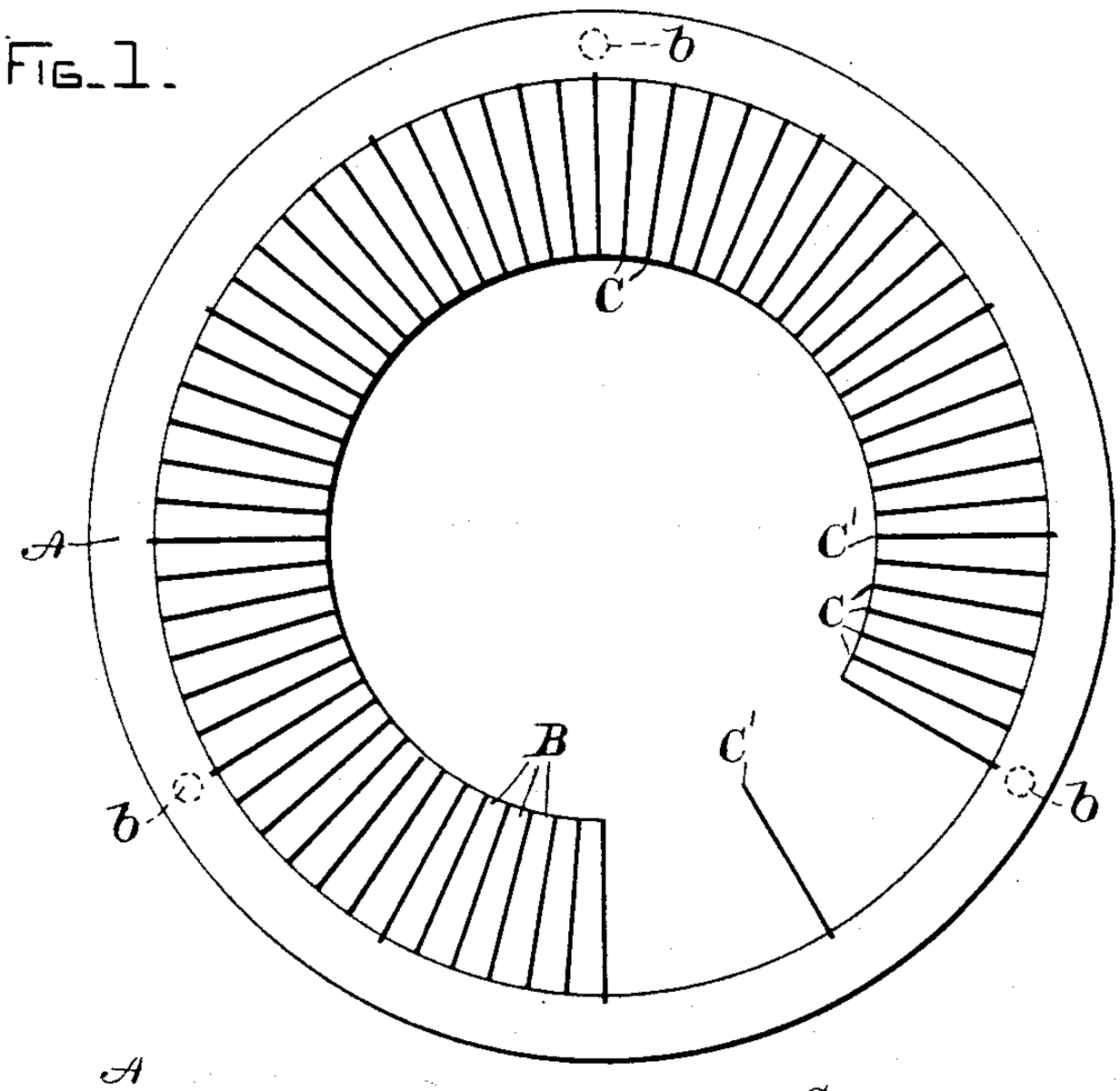
(No Model.) 2 Sheets—Sheet 1.

A. F. BATCHELDER.

METHOD OF AND MEANS FOR ASSEMBLING COMMUTATOR SEGMENTS.

No. 539,022. Patented May 14, 1895.

Fig. 1.



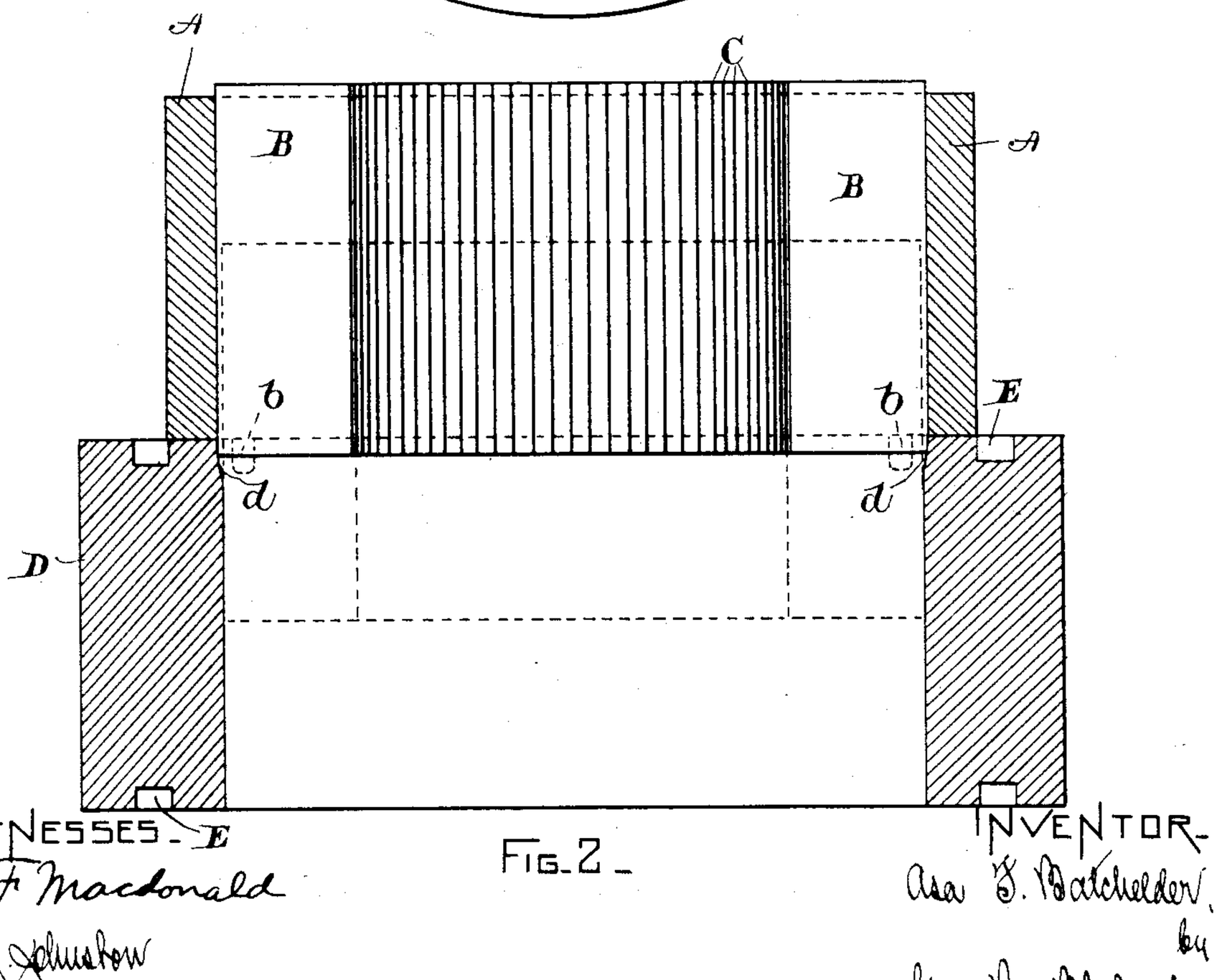


Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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FIG. 3.

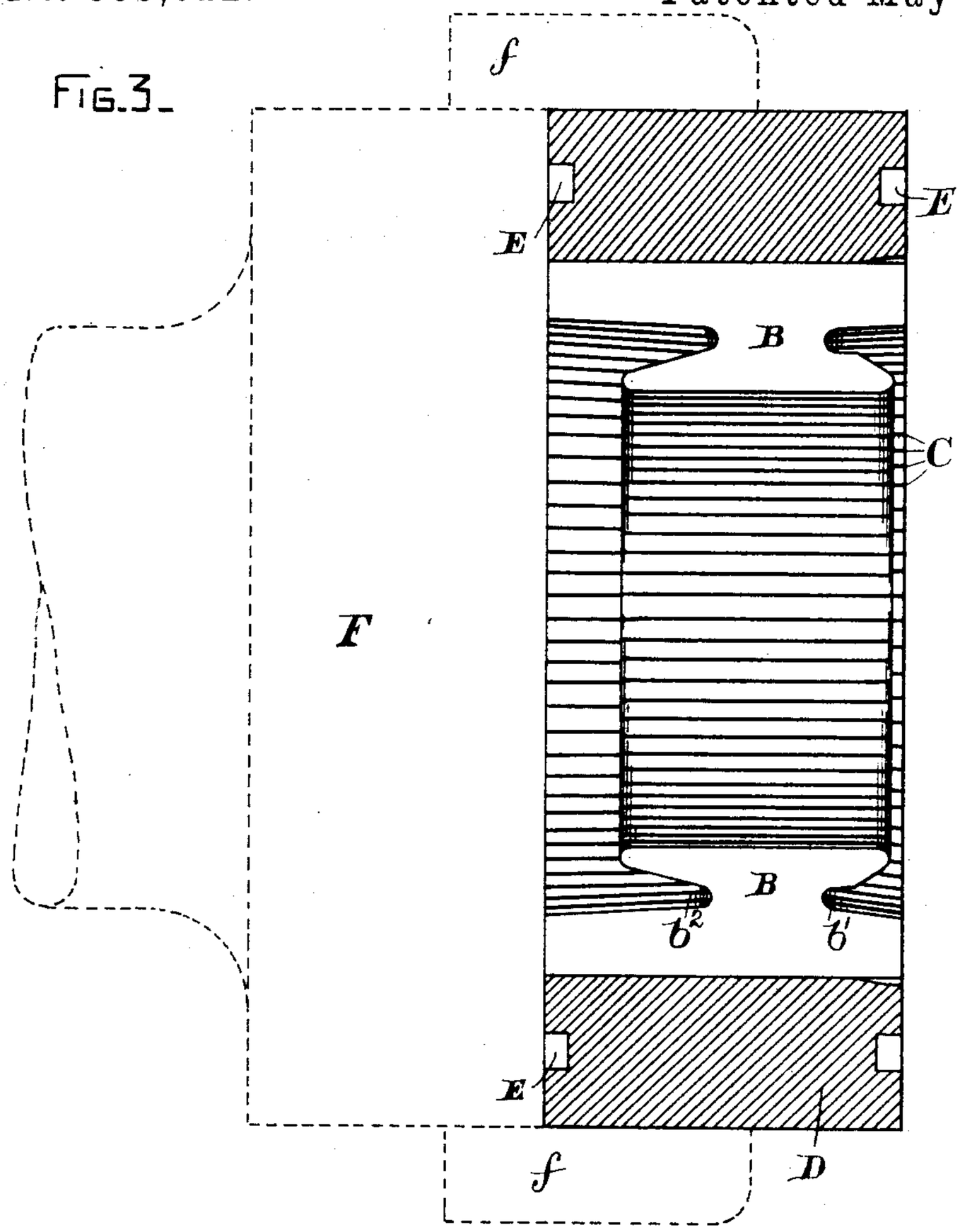
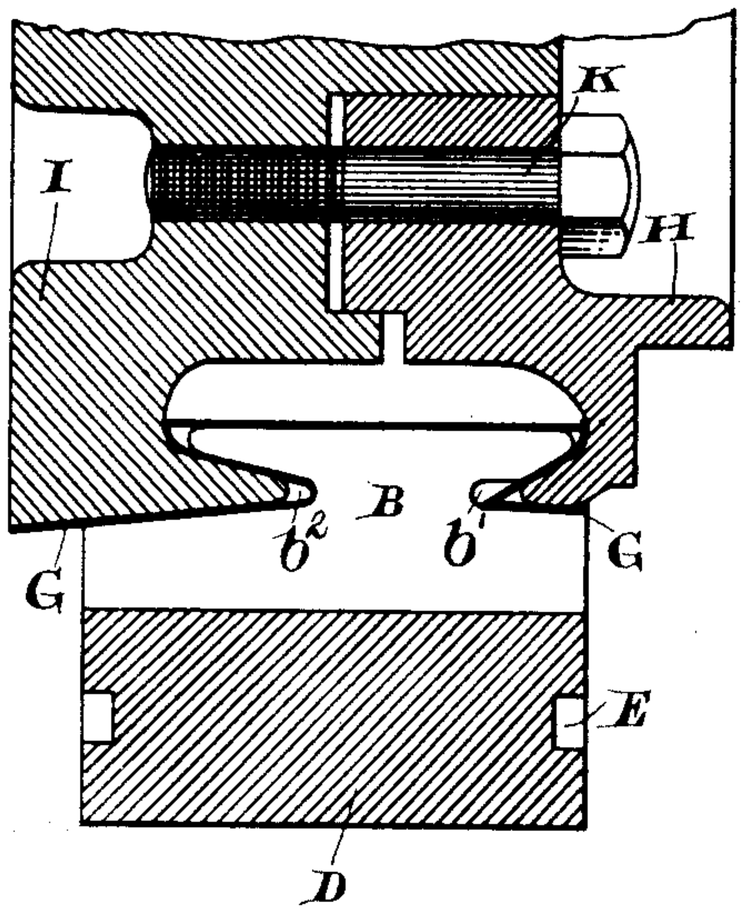


FIG. 4.



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UNITED STATES PATENT OFFICE.

ASA F. BATCHELDER, OF SCHENECTADY, NEW YORK.

METHOD OF AND MEANS FOR ASSEMBLING COMMUTATOR-SEGMENTS.

SPECIFICATION forming part of Letters Patent No. 539,022, dated May 14, 1895.

Application filed February 28, 1895. Serial No. 540,111. (No model.)

To all whom it may concern:

Be it known that I, ASA F. BATCHELDER, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Methods of and Means for Assembling Commutator-Segments, of which the following is a specification.

My invention relates to the assembling of commutators for dynamo-electric machines; and has for its object to provide a means of effecting this process which shall be cheaper, simpler and more accurate than those heretofore employed.

It has been customary to employ various means for assembling the commutator segments with their intervening insulations, but, so far as I am aware, none of these means have been entirely satisfactory. One of the methods devised to overcome the difficulties presented by the necessity for accuracy and the large number of parts in the problem, is that of employing a metal ring of somewhat greater size than the commutator to be constructed, then providing for each segment a set screw passing through the ring and placing the segments approximately in position with the insulation between them; and then adjusting the set screws upon the outside of the ring until the segments are brought up firmly. By variations in these adjustments the workmen would eventually be enabled to get an approximate accuracy of circle or cylinder; but the handling of so many different screws and the fact that each set screw, although capable of forcing the segment forward, could not return it if it were forced too far, have made the method one of extreme difficulty requiring skillful manipulation, and it is only by making the rings of such a thickness as to make them difficult to handle that it has been possible to prevent distorting them by the unequal pressure of different screws, so that, when the commutator was finally roughly assembled preparatory to turning it down in the lathe, it would be out of true and out of center in many cases. A concentric clamp has also been devised in which a band of metal was slit through by alternate slits from opposite edges, and the commutator was set up in the band. A pair of cones was then forced over the band, and the segments were brought to an approximate concentricity; but this has been objectionable because the band of metal did not take a true circle, but bent into a series of short straight lines and the commutator segments, occupying the angle between the short sections of the ring were consequently farther from the center than others. Both of the methods described are not only difficult of operation, but are wasteful of metal in the final turning down. Some other methods have also been practiced, but, so far as I am aware, they have been even less successful than these, and the first method described is that in common use in a large number of shops building electrical machinery. I obviate the difficulties attendant upon this operation in the manner following: I provide a ring or cylinder slightly less in length than the length of the commutator segments. At intervals upon the interior surface of this cylinder I cut slots dividing it into equal spaces, these slots however being only of sufficient width to hold the sheet of insulation and not being sufficient to cause any impairment of the rigidity of the cylinder. In each of these slots I insert, as indicated, a sheet of insulating material, and with this as a guide for spacing I insert the commutator bars loosely, each with a sheet of insulation between it and its neighbor. The ring being slightly larger than the diameter of the commutator when the bars are in place, owing to their slight inequalities and to minute differences in the thickness of the insulating material, the last one or two segments will make approximately a working fit so that the segments are just about sufficient to engage frictionally with the cylinder and not slip out if it is handled gently. I then take a second cylinder having any convenient means of attaching it in place in the lathe, this cylinder being smaller in internal diameter than the one in which the commutator segments are assembled and having a small portion of its inner surface flare out so as to be of the same diameter as the assembling cylinder. The commutator is then forced out bodily from

the assembling cylinder, by hydraulic pressure or other power sufficient for the purpose, into the second cylinder in which it is held with great rigidity by reason of the pressure exerted in forcing it into place. Being forced in bodily, the commutator bars do not slip over the insulation and mar it, thus impairing its efficacy, but the whole structure moves together. I then mount the cylinder carrying the bars (which cylinder in this case is of substantially the length of the bars themselves,) in a lathe, and turn first one end of the internal diameter of the commutator to fit the usual retaining rings. It may then be reversed and the other end of the internal diameter turned, after which the rings engaging the commutator in the ordinary construction of a dynamo-electric machine are put into place with proper insulation. The commutator is then forced from the retaining cylinder by suitable power and may, if desired, be turned in the lathe to present an even surface upon its outside. This turning will be less in extent and therefore less wasteful of metal than in any process with which I am acquainted.

The accompanying drawings show an embodiment of my method or process, and therein—

Figure 1 is a plan of a commutator and its assembling-ring, part of the segments being removed for clearness. Fig. 2 is a section through the assembling-ring, commutator, and turning-ring, as it is hereinafter called. Fig. 3 is a section of the commutator when its inner surface has been completed, and Fig. 4 is a sectional detail showing the usual clamping-rings just before the commutator is removed from the turning-ring.

Referring by letter, A is the assembling ring or cylinder referred to.

B, B are the segments of the commutator.

C, C are sheets of suitable insulation, mica being of course the preferred substance.

C′, C′ are sheets of mica inserted in saw-cuts or slots in the ring, in the case illustrated at every thirty degrees around the circumference. These cuts are preferably parallel to the axis upon which the commutator is to be mounted, though in the case of spiral segments this would not be the case.

b, *b*, &c., show in dotted lines pins formed upon the under end of the assembling cylinder to enable it to register readily with the cylinder which I have called the turning cylinder, in which the parts are manipulated.

Referring to Fig. 2, the parts already described are indicated by the same letters. D is the turning ring, its inner diameter being slightly less than that of the commutator as assembled in the assembling ring A. At *d*, *d* are shown the flaring portions of the inner surface already referred to, these being only sufficient in extent to allow the ready entrance of the commutator into this ring. At E, E in the cylinder D are grooves adapted to register with hook-bolts passing through the face plate of the lathe or boring mill in which the finishing operations are conducted.

Referring to Fig. 3, F is the head of the lathe and *f*, *f* are jaws supporting the cylinder in the lathe. This is, however, immaterial and is only shown for illustrative purposes, as any means whatever may be employed to support the ring D, provided this means engages with the outer part of the ring or cylinder D. In this illustration the commutator is shown with its internal surface completely finished or turned, and therein the wedge-shaped groove *b′* is turned upon one face or end of the commutator cylinder, and a groove of somewhat similar shape, b^2, is turned upon the other end, it being understood that the ring or cylinder D is first put in position in the lathe and one of the end surfaces turned, the cylinder being then removed from the lathe and reversed, and the other end is finished.

In Fig. 4 the purpose of the wedge-shaped grooves or surfaces is illustrated. Clamping rings H, I, of a shape registering with the wedge-shaped grooves *b′*, b^2 of Fig. 3, and having suitable insulation G interposed, are put in position in these grooves and secured firmly together by bolts K, thus holding the segments firmly in place. A very slight play is allowed when these rings are put in place, inasmuch as when the outer ring or cylinder D is removed, the commutator expands slightly by the relaxation of the pressure, and this play is taken up, the bolts K being then firmly seated. The commutator is removed from the cylinder D by hydraulic or other suitable pressure, and the operation is complete.

The steps thus pointed out enable me to assemble the commutator with a minimum of cost and a maximum of accuracy, and are, so far as I am aware, a great improvement over other processes in use.

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

1. The method of assembling a commutator herein set out, consisting in assembling the segments in a ring or cylinder slightly larger than the finished size of the commutator, then forcing them into a second cylinder of approximately the size of the finished commutator and adapted to hold the segments by frictional contact, then finishing the inner surface while so held, then adjusting the clamping rings in place upon the inner surfaces and removing the outer cylinder, and lastly finishing the outer surface of the commutator.

2. As a means of assembling the segments of the commutator of a dynamo-electric machine, an assembling ring or cylinder of slightly greater size than the finished commutator, such cylinder having longitudinal cuts upon its inner surface arranged to retain in position sheets of insulating material.

3. The means for assembling commutators herein set out, consisting of an assembling

ring or cylinder of slightly greater size than the commutator when completed, said cylinder provided with longitudinal cuts on its inner surface, a second cylinder of approximately the finished size of the commutator having its inner surface arranged to register at one end with the first cylinder, pins upon one cylinder and registering holes upon the other; the second cylinder provided with grooves upon its ends adapted to register with a centering ring upon the face plate of the lathe.

In witness whereof I have hereunto set my hand this 18th day of February, 1895.

ASA F. BATCHELDER.

Witnesses:
B. B. HULL,
A. F. MACDONALD.