

F. W. COTTERMAN.  
METHOD OF FORMING SECONDARY WINDINGS OF HIGH TENSION COILS.  
APPLICATION FILED SEPT. 2, 1916.

1,282,380.

Patented Oct. 22, 1918.  
2 SHEETS—SHEET 1.

Fig. 1.

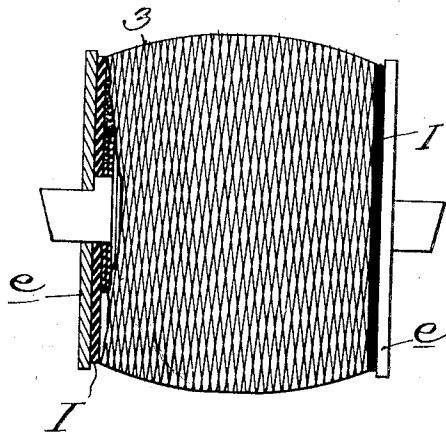
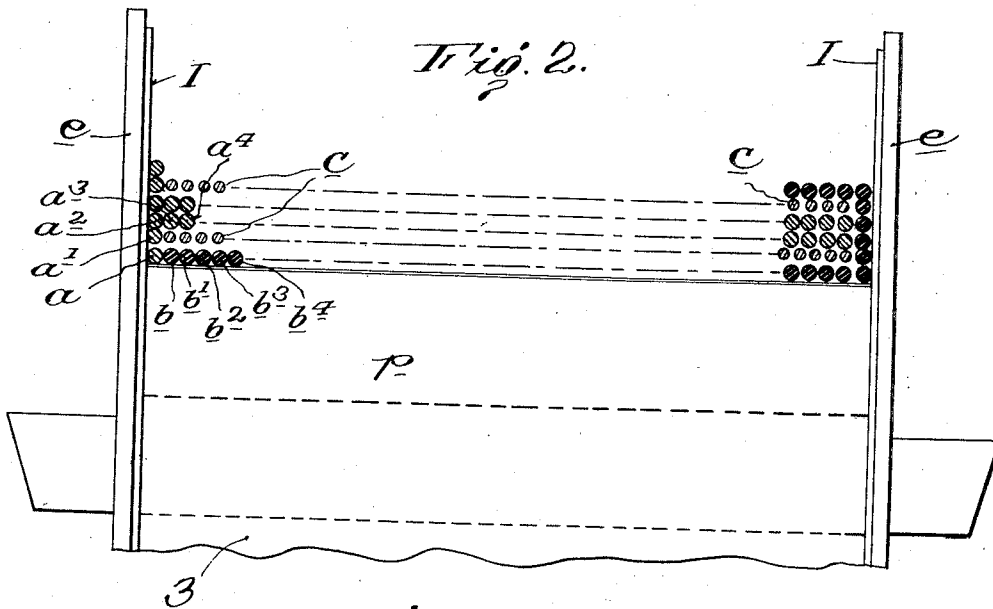
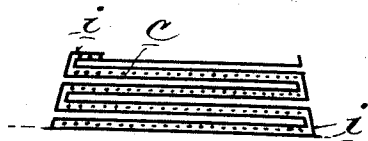


Fig. 2.



Inventor

Fig. 3. Frederick W. Cotterman

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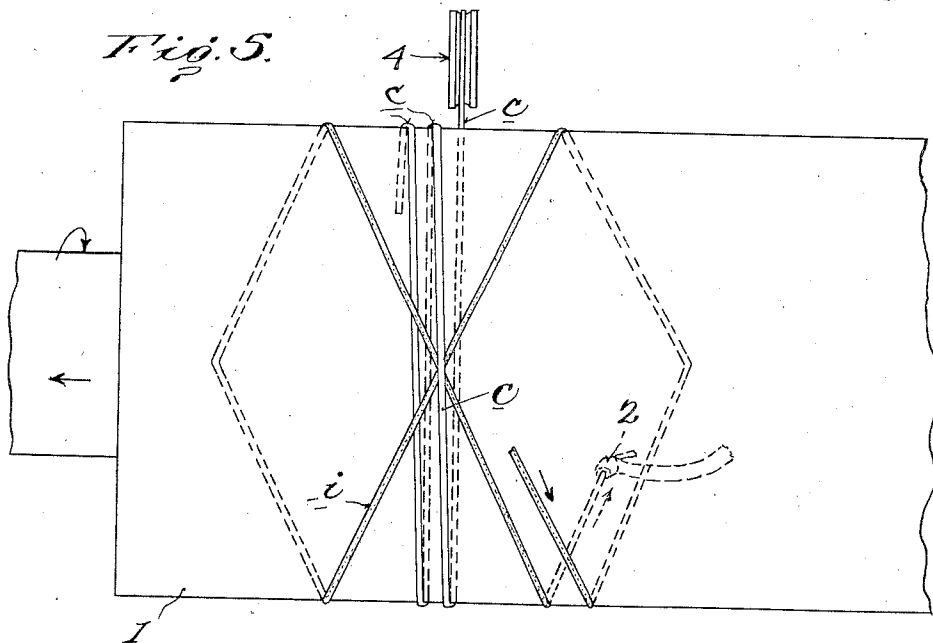
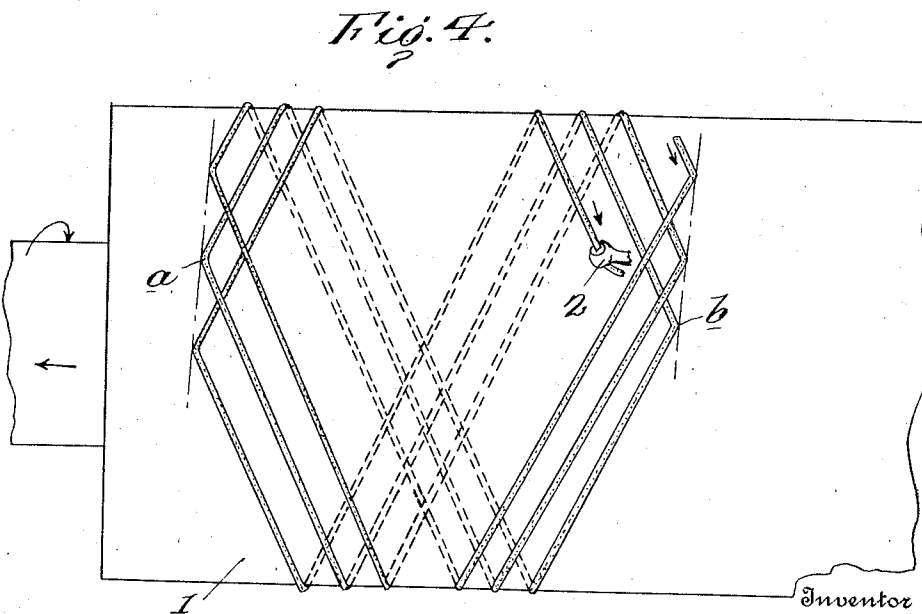
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# UNITED STATES PATENT OFFICE.

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## METHOD OF FORMING SECONDARY WINDINGS OF HIGH-TENSION COILS.

1,282,380.

Specification of Letters Patent.

Patented Oct. 22, 1918.

Application filed September 2, 1916. Serial No. 118,306.

*To all whom it may concern:*

Be it known that I, FREDERICK W. COTTERMAN, a citizen of the United States, residing at Dayton, in the county of Montgomery, State of Ohio, have invented certain new and useful Improvements in Methods of Forming Secondary Windings of High-Tension Coils, of which the following is a description, reference being had to the accompanying drawing and to the figures of reference marked thereon.

This invention relates to improvements in the method of forming secondary windings for high tension coils.

In practice at the present time the winding of the secondary coil is dependent upon the skill of an operator who, after each layer of the fine wire has been laid, applies a layer of suitable insulating material.

This invention has for an object the overcoming of this tedious present process by producing a method of winding in which the wire and insulating material are applied to the coil simultaneously and continuously until the secondary winding is completed. The method further consists in the winding of an insulating material in a series of "figure eights" and interposing a simultaneously applied wire upon the crossings formed by the said "figure eights" of insulating material.

The method further consists in applying a thread of insulating material wound in a continuous band like formation of "figure eights" and interposing a layer of wire between the edge of the band in such a manner as to lay on the crossings of the thread produced in forming the "figure eights".

The herein described method further consists in applying in layers a thread of insulation wound in a continuous band-like formation of "figure eights" interposing a wire in layers between the edges of the said band, and building up the said insulating material at each end of each layer applied for insulating the wire at the ends of each layer.

The method further consists in applying in layers a cotton thread of insulation, interposing a wire wound in layers between the layers of the cotton thread, and successively reducing the length of the progressively laid layers of insulation and wire.

The herein described method will be described in conjunction with the accompanying drawings, in which:—

Figure 1 is a view of a high tension coil as wound by my improved method;

Fig. 2 is an enlarged sectional diagrammatic view illustrating the manner of building up the insulating material at the ends of each layer;

Fig. 3 is a diagrammatical illustration of the successively laid layers of insulating thread and wire, the length of said layers being gradually reduced as the said layers are progressively laid;

Fig. 4 is a view illustrating the manner in which the band of "figure eights" are formed; and

Fig. 5 is a view showing the manner in which the wire is interposed in layers between the edges of the insulating band of continuously formed "figure eights" and designed to rest on the crossings of the insulating material formed between the edges of the band.

In the construction of a high tension coil for a magneto, it is usual to first apply the primary winding about the core. This primary winding consists of a suitably covered or insulated wire, which is wound to a certain number of layers. The length of this winding need not be so great as to produce a cumbersome primary winding, and as a consequence the necessary thickness of the covering or insulating material about this primary winding can be used to advantage.

This, however, does not apply to the secondary winding of a high tension coil, in which it is not unusual to apply upward of a mile of wire. The wire of the secondary winding is of very fine enameled gage, in order that a suitable length can be applied about the primary winding without rendering the coil clumsy or cumbersome. Between each layer of the wire of the secondary winding, it is necessary to interpose a layer of insulating material, which in the present case consists of a cotton thread.

In this present design, the secondary winding wire and insulating thread are applied simultaneously about the primary coil layers. The insulating thread is applied in substantially a continuous band of "figure eights" spirally wound from one end of the coil to the other, the "crossings" of the thread in each figure eight (of which there are approximately sixteen to twenty in a distance of .004 of an inch) serving to form a surface on which this wire that is being

applied in interposed relation with the insulating thread rests, sufficiently spaced and insulated from the preceding layer.

At each end of the coil for a short distance as each layer of the secondary winding is applied, the insulating thread is wound in substantially a vertical plane, thereby insuring the insulation of the layers of the fine wire up to the very end of each layer thereof.

In the building up of these layers of the secondary winding it has been found advantageous to shorten each succeeding layer of wire and insulating thread, allowing the secondary winding to assume somewhat the shape of a portion of a sphere or as will be termed herein, a form of "pyramiding" from the outer edges of the layers toward the center thereof. When a number of predetermined layers have been wound the coil is further treated in the usual manner.

The winding devices are diagrammatically illustrated in the drawings, and include the rotatable reciprocating winding spindle 1, and the rotatable insulation winding finger 2. The winding finger rotates in an opposite direction to the rotation of the winding spindle, and is tiltable at each end of the reciprocation of the winding spindle for building up the edges of the band of insulating "figure eights".

Referring to the drawings, the spirally wound band of "figure eights" is formed by the reciprocating and rotary movement of the winding spindle and the rotation of the winding finger at an angle and in an opposite direction to that of the winding spindle. These "figure eights" are best illustrated in Fig. 4 of the drawings, in which one side of the band is indicated at  $a$  and the opposite side of the band is designated by the letter  $b$ . As shown, there are three "figure eights" here represented, among which are formed a plurality of circumferential "crossings".

There are preferably sixteen to twenty of such circumferential spirally formed crossings in a longitudinal distance of about .004 of an inch upon which the wire rests, a different crossing point being had on each revolution.

Referring to Fig. 2 of the drawings, the manner of building up the layers, and more especially the relation of the edges  $a$  and  $b$  of the spirally wound band of "figure eights" and the wire  $c$  is shown.

The coil 3 is provided with the primary winding  $p$  between the usual ends  $e$  and insulation  $I$ . The winding fingers assume a gradual and substantially vertical winding position at each end of the layers during the winding operation, thereby preventing the formation of "figure eights" at these points. The edges  $a$  and  $b$  of the band, therefore, assume the following relative positions on each revolution; that is to say, as

$a'$  is applied,  $b'$  is wound; as  $a^2$  is applied,  $b^2$  is wound; as  $a^3$  is applied,  $b^3$  is wound;  $a^4$ ,  $b^4$ ,  $a^5$ ,  $b^5$  and so on, the winding finger 2 having by this time assumed its angular position and the process of forming "figure eights" continues until the opposite end of the layer is reached, where the edges  $a$  and  $b$  of the band are now reversely built upon themselves in a similar manner to that just described, during the tilting of the winding finger to substantially a vertical position, whereupon the reversing of the winding spindle in its reciprocating movement takes place and another layer of "figure eights" is applied. Thus it will be seen that the edges  $a$  and  $b$  of the band, as they are spirally wound back and forth, interpose layers of insulation  $I$  between the wire as diagrammatically illustrated in Fig. 3 of the drawings.

During the formation of this band of "figure eights" the wire  $c$  is applied as indicated in Fig. 5 of the drawings; the guide pulley 4 is in close proximity to the path of travel of the winding finger, and during every revolution thereof there is applied a turn of wire. The wire is interposed between the edges of the band of the "figure eights" and rests on the "crossings" formed therebetween. As has been heretofore mentioned, there are upward of sixteen to twenty of these crossings in a longitudinal distance of about .004 of an inch, and as a result a sufficient and readily applied insulating layer of cotton thread  $I$  is provided between each layer of wire.

The pyramiding or reducing of the lengths of the layers of the secondary coil is accomplished by shortening the distance of travel of the winding finger between the ends  $e$  of the coil, whenever desired.

From the foregoing, it will be apparent that I have provided a method of forming the winding of a secondary coil in an efficient manner and during a minimum amount of time.

Having thus described the invention, what is claimed as new is:—

1. The herein described method of forming a secondary winding for high tension coils, consisting of applying a thread of insulation in a continuous band like formation of "figure eights" spirally wound from one end of the coil to the other, and interposing a layer of wire between the edges of the band designed to lay on the crossings of the thread produced in forming the "figure eights".

2. The herein described method of forming a secondary winding for high tension coils, consisting of applying a thread of insulation in a continuous band-like formation of "figure eights" spirally wound from one end of the coil to the other, and at the same

time applying a layer of wire between the edges of the band.

3. The herein described method of forming a secondary winding for high tension  
5 coils, consisting of applying a thread of insulation in a continuous band-like formation of "figure eights" spirally wound from one

end of the coil to the other, interposing a wire between the edges of the band, and building up the said edges of the band in a 10 gradual and substantially vertical plane for insulating the wire at each end of the coil.

In testimony whereof, I affix my signature.

FREDERICK W. COTTERMAN.