No. 682,142. Patented Sept. 3, 1901.

# E. R. GILL.

## MEANS FOR COILING FLEXIBLE MATERIAL.

(Application filed Mar. 28, 1899.)

(No Model.)

Fig. 1.

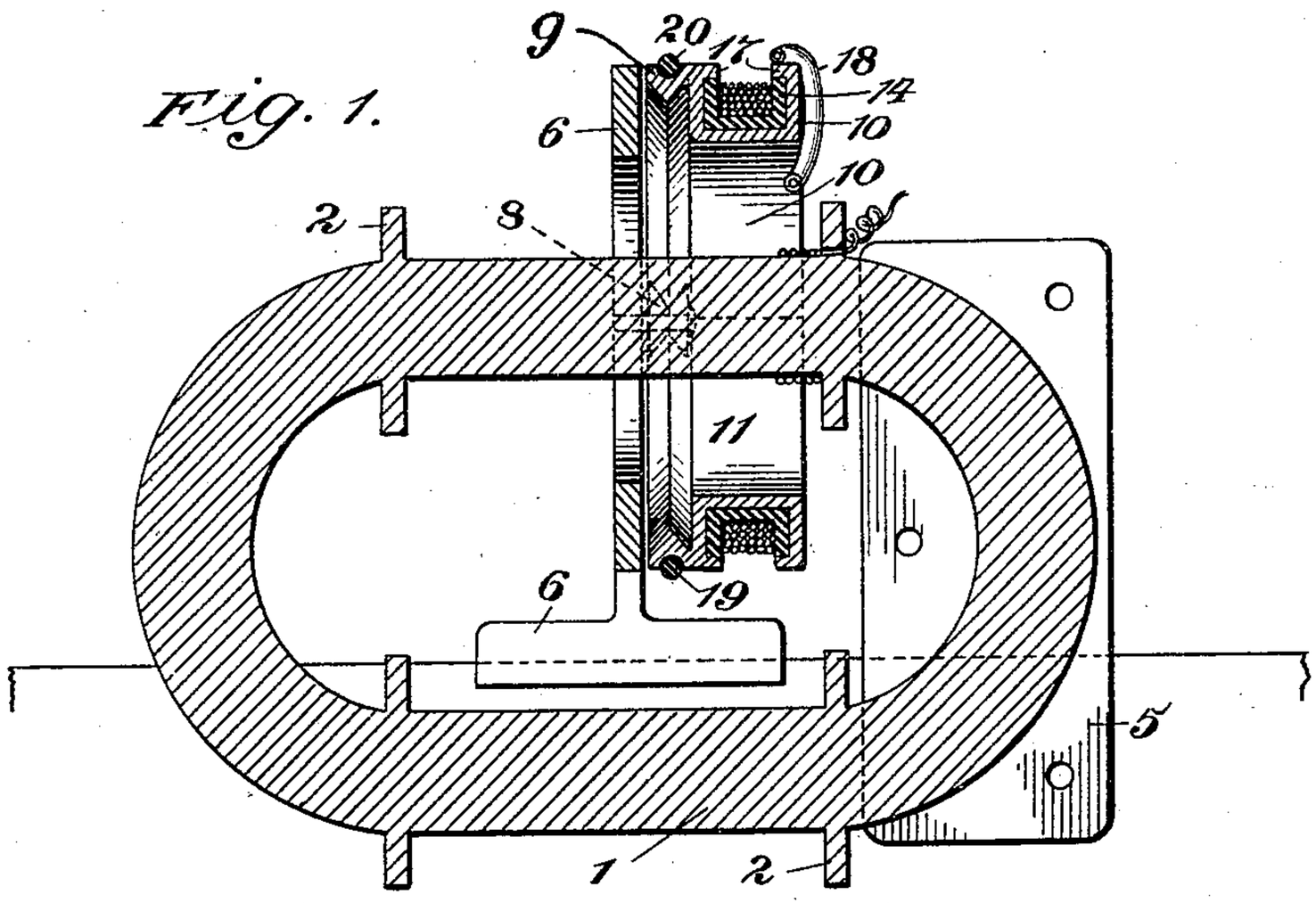
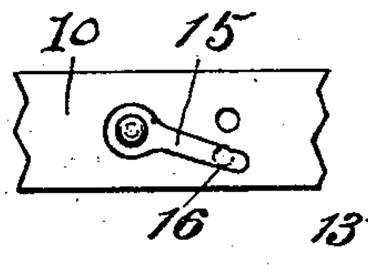



Fig. 4.



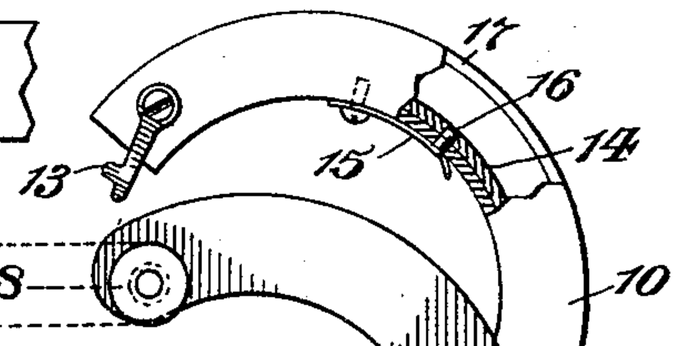
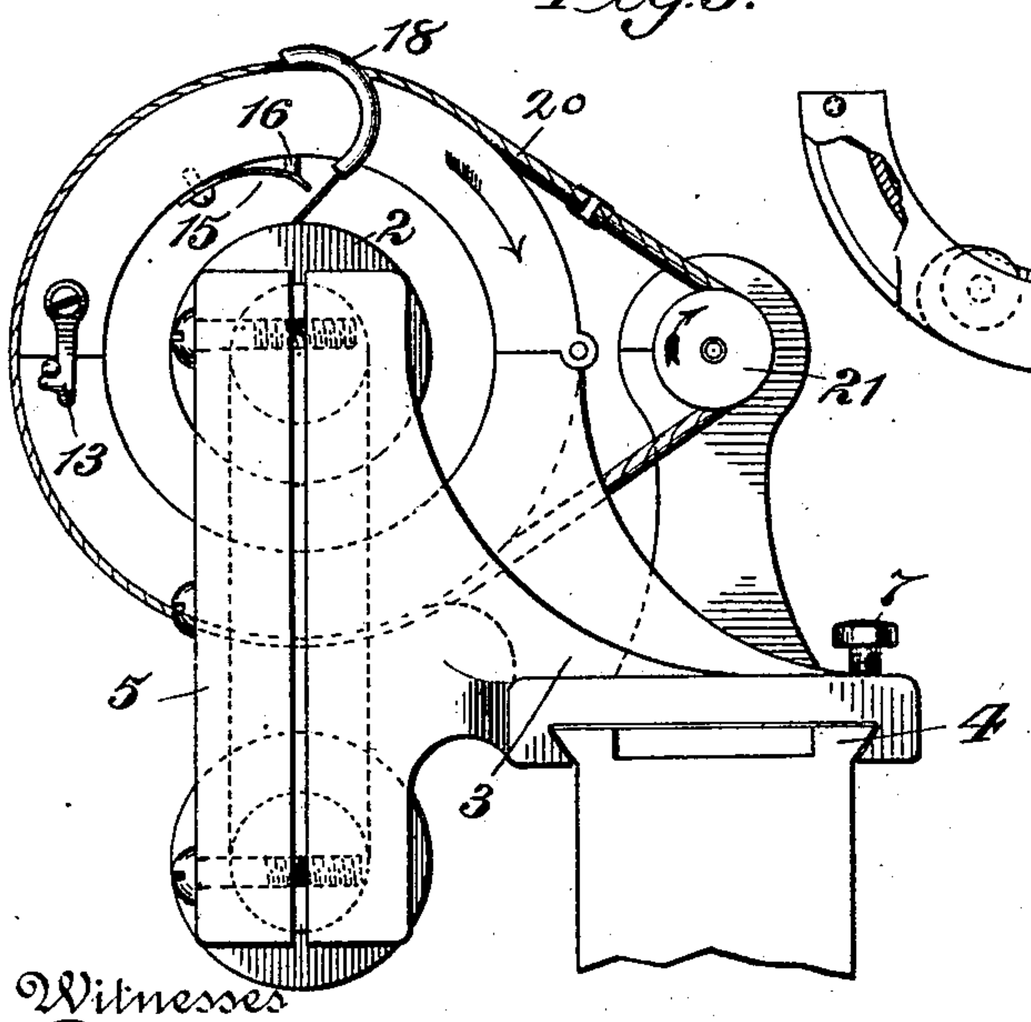




Fig. 2.

Fig. 3.ª



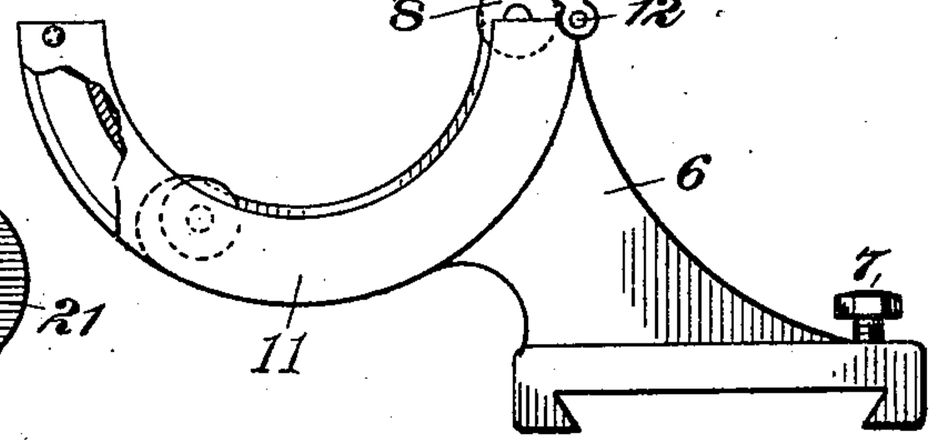




Fig. 3.

Witnesses
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# UNITED STATES PATENT OFFICE.

EDWIN R. GILL, OF NEW YORK, N. Y.

## MEANS FOR COILING FLEXIBLE MATERIAL.

SPECIFICATION forming part of Letters Patent No. 682,142, dated September 3, 1901.

Application filed March 28, 1899. Serial No. 710,755. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN R. GILL, a citizen of the United States, residing in the city, county, and State of New York, have invented a certain new and useful Improvement in Means for Coiling Flexible Material, of which the following is a specification.

My present invention relates to a means whereby a flexible material, such as wire or cord, may be coiled rapidly, certainly, and cheaply upon articles or parts of devices which are virtually closed upon themselves.

My invention is not limited in its application to any particular art; but I have shown and described it herein as applied to the manufacture of electrical apparatus, because it finds an especially valuable and wide application in this field of work.

Hitherto conductors have been applied to the magnetic parts of electrical apparatus of all kinds in either of two ways. One method involves forming a coil of wire and then combining it with a straight portion of a magnetic circuit by slipping a coil onto a previously-built core or building up the core around the coil. The second method involves winding the wire around the previously-built core in the first instance. The former of the above-named methods necessarily involves either an open magnetic circuit or joints in the magnetic core, which of course increases the reluctance of the magnetic circuit. This method is also open to the objection that it is only useful with practically straight cores. The second method, on the other hand, while available with solid or jointless closed magnetic circuits, whether straight or curved, involves winding with a shuttle by hand, and thus an expense of time and labor that is prohibitive.

It is to be understood that my present invention is applicable to the winding of all kinds of articles, whether closed on themselves or not, although chiefly useful in those cases wherein the parts to be wound are so disposed as to make it impracticable to slip on ready-wound coils. I have herein referred to such parts as "virtually closed" on themselves.

One convenient embodiment of my invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a longitudinal median section of my device adapted to use with an ordinary lathe and as disposed during operation upon an oblong jointless magnetic circuit. Fig. 2 is a side view of the same, showing the movable holder for the article to be wound. Fig. 3 is a side elevation of the outer carrier and its support, the former being shown opened. Fig. 3ª is a detail showing a preferred form of bearing-wheel for said outer carrier, and Fig. 4 is a detail view of the adjusting-catch employed for locking the inner and outer carriers together.

Inasmuch as the embodiment of my invention herein illustrated is intended for application to the well-known elements of an ordinary turning-lathe, I have not deemed it necessary to illustrate the various parts of such a lathe whereby the movements of the parts alluded to are accomplished.

The device to be wound, as shown in the drawings, consists of a jointless-oblong magnetic circuit 1, preferably provided with flanges 2 for supporting the sides of the wire coil when formed. These flanges may or may not be integral with the core 1 and are not, indeed, essential to my broad invention. In the form shown movement of the core 1 is automatically accomplished during winding by mounting the same upon a carriage 3, which may be the tool-carrier of the lathe, running, as is usual, upon a dovetail track 4. The carriage is preferably provided with jaws 5, which are clamped together over one end of the core 1. One of these jaws is removed in Fig. 1. Fixed in position upon the lathe is the carrier-support 6. This is conveniently fixed to the track 4 by means of the set-screw 7. (See Fig. 3.) The support 6 carries rollers or wheels 8, preferably three in number and grooved, as shown in Figs. 3 and 3ª. Upon these rollers and embracing them is the bearing-wheel 9, shaped, as shown, to fit said rollers 8 and carrying the two parts 10 and 11 of the outer carrier. This carrier is hinged, as at 12, and preferably provided with an appropriate catch 13 for securing the parts in plate. Fitting upon the circular periphery of the outer carrier 10 11 when closed is the inner carrier 14, made in two semicircular sections, so that by revolving the inner on the outer carrier the divisions between the

sections of the former may be made to coincide with those of the latter. In order to quickly find and to preserve temporarily this agreement between the joints, I prefer to use an adjusting means, such as the spring 15, fastened upon the outer carrier and provided with a pin 16, adapted to project through appropriate apertures in both the inner and outer carriers. When these apertures register, the joints in the inner and outer carriers are in agreement and the two can be opened together, as shown in Fig. 3. This position of the pin 16 also causes the inner carrier to turn with the outer one when the latter is rotated, and this is one of the principal functions of the catch. During operation when it is desired to have the inner carrier slide upon the outer carrier the pin 16 is withdrawn and the spring is turned upon its pivot, as shown in Fig. 4. For the best results it will be found advisable to secure the inner carrier from falling away from the outer carrier by providing rims 17 on the sides of the outer carrier projecting over the edges of the inner carrier. (See Fig. 1.) I prefer to supply a feeding-tube 18, carried by the outer carrier, through which the wire to be wound may be carried, as indicated in Figs. 1 and 2.

In order to rotate the carriers, a variety of devices might obviously be employed; but I prefer to supply an outer groove 19 on the bearing-wheel 9. When used upon a lathe this groove carries a belt 20, driven from a pulley on the lathe-center, as at 21.

The following is the mode of operation of my device as used on a lathe: The article upon which the wire is to be wound is first fixed upon the tool-carrier or other automatic carriage 3, the same being disconnected from the screw-gear or other longitudinal feed. The carriers are then opened and adjusted around the part to be wound upon, the catch-pin 16 being in the position shown. When closed, the wheel 9 and both carriers surround the part to be wound, being carried by the rollers 8. The end of the wire to be wound is then carried to the inner carrier and attached thereto in any well-known way. The lathe is then driven and the two carriers rotated, so as to wind the wire upon them in the same direction as that in which the wire must be finally placed upon the core 1. As soon as the amount of wire required on said core has been wound onto the carriers its last end is brought through the tube 18 and attached to the core 1 in any desired manner. The pin 16 is then withdrawn, as in Fig. 4, so that the inner carrier may slip on the surface of the outer, and the automatic feed for carriage 3 is brought into mesh in any way well known in screw-cutting lathes. Upon the lathe being now driven in the direction opposite to that in which it was driven to wind the wire onto the carriers the tube 18 will be carried rapidly around the core to be wound, and through it the wire will be wound onto said core. The arrow in Fig. 2 shows the direction of rotation of the carriers for this purpose when the tube is turned, as therein shown. As the wire winds onto the core it is drawn off of the carriers, and to facilitate this by permitting the coil on said carriers to turn as a whole the inner carrier is supplied and is allowed to slip upon the periphery of the outer carrier. In Fig. 1 is shown the beginning of a coil as it is wound upon the core by coöperation of the rotation of carriers described and the feeding movement of the lathe-tool carriage 3. When the first layer is completed, the lathe is preferably stopped and the feeding connection of the tool-carriage is reversed in a well-known way. Upon starting up again in the same direction the second layer of wire will be wound over the first. It is to be understood that my present invention covers such apparatus as involves hand movement of the core to be wound as well as that hereinabove described. Where a larger or smaller size of wire is to be wound, the movement of the core may be properly graduated by use of the usual adjustments for screw-cutting, as well understood in lathe-work.

It will be observed that since my bearing-wheel and the carriers are removable it is possible to use on the same supporting-rollers eight different sizes of carriers, each attached to the same size of bearing-wheel. Thus my device may be easily accommodated to various sizes of device to be wound.

The broad principle of my invention is applicable to the winding of articles having any desired shape of cross-section to be wound, as well as such articles, whether straight or curved, as inclose a space of any desired shape. My device can be used, for instance, to wind jointless Pacinotti or Gramme rings or to apply the coils of field-magnets having enlarged pole-pieces after the same are put together.

The particular means for mounting and rotating my carriers herein shown and described is not essential to my invention, and there are many other details of the machine as herein shown which may be indefinitely varied without departing from the spirit of my invention.

What I claim is—

1. In a means for coiling flexible material, a divisible rotatable outer carrier adapted to loosely surround the device to be wound upon, a divisible inner carrier borne loosely thereon, and means for rotating one of said carriers.

2. In a means for coiling flexible material, a divisible outer carrier adapted to loosely surround the device to be wound upon, a divisible inner carrier borne loosely thereon, means for rotating said carriers and means for locking said carriers together at will.

3. In a means for coiling flexible material, an outer carrier adapted to loosely surround the device to be wound upon, an inner carrier borne loosely thereon, means for rotat-

ing one of said carriers and means for locking said outer carrier in a closed position.

4. In a means for coiling flexible material, a divisible outer carrier adapted to loosely surround the device to be wound upon, a divisible inner carrier borne loosely upon said outer carrier and means for locking said two carriers together with coincident joints.

5. In a means for coiling flexible material, a divisible outer carrier adapted to loosely surround the device to be wound upon, a divisible inner carrier borne thereon and rims on the parts of the outer carrier to confine the parts of the inner carrier.

6. In a means for coiling flexible material, a fixed support, rollers thereon, a divisible wire-carrier, and a divisible bearing-wheel attached to said carrier adapted to embrace and to be operatively borne upon said rollers.

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Witnesses:
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