(No Model.)

C. H. RICHARDSON.

REGULATING APPARATUS FOR ELECTRIC MOTORS.

No. 503,750. Patented Aug. 22, 1893.

FIG. 1.

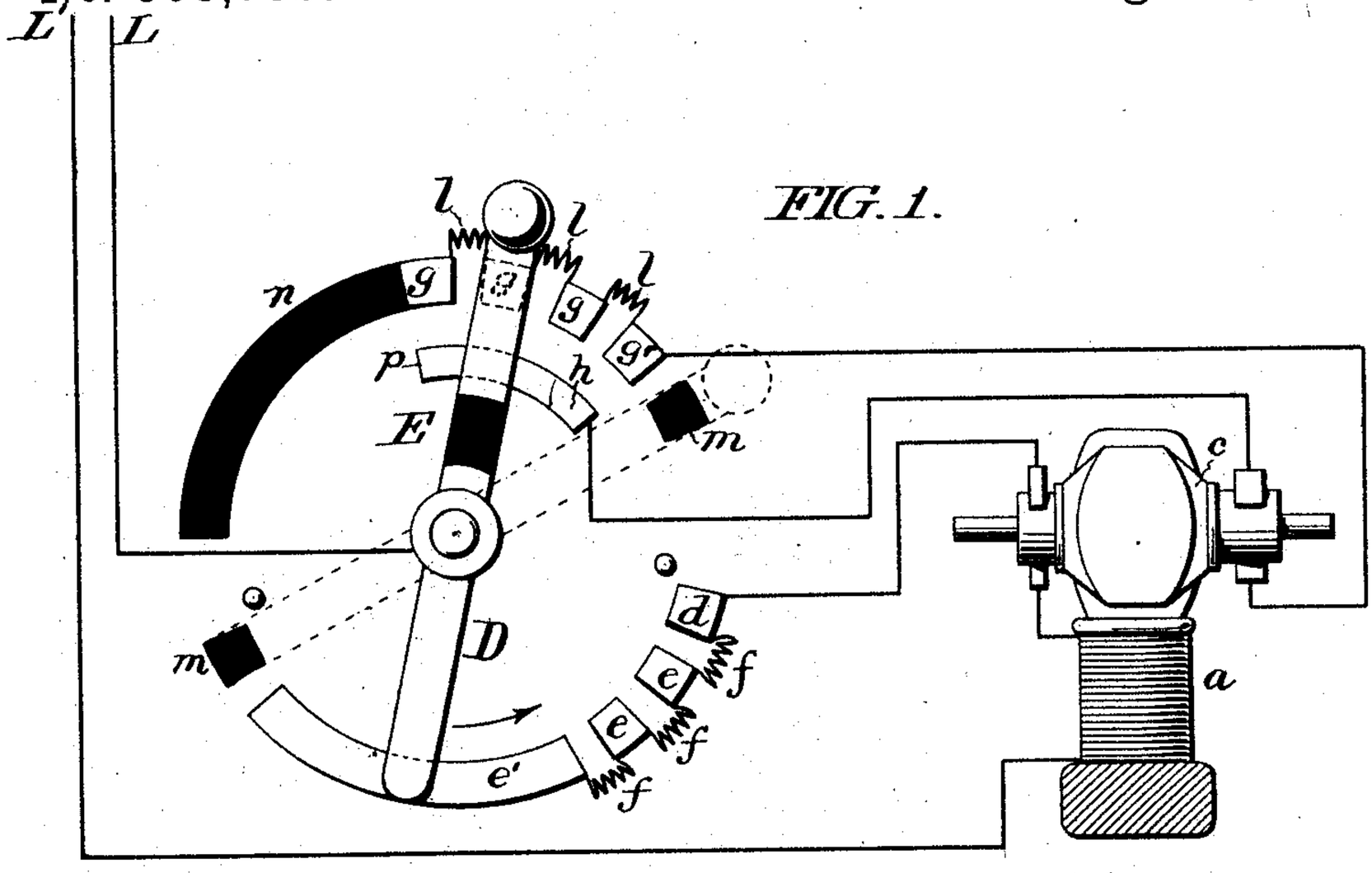
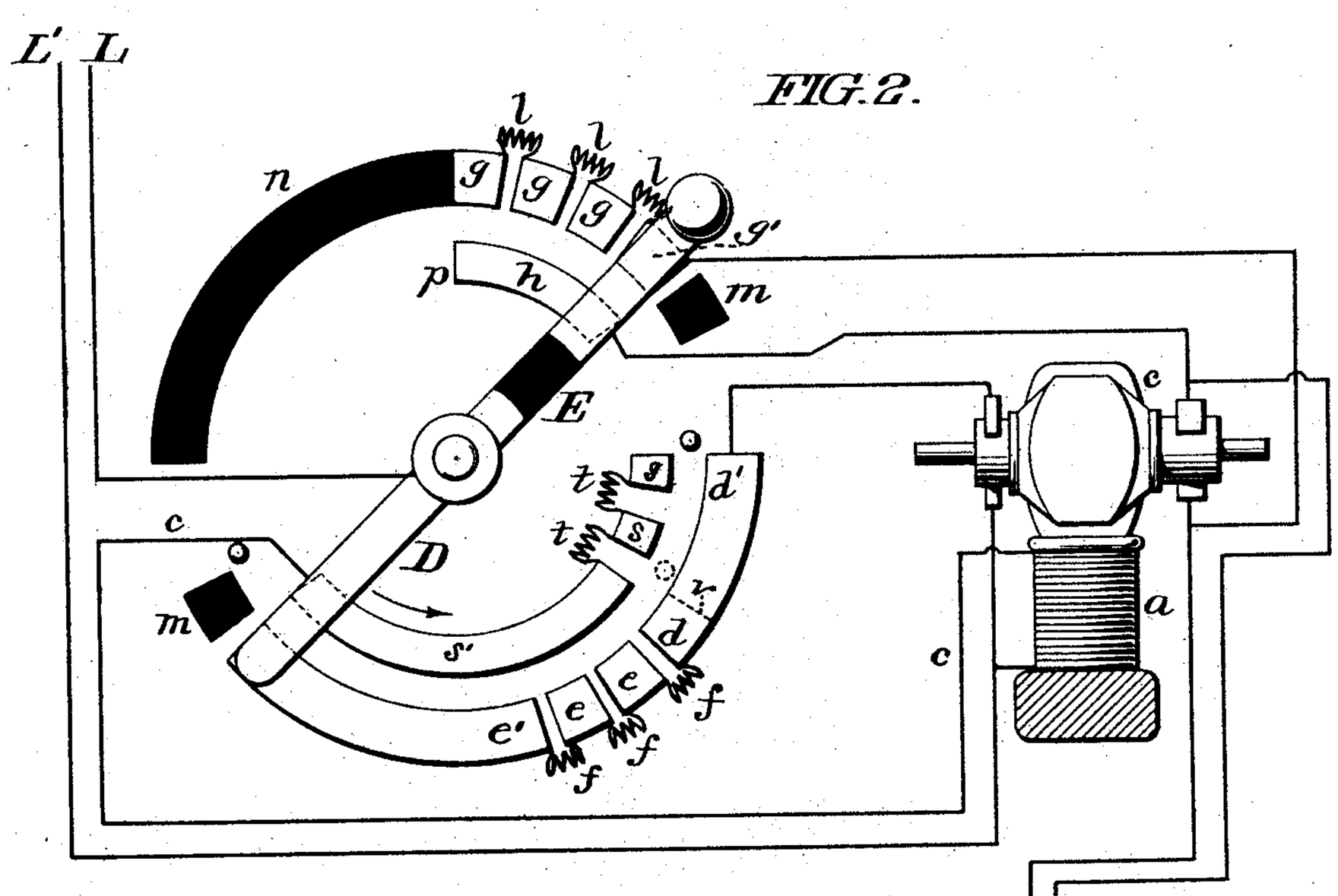


FIG. 2.



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CHARLES H. RICHARDSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE S. S. WHITE DENTAL MANUFACTURING COMPANY, OF SAME PLACE.

REGULATING APPARATUS FOR ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 503,750, dated August 22, 1893.

Application filed April 27, 1893. Serial No. 472,111. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. RICHARDSON, of the city and county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Regulating Apparatus for Electric Motors, of which the following is a specification.

As is well known the usual method of slowing the speed of an electric motor is to insert resistance in series with the armature of the motor. In my application, Serial No. 458,497, filed January 16, 1893, there is shown means for reducing speed while retaining a strong pull or torque, applicable to that form of motor known as a motor-generator, or a generator driven by a motor, which both consist of an electric generator driven by an electric motor; and my improvement in means for reducing speed consisted of a resistance in series with the motor for the first reduction in speed, and a variable resistance through which a circuit between the brushes of the generator was made. This circuit allowed a current to pass through the generator which required power and still further slowed it down, with a strong pull, as fully described in my said application.

The object of my present invention is to provide sure means for making the proper connections to throw in the necessary resistance to vary speed at the proper times, as if improperly made the motor might be damaged.

My improvements, hereinafter specifically claimed, involve the employment of a number of resistances of the proper ohms to give the desired reduction in speed, and a switch lever making contact with certain contact points properly connected to the resistances to connect them in appropriate manner to attain the desired result.

In the accompanying drawings which show my improvement as suitably embodied, Figure 1 is a diagrammatic view of my invention as applied to a series motor and generator, and Fig. 2 is a similar view of my invention as modified to adapt it to be applied to a shunt motor and generator.

Referring to Fig. 1, it will be seen that one main line L′ enters the motor and after passing through the motor field *a* and armature in the usual way connects with a resistance contact *d* of a series of resistances *f f f*, the number of which may be varied as desired. The contact *d* and other contacts *e e e′* connect with the resistances *f f f*, the last contact *e′* being prolonged to remain in contact with one end of a switch lever D which is provided with a non-conducting or insulating section E, while the other end of this lever is passing over contacts *g g g g′* and *h*. The contacts *g g g g′* are connected to resistances *l l l* which at one end are connected to one brush of the commutator of the generator *c* which is mechanically driven by the motor. The other brush of the generator is connected to segment *h*. Insulated rests *m m* for the switch lever in open circuit position are provided. *n* is an insulated guide for one end of the switch lever during times when the other end is passing over contacts *d e e e′*.

The operation of the above described apparatus is as follows:—With switch lever D on rests *m m* as shown by dotted lines the circuit is open and the motor at rest. Upon moving the switch lever in the direction indicated by the arrow until it makes contact at one end with contact *e′* and at its opposite end with contacts *g′* and *h*, the main current enters through L, D, *e′ f f f* and *d* to the motor, and out to line L′, thus starting the motor. That part of the switch lever beyond the insulating section E thereof connects contacts *g′* and *h* which short circuits the generator armature, allows it to generate a current, and slows down the motor to slowest speed. As the switch lever is moved farther in the direction indicated by the arrow, and one of its ends passes over contacts *g g g* more resistance is thrown into the circuit of the generator, decreasing current in its armature and allowing the speed of the motor generator to increase. After the lever passes point *p*—that is, leaves contact *h*—the generator circuit is broken, all internal load is taken off the motor, and the speed depends solely on the resistances *f f f* in the motor circuit. A farther movement of the switch lever D in the same direction as before successively cuts out resistances *f f f* until the last contact point

d is reached, when the motor is directly connected to main lines and runs at highest speed.

In Fig. 2 a modification of the improvement to suit it to a shunt wound motor is represented. Extra contact segments s s s' connected by resistances t t are placed to make contact with one end of the switch lever. Contact s' connects with motor field a by conductor c'; and as the lever when the motor is at rest projects beyond contact e', on starting the motor by manipulating the switch lever the field is charged first, then the motor is started, and the speed is regulated in the same way as by the apparatus shown by Fig. 1 until the switch lever passes to the first one of the contacts s s. The field charging current now passes through resistance t which weakens it as well as the magnetic strength of the field, which still further increases the speed of the motor. By moving the switch to the last contact s additional resistance t is inserted in the field circuit, the field is still further weakened, and the speed further increased. To keep the armature of the motor in circuit while the switch lever is moving over the contacts s s, the contact plate d is elongated as indicated at d' so that the lever when on either of said contacts s s will also make connection with said prolonged portion d' of contact d.

The number of resistances s may be varied according to the variations in speed desired; and if the high speeds provided for by means of these resistances are not required the prolonged portion d' of the contact d may be omitted and this contact terminate at the point indicated by dotted line v.

By my improvements it will be seen that as the switch mechanism in the motor circuit, and the switch mechanism in the generator circuit are simultaneously operated damage to the apparatus from improper manipulation of the switch is rendered impossible; and that the switch mechanism and manner of manipulating it are so simple that any one may operate the apparatus.

Although I have described and prefer to use a single switch actuating lever for operating simultaneously the switch mechanism in both the motor and the generator circuits, for varying speed as explained, I do not wish to be understood as confining my invention to the employment of a single lever, as in lieu thereof two levers so connected as to work together might be employed.

I claim as my invention—

The combination of the motor, the generator mechanically driven thereby, switch mechanism in the motor circuit, switch mechanism in the generator circuit, and the switch lever by which said mechanisms are simultaneously operated, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

CHARLES H. RICHARDSON.

Witnesses:
LEVI TEAL,
R. DALE SPARHAWK.