W. SHARDLOW

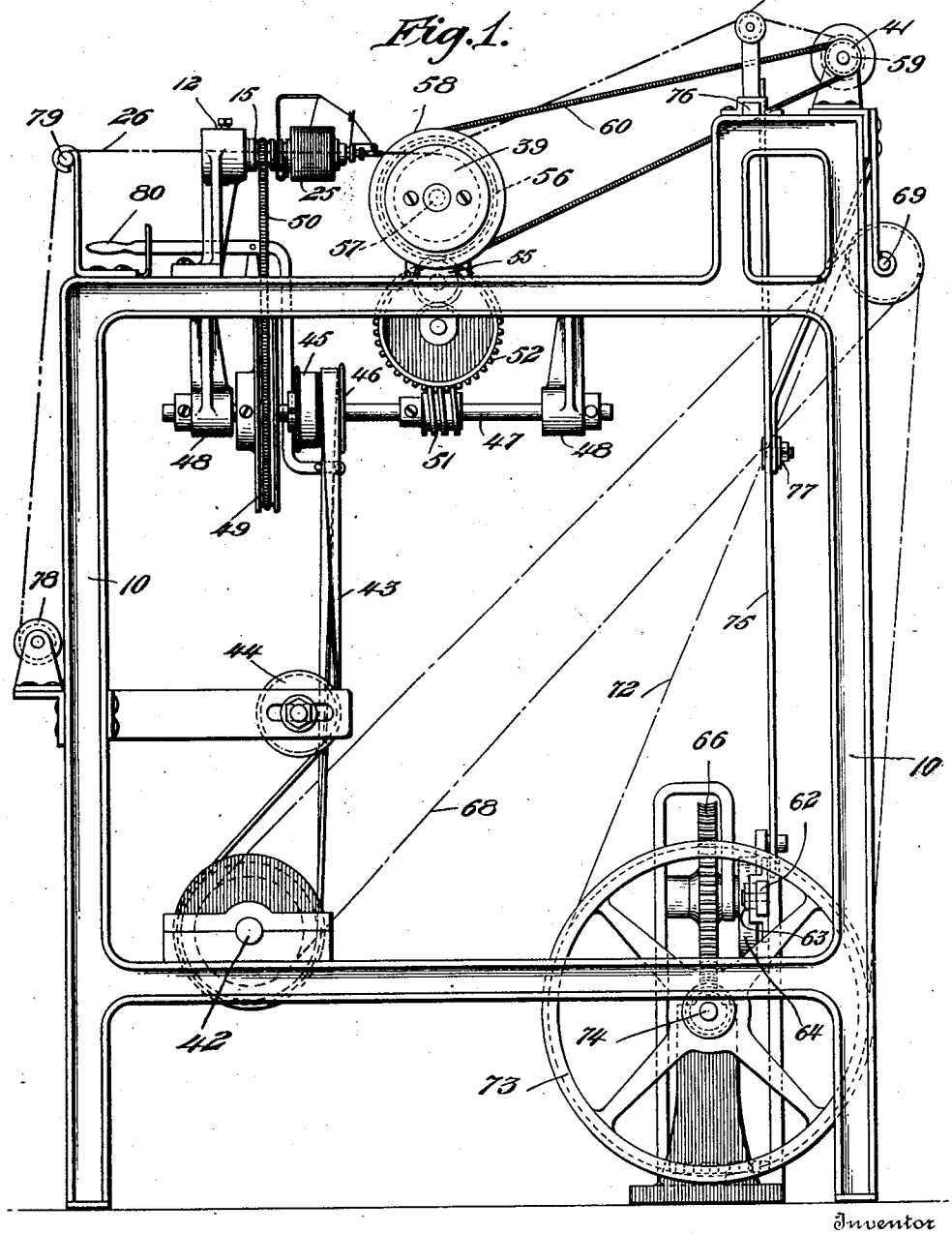
CORE WINDING MACHINE.

APPLICATION FILED NOV. 5, 1920.

1,433,242. Patented Oct. 24, 1922.

4 SHEETS—SHEET 1.

Fig. 1.



Inventor

William Shardlow

By Howard E. Barlow

Attorney

W. SHARDLOW.

CORE WINDING MACHINE.

APPLICATION FILED NOV. 5, 1920.

1,433,242. Patented Oct. 24, 1922.

4 SHEETS—SHEET 2.

Fig. 2.

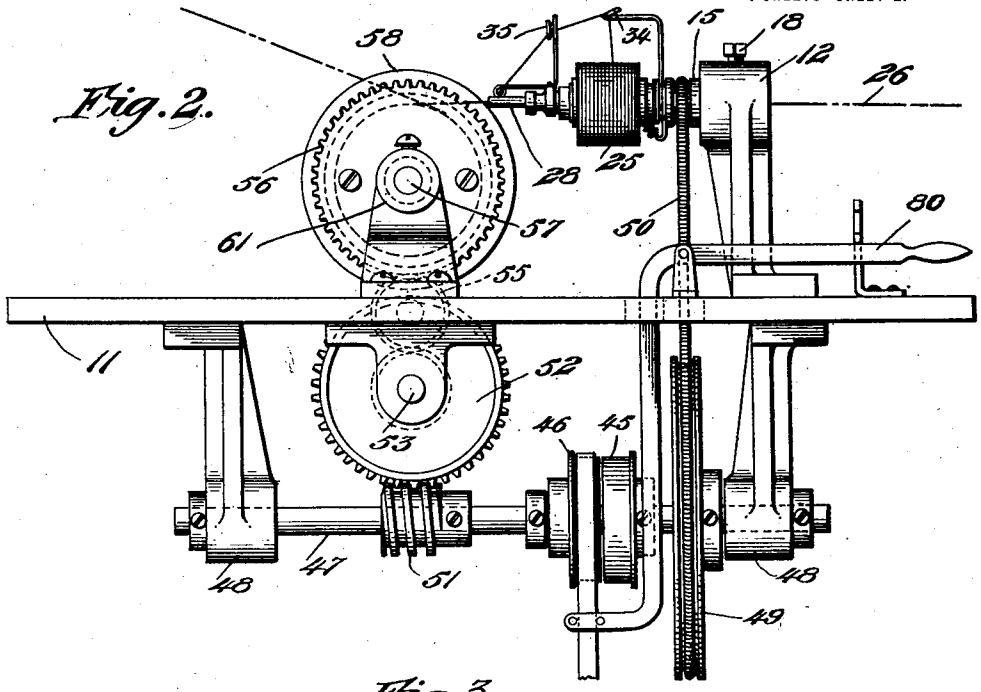
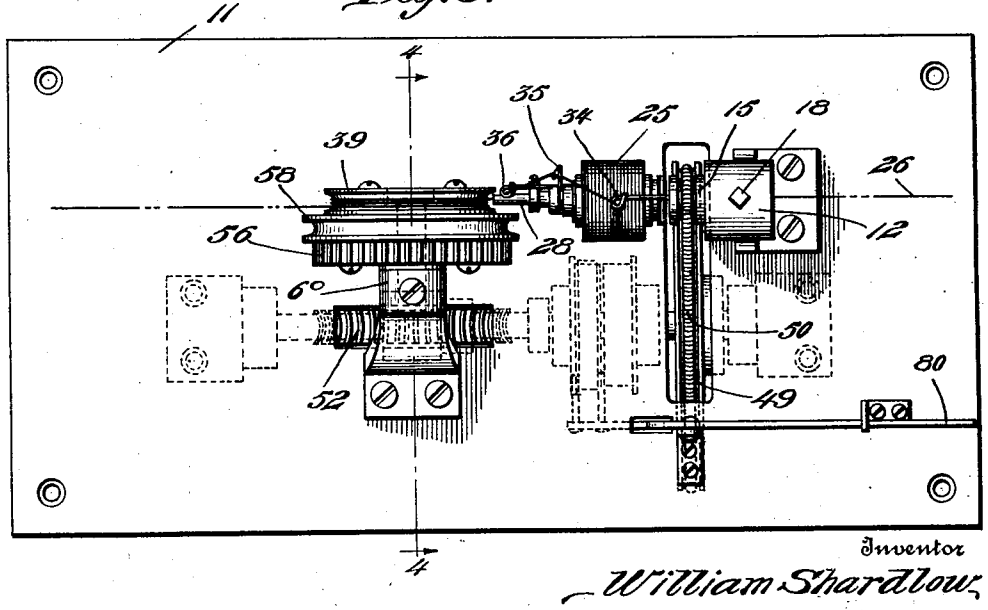


Fig. 3.



Inventor

William Shardlow.

By Howard E. Barlow

Attorney

W. SHARDLOW.

CORE WINDING MACHINE.

APPLICATION FILED NOV. 5, 1920.

1,433,242.

Patented Oct. 24, 192

4 SHEETS—SHEET 3.

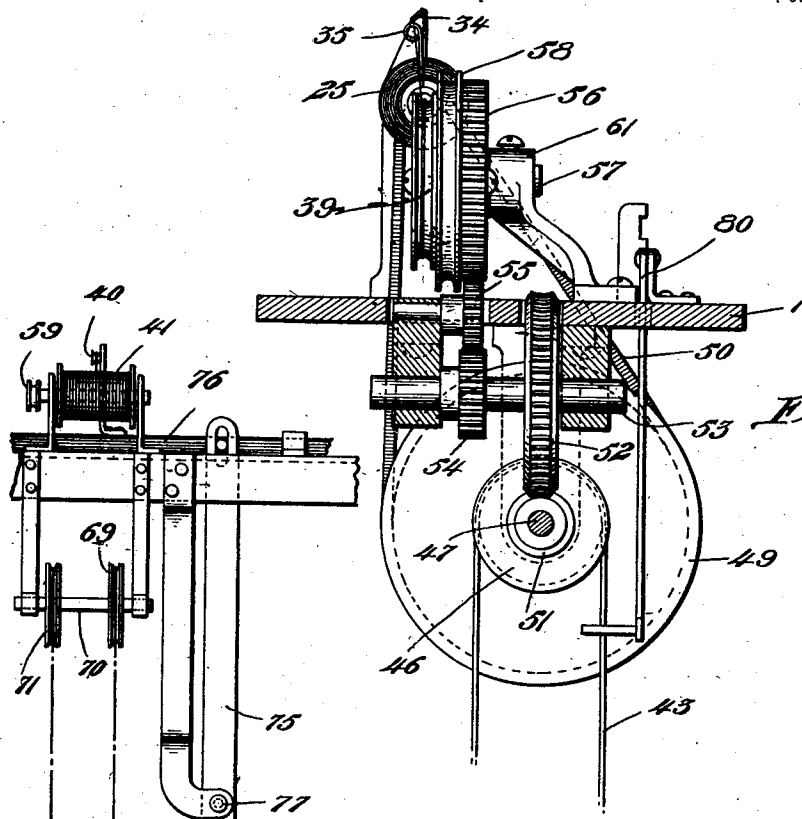


Fig. 4.

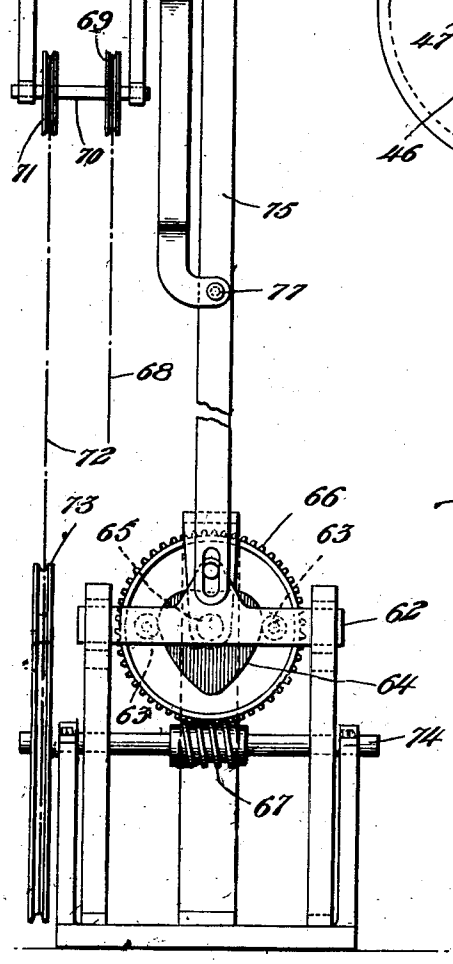


Fig. 5.

Inventor

William Shardlow

By Howard E. Barlow

Attorney

W. SHARDLOW.

CORE WINDING MACHINE.

APPLICATION FILED NOV. 5, 1920.

1,433,242.

Patented Oct. 24, 1922.

4 SHEETS—SHEET 4.

Fig. 6.

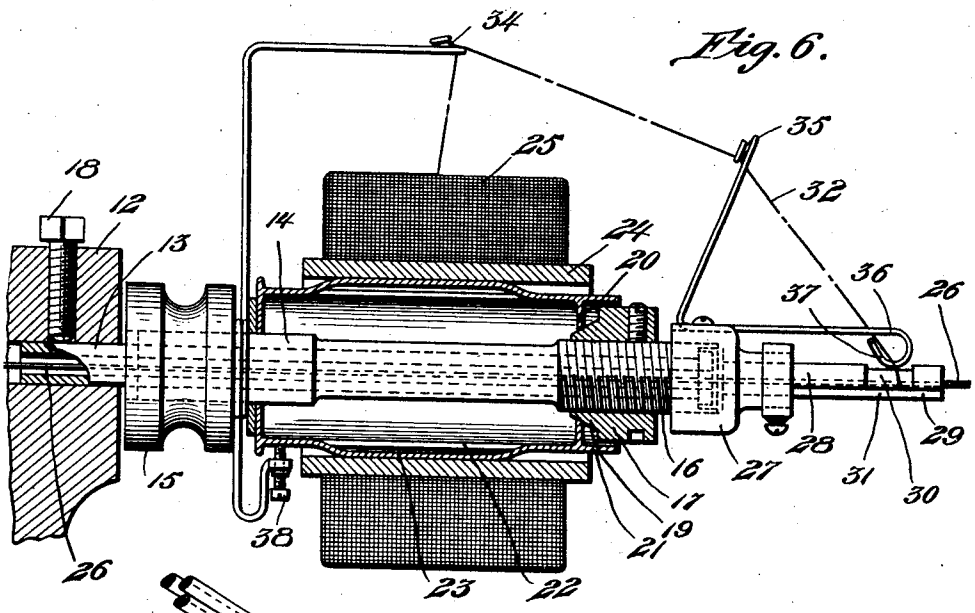


Fig. 7.

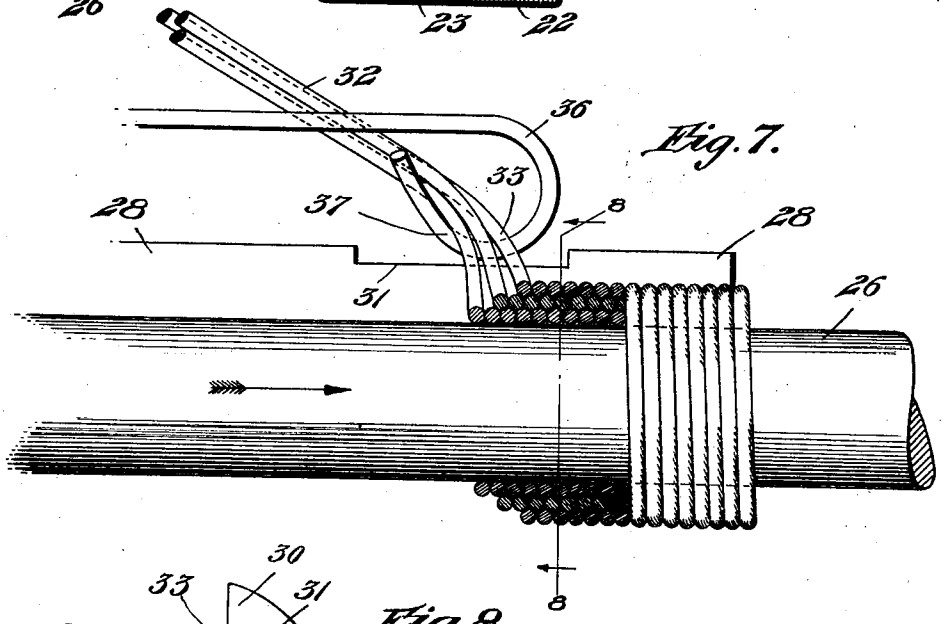
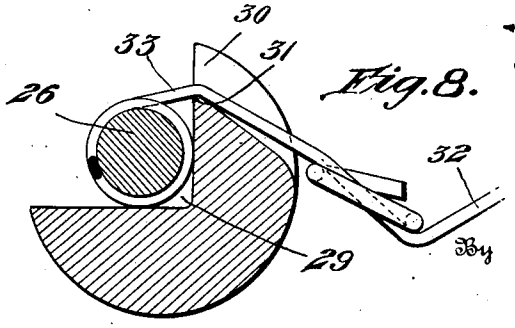


Fig. 8.



Inventor

William Shardlow.

By Howard E. Barlow

Attorney

Patented Oct. 24, 1922. 1,433,242

UNITED STATES PATENT OFFICE.

WILLIAM SHARDLOW, OF PAWTUCKET, RHODE ISLAND, ASSIGNOR OF ONE-HALF TO WILLIAM MEIKLEJOHN, OF PAWTUCKET, RHODE ISLAND.

CORE-WINDING MACHINE.

Application filed November 5, 1920. Serial No. 422,087.

To all whom it may concern:

Be it known that I, WILLIAM SHARDLOW, a subject of the King of England, residing at Pawtucket, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Core-Winding Machines, of which the following is a specification.

This invention relates to an improved method of and machine for laying a covering on a core, and relates more particularly to the winding of a covering of electric insulating material such as silk or the like, upon a core such for instance as electric wire, and the object of this invention is the provision of means whereby a plurality of layers of such covering may be wound upon a core.

A further object of this invention is to wind different layers of covering ends or strands of material under different tensions, the outer layer being of the greatest tension and imbedded in the preceding softer layers forming a perfect insulation that will not leak when subjected to a heavy voltage thus binding the whole together and so doing away with the use of cement or sizing on the covering material which is undesirable.

A still further object of the invention is to employ a covering thread having a plurality of ends or strands which are not twisted together and to lead all of these ends through the same guide or guides and so lay them simultaneously upon a wire or core but in different layers.

By this arrangement of winding, the wire or core is so thoroughly insulated that it will stand a much higher voltage without leaking than that insulated by the old methods.

The invention further consists in connecting the feed for the core and the drive for the flyer or winding mechanism so that at each revolution of the flyer the core may if desired, be advanced a distance equal to one diameter of the end or strand being laid.

The nature and advantages of the invention will be better understood when the following detail description is taken in connection with the accompanying drawings, the invention residing in the combination and arrangement of parts as claimed.

In the drawings forming part of this specification, like numerals of reference indicate similar parts in the several views and wherein.

Figure 1 is a side elevation of my improved core winding machine, showing one operating unit.

Figure 2 is a side elevation showing the head-driving unit connected to drive the rotatable winding flyer and the advancing wire or core to operate in direct relation one with the other.

Figure 3 is a top view of this head unit.

Figure 4 is a sectional elevation on line 4—4 of Figure 3, looking in the direction of the arrow.

Figure 5 is a rear elevation of the traverse mechanism for leading the covered wire properly onto the winding spool.

Figure 6 is an enlarged view of the flyer or winding head.

Figure 7 is a greatly enlarged diagrammatic view illustrating a thread of three ends or strands being laid in three different superimposed layers upon a wire core, each end forming a distinct layer and a portion of the covering being in section.

Figure 8 is a section on line 8—8 of Figure 7, looking in the direction of the arrow.

With reference to the drawings, 10 designates the frame upon which is mounted the operating mechanism. On the upper portion of this frame is supported the plate 11 upon which is mounted as a unit the flyer-head rotating-mechanism and the wire take-up or advancing mechanism to operate in unison and at a given ratio one to the other.

This flyer head comprises essentially a bearing 12 which is supported on the plate 11, in which head is fixed by a set screw 18, a hollow bearing spindle 13 through which the wire or core 26 to be covered is adapted to pass. Upon this spindle is rotatably mounted the mandrel 14, which is provided at one end with a grooved driving pulley 15 while the other end is threaded as at 16 to receive an adjustable bearing nut 17 having a cone-shaped bearing end 19 upon which rests the inwardly turned wall 20 of the sleeve 21. The surface of this sleeve is slit at intervals as at 22, about its circumference and portions 23 are raised from the surface thereof for the purpose of providing yieldable bearing and gripping members for the paper cop tube 24 carrying the covering thread or yarn 25.

On the outer end of this mandrel is secured a guide carrying member 27 which is provided with an outwardly-extending portion 28 having a longitudinally-disposed slot 29, V-shaped in cross section, in which the wire or core 26 is adapted to lie and be supported during the winding or covering operation. This extending portion is provided with a notch 30 having an edge 31 over which the ends 33 or strands of which the thread 32 is composed are drawn and flattened just previous to being laid or wound upon the core. It will be noted by this construction that this guiding edge 31 is very close to the surface of the wire being covered, that is about one-half the diameter of the core therefrom so that the strand when flattened on this edge will still be flat when laid upon the wire.

In guiding the thread from the bobbin 25 it is first passed through the guide eye 34, the same being supported on the mandrel 14 thence through the guide eye 35 which is supported on the member 27 and finally through or over a guide 36 which has a guide portion 37 positioned at an angle of about 20° relative to the axis of the wire. by so positioning this guide portion 37 the ends 33 of the thread are assisted in separating from each other as they are drawn over the guide edge 31 and laid upon the core.

By this construction of flyer-head it will be seen that the sleeve 21 is caused to rotate with the mandrel 14 as the thread is laid upon the core and as the thread is drawn from the bobbin it is of course, necessary that the bobbin should rotate slowly relative to the mandrel as the thread is drawn therefrom, and in order to provide a tension on the thread and prevent its sleeve from rotating too readily upon the mandrel, I have provided an adjustable friction screw 38, the end of which may be set to engage the surface of the sleeve and so provide the required frictional resistance. From this spinning head the wire or core is passed around the tension pulley 39 thence over the guide 40 to be wound upon a spool 41.

In driving the mechanism power is applied to the main shaft 42 from a motor or other source (not shown), and from this shaft a belt 43 is led over the idler pulleys 44 to engage the tight and loose pulleys 45 and 46, which pulleys are mounted upon the jack shaft 47. This jack shaft is supported on the under side of the plate 11 in the bearings 48. On this shaft is mounted the grooved pulley 49 which is provided preferably with a coiled spring wire driving belt 50 which leads up over the flyer pulley 15 for the purpose of transmitting a very high rate of speed to the flyer-head. Also on this jack shaft is mounted a worm 51 which transmits motion through the worm gear 52 to the cross shaft 53 see Figure 4, which cross shaft transmits motion through pinion 54, intermediate gear 55, to the large gear 56 which latter is mounted on a short shaft 57 supported in a bracket 61 and to this large gear is secured a tension pulley 39 for advancing the wire to be wound and also a grooved pulley 58 from which is transmitted rotation to a spool shaft pulley 59 through a belt 60.

In order to lay the covered wire or core properly upon its winding spool 41, I have provided a traverse mechanism best illustrated in Figures 1 and 5, which comprises essentially a laterally movable cross bar 62 having guide rolls 63, which rolls are engaged by a heart-shaped edge cam 64 to move the bar laterally. This cam 64 is rotatably mounted through a shaft 65, worm gear 66, and worm 67 to which is imparted a rotary motion from the main shaft 42 through the belt 68, pulley 69, jack shaft 70, pulley 71, belt 72, and large pulley 73, the latter being mounted on the cross shaft 74 with the worm 67. As this heart-shaped cam is rotated it transmits a slow lateral motion to the bar 62 which in turn through the upright rock lever 75 pivoted at 77 transmits this traverse motion to the guide pulley 40 mounted upon the bar 76.

In the operation of the machine the wire or core 26 to be covered is lead from the reel 78 up over the guide 79 and through the flyer-head over the feed pulley 39 and to the takeup or winding spool 41.

To start the machine it is only necessary to raise the shift lever 80 which draws the driving belt 43 from the loose pulley 46 onto the tight pulley 45. This causes the flyer-head to rotate at a very high velocity and revolve the thread about the wire or core, the mechanism is also caused to advance the core or wire in a direct proportion to the number of revolutions to the flyer. In this particular instance the advancing of the wire is approximately one diameter of one end or strand of the thread at each revolution of the flyer. Therefore when running at such a ratio it will be seen that there must be as many layers upon the wire as there are ends or plies in the covering thread, that is, if there are two ends or plies to the thread there will be two thicknesses of covering on the wire, and if there are three ends or plies to the thread there will be three thicknesses of covering on the wire.

It is found in the practical operation of the machine that in laying the loose ends or strands upon the wire that these ends or strands are drawn through or over guides of such a shape or character that the first revolution lays all of the ends side by side upon the wire. During the next revolution of these ends the wire or core has advanced sufficiently to cause ends Nos. 2 and

3 to wind over the covering laid by end No. 1. Thus it will be seen that Nos. 2 and 3 have now an increased tension over No. 1 end owing to the fact that the diameter of the wire has been increased by the covering laid by end No. 1. The next revolution causes end No. 2 to continue to be wound over covering laid by end No. 1 while end No. 3 is wound over the covering laid by No. 2. Therefore end No. 3 is drawn around a diameter which is greater than either end No. 1 or 2 and therefore has a tension greater than either, which causes this last layer to be wound very tightly upon the wire and be imbedded into the softer preceding layers rendering the whole homogeneous or bound together producing the effect of layers laid in a sizing or cement that is it cannot be readily unwound, which effect is caused by laying the first layer comparatively loose and each of the succeeding layers of covering with a tension greater than those preceding.

It is found in practice that by so leading these strands or threads upon a core that the wire is so thoroughly covered and insulated that it will stand a greatly increased voltage over similar insulations heretofore laid by other methods or processes. Then again it will be noted that all of the strands or ends are led through a single set of guides and all are simultaneously applied to their relative positions to lead their different layers at the same time upon the wire or core.

This is found to be an advantage owing to the fact that if the three ends, more or less, were passed through separate guides they would be caused to so often break that such an arrangement would be quite impractical, as it is found in practice extremely difficult to form a thread with ends or strands that do not cross each other and such crossing would certainly cause the ends to break down if led through separate guides. Then again the fibers of the thread ends or plies naturally cling and adhere to each other which would cause frequent breaking down of the ends if they were separated and led through different guides. Therefore it will be seen that by leading all of the ends through the same guide and by separating these ends only by the different tensions which are applied thereto while laying the different layers upon a core permits these fibers in the different ends or plies to cling to each other, which clinging effect does not in this case break down the ends but simply serves to form a more homogeneous covering.

By my improved method of applying a silk insulating covering to wire it may be done very rapidly, at the minimum expense and with the minimum attention of the operator, and when so covered the wire will stand an extremely high voltage without leaking.

The foregoing description is directed solely towards the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

I claim:

1. In a core-winding machine, means for leading a plurality of strands from the same source together through the same guide and laying them onto a core so as to provide a plurality of superimposed covering layers all in a single operation.

2. In a core-winding machine, means for leading a plurality of strands from the same source together through the same guide and laying them onto a core so as to form a plurality of superimposed covering layers all in a single operation all of said strands being conducted to the core simultaneously.

3. In a core-winding machine, means for leading a plurality of strands from the same source together through the same guide and laying them onto a core so as to provide a plurality of superimposed covering layers all in a single operation, all of said strands being conducted to the core simultaneously and at different tensions.

4. In a machine of the character described, means for leading a plurality of ends or strands from the same source and laying them upon a core forming a plurality of different superimposed layers all in a single operation, each of said layers being wound with a different tension.

5. In a machine of the character described, means for leading a plurality of ends or strands from the same source and laying them upon a core forming a plurality of different superimposed layers all in a single operation, each of said layers being wound with a different tension, the greatest tension being applied to the outermost layer.

6. In a core-winding machine, means for advancing the core, means for revolving the covering thread supply about the core to wind the layers thereon, means for leading a thread formed of a plurality of separate substantially untwisted ends or strands from said supply, means for separating said strands as they are wound upon the core whereby each forms a separate layer wound upon the one preceding.

7. In a machine for winding wire, means for advancing the wire, means for revolving the covering thread supply about the wire to wind a plurality of layers thereon, a thread formed of a plurality of separate substantially untwisted ends or strands, means for leading said thread from said supply to the

winding point, means for separating said strands as they are wound upon the wire whereby each strand forms a separate layer wound upon the one preceding, all of said layers being wound simultaneously.

8. In a machine for winding wire, means for advancing the wire, means for revolving the covering thread about the wire to wind the layers thereon, means for leading a thread formed of a plurality of separate substantially untwisted ends or strands from said supply to the winding point, means for separating said strands as they are wound upon the core, whereby each strand forms a separate layer wound upon the one preceding, all of said layers being wound simultaneously, and each layer being wound with a different tension.

9. In a wire-covering machine, a central tube through which the wire to be covered is led, a supply of covering thread comprising a plurality of separate strands rotatably mounted on said tube, guides for conducting the thread from said supply to the point of winding, means for advancing the wire, and a driving unit connected to rotate the winding mechanism in time with said wire-advancing means in such a manner that the separate strands will each be laid side by side, each forming a layer wound upon the one preceding.

10. An improved method of covering a core, which consists in providing substantially untwisted thread with a plurality of loose strands or ends and laying these ends to form a plurality of separate superimposed layers of covering upon the core.

11. An improved method of covering wire which consists in providing a substantially untwisted thread with a plurality of strands or ends and winding these ends simultaneously upon the wire, each end providing a separate layer or covering.

12. An improved method of covering wire which consists in providing a substantially untwisted thread with a plurality of strands or ends, and winding these ends simultaneously upon the wire providing a plurality of superimposed covering layers.

13. An improved method of covering wire which consists in providing a substantially untwisted thread with a plurality of strands or ends and winding these ends simultaneously upon the wire providing a plurality of superimposed covering layers, each of said layers being wound with a different tension.

14. An improved method of covering wire, which consists in providing a substantially untwisted thread with a plurality of strands or ends and winding these ends simultaneously upon the wire providing a plurality of superimposed covering layers, each succeeding layer being wound tighter than the one preceding.

15. An improved method of covering wire, which consists in providing a thread with a plurality of strands or ends, rotating the covering thread about the wire to wind it thereon, advancing the wire the diameter of one strand at each revolution of the winder causing the strands to wind in layers one upon the other and finally reeling the finished product.

In testimony whereof I affix my signature.

WILLIAM SHARDLOW.