

(No Model.)

E. THOMSON.

REGULATOR FOR DYNAMO ELECTRIC MACHINES.

No. 509,499.

Patented Nov. 28, 1893.

FIG. 1.

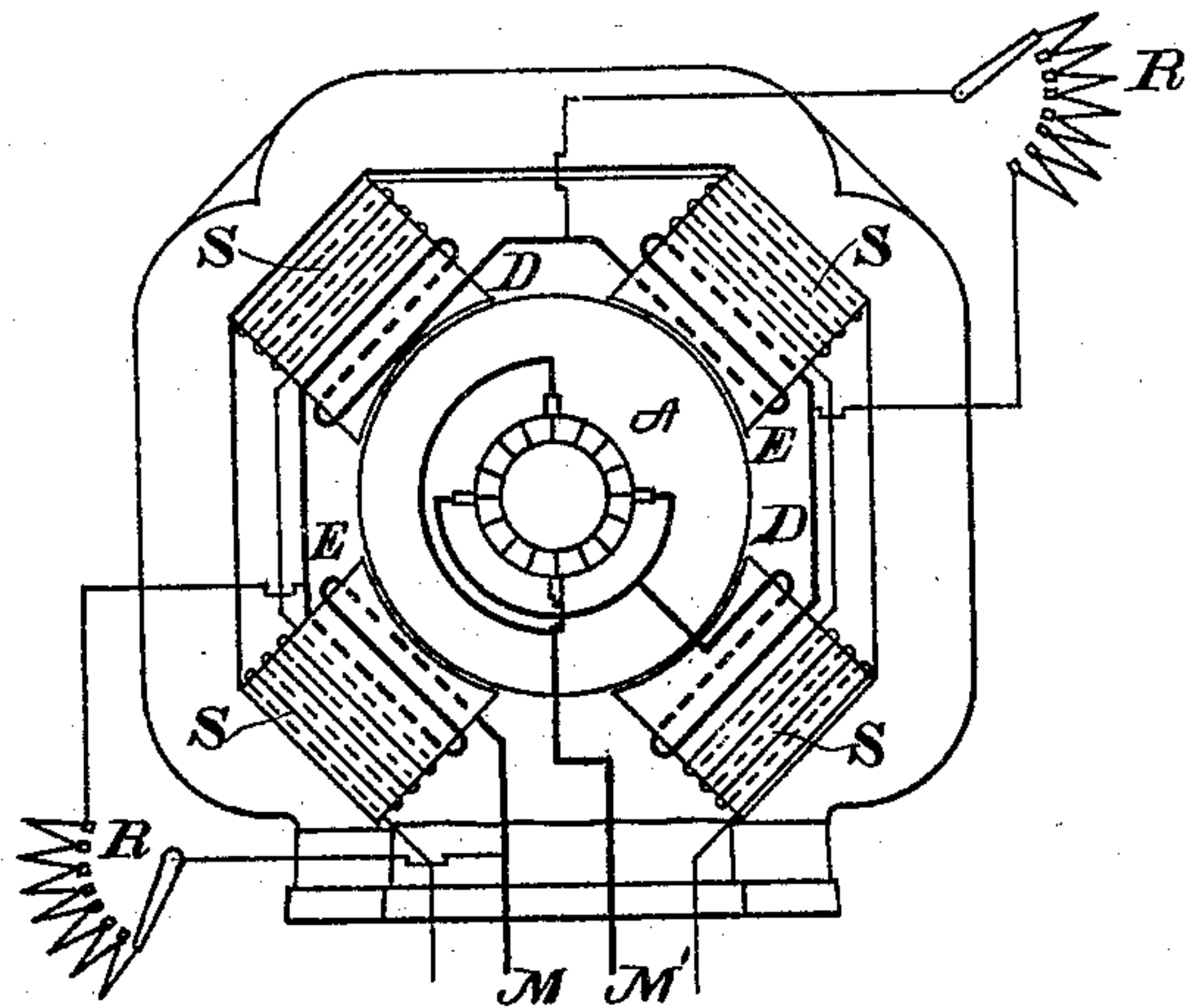


FIG. 2.

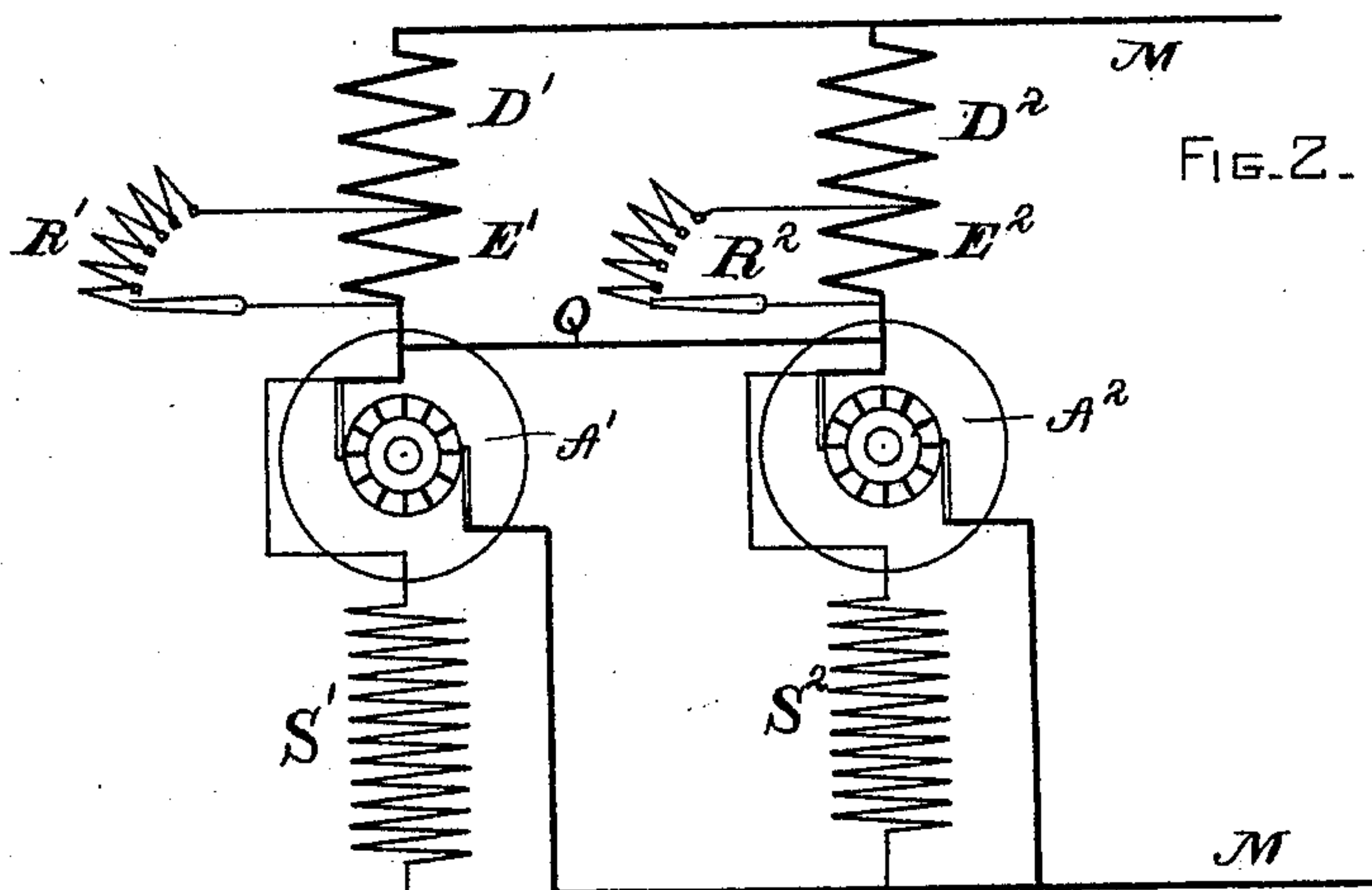
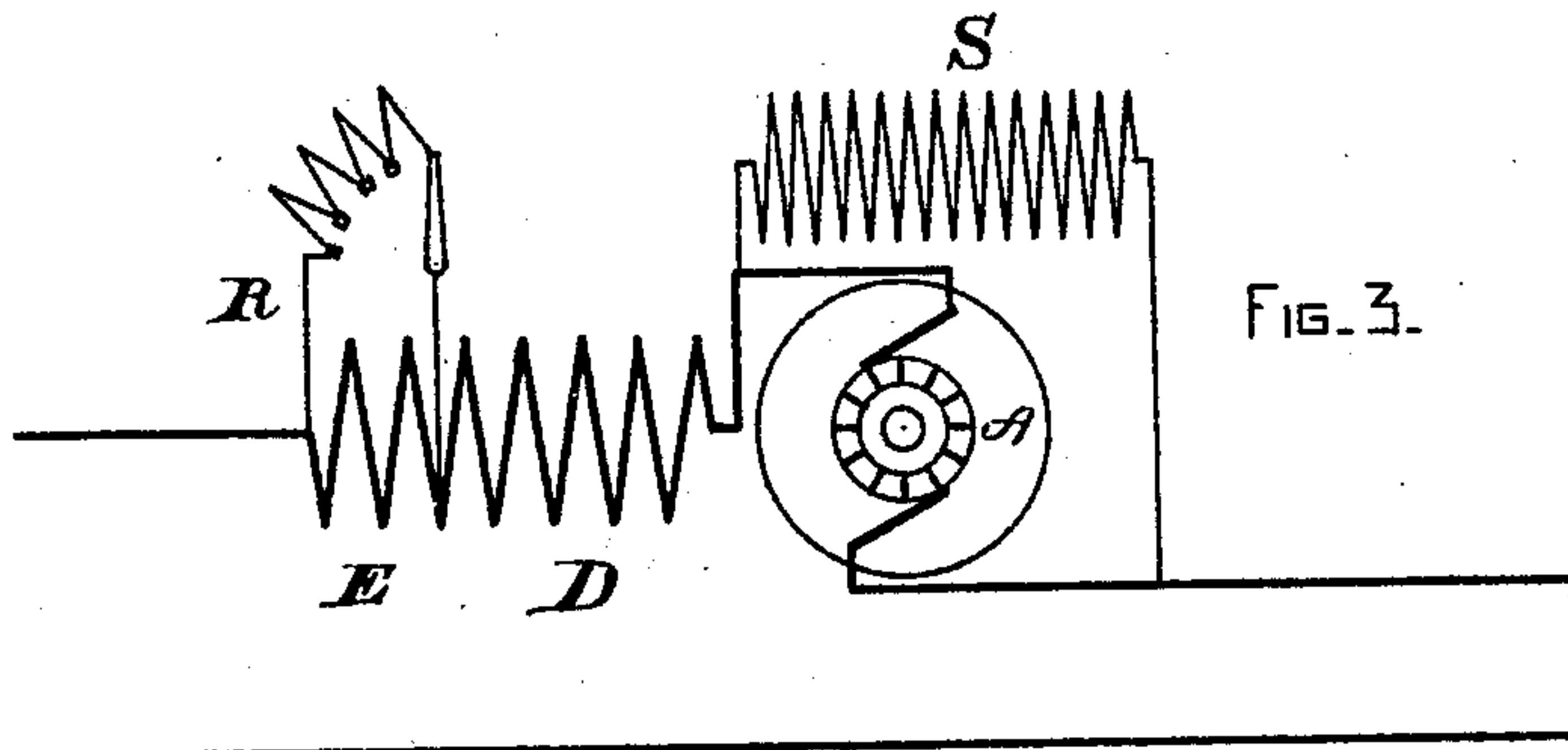


FIG. 3.



WITNESSES.

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REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

SPECIFICATION forming part of Letters Patent No. 509,499, dated November 28, 1893.

Application filed April 11, 1892. Serial No. 428,708. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Dynamo-Electric Machines, of which the following is a specification.

The present invention relates to an improvement in that class of dynamo electric machines whether generators or motors which are compound wound, and which consequently have a portion of their field magnetism furnished by a shunt across the mains, or by a separate exciter kept at a fairly constant potential, while the remaining portion of their field magnetism is due to the main current passing through a second set of field coils, generally known as "series" coils.

My invention is designed to adapt such machines to the conditions incident to their working in multiple arc, and at the same time to provide for the relative adjustment of the magnetic effects due to the series coils of the different machines, so that each one may be kept at such potential as to take its proper proportion of the load. The adjustment of the series field is also made for the purpose of adapting the electromotive force of the machines to variations in drop of potential, so that under light load they may give a certain potential, and under heavy loads may increase the potential by what is known as "over-compounding" or compounding for increase of potential at the terminals, or for constant potential at a distant point. Two or more such machines when running in multiple arc and feeding the same system of mains, should be provided for stability of action, with an equalizing connection between those points in their circuits at which their series field terminals are connected to the commutator brushes. Now with machines thus working in multiple arc and connected by an equalizer their series field coils are practically in multiple arc, and if a shunt be thrown around one of them, such a shunt will act equally to divert current from all the other field coils connected in the system. It does not, in other words, individualize its shunting effect to the particular machine for

which it is intended. Evidently then, no proper adjustment of the relation to each other of the series windings of the different machines can be obtained under the condition mentioned. To avoid this difficulty is the aim of the present invention. The series turns of such machines as are running in multiple arc are divided into two or more sections, part of which are always in the main circuit and are not varied by shunting, while around the remainder a variable shunt is provided, whereby in each machine the total influence of the different sections of the series coil may be varied by a proper variation of one such section. It is evident that in this way an individual adjustment may be obtained which, while not absolute, may be made approximately correct, and the proper balance of work between the machines may be preserved by adjusting the relative effects of their series windings.

In the accompanying drawings illustrating the invention, Figure 1 shows a dynamo electric machine wound after the present invention. Fig. 2 shows diagrammatically two machines similarly wound, and coupled up so as to work in multiple arc on a common circuit, and Fig. 3 shows a single machine by itself similarly constructed.

The machine shown in Fig. 1 has four poles which are energized by shunt or separate exciting coils S, and in addition by coils D D, E E, through which the main current passes, and which are the series coils for compounding. Variable resistances R R are put in shunt around the coils E E, while the coils D D are left unshunted and traversed by the main current *in toto*. Of course however, these coils may be shunted by a permanent shunt at any time when the number of ampere turns in D D becomes too great for the existing condition of the circuit.

Referring now to Fig. 2, two armatures A', A² are shown with shunt field magnet coils S', S², which, as stated before, may be replaced by separate exciting coils furnishing an initial field. In series with the armatures are heavy series coils divided into sections D', E' for the one machine, and D², E² for the other. The sections D', D² are connected directly to the main M, and are never shunted. Around

the sections E' , E^2 respectively are variable resistance shunts R' , R^2 whereby such sections may be more or less completely shunted and the desired adjustment of the machines individually and relatively to one another be effected. The equalizing connection is shown at Q. The variable resistances may be of any desired type. They may in fact be shunts of definite value connected across the sections E' , E^2 , such as strips of German silver shunting from five to fifteen or twenty per cent. of the current, one strip being removed and replaced by another as becomes necessary to give the desired effect.

In Fig. 3 a single machine A is shown diagrammatically which has its field excited by a shunt coil S and a series coil divided into sections D and E. The section E is shunted by a variable resistance R, and renders the effect of the series coil variable.

The operation of the invention will be understood from the foregoing. Evidently if the shunting resistance spanned the entire series coil it would not only divert current from the coil of that particular machine, but also would shunt substantially the same amount of current around the corresponding coils of such other machines as might be running in multiple therewith, for the resistance of the equalizing connection is very low. The field of each machine would therefore be correspondingly affected. When only a portion of the series coil is shunted, as herein described, the relative effect of the series coils upon the different machines may be regulated, for any influence which a change of resistance R' or R^2 has upon a companion machine is comparatively small, and may be rendered unimportant.

My invention is especially important when using machines in which the characteristic curve, or curve of compounding, is different for the different machines. In such case the machines might run together perfectly at half load but at full load one machine would be found to be carrying more than its due share of current. This condition of affairs

should be rectified by lowering the potential of that machine which is doing the greater part of the work, and this may be done by simply adjusting the series field strength accordingly.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of two or more compound wound dynamo electric machines working in multiple arc and connected by an equalizer, with means for adjusting individually, and with relation to one another the field strength of the different machines due to their respective series windings, as set forth.

2. The combination of two or more compound wound dynamo electric machines working in multiple arc and connected by an equalizer, with means for shunting portions of the series windings of such machines individually, and thereby altering the relation between their respective series fields, as required.

3. The combination of two or more compound wound dynamo electric machines working in multiple arc and connected by an equalizer, and having their series windings divided respectively into sections, part of which are always in the main circuit of the machines, and another part of which are shunted by shunt connections of variable resistance.

4. The combination of two or more compound wound dynamo electric machines working in multiple arc, and means for shunting portions of the series windings in such machines and thereby altering the relation between their respective series fields, as required.

5. A compound wound dynamo electric machine having its series winding divided into sections, and a shunt connection of variable resistance around a part only of such series winding, as set forth.

In witness whereof I have hereunto set my hand this 5th day of April, 1892.

ELIHU THOMSON.

Witnesses:

JOHN W. GIBBONEY,
BENJAMIN B. HULL.