

## CHAPTER XLI.

### IMPROVEMENT IN "UNIPOLAR" GENERATORS.

ANOTHER interesting class of apparatus to which Mr. Tesla has directed his attention, is that of "unipolar" generators, in which a disc or a cylindrical conductor is mounted between magnetic poles adapted to produce an approximately uniform field. In the disc armature machines the currents induced in the rotating conductor flow from the centre to the periphery, or conversely, according to the direction of rotation or the lines of force as determined by the signs of the magnetic poles, and these currents are taken off usually by connections or brushes applied to the disc at points on its periphery and near its centre. In the case of the cylindrical armature machine, the currents developed in the cylinder are taken off by brushes applied to the sides of the cylinder at its ends.

In order to develop economically an electromotive force available for practicable purposes, it is necessary either to rotate the conductor at a very high rate of speed or to use a disc of large diameter or a cylinder of great length ; but in either case it becomes difficult to secure and maintain a good electrical connection between the collecting brushes and the conductor, owing to the high peripheral speed.

It has been proposed to couple two or more discs together in series, with the object of obtaining a higher electro-motive force ; but with the connections heretofore used and using other conditions of speed and dimension of disc necessary to securing good practicable results, this difficulty is still felt to be a serious obstacle to the use of this kind of generator. These objections Mr. Tesla has sought to avoid by constructing a machine with two fields, each having a rotary conductor mounted between its poles. The same principle is involved in the case of both forms of machine above described, but the description now given is confined to the disc type, which Mr. Tesla is inclined to favor for that machine. The discs are formed with flanges, after the manner of pulleys, and are connected together by flexible conducting bands or belts.

The machine is built in such manner that the direction of magnetism or order of the poles in one field of force is opposite to that in the other, so that rotation of the discs in the same direction develops a current in one from centre to circumference and in the other from circumference to centre. Contacts applied therefore to the shafts upon which the discs are mounted form the terminals of a circuit the electro-motive force in which is the sum of the electro-motive forces of the two discs.

It will be obvious that if the direction of magnetism in both fields be the same, the same result as above

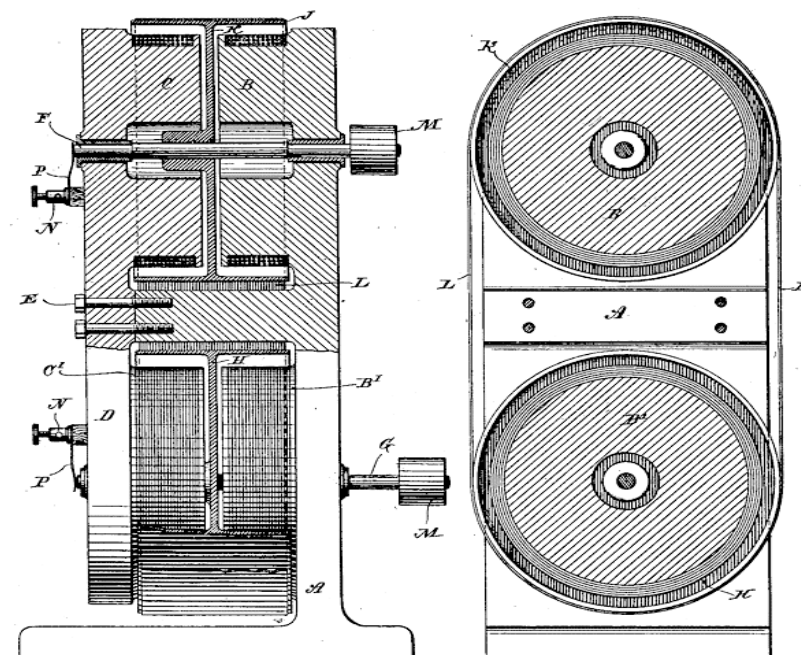


Fig. 290

Fig. 291

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will be obtained by driving the discs in opposite directions and crossing the connecting belts. In this way the difficulty of securing and maintaining good contact with the peripheries of the discs is avoided and a cheap and durable machine made which is useful for many purposes such as for an exciter for alternating current generators, for a motor, and for any other purpose for which dynamo machines are used.

Fig. 290 is a side view, partly in section, of this machine. Fig. 291 is a vertical section of the same at right angles to the shafts.

In order to form a frame with two fields of force, a support, A, is cast with two pole pieces u B' integral with it. To this are joined by bolts E a casting D, with two similar and corresponding pole pieces c c'. The pole pieces B B' are wound and connected to produce a field of force of given polarity, and the pole pieces c c' are wound so as to produce a field of opposite polarity. The driving shafts F G pass through the poles and are journaled in insulating bearings in the casting A u, as shown.

H K are the discs or generating conductors. They are composed of copper, brass, or iron and are keyed or secured to their respective shafts. They are provided with broad peripheral flanges j. It is of course obvious that the discs may be insulated from their shafts, if so desired. A flexible metallic belt L is passed over the flanges of the two discs, and, if desired, maybe used to drive one of the discs. It is better, however, to use this belt merely as a conductor, and for this purpose sheet steel, copper, or other suitable metal is used. Each shaft is provided with a driving pulley M, by which power is imparted from a driving shaft.

N N are the terminals. For the sake of clearness they are shown as provided with springs p, that bear upon the ends of the shafts. This machine, if self-exciting, would have copper bands around its poles ; or conductors of any kind such as wires shown in the drawings – may be used.

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