A. D. SCOTT.

WIRE STRETCHING DEVICE.

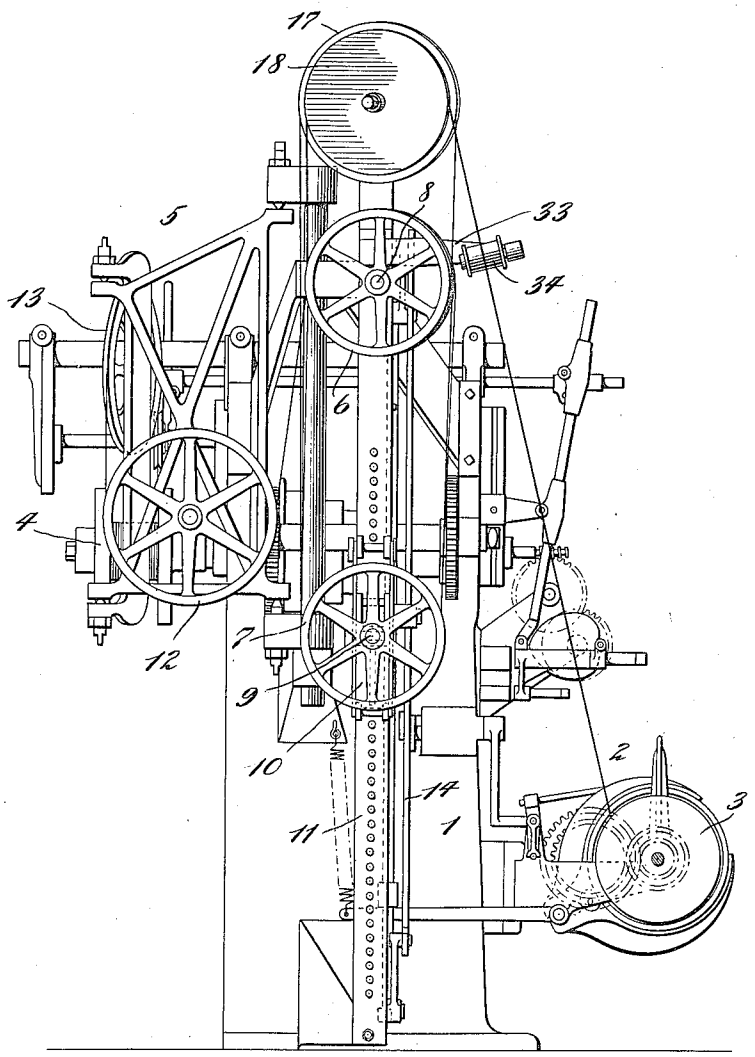
APPLICATION FILED AUG. 23, 1911.

1,064,936.

Patented June 17, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

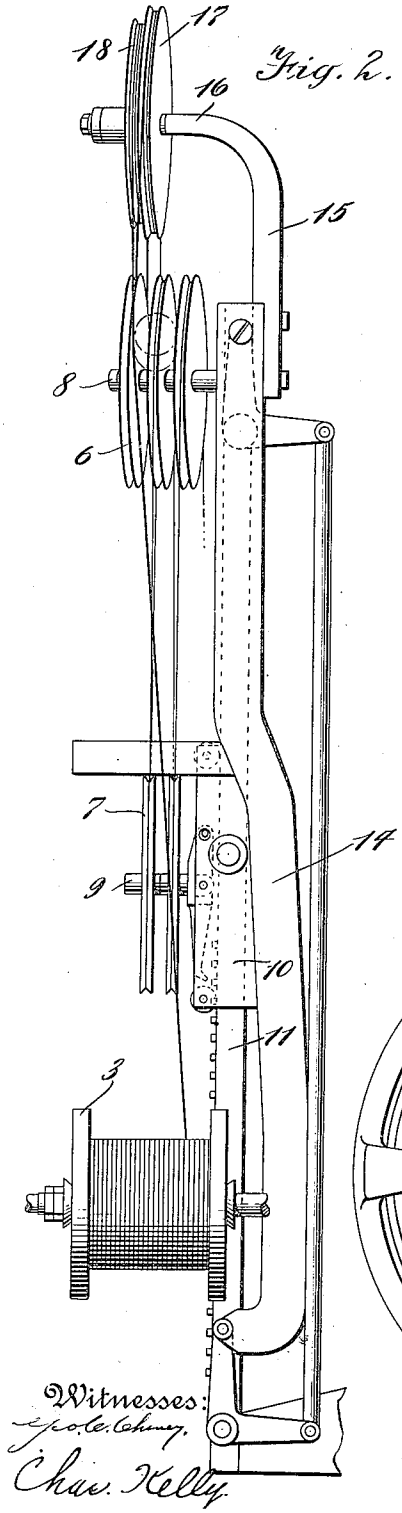


Fig. 3.

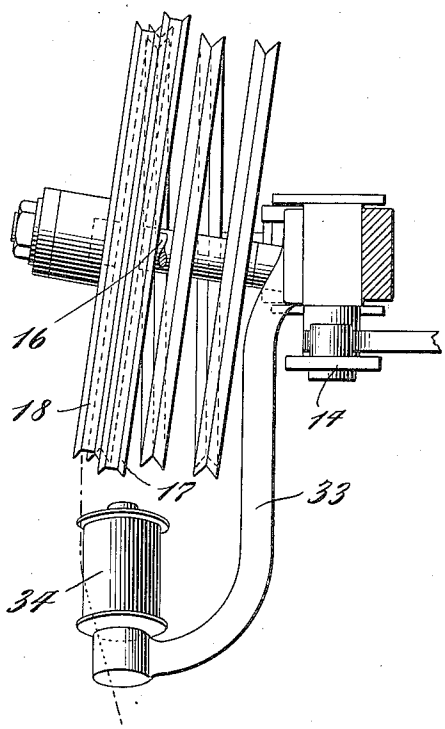
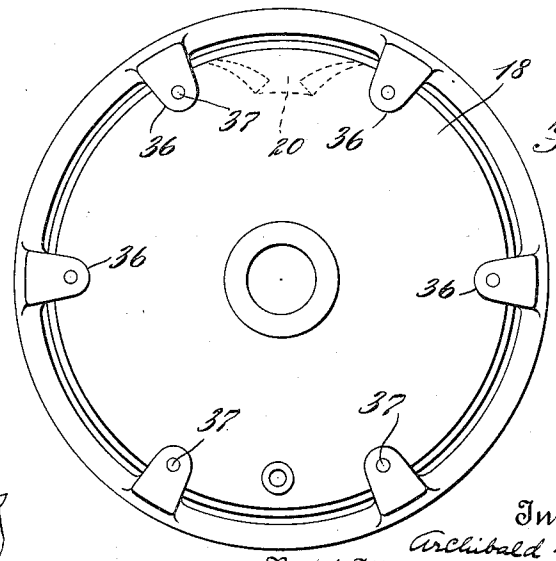


Fig. 7.



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1,064,936. **Patented June 17, 1913.**

3 SHEETS—SHEET 3.

Fig. 5.

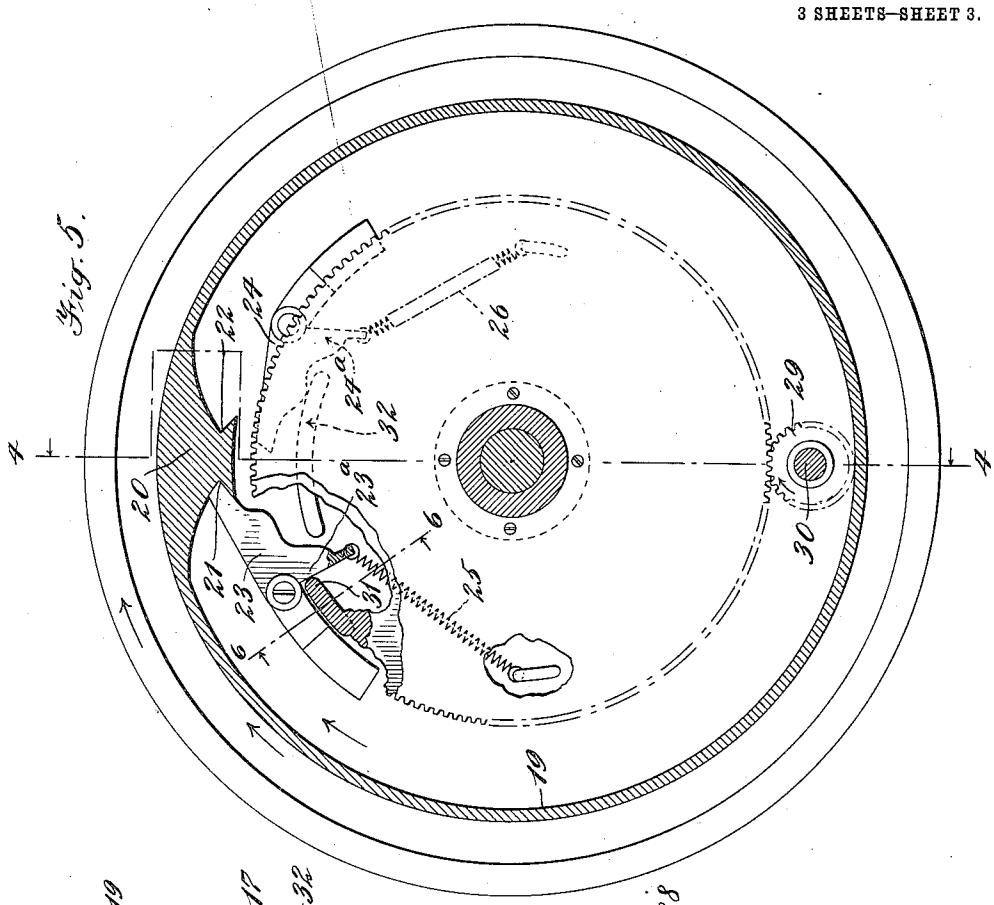


Fig. 4.

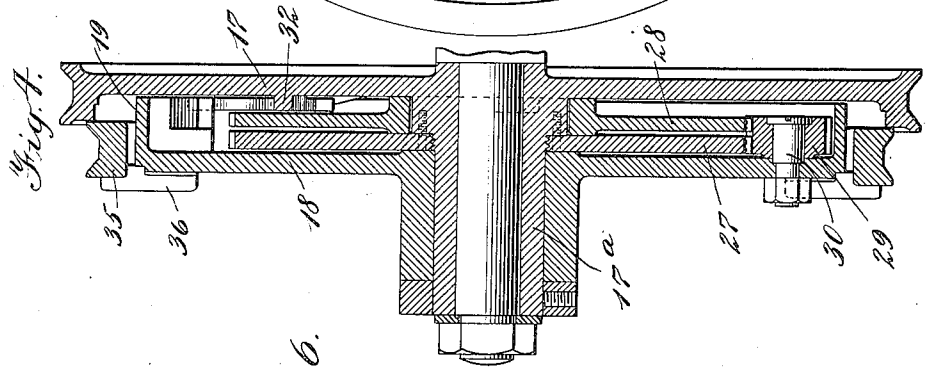
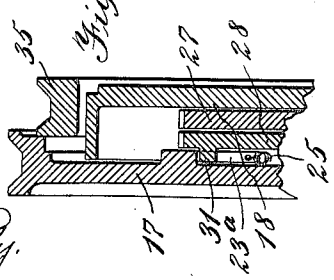


Fig. 6.



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UNITED STATES PATENT OFFICE.

ARCHIBALD DOUGLAS SCOTT, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO VARLEY DUPLEX MAGNET COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

WIRE-STRETCHING DEVICE.

1,064,936. Specification of Letters Patent. Patented June 17, 1913.

Application filed August 23, 1911. Serial No. 645,578.

To all whom it may concern:

Be it known that I, ARCHIBALD DOUGLAS SCOTT, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Wire-Stretching Devices, of which the following is a specification.

My invention relates broadly to new and useful improvements in wire stretching devices or machines, and more particularly to a wire stretching means in the form of an attachment to be used in connection with a winding machine for winding wire coils, such, for instance, as shown in my application Serial Number 584,040, filed September 27, 1910.

It is well known in the art that wire is usually manufactured in a fixed series of gages, and that it is difficult, if not impossible, to promptly secure wire of a gage between any two of such fixed gages, and it occurs often that a manufacturer engaged in the winding of coils may employ a smaller gage wire than that which he has in stock, or one which would come somewhere between two of the standard gages.

The object of my invention, therefore, is to provide a wire-stretching apparatus which is capable of general application, but which is particularly designed to form an attachment to a winding machine so that, during the process of winding, the wire will be stretched so as to reduce its diameter to the gage required, the stretching taking place during the winding operation and without interfering with the latter.

The invention consists in the combination of parts to be fully described hereinafter, and the novelty of which will be particularly pointed out and distinctly claimed.

I have fully and clearly illustrated my invention in the accompanying drawings to be taken as a part of this specification and wherein:

Figure 1 is a view in side elevation of a winding machine having my stretching means applied thereto; Fig. 2 is an enlarged detail view looking from the right of Fig. 1, showing the relative arrangement of the stretching means to parts of the winding apparatus; Fig. 3 is an enlarged top plan view of the parts shown in Fig. 2; Fig. 4 is a section through the stretching means on the line 4—4 of Fig. 5; Fig. 5 is a view in elevation, partly in section, and with parts broken away, of the stretching means; Fig. 6 is a detail sectional view of the stretching means; and Fig. 7 is a view in elevation of one of the members of the stretching means.

Referring to the drawings by characters of reference: the invention, for the purposes of this application, and in order that its operation may be readily understood, is shown as applied to a winding machine of the general type shown in my application Serial Number 584,040, filed September 27, 1910, for winding wire into coil form, and I will briefly describe such a machine, it being believed that a detailed description will be unnecessary.

In the drawings 1 designates a standard upon which is mounted a supply mechanism 2 including a supply spool 3 from which the wire to be wound is taken. 4 designates a winding mandrel, and 5 designates a freshly swinging crane formed of two parts which traverse the mandrel lengthwise under the pull of the strand being wound. 6, 7 designate, respectively upper and lower sets of grooved pulleys, the upper set being on a fixed shaft 8, and the lower set on a shaft 9 carried by a vertically slidable carriage 10 on a vertical post 11. The wire from the spool passes about said grooved pulleys 6 and 7 and then over grooved pulleys 12, 13 carried, respectively, by the members of the jointed swinging frame. The vertical movements of the carriage 10 operate or control the controlling member 14, the movements of which regulate the feed from the supply spool 3 so as to cause the same to feed the wire at different speeds, according to the amount demanded by the mandrel, and also for reversing the revolution of the supply spool to back wind. All of these features of construction just described form the subject matter of my application heretofore referred to, in which they are described in detail, and it is not thought necessary to make any more detail description or showing of the same in this application, as the present invention can be readily understood from the brief description already given.

I will now proceed to describe an embodiment of my present invention which at the present time appears to be the best way of putting the same into practice, although it

will be understood that the same is capable of wide variation, without departing from the spirit and scope thereof.

Mounted on the post 11 above the shaft 8 and wheels 6 carried thereon, is a vertical standard or bracket 15 having a horizontal extension 16 upon which is mounted for rotation a grooved wheel 17, and adjacent to said grooved wheel 17 is a second grooved wheel 18 of comparatively smaller diameter than the first-mentioned wheel, means being provided in the embodiment shown, whereby, during the winding operation, that is, when the wire is being wound on the mandrel, except when winding wire previously stretched, said grooved wheels 17 and 18 turn in unison at the same angular velocity. During the operation of the machine the wire from the spool 3 is carried over and wrapped around the groove of the wheel 18 for a plurality of turns, say, two or three, and is then carried beneath and around the outermost of the wheels 6 on the shaft 8, whence the strand is carried over and is wound about the larger wheel 17 for a plurality of turns. From the wheel 17 the wire is carried beneath and about the outermost of the wheels 7 on the carriage 10, whence it is carried over the middle wheel 6, then down and beneath the inner wheel 7 and then up and over the upper wheel 6, whence it leaves the manifold and passes over the wheels 12 and 13 of the freely swinging crane.

By the above arrangement, during the normal operation of winding, the revolution of the mandrel pulls the strand from the feed spool and it is obvious that, due to the tension exerted by such pull, the strand will be closely wrapped and will frictionally engage the pulleys 17 and 18 to such an extent that, were not said pulleys revoluble, the wire would bind on the same to such a degree as to substantially prevent its (the wire's) movement.

In view of the fact that the pulley 17 is of greater diameter than the pulley 18, it is obvious that the pull on the wire, caused by the revolution of the larger wheel, will cause a demand for the wire which is greater than the smaller pulley can supply, due to the difference in the diameter of the wheels, the result being that the wire will be stretched in order to make up the deficiency which the smaller wheel cannot supply and this stretching reduces the diameter of the wire to the gage desired. In other words, two members are provided which travel forward with their circumferences at different linear velocities, and as shown and described they may travel at the same angular velocity, but the stretching is effected as the result that the linear travel of the wire over the larger member is at a greater velocity than the travel over the smaller member, and consequently the smaller member does not supply the wire to the larger member as fast as the wire passes from the latter, which can only result in a stretching of the wire at some point between the members. The wheels are selected so that the diameter of the small wheel is to the diameter of the large wheel as the length of the wire before stretching is to the length after stretching to the desired gage.

Of course, it will be understood that, during the above operation, the two wheels are locked together so that they turn in unison at the same angular velocity, the wire being fed off of the larger wheel faster than it is fed from the smaller wheel to the larger wheel so that the wire between the two wheels, when passing over the outer of the wheels 6, is stretched.

It sometimes occurs during the operation of winding that the wire must be wound backward from the mandrel onto the supply spool, and I make provision whereby the wire which has already been stretched and wound on the mandrel and then rewound onto the supply spool from the mandrel will not be restretched upon again being fed to the mandrel, said means automatically operating to stretch the wire of normal gage as soon as the stretched wire which has been wound on the supply spool passes to the mandrel for the second time. In order to accomplish this result, the two wheels 17 and 18 are formed independent of each other so as to be capable of independent rotation on their shaft, locking means being provided whereby, during the normal winding operation or forward revolution of said wheels they are locked together, but, during the back-winding or rearward revolution, they move at different angular velocities, so that the wire which has been stretched and wound on the mandrel will pass to the supply spool, and the said pulleys, when the forward winding is resumed, will move forward at different angular velocities until the length of stretched wire on the supply spool has passed to the mandrel, and said pulleys will then be locked together to revolve at the same angular velocity and resume the stretching operation. In order to accomplish this result, I form the smaller pulley with an annular laterally projecting flange 19 which extends toward the adjacent face of the large pulley 17, and is provided at a point in its circumference with an inward projection 20 formed with oppositely-disposed locking recesses 21, 22, as clearly shown in Fig. 5 of the drawings. Mounted on the face of the larger pulley, which is toward said flange, are arranged oppositely-disposed pivoted pawl levers 23, 24, which are adapted to be swung outwardly by means to be presently described, so that the ends thereof may engage the recesses 21 and 22 to

lock the large and small pulleys together, said pawls being normally urged toward retracted position out of engagement with said recesses by means of tension springs 25, 26 indicated in Fig. 5 of the drawings.

Mounted on the hub 17ª of the large wheel, and fixed thereto to rotate therewith, is a gear 27 which, for the purposes of this application, we will say contains 81 teeth, and, loosely mounted on the said hub, for free rotation relative to the same, is a second gear 28 having, say, 80 teeth, said gears being of the same diameter and arranged in mesh with a pinion 29 turning on a stud 30, fixed to the smaller gear. The gear 28 carries on its face toward the pulley 17 a projection 31, which is adapted to coöperate with the tails 23ª and 24ª of the pawls 23 and 24, under conditions to be presently set forth, to throw one or the other of said pawls outwardly against the force of its spring to bring said pawl into position to engage the projection 20 to lock the pulleys together. In Fig. 5 of the drawings the pawl 23 is shown in engagement with the recess 21 so as to lock the two pulleys together whereby the pull of the wire from the larger pulley to the small pulley will serve to rotate both pulleys in unison. If, now, for any reason, it should be desired to backwind, the pull of the wire passing to the supply spool will be exerted on the small pulley tending to rotate it in the opposite direction from that when winding on the mandrel. As the two pulleys are of different diameters, it is obvious that the pulley of the smaller diameter will turn faster during the back-winding than the pulley of the larger diameter, owing to the fact that the same length of strand is being pulled from both pulleys. As soon as the smaller pulley begins to move faster than the larger pulley, the projection 20 will be moved out of engagement with the pawl 23 and the continued rotation of the smaller pulley with the pinion 29 will serve to move the gear 28 backward relative to the pawl 23, so that the projection 31 is moved from engagement with the pawl and the latter is swung down by its spring to a position corresponding to that shown in dotted line of the pawl 24 in Fig. 5. The inward movement of the pawls may be limited by an abutment 32, shown in full and dotted lines in Fig. 5, and in section in Fig. 4. As long as the backwinding takes place, both pulleys and the gears 27, 28 revolve in the direction of the arrows shown at the left of Fig. 5, but the smaller pulley constantly gains a definite length upon each revolution, such definite length corresponding to a definite length of the wire which is rewound on the feed spool, and during this operation the distance between the projection 31 on the gear 28, and the tail of the pawl 23, is constantly increasing so that said distance is proportional to the amount of wire which is backwound. The backwinding having been completed for the desired length of wire, the winding may then be started and the pull of the wire passing to the mandrel exerted on the larger pulley will rotate the same, and the pull of the wire from the large to the small wheel will rotate the small wheel at a greater angular velocity than that of the large wheel. This will continue until the pawl 23 is raised by the projection 31 on gear 28 and engages the recess 21, whereupon the stretching of the wire will be resumed. It will be understood that no stretching takes place during the rewinding as long as the pulleys are capable of independent rotation, and, as the distance the projection 31 has been moved from the tail of the pawl during the backwinding is dependent on the amount of wire taken up by the supply spool, the pulleys will be locked together when the rewinding is resumed as soon as the length of stretched wire on the supply spool has passed the point in the mechanism where the wire is stretched.

It will be understood that the gears 27 and 28 can be proportioned to permit any desired amount of wire being rewound from the mandrel onto the supply spool. In this connection, should the backwinding continue beyond the amount for which the gears are proportioned long enough to bring the projection around so as to engage the tail 24ª of the pawl 24, it will throw the pawl out so as to engage the recess 22, whereby the pulleys will be locked together during the backwinding operation in such manner as to prevent damage to the mechanism and the wheels 17 and 18 will rotate at the same angular velocity which will cause the wire to slip on one of the wheels during the remainder of the backwind operation. When forward winding is resumed the parts will behave as above described except that the pawl 23 will engage recess 21 before all the wire that has been stretched has passed the mechanism. This will result in stretching a second time as much wire as was back wound after the pawl 24 engaged recess 22. In practice this should not happen as the proportions of the gear should be such as to provide for the largest amount of wire that it might be necessary to backwind. The guide wheel 34 carried by bracket 33 mounted on 11 is provided to properly guide the wire to the wheel 18.

In Fig. 7 is shown one way of constructing the member 18, the grooved rim 35 thereof being preferably separable and connected to the body of said member by inwardly directed lugs 36 adapted to be secured to said member by any suitable fastening devices indicated at 37. It will be understood, however, that this is a mere detail

which is capable of variation without departing from the spirit of the invention.

During the normal winding operation of the machine, the pull of winding the wire is not sufficient to stretch it, the whole stretching being produced by the stretching mechanism, by which arrangement I am able to subject the wire to a definite amount of stretching. In other words the wire between the supply spool and the stretching means, and between the stretching means and the mandrel is not being stretched, and only the wire which is wound on the stretching members is being stretched.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a winding machine in combination a supply spool, a winding mandrel, wire-stretching means between the mandrel and the supply spool operating to stretch the wire as it passes to the mandrel, and means whereby the wire on the mandrel may be unwound therefrom and pass the stretching means and then be rewound on the mandrel without being restretched.

2. In a winding machine in combination with a winding mandrel and a supply spool, of a wire stretching means between the said mandrel and supply spool and operating to stretch the wire as it passes from the supply spool to the mandrel, and means whereby the direction of travel of the wire may be reversed and again rewound on the mandrel without being again stretched.

3. A wire stretching means comprising two revoluble members of different diameters mounted on the same shaft, connected to revolve at the same angular velocity, and adapted to have the wire wound about the same, and a member around which the wire passes between said revoluble members.

4. A wire stretching means comprising two revoluble members of different diameters, about which the wire is adapted to be wound, means for coupling the said members to cause them to move at the same angular velocity in one direction, and means whereby said members may revolve at different angular velocities in the other direction.

5. A wire stretching means comprising two revoluble members of different diameters, about which the wire is adapted to be wound, means for coupling the said members to cause them to move at the same angular velocity in one direction, and means whereby the member of smaller diameter may revolve in the opposite direction at a greater angular velocity than the member of larger diameter.

6. A wire stretching means comprising two revoluble members of different diameters, about which the wire is adapted to be wound, means for coupling said members to cause them to move at the same angular velocity in one direction, and means for uncoupling said members to permit independent revolution thereof when revolved in the other direction.

7. A wire stretching means comprising two revoluble members of different diameters, about which the wire is adapted to be wound, means for coupling said members to cause them to move at the same angular velocity in one direction, and means whereby the reverse movement of said members uncouples them for revolution independent of each other.

8. A wire stretching means comprising two revoluble members of different diameters, about which the wire is adapted to be wound, means for coupling said members to cause them to revolve in one direction at the same angular velocity, means permitting the smaller member to revolve at greater angular velocity than the larger member when revolved in the opposite direction, and means whereby when the said members are again driven forward the coupling means is operated to couple the members after the smaller member has resumed its normal position relative to the large member.

9. A wire stretching means comprising two revoluble members of different diameters about which the wire is adapted to be wound, means whereby said members travel forward at the same angular velocity, and means whereby they may travel rearward at different angular velocities.

10. A wire stretching means comprising two revoluble members of different diameters, means for coupling said members to cause them to revolve forward at the same angular velocity, and means whereby the reversal of revolution automatically disconnects said members to permit them to revolve rearward at different angular velocities.

11. A wire stretching means comprising two revoluble members of different diameters, means for coupling the same to cause them to revolve forward at the same angular velocity, means for operating the coupling means to release said members to permit them to revolve rearward at different angular velocities, and means set by the relative rearward revolution of said members for permitting a determined relative revolution of said members forward after such rearward revolution and then operating the coupling means to couple said members.

12. A wire stretching means comprising two revoluble members of different diameters, means for coupling said members to cause them to move forward at the same angular velocity, means for releasing the coupling means to permit rearward revolution of said members at different angular velocities, and means set by the rearward movement of said members for determining

the operation of the coupling means to couple said members when the latter are again revolved forward.

13. A wire stretching means comprising two revoluble members of different diameters, means for coupling said members to cause them to move forward at the same angular velocity, means whereby the rearward movement of said members uncouples the same to permit them to revolve rearwardly at different angular velocities, and means acting in accordance with the relative movement between said members on their rearward revolution to cause the coupling means to again couple said members upon forward revolution after a relative movement equal to the rearward relative movement.

14. A wire stretching means comprising two revoluble members of different diameters, means for coupling said members to cause them to move forward at the same angular velocity, means whereby the rearward movement of said members uncouples the same to permit them to revolve rearwardly at different angular velocities, and rotary means acting in accordance with the relative movement between said members on their rearward revolution to cause the coupling means to again couple said members upon forward revolution after a relative movement equal to the rearward relative movement.

15. A wire stretching means comprising two revoluble members of different diameters, means for coupling said members to cause them to move forward at the same angular velocity, means whereby the rearward movement of said members uncouples the same to permit them to revolve rearwardly at different angular velocities, means acting in accordance with the relative movement between said members on their rearward revolution to cause the coupling means to again couple said members upon forward revolution after a relative movement equal to the rearward relative movement, and gearing driven by the relative movement of said members for operating said coupling means.

16. A wire stretching means comprising two revoluble members of different diameters, means for coupling said members to cause them to move forward at the same angular velocity, means whereby the rearward movement of said members uncouples the same to permit them to revolve rearwardly at different angular velocities, and means whereby a resumption of the forward movement couples said members to cause them to again move forward at the same angular velocity.

17. A wire stretching means comprising a shaft, two revoluble members of different diameters mounted on said shaft, means for coupling said members to cause them to move forward in unison at the same angular velocity, a toothed member on the shaft having means to place the coupling means in coupling position, a second toothed member fixed to the larger of said revoluble members, and having a greater number of teeth than the first named toothed member, and a pinion on the smaller of said members meshing with both said toothed members.

18. A wire stretching means comprising a shaft, two revoluble members on the shaft adapted to receive the wire on their circumferences, said members being of different diameters, a pawl for coupling the members to cause them to revolve forward at the same angular velocity, means to move the pawl from coupling position, a rotary toothed member on the shaft adapted to engage the pawl to move it to coupling position, a second toothed member on the shaft fixed to the larger of the revoluble members, said second toothed member having more teeth than the first named toothed member, and a pinion carried by the smaller of said revoluble members and meshing with both said toothed members.

19. A wire stretching means comprising two revoluble members of different diameters adapted to have the wire wound on their circumferences, coupling means to couple said members to cause them to move forward at the same angular velocity, means whereby a rearward revolution of said members automatically uncouples the same, and a second coupling means rendered effective after a predetermined relative rearward movement of said revoluble members.

20. A wire stretching means comprising concentric revoluble members of different diameters and adapted to have the wire wound around the same, means whereby said members are revoluble at the same angular velocity, and a member around which the wire passes from one revoluble member to the other.

21. A wire stretching means comprising stretching members adapted to move in one direction to stretch the strand, means whereby the reversal of the travel of the strand reverses the direction of the movement of said members, and means whereby said members may again move forward without stretching the wire which has already been subjected to the stretching operation.

22. A wire stretching means comprising members adapted to travel forward at different lineal velocities to stretch the wire, means whereby said members may travel rearward and the stretched wire pass the same, and means whereby the resumption of the forward movement of the members will be at the same lineal velocity through a determined period sufficient to permit the

once stretched wire to again pass said members without being stretched.

23. A wire stretching means comprising revoluble members adapted to have the wire wound around the same, means whereby said members revolve forward with their circumferences at different lineal velocities, and means whereby said members may travel rearward with their circumferences at the same lineal velocity.

24. A wire stretching means comprising revoluble members adapted to have the wire wound around their peripheries, means whereby said members may revolve forward with their peripheries at different lineal velocities, means whereby they may travel rearward at the same lineal velocity, and means whereby they may subsequently travel forward at the same lineal velocity through a period equal to the said rearward travel.

25. A wire stretching means comprising revoluble members adapted to have the wire wound around their peripheries, means whereby said members may revolve forward with their peripheries at different lineal velocities, means whereby they may travel rearward at the same lineal velocity, means whereby they may subsequently travel forward at the same lineal velocity through a period equal to the said rearward travel, and means for automatically causing the said members to travel forward at different lineal velocities after the termination of said last mentioned forward travel.

26. In a winding machine a supply spool, a winding mandrel, means for driving the mandrel to draw the wire from the supply spool, wire stretching means between the mandrel and the supply spool to stretch the wire as it passes to the mandrel, means for reversing the travel of the wire to wind it from the mandrel onto the supply spool, and means whereby the wire from the mandrel passes to the supply spool without being restretched.

27. In a winding machine a supply spool, a winding mandrel, means for driving the mandrel to draw the wire from the supply spool, wire stretching means between the mandrel and the supply spool to stretch the wire as it passes to the mandrel, means for reversing the travel of the wire to wind it from the mandrel onto the supply spool, and means whereby the stretched wire may be wound from the mandrel onto the supply spool and rewound onto the mandrel without being stretched.

28. A wire stretching means comprising two revoluble members of different diameters about which the wire is adapted to be wound, means whereby said members travel forward at the same angular velocity, means whereby they may travel rearward at different angular velocities, and means for limiting the said rearward travel.

29. A wire stretching means comprising two revoluble members of different diameters about which the wire is adapted to be wound, means whereby said members travel forward at the same angular velocity, means whereby they may travel rearward at different angular velocities, and means for limiting the said rearward travel at different velocities.

30. A wire stretching means comprising two peripherally grooved revoluble concentric wheels of different diameters adapted to receive the wire on their peripheries, a third peripherally grooved revoluble wheel, and means whereby said wheels may revolve on fixed centers relative to each other.

31. A wire stretching means comprising two revoluble concentric members of different diameters adapted to receive the wire on their peripheries, a third revoluble member, and means whereby said members may revolve on fixed centers relative to each other.

32. A wire-stretching means comprising revoluble members adapted to have the wire wound around the same, means whereby said members revolve forward with their circumferences at different lineal velocities, means whereby said members may travel rearward with their circumferences at the same lineal velocity, and means whereby said members may subsequently travel forward with their circumferences at the same lineal velocity.

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

ARCHIBALD DOUGLAS SCOTT.

Witnesses:

W. A. PAULING,

C. G. HEYLMAN.

It is hereby certified that in Letters Patent No. 1,064,936, granted June 17, 1913, upon the application of Archibald Douglas Scott, of Jersey City, New Jersey, for an improvement in "Wire-Stretching Devices," an error appears in the printed specification requiring correction as follows: Page 1, line 78, for the word "freshly" read *freely;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of July, A. D., 1913.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.