D. NOBLE.

MACHINE FOR COVERING OR INSULATING WIRE WITH YARN OR ITS EQUIVALENT.

APPLICATION FILED AUG. 5, 1909.

970,098.

Patented Sept. 13, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

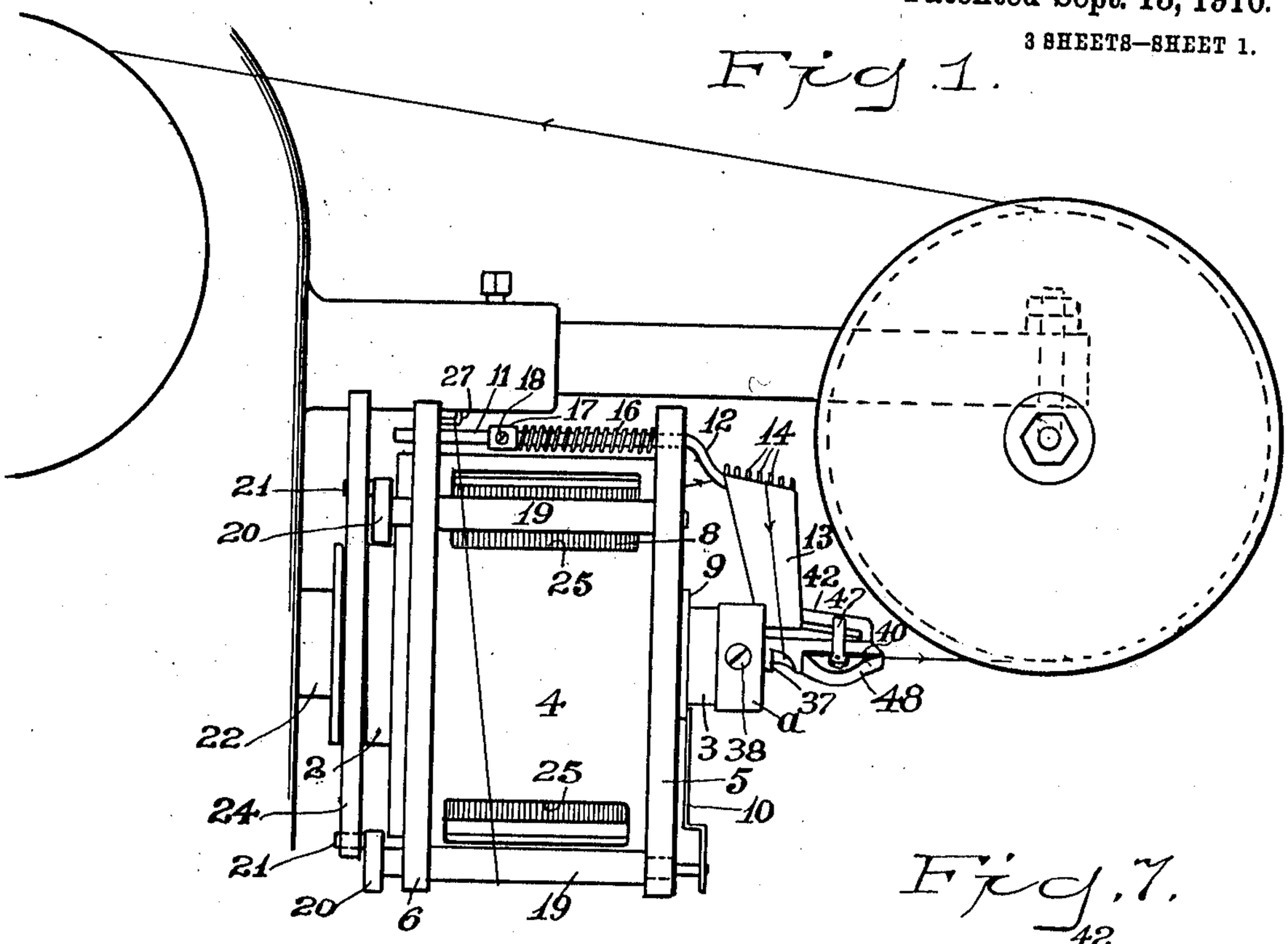


Fig. 7.

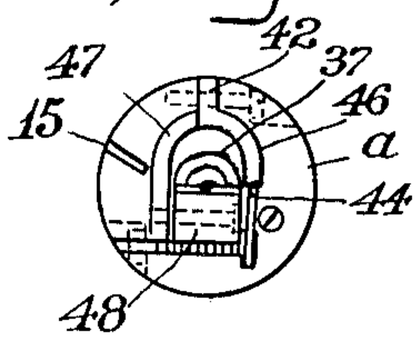
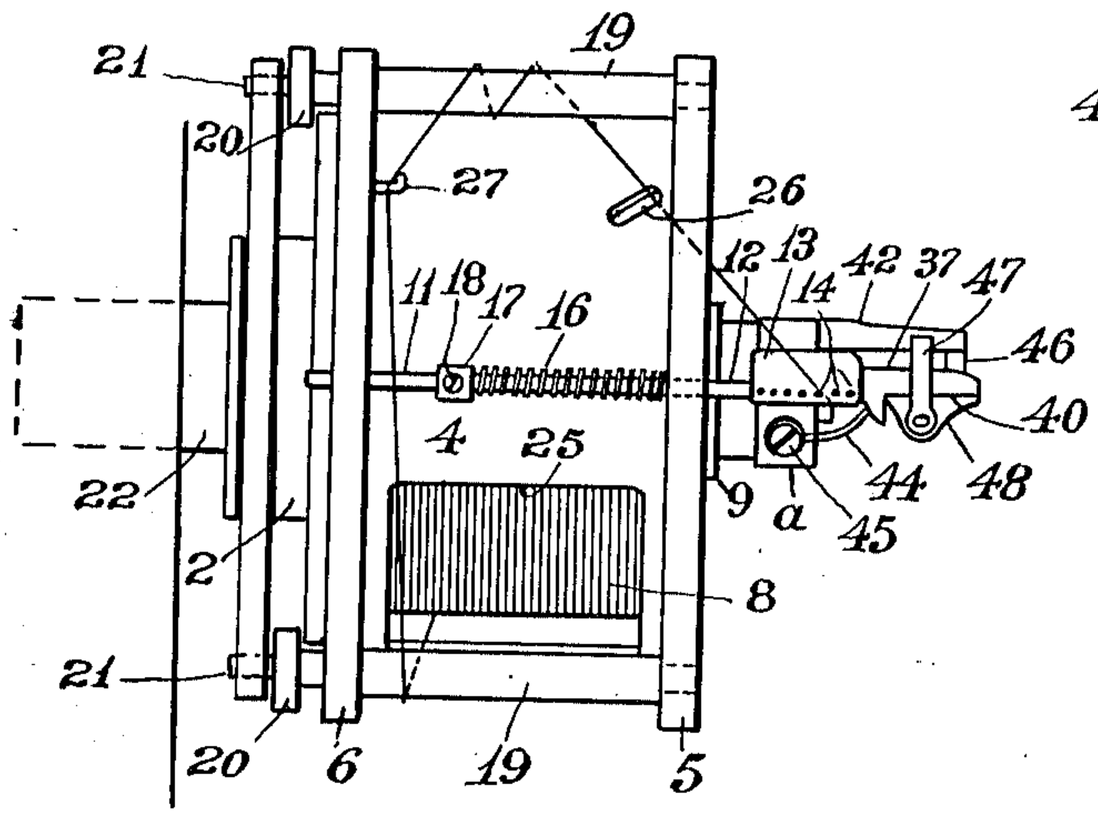


Fig. 2.



WITNESSES:

H. A. Lamb.

M. J. Loughren

INVENTOR

Donald Noble

BY H. W. Smith Jr.

ATTORNEY

D. NOBLE.

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Fig. 3.

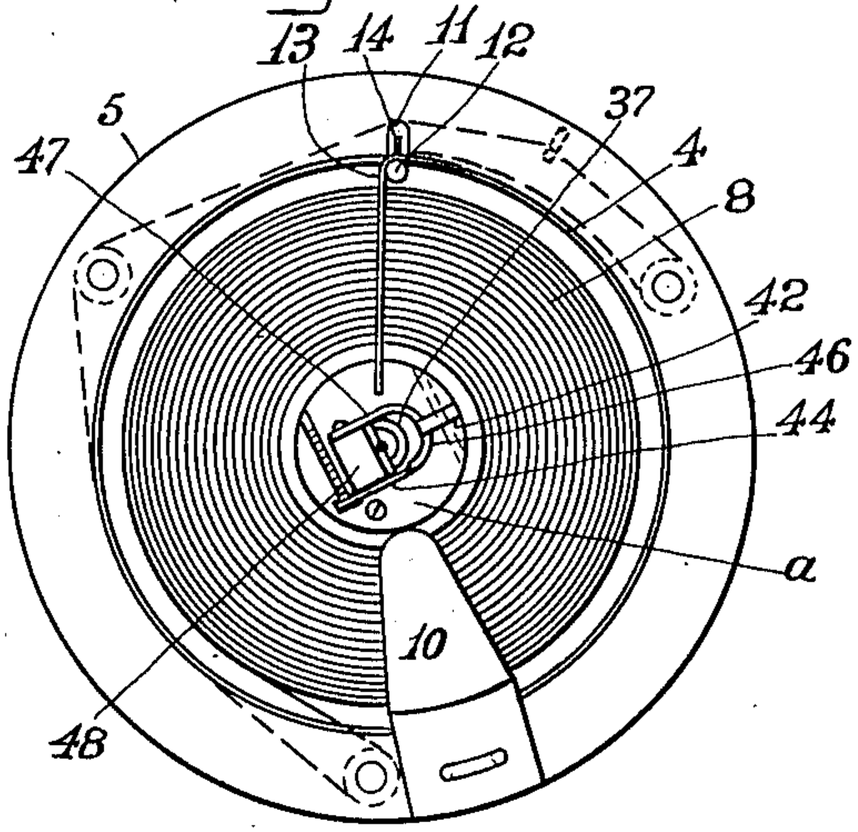


Fig. 4.

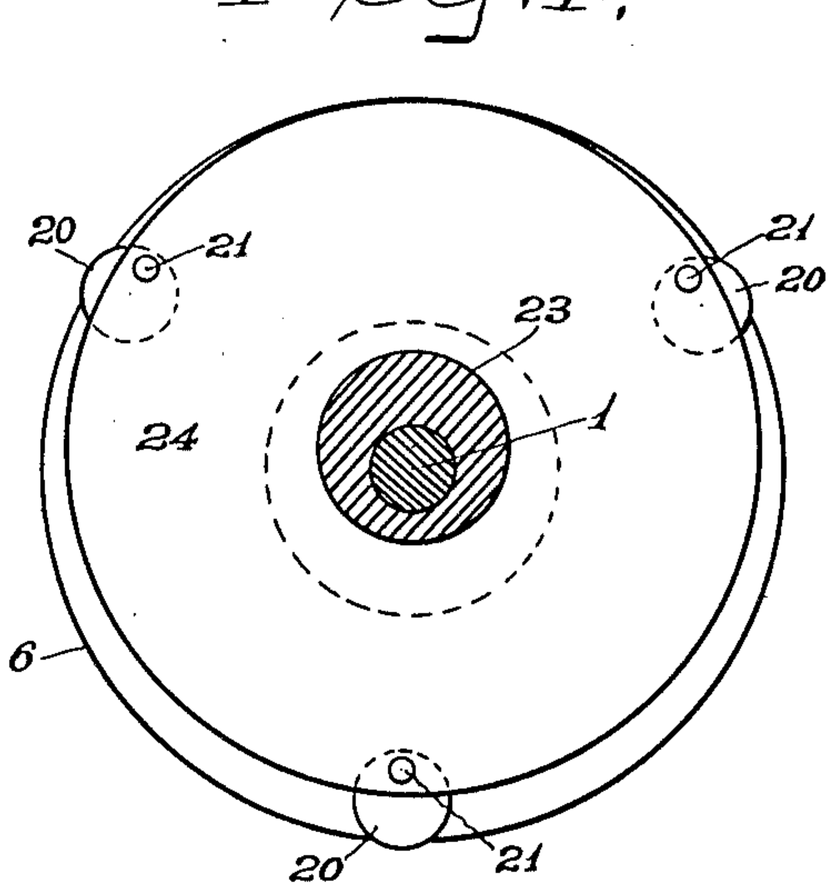


Fig. 5.

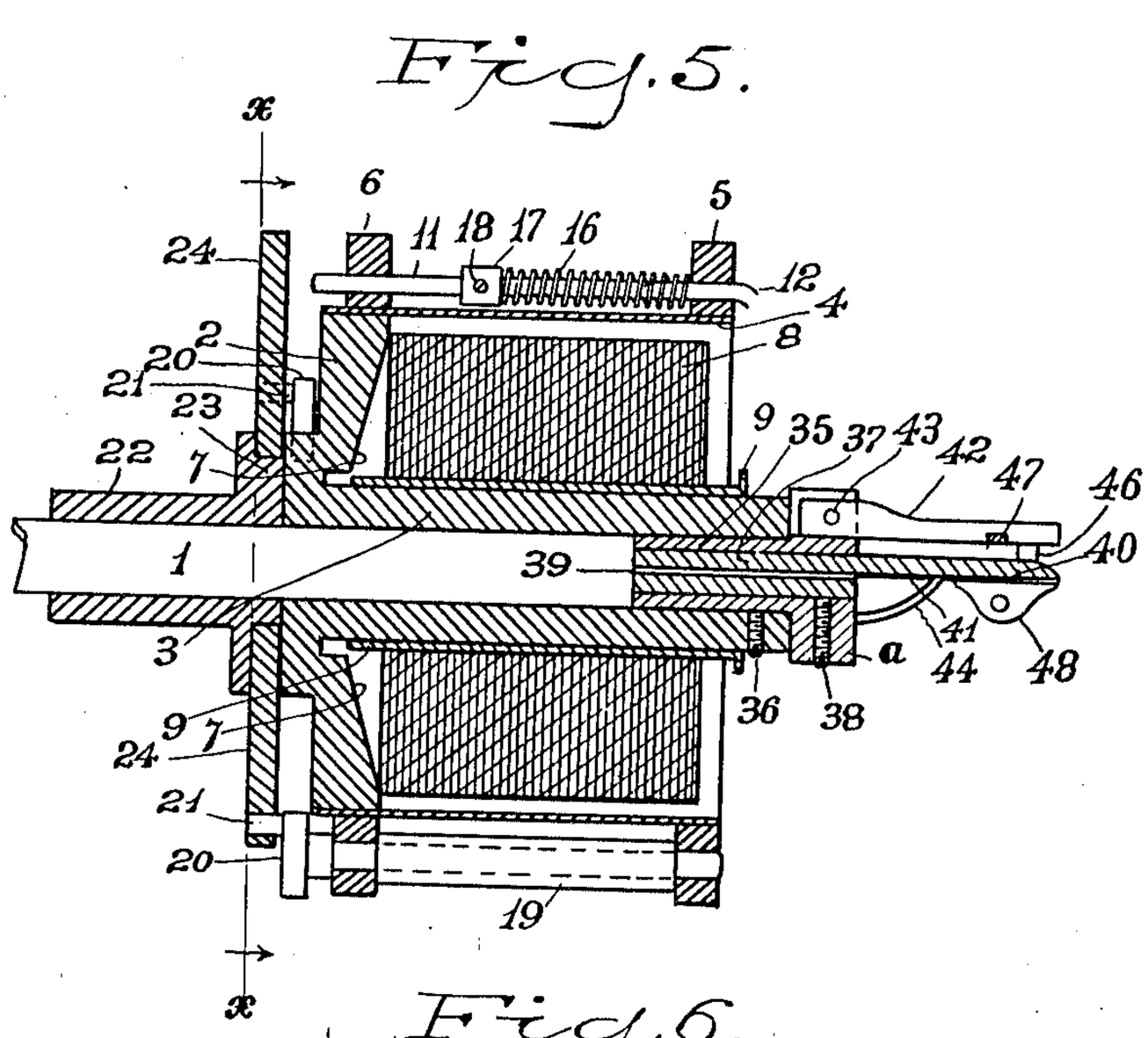
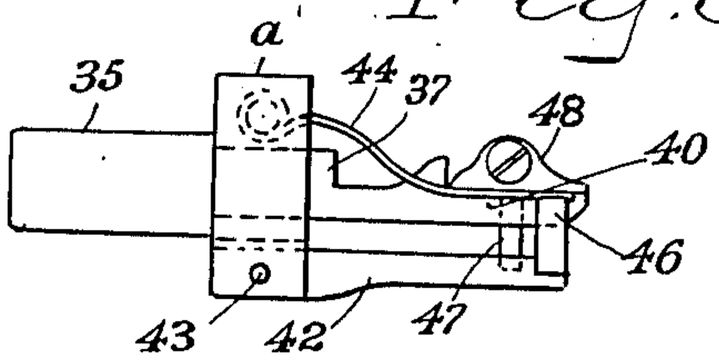


Fig. 6.



WITNESSES:

H. A. Lamb.

W. J. Leydecker

INVENTOR

Donald Noble

BY J. M. Mellen Jr.

ATTORNEY

D. NOBLE.

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3 SHEETS—SHEET 3.

Fig. 8.

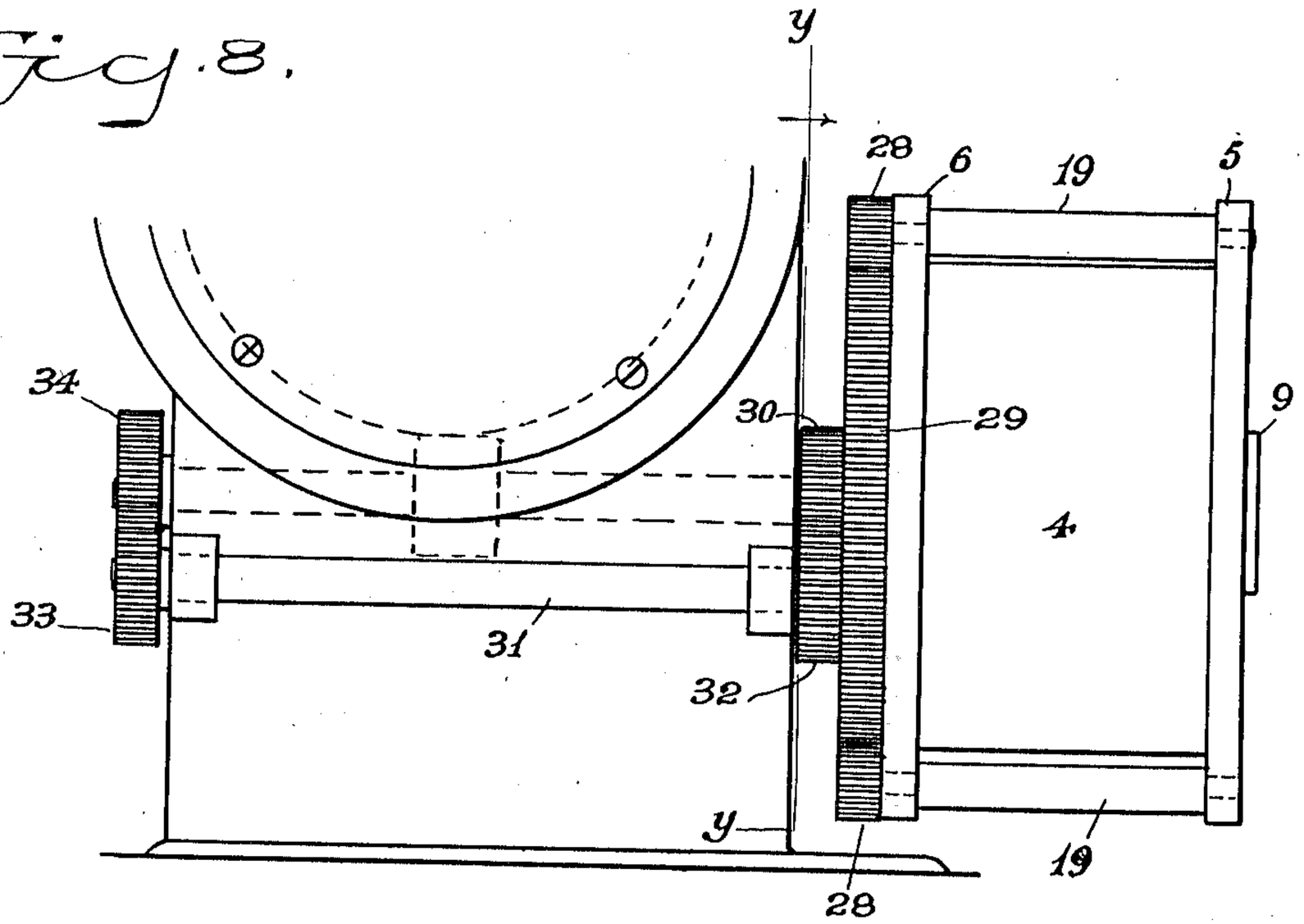
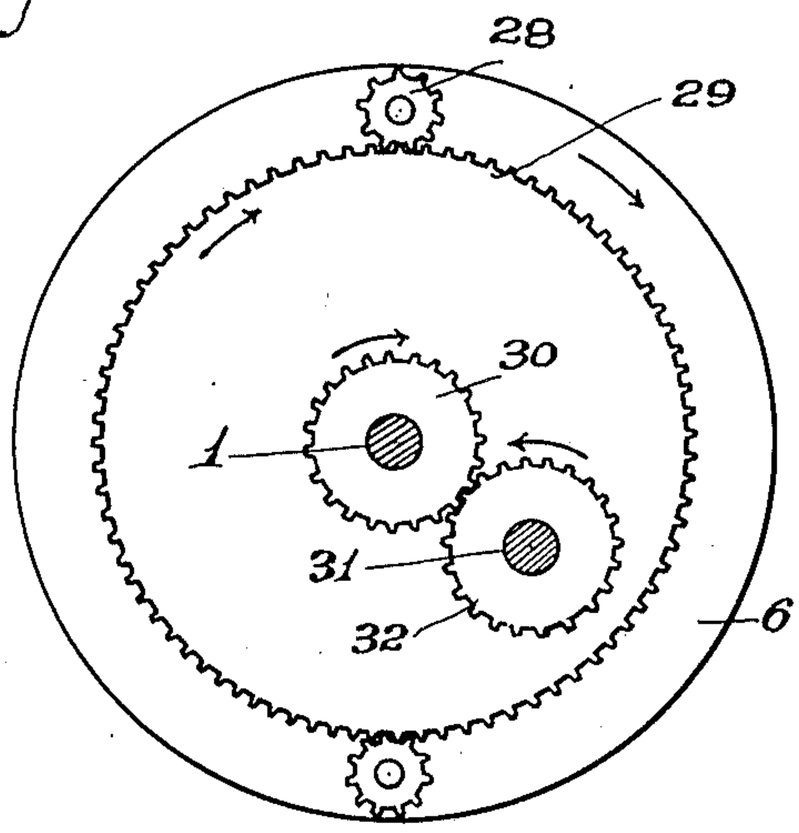


Fig. 9.



WITNESSES:

H. A. Lamb.

M. J Lingdeu

INVENTOR

Donald Noble

BY

ATTORNEY

UNITED STATES PATENT OFFICE.

DONALD NOBLE, OF BRIDGEPORT, CONNECTICUT.

MACHINE FOR COVERING OR INSULATING WIRE WITH YARN OR ITS EQUIVALENT.

970,098. Specification of Letters Patent. **Patented Sept. 13, 1910.**

Application filed August 5, 1909. Serial No. 511,374.

To all whom it may concern:

Be it known that I, DONALD NOBLE, a subject of Edward VII, King of Great Britain, and residing at Bridgeport, in the county of Fairfield and State of Connecticut, United States of America, have invented certain new and useful Improvements in Machines for Covering or Insulating Wire with Yarn or Its Equivalent; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to machines for covering or insulating wire with yarn or its equivalent, and has for its object to cover the finest wire independent of the size of the yarn cop, without undue tension or strain on the wire such as would be likely to cause the latter to break or become distorted, while at the same time the machine may be speeded very high without detriment to the perfect covering of the wire and without damaging the latter in the slightest degree.

With these ends in view my invention consists broadly in feeding the yarn or covering to the winding devices at a predetermined tension which is entirely independent of the speed of the spinning head or the tension on the yarn cop, whereby the yarn is delivered at the proper tension, according to the size of the wire, the size of the yarn itself and the speed at which the spinning head is run.

Furthermore, my invention consists in the combination and arrangement of parts hereinafter fully set forth and then particularly pointed out in the claims which conclude this description.

In the accompanying drawing Figure 1 is a detail side elevation of the spinning head equipped with my improvement—Fig. 2 a view similar to Fig. 1 but showing the spinning head in a slightly different position—Fig. 3 a detail front elevation of the spinning head—Fig. 4 a section at the line *x*, *x*, of Fig. 5—Fig. 5 a detail sectional elevation of the spinning head—Fig. 6 a detail elevation of the spinning nozzle—Fig. 7 a front elevation of said nozzle—Fig. 8 a detail elevation of the spinning head showing a modified form of my improvement applied thereto, and Fig. 9 a section at the line *y*, *y*, of Fig. 8.

Similar numerals of reference denote like parts in the several figures of the drawing.

Hitherto great difficulty has been experienced in covering wire, particularly fine wire, at a high speed, on account of improper tension at which the covering yarn is delivered to the wire during the process of covering, since a tension that is too great will bend the wire and cause the same to become distorted or broken. My invention aims to provide a spinning head with instrumentalities that shall deliver the yarn to the covering devices at a proper tension, while at the same time ample tension is maintained between said instrumentalities and the yarn as it is delivered from the cop itself.

The problem which hitherto has not been solved with any marked degree of success is to cover the finest copper wire with yarn laid on tightly and properly polished and ironed without pulling the wire out of its path, and it is to this particular function of machines of this character that my invention is directed. I have not illustrated nor will I describe any of the parts of a winding machine of this description except those that are immediately associated with the spinning head which winds the yarn around the wire, since my invention has reference solely to the delivery of the yarn immediately to the covering devices and the proper ironing or polishing of the covered wire.

1 is the power shaft of the machine and 2 is the spinning head which has an internal hollow hub 3 that is tightly secured to said shaft so that it will be understood that the spinning head will revolve in harmony with the shaft.

4 is the rim of the spinning head, and 5, 6, are rings that are secured respectively to the front and rear portions of this rim so as to form flange-like projections. The entire rear wall of the spinning head is inclined from the outer periphery toward the center as shown at 7 for the purpose of coöperating with the self diminishing tension on the yarn cop hereinafter to be explained.

8 is the yarn cop wound on a cop tube 9 that fits the cop tightly which tube is placed around the hub 3 and is loose thereon so as to be capable of an independent revolution, this position of the yarn cop and tube within the spinning head being clearly shown at Fig. 5.

In Letters Patent No. 919,751, issued to me April 27, 1909, I showed and described certain means for exerting an automati-

cally diminishing tension against the yarn cop, which means comprised a spring controlled tension finger carried by the spinning head and bearing against the outer face of the cop, the opposite peripheral edge of the cop having a constant bearing against the incline 7, so that as the diameter of the cop decreased the rear peripheral edge of the same would bear against said incline at points nearer the axis of revolution of the spinning head, while the spring controlled tension finger would constantly bear against the front of the cop but with a diminishing pressure owing to the continual weakening of the spring. In the present application I have illustrated this automatically diminishing tension, 10 being the spring controlled tension finger which bears against the face of the cop and coöperates with the incline 7 in bringing about the proper tension against such cop, but I have not illustrated the manner in which this finger is carried by the spinning head, since this forms no part of my present invention, and is, moreover, fully shown and described in the Letters Patent aforesaid.

Extending loosely through the rings 5, 6, is a small rod 11 which has an offset portion 12 in front of the ring 5 to which latter is secured a sheet metal strip 13 having at the top a series of teeth 14, said strip extending down to a point in proximity to the wire covering devices and normally engaging within a notch 15 in the head *a* of the spinning nozzle hereinafter to be explained. Around this rod 11 is a coil spring 16 which is confined between the ring 5 and a collar 17 around the rod 11 and secured thereto by a set screw 18. The force of the spring 16 keeps the strip 13 engaged with the notch 15 so that said strip will normally occupy a fixed position, but when it becomes necessary to renew the cop within the spinning head this strip is merely forced out of the notch against the resiliency of the spring 16 and then swung to one side, and this rod 11 and the parts carried thereby including the strip 13 constitute what I shall hereinafter term the yarn guide, since the yarn is engaged with the teeth 14 and led down along the side of the strip immediately to the wire covering devices, a plurality of teeth 14 being provided in order that the incline at which the yarn is led to the covering devices may be properly determined.

Heretofore the yarn has been led from the cop and delivered to the wire covering devices at a tension which is sufficient to draw the yarn from the cop itself, this tension in the present instance being augmented by the spring controlled finger 10 as hereinbefore described, but such a tension is altogether too powerful in the covering of fine wire since it will drag the latter sidewise and out of line, the result being that the wire will either become broken or so distorted as to prevent the proper covering of the same.

The most important feature of my invention relates to yarn delivering devices intermediate of the cop and the wire covering instrumentalities, whereby the yarn will be drawn from the cop always at a comparatively strong tension and then paid off to the wire covering instrumentalities at a greatly decreased tension which may be predetermined according to the demands of the occasion.

Journaled between the rings 5, 6, are rolls 19 which are capable of free independent revolutions, and secured to the inner journals of these rolls are cranks 20 provided with crank pins 21.

22 is a stationary sleeve around the shaft 1, the latter revolving freely within this sleeve, the forward end of the latter being formed into a hub 23 which is eccentric with respect to the axis of the shaft 1, and around this hub is journaled a disk 24 through which latter near its periphery the crank pins 21 extend.

As the spinning head revolves the rolls 19 will of course be carried thereby and the disk 24 will likewise be revolved around the eccentric 23 by reason of its connection with the crank pins 21. As the disk 24 revolves around this eccentric hub 23 the rolls 19 will thereby be turned axially one complete revolution. In other words, the disk 24 will be given a movement by the eccentric 23 sufficient to cause the rolls to turn one complete revolution. These rolls 19 are the devices which I employ for the purpose of drawing the yarn from the cop at the cop tension and delivering the same to the wire covering instrumentalities at a predetermined and greatly decreased tension, and I will now describe the manner in which these rolls perform their function.

The yarn is led through suitable openings 25 in the rim 4 and passed around one of the rolls and thence led and passed around a second roll and thence led and passed around a third roll and thence inserted through an eye 26 in the rim and passed over the thread guide directly to the wire covering devices. The passing of the yarn around the rolls of course causes more or less friction between said yarn and rolls when the latter are revolved axially, but there is considerable slipping between the yarn and rolls as the latter are revolved. If too many coils of yarn were disposed around one or more of these rolls the result would be that the yarn would exert such a grip upon the rolls that when the latter revolved altogether too much yarn would be paid out to the wire covering devices which would create a slack and quickly cause the yarn to become snarled. If the coils of yarn around the rolls were too few in number the yarn would not grip the rolls

with sufficient friction, and the consequence would be that as the rolls revolved axially no yarn would be paid out to the covering devices by the action of the rolls, and the tension at which the yarn would be delivered to the wire covering devices would be nearly as great as the tension required to draw the yarn from the cop itself and this would be altogether too great in the instance of finer grades of wire. The proper coiliug of the yarn around the rolls for various sizes of wire is readily ascertained by experiment, the point being to maintain a constant diminished tension on the yarn as it is paid out to the covering devices.

The axial revolution of the rolls is always such that there is a tendency to pay out to the wire covering instrumentalities too great an amount of yarn, but this is counteracted by the slipping between the rolls and yarn, this slipping being due to the back drag on the yarn caused by the comparatively greater tension at which the yarn is drawn from the cop itself, and therefore the yarn is paid out to the wire covering instrumentalities at a certain predetermined and greatly diminished tension which is sufficient for the purpose of properly covering the wire without bending or distorting the latter. The greater the extent of revolution of these rolls the greater is the excess of yarn which these rolls tend to pay out, and therefore the greater is the slipping between the yarn and rolls in order to take up this excess, and in this connection I desire to state that the number of rolls and the extent of revolution thereof are immaterial although it is of course desirable to employ such number of rolls properly revolved as will give the best results. For instance, I prefer to distribute the friction between the yarn and the rolls over a plurality of rolls because this is a better mechanical construction, and I likewise prefer to revolve the rolls axially throughout a minimum extent so as to reduce the slipping to a minimum. Too great a number of coils around a roll might cause them to overlie each other and become bunched and this would of course prevent the proper slipping between the yarn and rolls and would be a bad feature generally, and even in the instance of one and a half coils such as I have shown at Fig. 2 around one of the rolls, I prefer to engage the yarn with a hook 27 which extends from the inner edge of the ring 6 so that the coils will always be spread apart on the roll. The direction in which the rolls revolve is immaterial since the yarn may be disposed around the rolls in right or left handed coils.

The description heretofore given with respect to the means employed for axially revolving the rolls 19, refers particularly to Figs. 1 to 5 inclusive, but at Figs. 8 and 9 I have illustrated a modification of my improvement in this respect and will now describe the same. In this modification I employ but two of the rolls 19 and to their journals in the rear of the ring 6 are secured pinions 28 which are in mesh with a large gear 29. 30 is a small gear concentric with the gear 29 and rigid therewith, and these gears are loose around the power shaft 1 so as to be capable of a revolution independent thereof. Journaled within the frame of the machine is a secondary shaft 31 carrying at its outer extremity a small gear 32 which meshes with the gear 30 while at its inner extremity is carried a small gear 33 which meshes with a small gear 34 carried by the power shaft, so that it will be readily understood that independent motion may be communicated from the power shaft to the gear 29, through the medium of the gears 34, 33, 32, and 30. The gear 34 has less teeth than the gear 30, so that it will be readily understood that, as the pinions 28 are bodily carried around by the revolution of the ring 6 the large gear 29 will likewise be revolved in the same direction but at a slightly decreased speed, and this dragging back on the part of the gear 29 will cause the pinions 28 to be independently turned on their axes thereby effecting a correspondingly independent revolution of the rolls 19. As a matter of fact the gear 34 has one tooth less than the gear 33, while the gear 32 has one tooth less than the gear 30, and this will cause the large gear 29 to revolve a trifle slower than the ring 6 and thereby cause the pinions and the rolls to turn axially about a quarter of a revolution. I very much prefer this gear construction illustrated at Figs. 8 and 9, because the rolls will thereby tend to pay out only a minimum excess of yarn to the wire covering devices, while the slipping between the yarn and rolls is also reduced to a minimum, but I do not wish to be limited to any particular way of revolving these rolls independently since this may be accomplished in several ways two of which I have already shown and described.

My improvement may be utilized in connection with any kind of spinning nozzle for winding the yarn around the wire, but I have shown and will now describe a particular construction of spinning nozzle such as I prefer to employ.

The head *a* has formed integral therewith a reduced bushing 35 which latter extends within the forward extremity of the hub 3 and is secured by means of a screw 36, and through this head and bushing extends a quill 37 secured by a set screw 38 driven through the head *a*. This quill has a central perforation 39 through which the wire to be covered passes, and the portion of the quill projecting outside the head *a* is flattened on one side as shown at 40 and has a groove 41 extending lengthwise thereof and

coincident with the perforation 39 in the rear part of the quill. 42 is a finger pivoted at its rear end at 43 within the head *a* so as to be capable of movements toward and away from the projecting portion 40 of the quill, and 44 is a spring whose rear end is secured within the head *a* by means of a screw 45, while the front end of the spring bears against a lug 46 that extends from the forward extremity of the finger 42, the function of this spring being to force the finger away from this projecting portion 40 of the quill. Extending from the forward portion of the finger 42 to a point beyond the flattened portion 40 of the quill is a projection 47 to the extremity of which is pivoted a shoe 48 which latter in its normal position is kept firmly against this flattened portion 40 by means of the spring 44. The lower face of this shoe is plain and polished and as the covered wire is withdrawn between this shoe and the flattened portion of the quill the yarn around the wire will be ironed and polished thus greatly contributing to the manufactured product. The yarn is wound around the wire in the immediate rear of the shoe by the rapid revolution of the spinning head, and neither the finger 42 nor the ironing shoe 48 can be thrown outwardly by centrifugal force because each of these elements balances the other so far as such force is concerned. That is to say, a centrifugal force acting upon the finger would cause the ironing shoe to hug the quill more tightly, while a centrifugal force tending to separate the shoe from the quill would be effectually resisted not only by the spring 44 but also by the centrifugal force acting on the finger. Therefore, at all times during the revolution of the spinning head, the ironing shoe will perform its function upon the covered wire as the latter passes outwardly through the quill.

The rolls 19 may be properly described as "planetary rolls" since they revolve around the axis of the spinning head and at the same time rotate axially and these rolls are the sole means whereby the yarn is drawn from the cop, and it must be borne in mind that these rolls always tend to draw from the cop and to pay out to the wire covering instrumentalities an amount of yarn in excess of that actually needed, which excess is constantly taken up by the slipping between the yarn and rolls, so that there is always a tension on the yarn between the rolls and the cop and between the wire covering instrumentalities and the rolls, and that the tension on the yarn between the rolls and the wire covering instrumentalities is predetermined and greatly diminished.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a machine for covering or insulating wire with yarn or its equivalent, the combination with the yarn covering instrumentalities which carry the yarn cop, a suitable tension acting against said cop, means for revolving said instrumentalities, and an independent positively rotating auxiliary tension device which has a slipping engagement with the yarn and is interposed between the cop and said instrumentalities.

2. In a machine for covering or insulating wire with yarn or its equivalent, the combination of the wire covering instrumentalities carrying the yarn cop, a suitable tension acting thereagainst, means for revolving said instrumentalities, and means, carried by said instrumentalities and having a slipping engagement with the yarn and operating independent of said instrumentalities, for paying out the yarn to the wire at a tension that is always less than that required to draw the yarn from the cop itself.

3. In a machine for covering or insulating wire with yarn or its equivalent, the combination with the wire covering devices which carry the yarn cop, a proper tension thereagainst and means for revolving said devices, of means interposed between said cop and devices and having slipping frictional engagement with the yarn and operating always with a tendency to pay out to the wire an amount of yarn in excess of that required and at a tension less than that required to draw the yarn from the cop itself.

4. In a machine for covering or insulating wire with yarn or its equivalent, the combination with the covering devices carrying the yarn cop, a suitable tension thereagainst, and means for revolving said devices, of means having a slipping frictional engagement with said yarn intermediate of said cop and devices and operating to draw the yarn from the cop and to pay out to said devices an amount of yarn at a predetermined and diminished tension.

5. In a machine for covering or insulating wire with yarn or its equivalent, the combination with the covering devices which carry the yarn cop, a suitable tension thereagainst, and means for revolving said devices, of means interposed between said devices and the cop and operating to draw the yarn from the latter at the cop tension and to pay out said yarn to the wire to be covered at a predetermined and diminished tension.

6. In a machine for covering or insulating wire with yarn or its equivalent, the combination of the spinning head which carries the yarn cop, a suitable tension thereagainst, the spinning nozzle, and means for revolving said head and nozzle, with yarn delivering devices carried by the spinning head and interposed between said cop and nozzle, said devices operating independently

to draw the yarn from the cop and to deliver it to the spinning nozzle always with a tendency toward an excess supply which tendency is constantly counteracted by the cop tension.

7. In a machine for covering or insulating wire with yarn or its equivalent, the combination of the spinning head which carries the yarn cop, a suitable tension acting against said cop, the spinning nozzle carried by said head, means for revolving said head, planetary rolls carried by said head around which rolls the yarn is wound as it passes from the cop and from which rolls the yarn is delivered directly to the spinning nozzle, and means for rotating said rolls independently and always with a tendency to pay out to said nozzle an amount of yarn in excess of that needed.

8. In a machine for covering or insulating wire with yarn or its equivalent, the combination with the spinning head which carries the yarn cop, a suitable tension against said cop and means for revolving said head, of planetary rolls carried by said head and around which the yarn is wound as it passes from the cop and from which the yarn is delivered directly to the wire to be covered, and means for rotating said rolls independently and always with a tendency to pay out to the wire an amount of yarn in excess of that needed which excess is constantly taken up by the slipping between said rolls and yarn due to the comparatively strong tension at which the yarn is drawn by the rolls from the cop.

9. In a machine for covering or insulating wire with yarn or its equivalent, the combination of the spinning head which carries the yarn cop, a suitable tension acting against said cop, the spinning nozzle carried by said head and to which the yarn is led from the cop, means for revolving said head and nozzle, planetary rolls carried by said head around which rolls the yarn is wound as it passes from the cop and from which rolls the yarn is delivered directly to the spinning nozzle, and means for rotating and operating said rolls independently to draw the yarn from the cop at a comparatively strong tension and to pay out said yarn to the spinning nozzle at a constant and greatly diminished tension which is maintained and predetermined by the bight of the yarn against the rolls and by the slipping between the yarn and rolls due to the back draft exerted by the comparatively strong tension on the yarn as it is drawn from the cop.

10. In a machine for covering or insulating wire with yarn or its equivalent, the combination with the spinning head which carries the yarn cop, a suitable tension against said cop, the spinning nozzle carried by said head, and means for revolving said head and nozzle, of planetary rolls carried by said head and around which the yarn is wound immediately prior to its delivery to said nozzle, and means for rotating said rolls independently to draw the yarn from the cop at a comparatively strong tension and to pay out the yarn to said nozzle at a constant and greatly diminished tension, the tendency of the rolls being always to pay out an amount of yarn in excess of that needed which excess is taken up by the slipping between the yarn and rolls due to the comparatively strong tension at which the yarn is drawn from the cop.

11. In a machine for covering or insulating wire with yarn or its equivalent, the combination with the spinning head of the nozzle comprising a head suitably secured to the spinning head and having extending therethrough a quill with its forward extremity flattened and with a guide way for the wire extending throughout said quill, a spring controlled finger pivoted within the nozzle head and having a projection extending beyond said flattened portion of the quill, and an ironing shoe pivoted to said projection and maintained in contact with said flattened portion by said finger whereby the centrifugal force tending to separate said shoe and quill is counteracted.

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

DONALD NOBLE.

Witnesses:
F. W. SMITH, Jr.,
M. T. LONGDEN.