No. 724,928. PATENTED APR. 7, 1903.

C. T. J. OPPERMANN.

ELECTRIC CONTROLLER.

APPLICATION FILED FEB. 18, 1903.

NO MODEL. 6 SHEETS—SHEET 1.

FIG. 1.

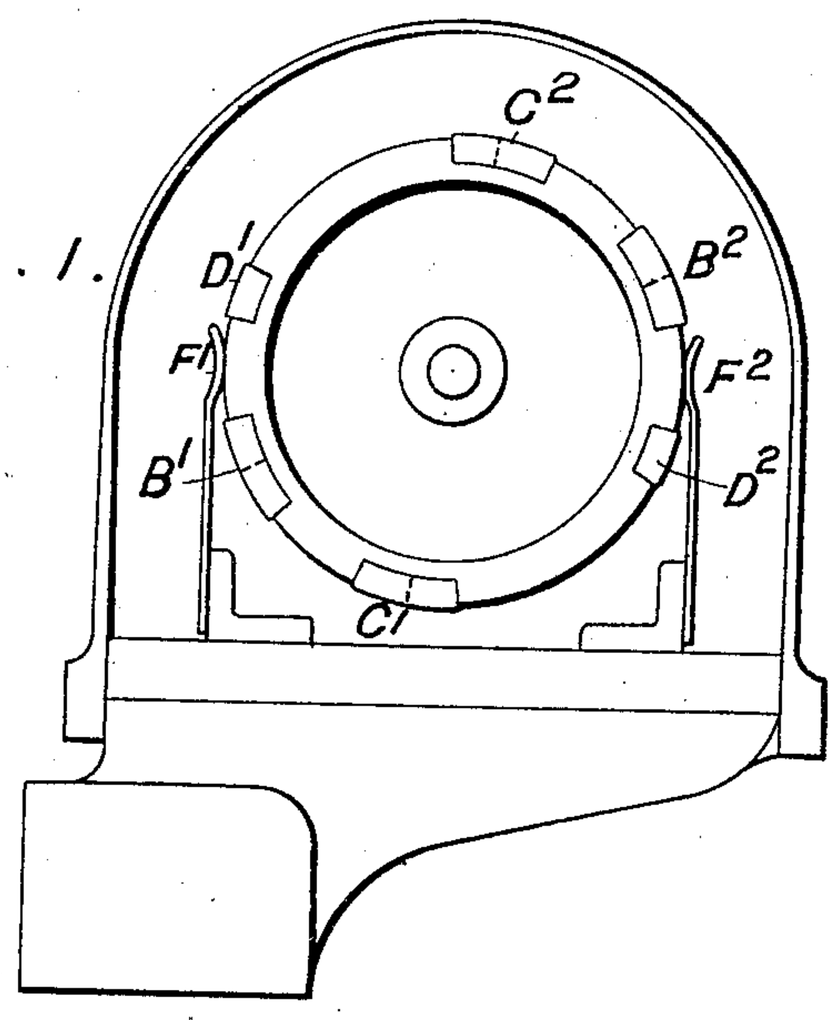
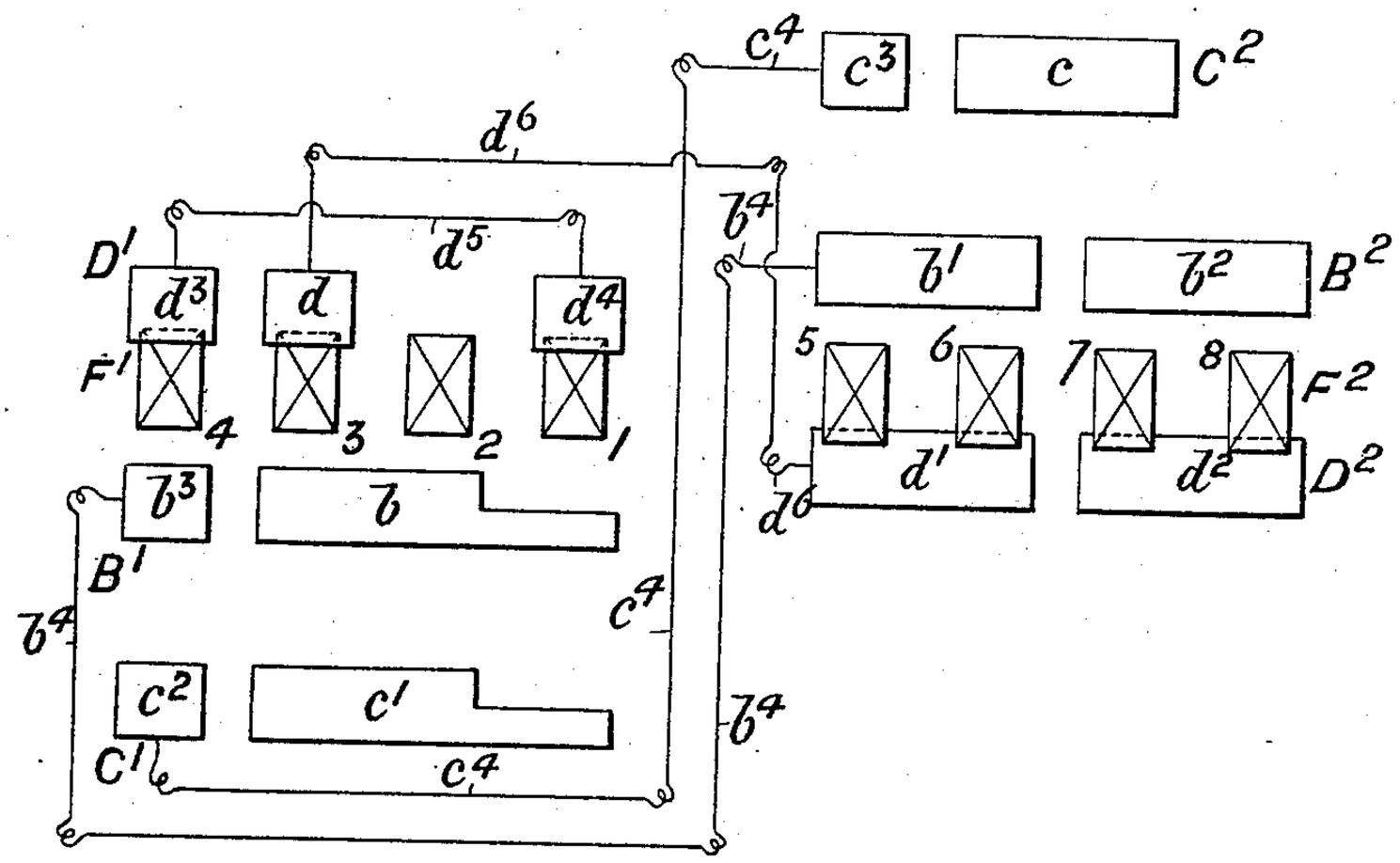


FIG. 6.



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NO MODEL. 6 SHEETS—SHEET 2.

FIG. 2.

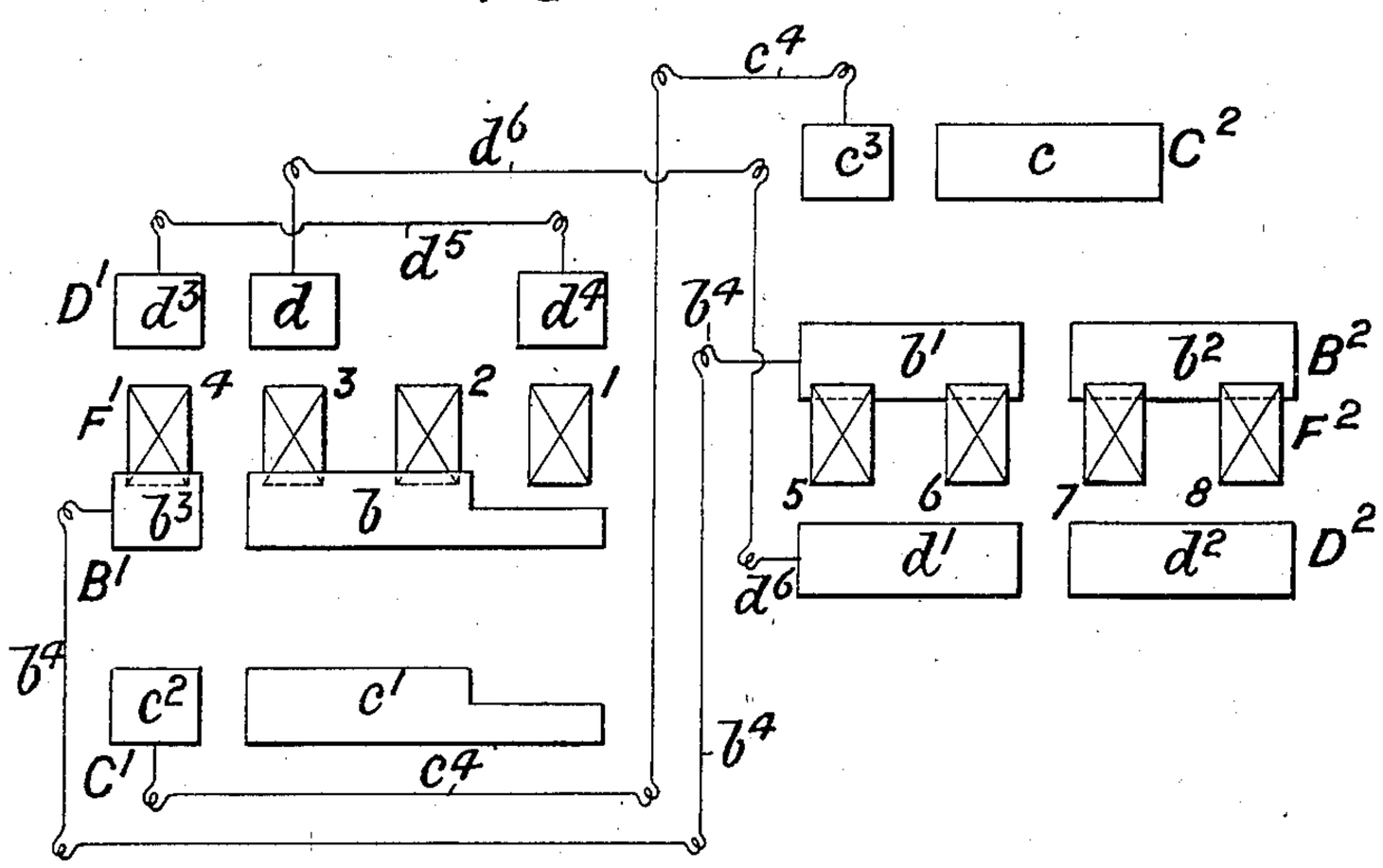
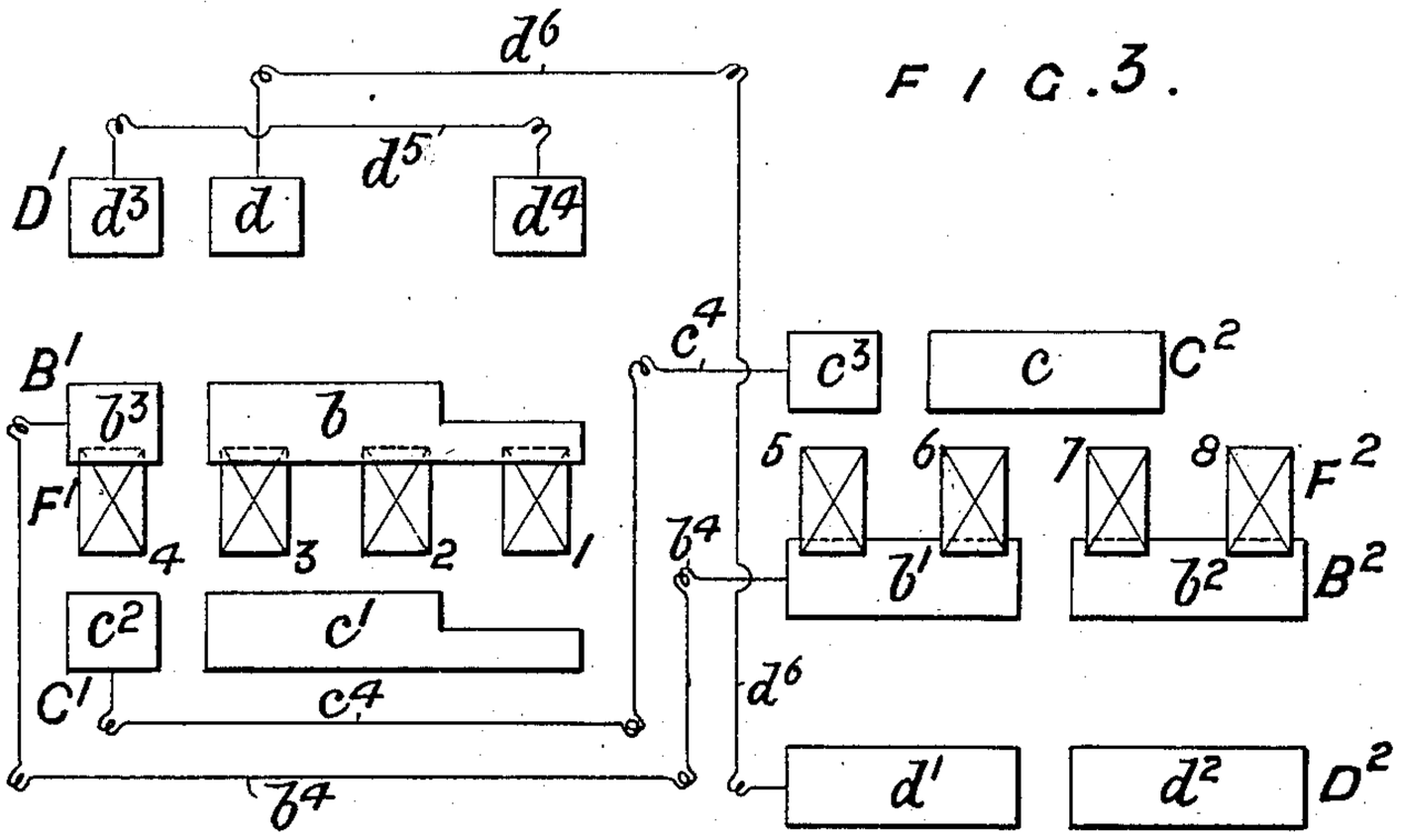


FIG. 3.



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NO MODEL. 6 SHEETS—SHEET 3.

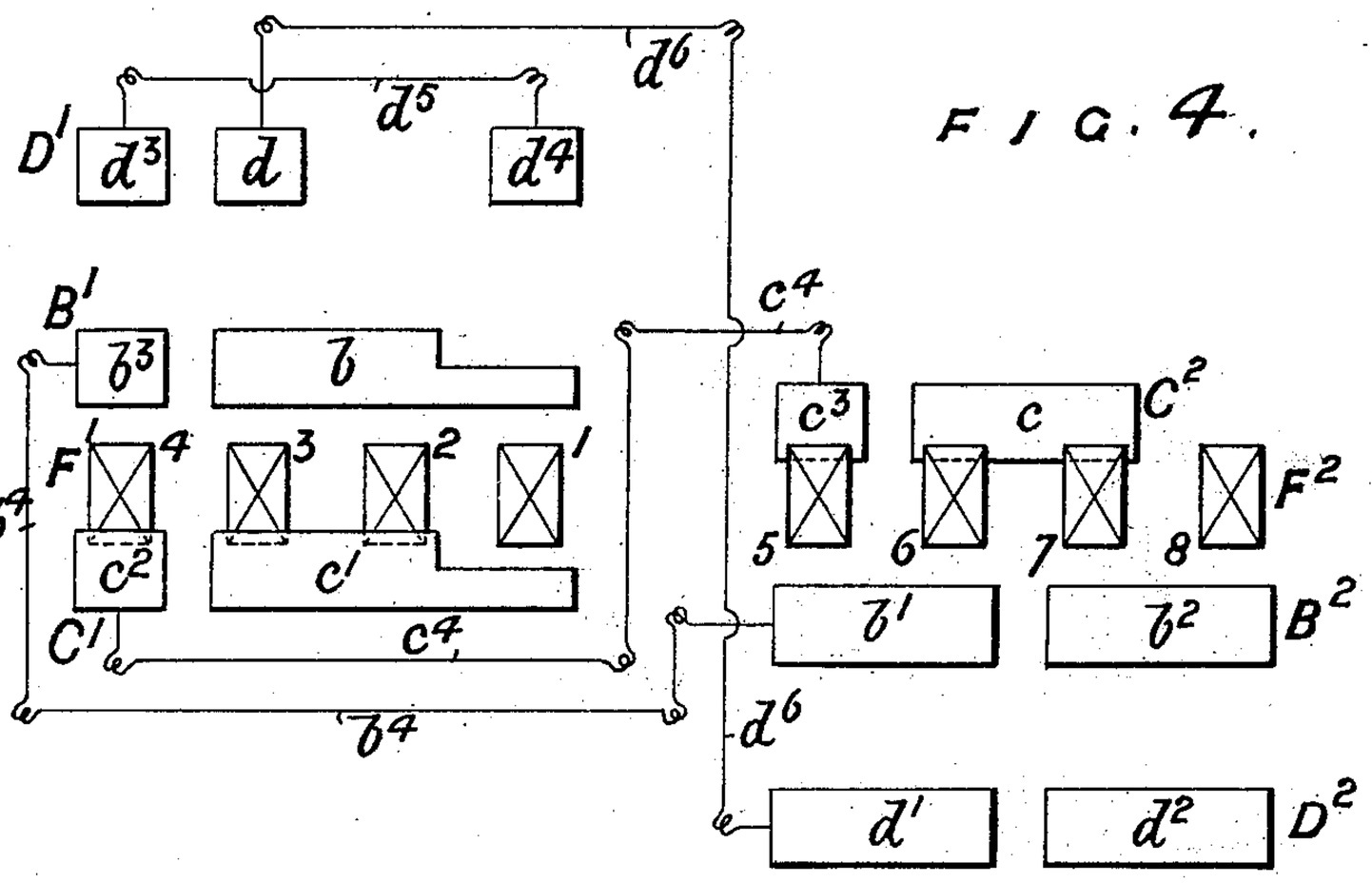

FIG. 4.

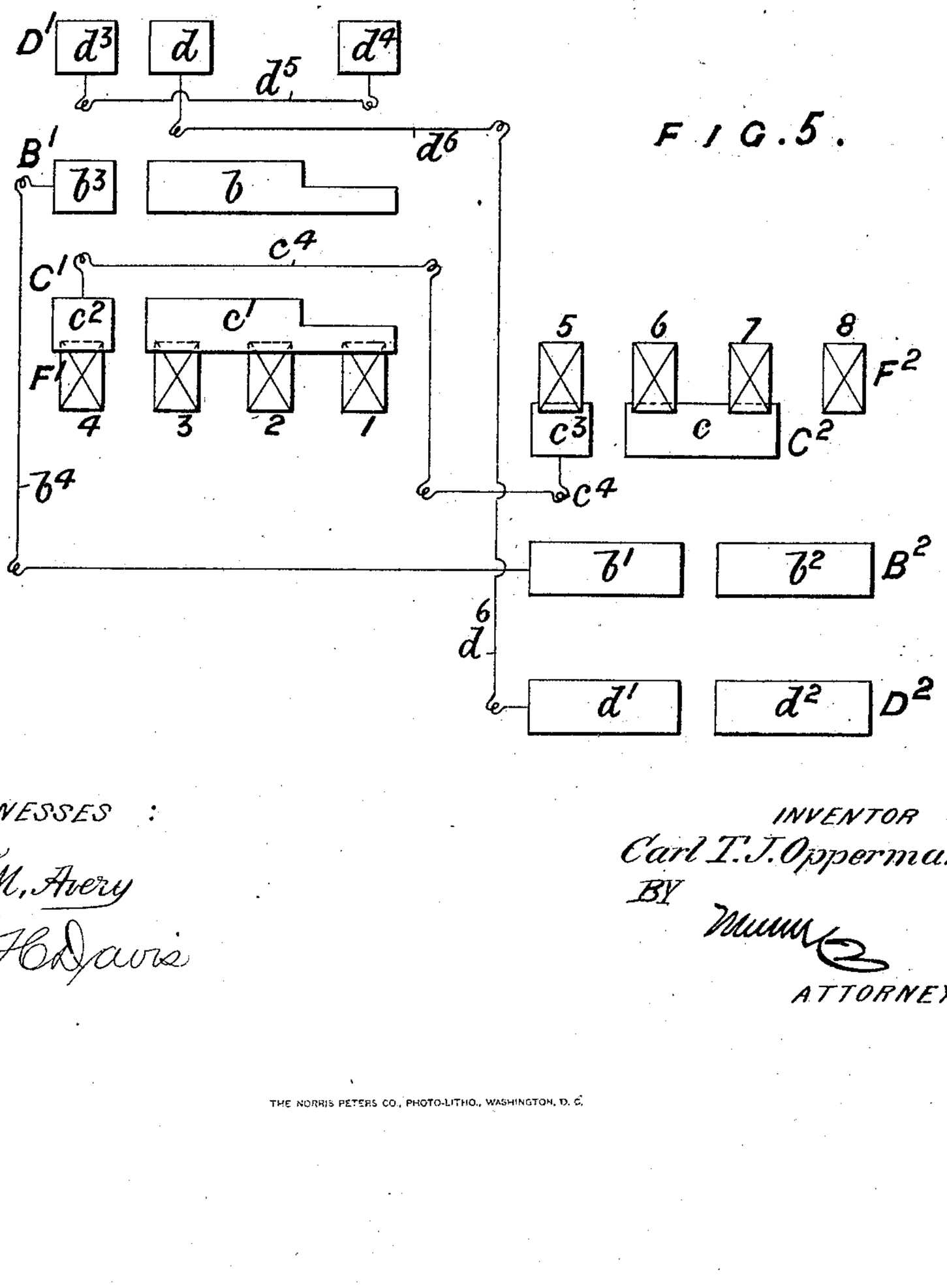

FIG. 5.

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NO MODEL. 6 SHEETS—SHEET 4.

FIG. 7.

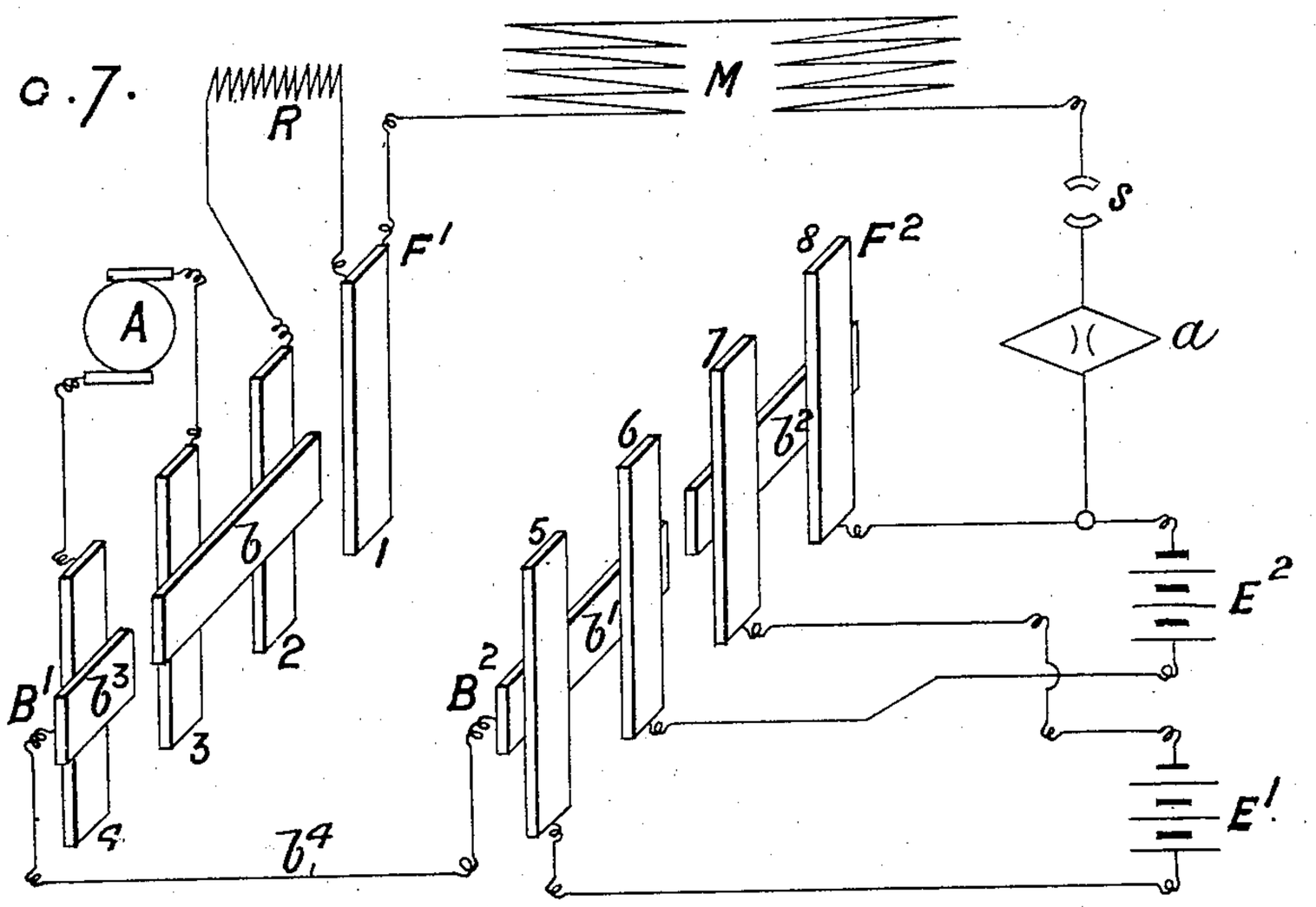
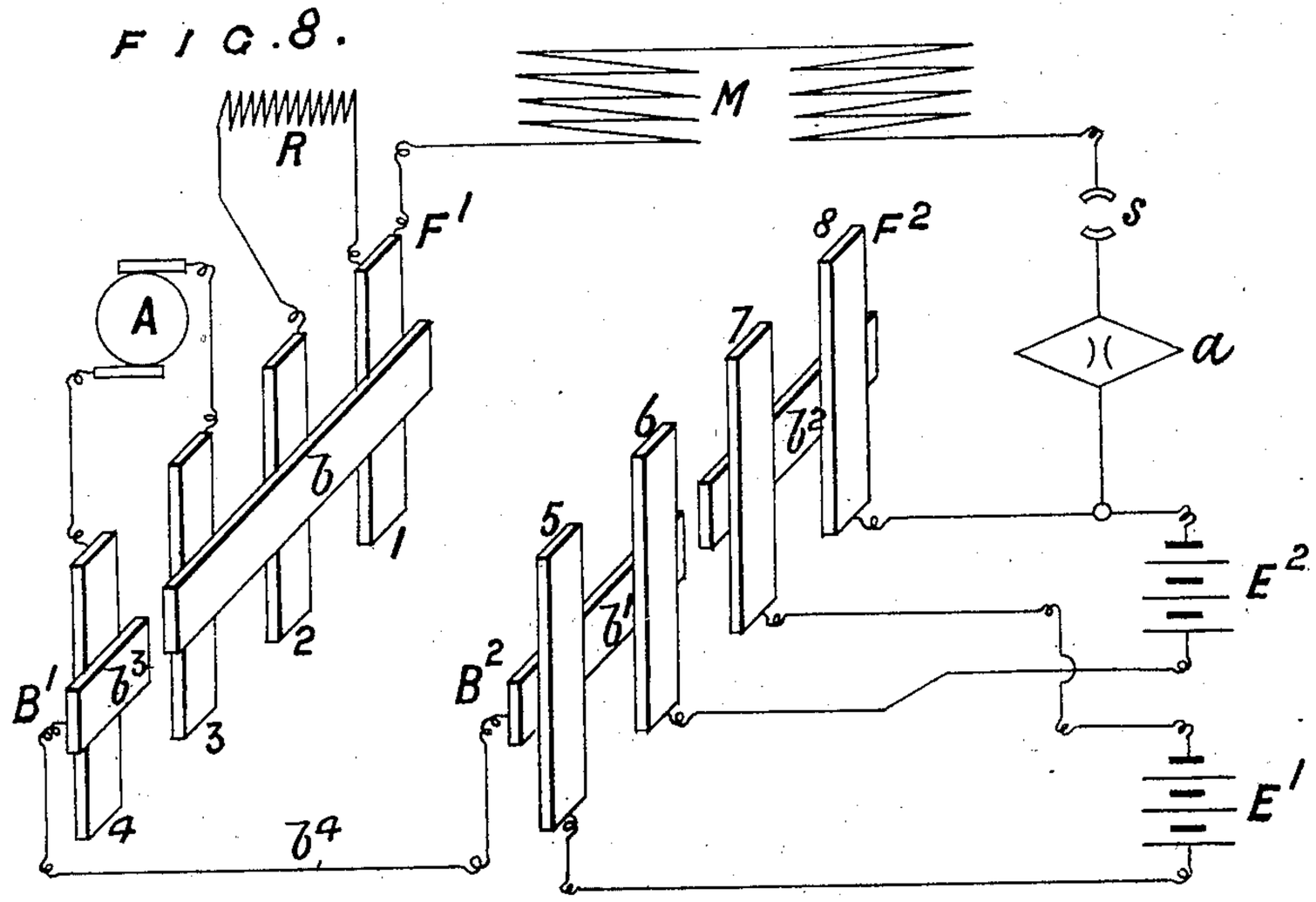


FIG. 8.



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NO MODEL. 6 SHEETS—SHEET 5.

FIG. 9.

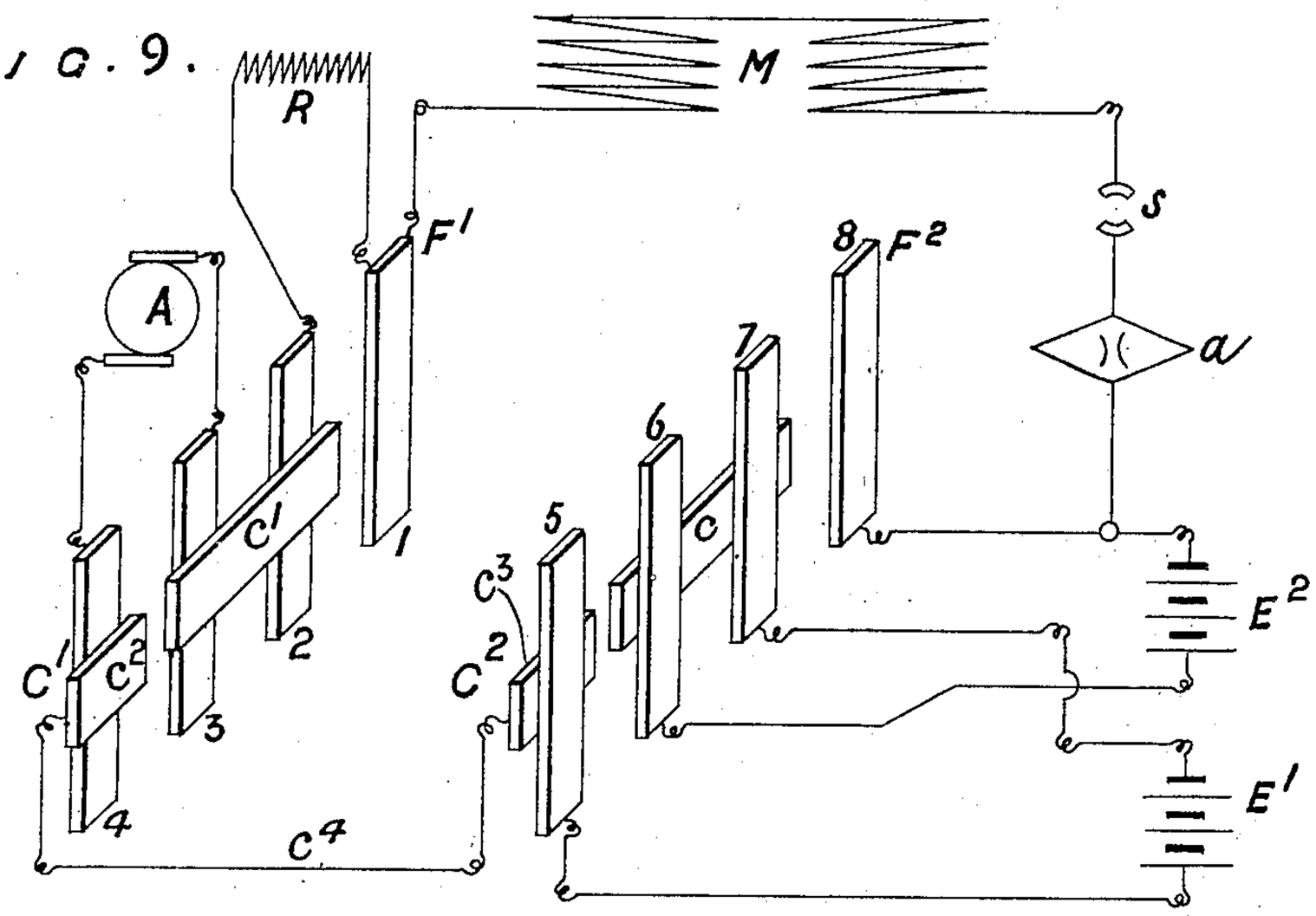
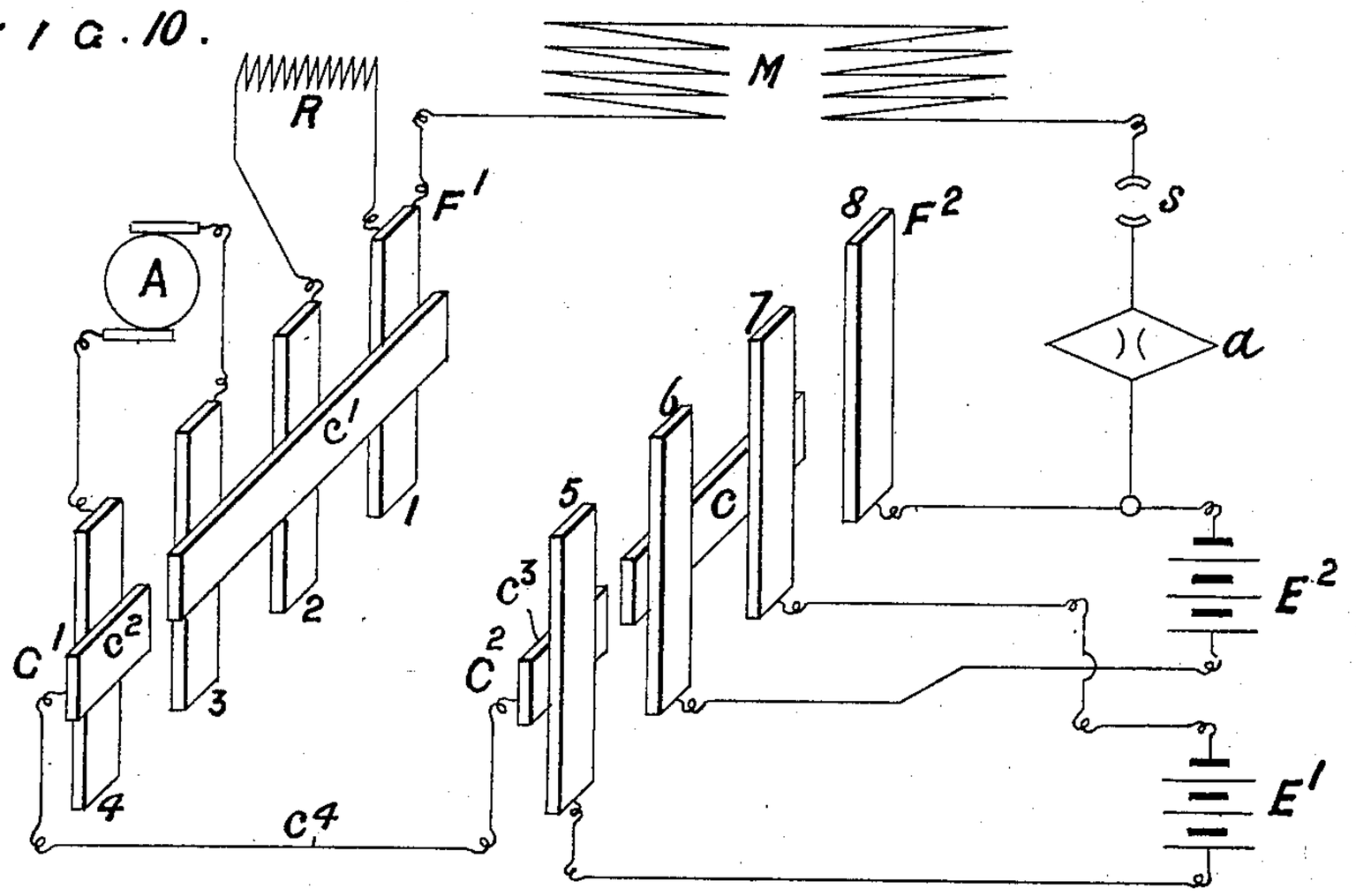


FIG. 10.



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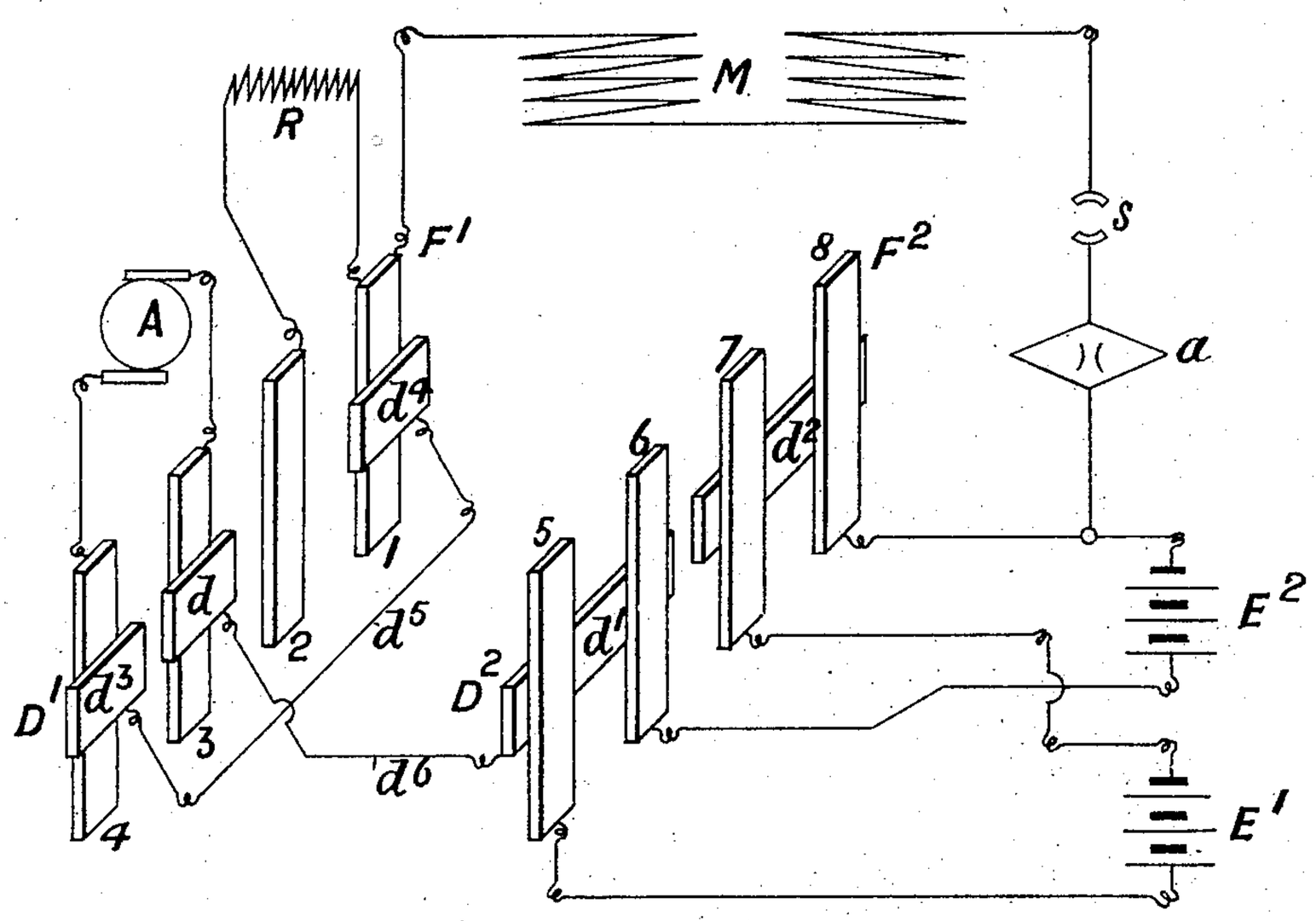
NO MODEL. 6 SHEETS—SHEET 6.

FIG. II.



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UNITED STATES PATENT OFFICE.

CARL TUNSTILL JOHN OPPERMANN, OF LONDON, ENGLAND.

ELECTRIC CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 724,928, dated April 7, 1903.

Application filed February 18, 1903. Serial No. 143,972. (No model.)

To all whom it may concern:

Be it known that I, CARL TUNSTILL JOHN OPPERMANN, electrical engineer, a subject of the King of Great Britain, residing at 2 Wynyatt street, Clerkenwell, London, England, have invented certain new and useful Improvements in Electric Controllers, of which the following is a specification.

My invention relates to a controller-switch for electrically-driven vehicles, and has for its object to enable, by means of one controller having comparatively few contact-pieces, four different speeds in the forward direction of running and one speed in the backward direction of running, to be obtained without the use of a separate reversing-switch.

Reference is to be had to the accompanying drawings, forming part of this specification, wherein—

Figure 1 is an end elevation of the controller. Figs. 2, 3, 4, 5, and 6 are developments showing the controller-contacts in four different positions of connection for forward running at four different speeds and one position for backward running. Figs. 7, 8, 9, 10, and 11 are perspective diagrammatic views of the connections corresponding to the positions shown in Figs. 2 to 6 to facilitate the comprehension of the description.

The movable part of the controller is cylindrical and rotatable about its axis and carries sets of bridging contact-pieces B′ B^2 C′ C^2 D′ D^2, arranged in diametrically opposite pairs, so that by rotating the cylinder in the one or other direction from its normal off position (shown in Fig. 1) the two sets of contacts of a pair will make contact respectively with two sets of stationary spring-contacts F′ F^2, respectively connected to the battery, to the motor-armature, to the field-magnets, and to a resistance, the bridging contact-pieces of the cylinder being adapted to connect together certain of the stationary contacts, so as to vary the connection, as hereinafter described, according to the angular position to which the cylinder is moved.

The battery is divided into two equal parts E′ E^2, and the connections are as follows: Distinguishing the sets of stationary contacts F′ by the numbers 1 2 3 4 and the contacts F^2 by the numbers 5 6 7 8, arranged vis-a-vis in the order shown, the positive and negative terminals of the battery E′ are respectively connected to the contacts 7 and 5 and those of battery E^2 to the contacts 8 and 6. The field-magnets M of the motor are connected, through an ammeter *a* and safety cut-out switch *s*, with contact 8 and with the opposite contact 1. The resistance R is connected with the contacts 1 and 2. The circuit-terminals of the armature A are connected with the contacts 3 and 4.

The arrangement of the bridging contacts relatively to each other and to the stationary contacts is such that when the controller is moved from the normal or off position to the first position for forward running, as shown in Figs. 2 and 7, the contacts 7 8 will be connected together by the bridge-contact b^2, and the contacts 5 6 will similarly be connected together by the bridge-contact *b*′ of the set B^2 at the same time that the contacts 2 3 will be connected together by the bridge-contact *b* of the set B′, while the contacts 4 5 of the opposite sets F′ F^2 will be connected by a permanent connection b^4 between the contact b^3 of the set B′ and the contact *b*′ of the set B^2. In this position the two parts E′ E^2 of the battery will be put into parallel, and the armature, the resistance, and the field-magnets will be in series with them. At the second position (shown in Figs. 3 and 8) the connections made by the contacts *b*′ b^2 will remain unaltered, while those made by contact *b* will alone be varied by said contact making connection between the contacts 3 and 1 of set F′, so that the resistance will be cut out. At the third position (shown in Figs. 4 and 9) the contacts 6 and 7 only of the set F^2 will be connected together by the contact *c* of the set C^2, and the contacts 2 3 of the set F′ will be connected together by the contact *c*′ of the set C′, contacts 4 5 being connected by contacts c^2 c^3, joined permanently by c^4, so that the whole of the cells will be put into series with each other and with the motor and the resistance, which is again put into circuit. At the fourth position (shown in Figs. 5 and 10) the connections remain unaltered, except that contact *c*′ now joins contacts 1 and 3, so that the resistance will be cut out. The same results will be produced in converse order on the return of the controller to the off position.

On moving the controller in the reverse di-

rection from the normal off position for the purpose of reversal the two parts of the battery will be in parallel by the connection of contacts 5 and 6, 7 and 8 by the contacts d' d^2 of the set D^2; but the contact 4 will in this case be connected to contact 1 by contacts d^3 d^4, connected by a permanent connection d^5, while the contact 5 of set F^2 will be cross-coupled to contact 3 of set F' by contacts d' d, which are permanently connected by d^6, so that the resistance will be cut out and the direction of the current in the armature A will be reversed.

In connection with the controller I provide charging-terminals, respectively connected with contacts 5 and 8 of the set F^2, to which the corresponding terminals on the charging-mains are connected when the controller is placed in the fourth position (shown in Fig. 10) and the safety cut-out switch s is open.

I claim—

A controller-switch for electrically-propelled vehicles, comprising a cylindrical part rotatably mounted in rubbing contact with two stationary sets each of four spring-contact fingers which are electrically connected to the poles of two equal sets of battery-cells, to the armature-brushes of the motor, to a resistance, and to the one terminal of the motor field-coils whereof the other terminal is connected to the one pole of one of the sets of battery-cells; the said cylindrical part carrying pairs of rows of bridging contact-pieces so arranged and so electrically interconnected and so disposed relatively to the spring contact-fingers, that by means of three pairs of rows of bridging-contacts five permutations of electrical connection can be effected corresponding to four different speeds in forward running and reversal at one speed, as described.

CARL TUNSTILL JOHN OPPERMANN.

Witnesses:
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T. W. KENNARD.