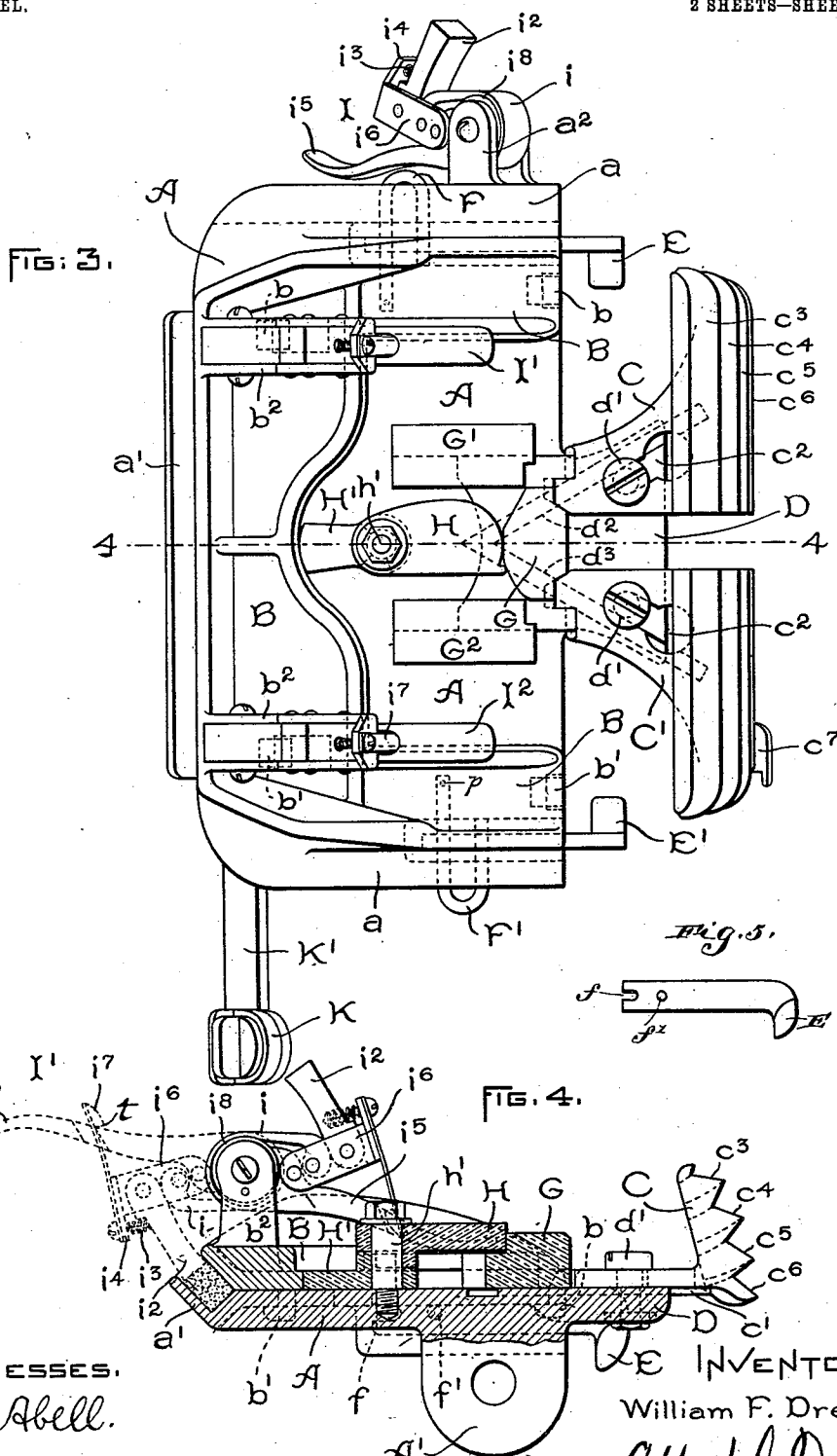


W. F. DREES.
FORM FOR WINDING ARMATURE COILS.

APPLICATION FILED SEPT. 1, 1898.

NO MODEL.

2 SHEETS—SHEET 2.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

FORM FOR WINDING ARMATURE-COILS.

SPECIFICATION forming part of Letters Patent No. 733,633, dated July 14, 1903.

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To all whom it may concern:

Be it known that I, WILLIAM F. DREES, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Forms for Winding Armature-Coils, of which the following is a specification.

My invention has reference to the art of winding counterpart coils for the armatures of dynamo-electric machinery, and is particularly applicable to the smaller sizes of coils—such, for instance, as those commonly used in railway-motors. In no other class of apparatus is it so difficult to find space for the coils, modern demands tending constantly to increase output without corresponding increase in size. To accommodate these demands, it is now customary to use several coils for each slot of the armature-core. It is manifest that the arrangement just indicated demands great exactness of construction, inasmuch as any inaccuracy in any one coil makes it difficult to fit all of the coils in place. It has heretofore been customary to wind separate coils, each differing slightly from the others and each having its own place in the group occupying a slot. The coils composing each group, each of which was wound upon its own form, were assembled and insulated before being placed in the slot. This method is laborious and demands considerable skill.

To replace the process just pointed out by one that is cheaper, faster, and far more accurate is the object of the present invention. These ends I attain by a new type of winding-form in which all of the coils are wound in parallel and at the same time, being then insulated and treated like any single coil of old types. The coils are thus made with great accuracy and at reduced cost.

This is the first apparatus by which a number of wires of equal length can be wound into an Eickemeyer coil.

In the accompanying drawings, which show a form made according to my invention, Figure 1 is a perspective of the form with a compound coil in position upon it. Fig. 2 is a similar view of the coil as removed from the form. Fig. 3 is a plan of the form ready to

receive the coil. Fig. 4 is a section on the line 4 4 of Fig. 3 looking up, and Fig. 5 is a detail view of the guide E.

In Fig. 2 the coil L is shown to be formed of the three wires 1 2 3, which are wound in multiple, so that each in reality forms a separate coil, all of the coils having the same number of turns. The coils illustrated are of four turns each. Nothing in my invention limits me in this regard, as I may wind more or less than three different coils in multiple and of any desired number of turns. The necessary modifications of the winding-form will be readily understood. The coil shown is of the general type illustrated in the patent to R. Eickemeyer, No. 377,996, February 14, 1888, a modification of which is shown in the patent to A. F. Batchelder, No. 596,136, December 28, 1897, the coils of the latter being the first to be made according to the present invention, as set forth in lines 52 to 55 of the patent; but other kinds might be made by a form constructed in accordance with my invention.

Referring now to Figs. 1, 3, and 4, the form consists of a base-plate A, having a lug A', by which it is secured to the rotatable standard on which it is customary to mount all of these devices. A removable upper plate B rests upon the base or support A, being secured to it by the hooks *b b'*, which engage with slots in the base-plate, not only securing the two plates together, but insuring the proper relative position of the coil-forming grooves. A key and groove is an equivalent construction. Upon each end of the plate A is a lip *a*. Another lip *a'* upon the back of the plate forms with the overhang of the plate B a guide or groove for the coil. Upon the front of the plate A is a lug D, supporting two sliding plates C C', each having in one of the grooves *d² d³* in the plate A and an integral lug D a feather *c'*, (see Fig. 4,) which registers with the appropriate groove. Keys on plate B and grooves in plates C and C' are obvious alternatives. Studs *d' d'*, rigidly secured to the lug D and working in keyhole-slots *c² c²* in the plates C C', permit the ready removal of the plates, and a block G holds them during the winding of the coil in their illustrated position, being forced outward by the cam H

working on the stud h' , which is supported in the base A. Another cam H' (see Figs. 3 and 4) turns on the same stud, and collars cut away at h permit one cam to move the other, but with a certain amount of lost motion. The cam H' in combination with the hooks b b' locks the plate B to the base A. The cam H may be turned to release the block G and the plates C C', leaving the cam H' and plate B undisturbed. The block G slides in undercut guides G' G², secured to the plate A. Two removable guides E E' work in channels in the plate A, being secured in working position by the staples F F', one leg of each of which works in a slot f in the end of the guide E, by which the position of the latter is determined, and the other leg then enters a hole f' , holding the guide firmly in place. A pin p in the staple serves to prevent the complete withdrawal of the staple from the base A. The plates C C' are provided with shelves or "terraces," as they are commonly called, c^3 to c^6 . There are four of these, one for each turn of the coil. The number of terraces may evidently be varied. A greater number of turns could be given each coil, or by using two or three of the ones shown coils of less turns may be wound.

In forming the coils it is desirable to keep each part firmly in place while succeeding parts are wound. This is particularly necessary where the wire makes a sharp bend, because the stiffness of the material makes it apt to spring slightly out of place. To hold the parts of the coil, therefore, I provide clamps I I' I². One of these, I, is pivoted in a lug a^2 , projecting from a base-plate A, the others being carried in corresponding lugs b^2 b^3 , projecting from plate B. Each of the clamps consists, essentially, of a resilient band i , one end of which is formed into a handle i^5 , while the other is secured to a bar i^6 , to which is attached a ram or clamping-piece i^2 , adapted to engage with the coils. The band bears on a drum i^3 , rigid with the lug b^2 . A slightly-resilient latch i^7 has a detent t on its upper end, which passes through a hole in the handle, and the detent locks the handle when the latter has been sufficiently depressed. A lip i^4 projects from the bar i^6 , against which bears a spring i^3 , serving to hold the ram i^2 in position to engage the coil when depressed, the radius of the end of the ram from the center of motion of the clamp as a whole being such that the ram will register with the coil-groove. By this construction the clamps will remain in whatever position they may be when the handle i^5 is depressed, so that the latch i^7 holds it down. This action causes the resilient band i to pull down the bar i^6 , and consequently force the ram i^2 upon the coils on the lip a . The action of the clamp, it will readily be seen, is independent of the size of coil or number of its wires.

The winding of the three coils is done as follows, it being understood in the art that it

is desirable and practically necessary to have the coils of equal length, so that their resistance and inductance may be equal in all positions of the armature. To effect this, those wires which lie next the core on one side of the coil are farthest from it on the other. It is also customary to leave free ends of the coil of some length for greater convenience in connecting. The three wires are held in the clamp K, carried on the projecting arm K'. The clamp shown is an ordinary eccentric device, for which any other form may be substituted. The wires are then carried along the lip a' , then over the lip a at the right or upper end of the form, (see Fig. 3,) then under the guide E, making the bend shown at L' in Fig. 2, then over the upper terrace c^3 and under the guide E', making the bend shown at L² in Fig. 2. The wires forming at L³ the under side of the coil or part thereof lying next the core by the turn at L' are brought out, so that at L⁴ they are on the outside or farthest removed from it. Similarly by the bend at L² they return to their former path, lying just above the first turn. Passing around the form they occupy in succession the terraces c^4 c^5 c^6 , the last turn or end of the coil being bent slightly, so as to engage the guide c^7 . As each turn is placed the clamps I I' I² are pressed down, being raised for the insertion of the next turn. After the coil is wound the cam H is turned to the left, leaving cam H' undisturbed, so as to leave plate B and the parts of the coil supported by it in place. Block G is then pressed back and plates C C' removed by sliding them back at an angle to both sides of the coil until studs d' d' can pass through the enlarged ends of slots c^2 . The upper parts of the coil are then depressed to the level of the part occupying terrace c^6 . Strips of insulation l (see Fig. 2) are inserted between the coils. The wires are temporarily secured with twine or soft wire. The cam H' is now swung on its pivot and the part B lifted or slid from the support A. The clamps I I' I² being opened and guides E E' removed, the coil is then taken from the form. The customary subsequent insulation may be effected in any desired or usual way; but not being any part of my invention I have not deemed it necessary to describe it.

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

1. The combination of the removable plates having terraces or grooves for the wires of the coil, with the base-plate, the upper plate registering with the base-plate, and a cam device locking the terraced plates and the upper plate in position.

2. The combination of the terraced plates, the upper plate, and the base-plate, with the cams for the upper plate and the terraced plates, the cams having a common center and a cut-away portion by which one of them has lost motion relative to the other.

3. In a coil-form, a clamp having a fixed

drum, a band engaging the drum, a part for compressing the coil, and a latch for holding the clamp in its adjusted position.

4. In a clamp, the fixed drum, the band
5 surrounding the drum, and the latch for holding the band in engagement.

5. In a clamp for a coil-form, the fixed drum, the band surrounding the drum, the ram for compressing the coil, and the latch for holding the band in its adjusted position.

6. In a coil-former, the combination with a base-plate, of an upper plate removably attached thereto and adapted to form in combination with the base-plate grooves for the
15 wire of the coil, and a cam pivoted in said base-plate and adapted to bear against the upper plate to secure it in position.

7. In a coil-form, a base-plate, terraced plates C, C', and guides for the plates, by
20 which they may be withdrawn at an angle to both sides of the coil.

8. In a coil-former, the combination with a support, of terraced plates provided with slots having enlargements at their ends farther
25 from the support, studs secured to said support and engaging in said slots, and means whereby said terraced plates can be slid inwardly toward said support.

9. In a coil-former, the combination with a
30 support, of terraced plates adapted to be secured in operative position to said support, and means whereby said terraced plates can be moved inwardly toward said support and removed therefrom.

10. In a coil-former, the combination with a support, of terraced plates held in sliding
35 relation with said support, and a cam pivoted to said support and adapted to move said plates into their operative positions.

11. In a coil-former, the combination with a support, of terraced plates held in sliding
40 relation with said support and adapted to be removed therefrom, and means for locking said plates in their operative positions.

12. In a coil-former, the combination with a support, of terraced plates removably attached to said support, a block in sliding
45 relation with said support and adapted to bear against said plates in their operative position, and a cam pivoted to said support and adapted to bear against said block.

13. In a coil-former, the combination with a support, of terraced plates adapted to slide
50 on said support and toward each other and to be removed from said support.

14. In a coil-former, the combination with a support, of an upper plate and terraced
55 plates removably attached thereto, and a device pivoted to said support for locking said upper plate and terraced plates in operative positions on said support.

15. In a coil-former, the combination with a support, of wire-guides removably attached to said support, a stud secured in said sup-

port, and cams on said stud for locking said
65 guides upon said support, and capable of independent and coöperative movement.

16. In a coil-former, the combination with a support, of an upper plate removably secured to and forming a wire-guide with said
70 support, terraced plates removably secured to said support, and independent guides removably secured to said support.

17. In a coil-former, the combination with a support, of an upper plate removably secured to and forming a wire-guide with said
75 support, and clamps mounted on said upper plate and adapted to bear in the guide between said upper plate and said support.

18. In a coil-former, the combination with
80 a support, of guides adapted to be inserted in channels in said support, and means for securing said guides in the channels.

19. The combination with a support, of guides adapted to be inserted in channels in
85 said support, and latches locked in said support, but adapted to be moved to lock and unlock said guides in said support.

20. The combination with a channelled support, of guides adapted to be inserted in said
90 channels, each guide having an end slot and a perforation, and a staple for each guide adapted to pass through said slot and perforations to lock the guide to the support.

21. The combination with a support, of
95 guides, a movable staple for securing the guides to said support, and a pin in said staple to prevent the complete withdrawal of the staple from the support.

22. The combination with a clamping-piece,
100 of a drum, a band bearing upon said drum and adapted to actuate said clamping-piece, and means for moving said band.

23. The combination with a clamping-piece, of a drum, an integral band and handle, said
105 band adapted to bear on said drum and actuate said clamping-piece.

24. The combination with a pivoted clamping-piece, of a drum, a band bearing on said drum and actuating said clamping-piece, and
110 a spring for guiding said clamping-piece.

25. The combination with a clamping-piece, of a drum, a band bearing on said drum, and actuating said clamping-piece, a handle for moving said band, and a resilient detent for
115 said handle.

26. The combination with a bar or pivot support, of a drum, a handle, pivoted to said bar, a resilient band forming a continuation of said handle, bearing on said drum and at-
120 tached to said bar, and a ram pivoted to said bar.

In testimony whereof I have hereunto set my hand this 30th day of August, 1898.

WILLIAM F. DREES.

Witnesses:

A. F. MACDONALD,

A. H. ABELL.