the traverse-arm lever 51 will rock back and forth across the guide 21. The free end of the traverse-arm carries a suitable eye or slot, (best shown in detail Fig. 8,) through which the thread may pass on its way to the guide 21. The cam 18 is set in such manner that it will cause the free end of the traverse-arm to keep slightly ahead of that portion of the guiding-groove through which the thread is passing. Inasmuch as this traverse-arm is only to give a general positioning of the thread, the pitch of the cam 18 at each extreme may be softened, so as to avoid a shock at each end of the stroke of the rocking traverse-arm. While this softening of the groove in the cam 18 will cause the traverse-arm to slow up at the end of each stroke, the accuracy of the cop-wind will not be at all impaired, because that is solely effected by the rotary guide 21. Where an eye is employed at the free end of the traverse-arm, the operator's time might be wasted in threading the machine, and accordingly it is preferable to employ the slot shown in Fig. 8, in which 54 and 55 are wires forming between them said slot through which said thread passes. As a further labor-saving device both wires or either of them—for example, 55—might be turned back, as shown, to form an inclined surface 56. Assuming that the machine is threaded (except for passing the thread into the said slot) and the position of the thread is substantially as indicated in dotted outline in Fig. 8, the movement of the free end of the traverse-arm toward said thread would cause it to ride up the incline 56 and over its end, from which by the normal tension of the thread it would be drawn into the slot, as shown in the solid line.

What I claim is—

1. In a winding-machine for thread and the like, in combination, a cop-spindle, a rotary thread-guide, a spirally-formed shallow groove in the periphery thereof to receive the thread to be wound, and means to lead the thread back and forth relatively to said guide whereby the thread is generally positioned prior to entering the cam-groove.

2. In a machine for winding thread or the like, the combination of a rotary thread-guide having a cam groove or space in its periphery to receive the thread to be wound, with means for rotating said guide, and means for maintaining said guide at a uniform distance just clear of the surface of the cop or the like as the latter is being wound, and with means movable relatively to said guide to lead the thread to the cam-groove.

3. In a thread-winding machine for cops and the like, in combination, a positively-driven rotary thread-guide, a spirally-formed cam-groove therein, means for rotating said thread-guide, a cop support or spindle and means for rotating the same independently of said thread-guide, means for separating said thread-guide and cop-spindle so that the surface of the cop shall be free from the surface of the guide, and means movable relatively to the thread-guide whereby the thread is carried back and forth across said guide in front of that portion of the groove which serves to guide said thread.

4. In a machine for winding thread upon cops or the like, in combination, a rotary thread-guide, a spirally-formed shallow groove therein, mechanism for rotating said guide, a cop-spindle adjacent said guide, a traverse-arm adapted to lead the thread to the guiding cam-groove, and means to move said traverse-arm relatively to said guide.

5. In a machine for winding cops or the like, in combination, a rotary thread-guide, a spirally-formed shallow groove therein, means for rotating said thread-guide, a cop support or spindle, and means for keeping the surface of said cop at a uniform distance from the surface of said cylindrical thread-guide while the cop is being wound, and a traverse-arm for leading the thread to the thread-guide and means for actuating said traverse-arm.

6. In a machine for winding cops or the like, in combination, a rotary thread-guide, a spirally-formed shallow groove therein, mechanism for rotating said guide, a cop-spindle and means for actuating said cop-spindle independently of said guide, and a traverse-arm adapted to lead the thread to the guide, said traverse-arm moving back and forth across said guide, and means for actuating said traverse-arm.

Signed at New York, N. Y., this 2d day of February, 1900.

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Witnesses:

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L. VREELAND.