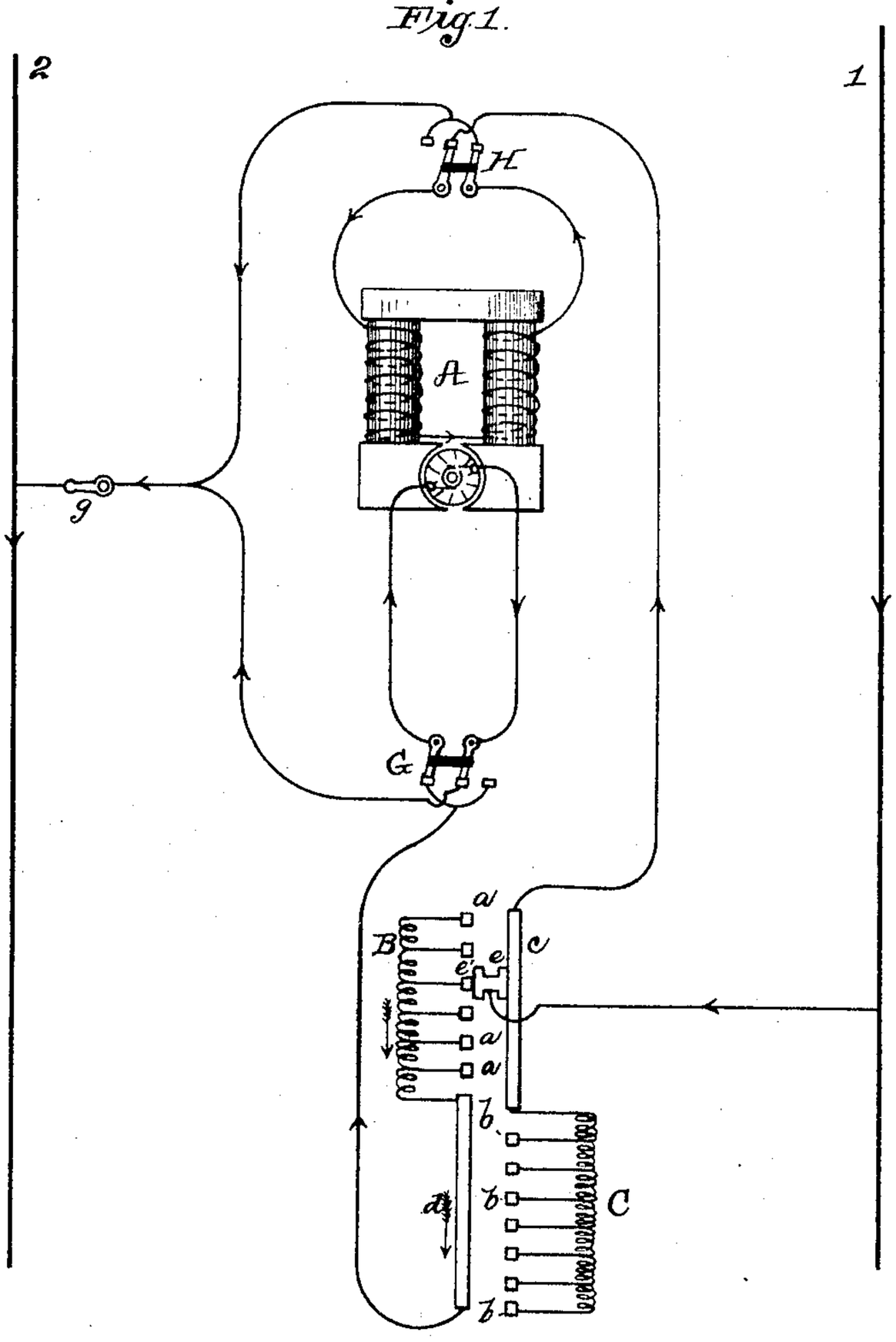
(No Model.) 2 Sheets—Sheet 1.

F. J. SPRAGUE.

ELECTRO DYNAMIC MOTOR.

No. 321,150. Patented June 30, 1885.

Fig. 1.



ATTEST:
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H. W. Hoddle.

INVENTOR:
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(No Model.)

2 Sheets—Sheet 2.

F. J. SPRAGUE.

ELECTRO DYNAMIC MOTOR.

No. 321,150. Patented June 30, 1885.

Fig 2.

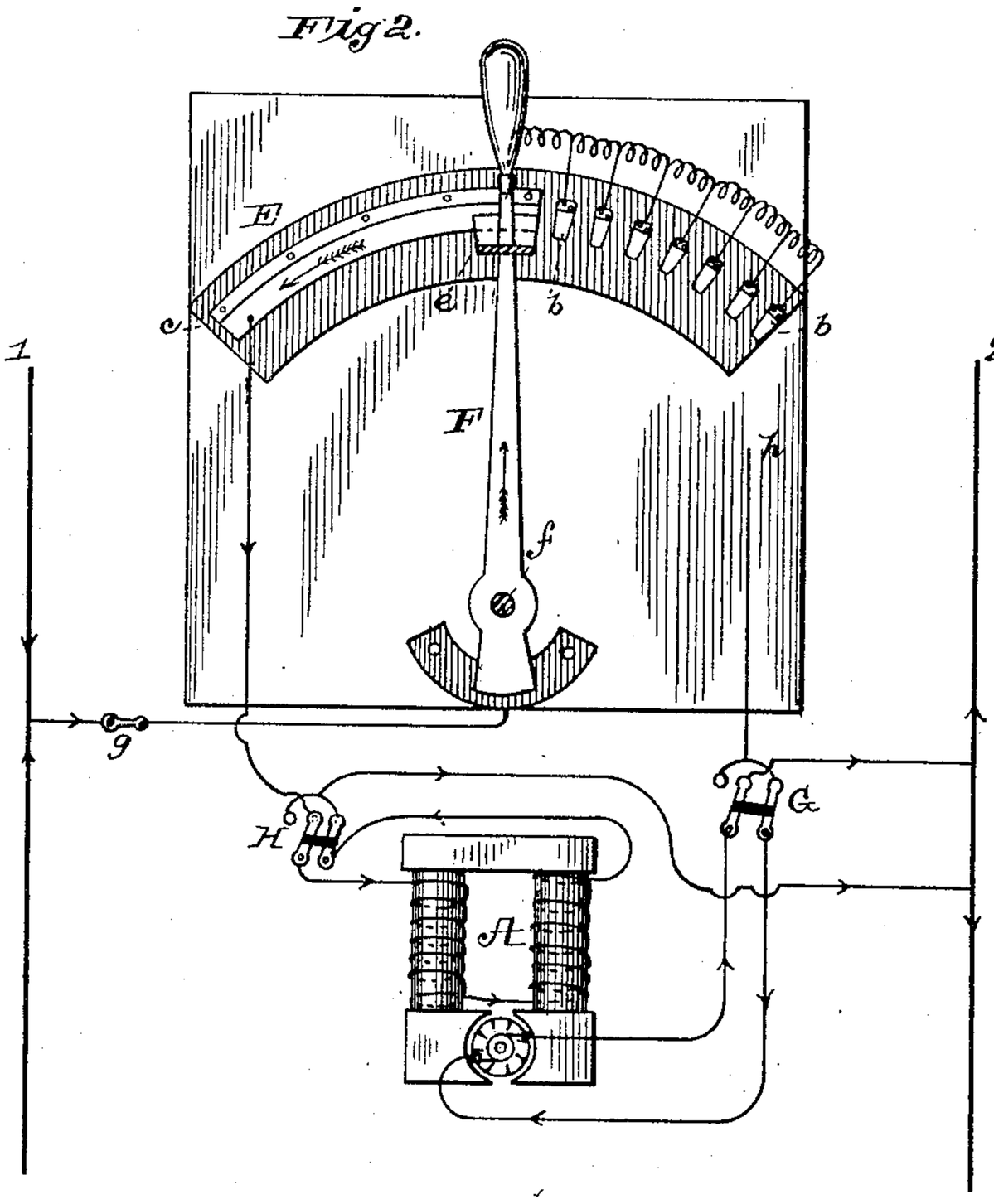


Fig. 3.

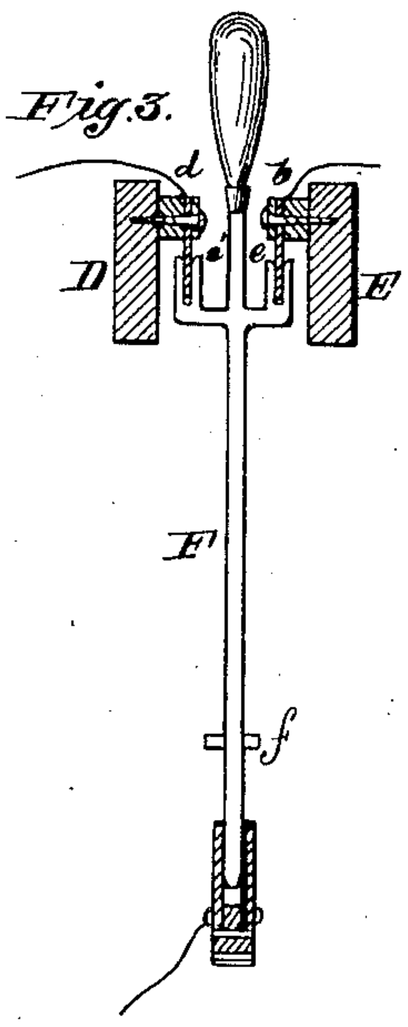
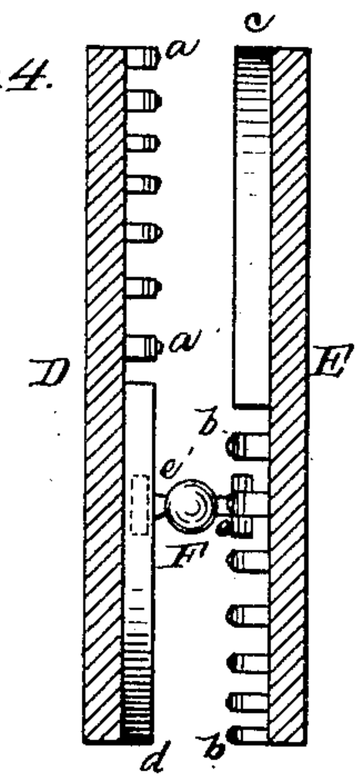


Fig. 4.



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INVENTOR:

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UNITED STATES PATENT OFFICE.

FRANK J. SPRAGUE, OF NEW YORK, N. Y.

ELECTRO-DYNAMIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 321,150, dated June 30, 1885.

Application filed May 20, 1885. (No model.)

To all whom it may concern:

Be it known that I, FRANK J. SPRAGUE, of New York city, in the county and State of New York, have invented a certain new and useful Improvement in Electro-Dynamic Motors, of which the following is a specification.

In my application Serial No. 157,699, of which this application is a division, is set forth and claimed a method of operating electro-dynamic motors, and in said application is described, also, an apparatus by which this method is carried into effect. The present application relates to such apparatus, the Commissioner of Patents having required me to embody this in a separate application. Such method consists in first introducing the motor into circuit with a very strong field and with a small difference of potential at the terminals of the armature-circuit, so that the motor starts slowly, then progressively raising the armature-circuit potential until that circuit is brought up to full potential, and then to still further increase the speed, weakening the field-magnet strength.

The apparatus by which this method is carried into effect is illustrated in the accompanying drawings, in which—

Figure 1 is a diagram of a motor with its connections, and of the apparatus embodying my invention; Fig. 2, a vertical longitudinal section of the commutator which I employ, with a diagram of the connections; Fig. 3, a vertical transverse section of the commutator, and Fig. 4, a top view of the commutator.

A is a shunt-wound electro-dynamic motor. 1 2 are the line-conductors from which said motor derives current. B is a series of resistance-coils for the armature-circuit, the terminals of which are brought to contact-blocks *a a;* and C is a similar series of resistances for the field-circuit connected with contacts *b b*. Situated opposite the contacts *a a* in a line with contacts *b b* is a long contact-block, *c*, connected in the field-circuit, and opposite the contacts *b b*, in line with contacts *a a*, is a similar long contact-block, *d*, in the armature-circuit. The contacts *a a* and *d* are mounted in the form of an arc on an insulating-strip, D, and contacts *b b* and *c* are similarly mounted on strip E. The contacts are preferably of the form shown, being supported off from the strip, so as to enter between the jaws of forked contacts *e* and *e'*, which are carried by a metal arm, F, pivoted at *f*, and working back and forth between the two series of contacts. To this arm F is permanently connected one of the terminals of the supplying-circuit. When the contacts *e e'* are at the highest position in the diagram Fig. 1, it will be seen that all the resistance-coils B are in the armature-circuit, but there are none in the field-circuit; consequently there is a strong field-magnet and weak armature when the motor is started by throwing in switch *g*. On then moving the contacts *e e'* down resistance is cut out of the armature-circuit, while as contact *e'* is moving on the long block *d* there is no change in the field-circuit. Thus the armature-circuit is gradually raised to the full potential, which is reached when the contact *e'* reaches the lowest of the contacts *a*. Then, to weaken the field and still further increase the speed or power, or both, of the motor, the contacts *e e'* are moved farther down, and as they pass from one contact *b* to another, resistance-coils C are placed in circuit and the field is gradually weakened, while the armature-circuit is not affected, because contact *e* is moving on the long block *c*. The ends of the two long blocks extend opposite each other, so that circuit is maintained in passing from the armature-resistance contacts to the field-resistance contacts. In practice these effects are produced by moving the pivoted arm F along the two series of contacts. The motor is thus made to start slowly, and then to gradually increase its speed up to the maximum. While the motor is running its field-magnet may be regulated without affecting the armature-current by changing the position of the moving contacts between contact *c* and contacts *b b*.

It will be understood that in the section Fig. 2 only the field-circuit resistance-contacts can be seen; hence the wire which leads to the armature resistance-contacts is broken off in this figure at *h*.

G is a switch for reversing the armature-circuit, and H a similar switch for reversing the field-circuit.

It is evident that the apparatus set forth may be employed to regulate the field and armature circuits of two or more motors connected together.

What I claim is—

1. The combination, with separate armature and field circuits, of an adjustable resistance in each of said circuits and a single switch for controlling both such resistances, substantially as set forth.

2. The combination, with an electro-dynamic motor, of a series of resistance-coils in the armature-circuit of the motor, contact-terminals for said coils, a contact-terminal for the field-circuit, and a contact connected with the supplying-circuit traveling between said field-resistance terminals and said field-circuit terminal, substantially as set forth.

3. The combination, with an electro-dynamic motor, of a series of resistance-coils in the field-circuit of the motor, contact-terminals for said coils, a contact terminal for the armature-circuit, and a contact connected with the supplying-circuit traveling between said resistance-terminals and said armature-circuit terminal, substantially as set forth.

4. The combination, with an electro-dynamic motor, of a series of resistance-coils in the armature-circuit of the motor and a series of resistance-coils in the field-circuit of the motor, a set of contacts for each series of resistances, and a contact connected with the supplying-circuit and movable along the contacts of both series, substantially as set forth.

5. The combination, with an electro-dynamic motor, of a series of resistance-coils in the field-circuit thereof and contact-terminals for said resistance-coils, a series of resistance-coils in the armature-circuit and contact-terminals therefor, a contact in the armature-circuit contiguous to said field-resistance contacts, a contact in the field-circuit contiguous to said armature-resistance contacts, and a contact connected with the supplying-circuit traveling between said field-resistance contacts and the contiguous armature-circuit contact, and between said armature-resistance contacts and the contiguous field-circuit contact, substantially as set forth.

This specification signed and witnessed this 15th day of May, 1885.

FRANK J. SPRAGUE.

Witnesses:

A. W. KIDDLE,

E. C. ROWLAND.