

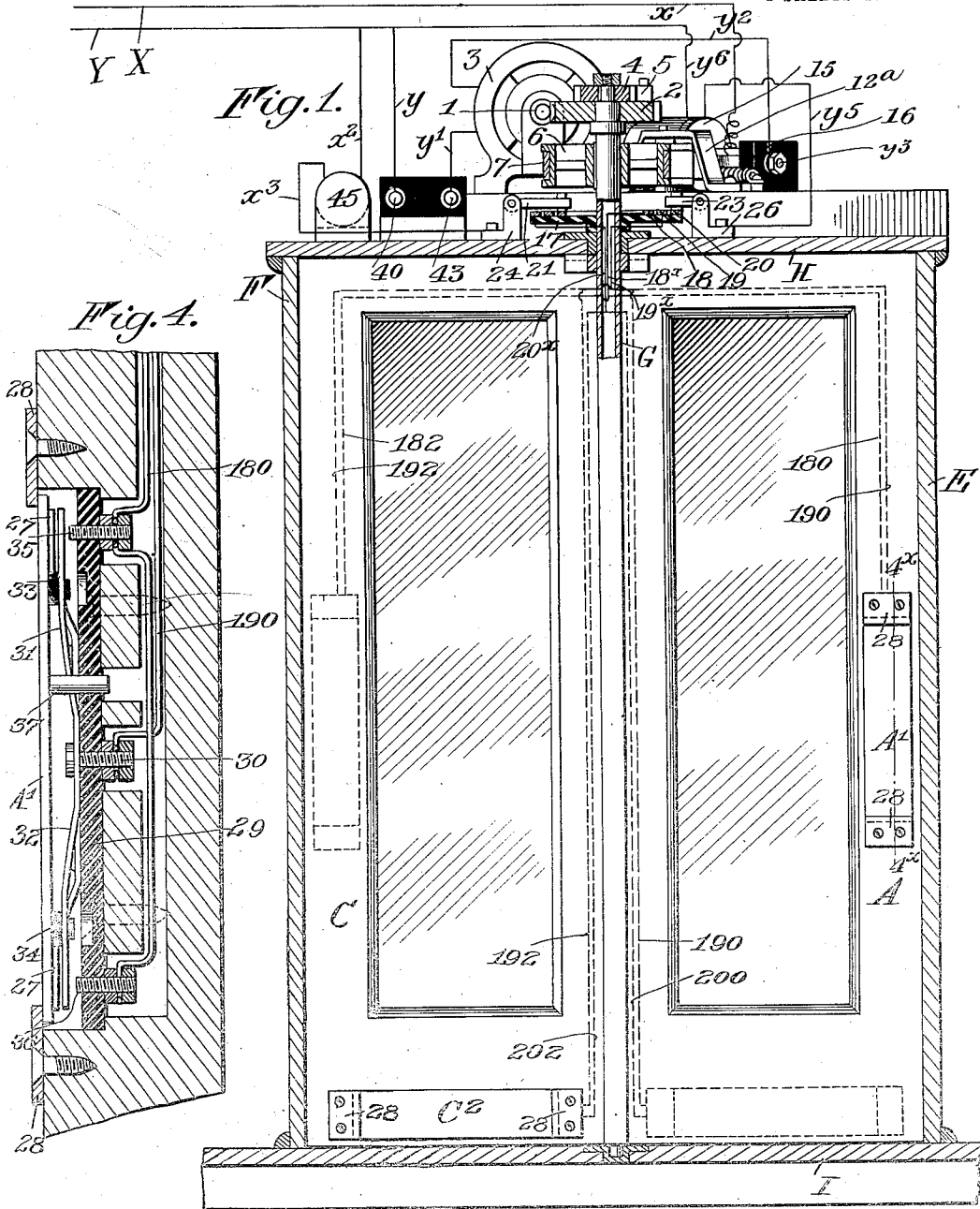
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AUTOMATIC DOOR OPERATING MECHANISM.

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1,119,080.

2 SHEETS-SHEET 1.



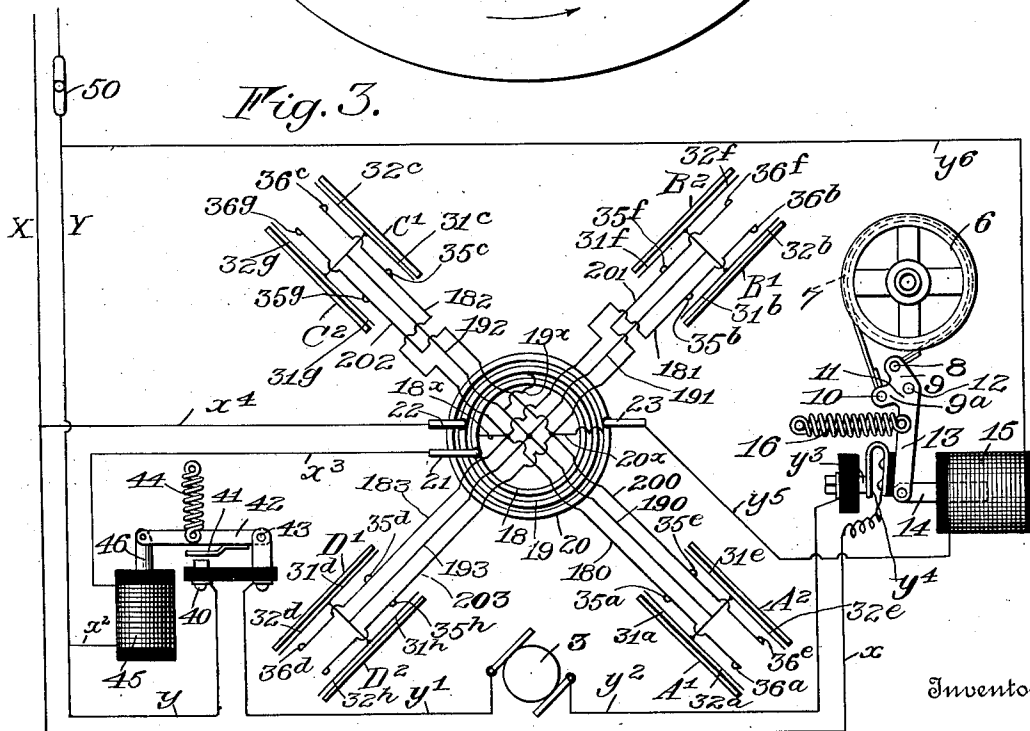
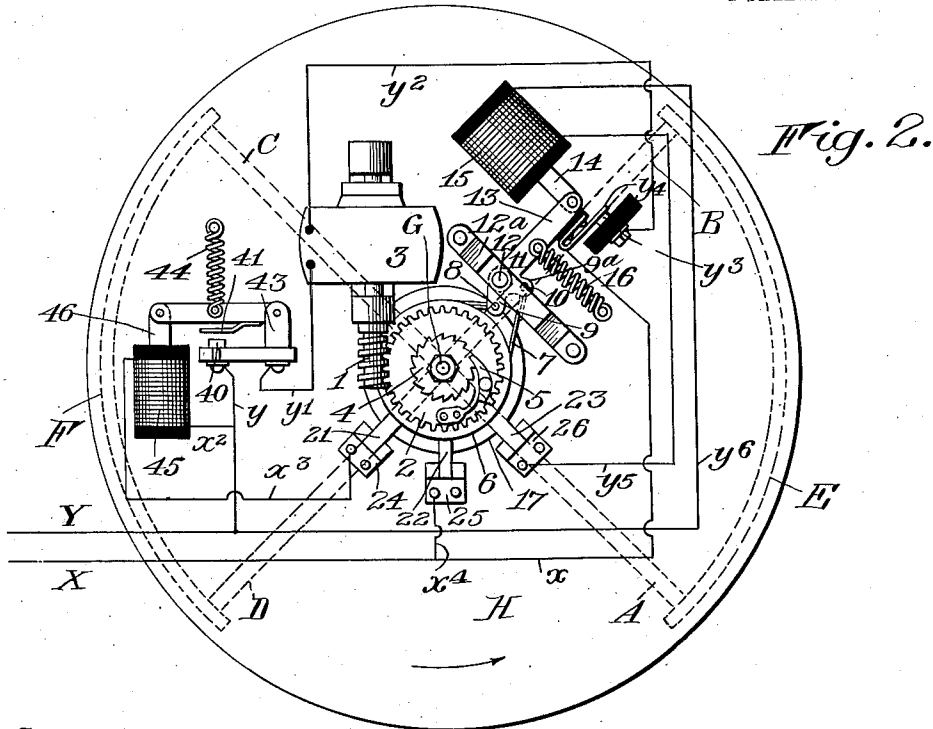
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2 SHEETS--SHEET 2.



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AUTOMATIC DOOR-OPERATING MECHANISM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ROBERT HOPE-JONES, of North Tonawanda, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Automatic Door-Operating Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of the specification, and to the reference-numerals marked thereon.

The present invention has for its object to provide a mechanism for automatically operating doors and adapted particularly to be used in connection with multipanel revolving doors, whereby the latter may be caused to move in advance of the operator.

A further object of my invention is to provide an operating or driving mechanism adapted to operate intermittently and controlling devices therefor actuated by the operator for setting said mechanism into operation or arresting it, as may be required.

To these and other ends the invention consists in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings: Figure 1 is a side elevation partly in section of a revolving door provided with operating and controlling mechanism constructed in accordance with my invention, Fig. 2 is a top plan view thereof; Fig. 3 is a detail diagrammatic view showing the circuit arrangement of the controlling mechanism; and Fig. 4 is a sectional view taken on the line 4*-4* of Fig. 1, showing one of the contact making members.

Similar reference numerals throughout the several figures indicate the same parts.

In illustrating my present invention, I have shown it applied to the well known type of revolving doors comprising a plurality of panels, usually four in number, indicated by A, B, C, and D, rotating in a casing composed of segmental side walls, E and F, as shown in Fig. 2. The several doors radiate from a central shaft G on which they are supported, said shaft being journaled near its upper end and at the lower end in the top H and the bottom I of the casing. In the operation of doors of this

character a person stepping into the casing at one side or the other pushes the door or panel immediately in front of him, such as the door A or C, causing all of the doors to revolve until the particular panel which is ahead of him passes beyond the segmental side of the casing and provides an exit space. In the construction of doors of this character it is customary to employ four panels which are arranged at right angles to each other and in order to provide ample space for the accommodation of an adult person and permit him to walk through the casing and use his normal length of step, it is necessary to make the doors of considerable width and in order to obtain a substantial structure, the doors are necessarily quite heavy. It is also customary to provide the doors with plate glass panels and in many instances, especially in the more ornamental structures, the frame work or sash is made wholly of metal, consequently the structure as a whole is ponderous and somewhat difficult to operate, especially if the door is in position of rest and each person desiring to pass through the doorway is required to start it in motion.

To facilitate the operation of the door, so that it may be rotated intermittently at the volition of the operator, I have provided an operating mechanism which will be actuated whenever he attempts to push a door ahead of him and the controlling devices by which the driving mechanism is started and arrested are so arranged that the door or doors will continue to revolve as long as the operator follows it in the direction of its movement and exerts a slight pressure upon the operating member. The controlling devices also embody an arresting member which is thrown into operation in the event the person operating the door should halt or so retard his movement that the door following him engages a portion of his body.

In carrying out my invention I have mounted upon the top H of the door casing a driving mechanism consisting of a worm 1 and a gear wheel 2, the former being driven from any convenient source of power, preferably an electric motor, indicated by 3. The gear wheel 2 is journaled loosely upon the upwardly projecting end of the vertical door shaft G and imparts rotary movement thereto in one direction by means of a ratchet wheel 4 keyed to the shaft with

which a driven connection is maintained by means of a spring operated dog or pawl 5, this connection causing the doors to be moved in one direction and also permitting them to move in the same direction at an increased rate of speed, should an operator impart momentum to the doors greater than the rate of speed at which they may be operated by the driving devices. Also mounted on the shaft G and rigidly connected thereto is a brake wheel 6 encircled by a brake band 7, one end of which is connected, as indicated at 8, to an arm 9 of a bell crank lever 11, its opposite extremity 10 being attached to an arm 9^a of the bell crank lever which is pivoted at 12 to the bracket 12^a, the opposite extremity 13 of the lever being connected by a rod 14 to the movable core or element (not shown) of an electromagnet in the form of a solenoid 15. Co-operating with the lever 11 is a spring 16 which normally operates in a direction to rock the bell crank lever to disengage the brake band 7 from the wheel 6. Also secured to the shaft G is a disk 17 of insulating material provided on one of its faces with concentric collector rings 18, 19 and 20 with which respectively engage wipers or brushes 21, 22 and 23 pivotally supported in stationary brackets 24, 25 and 26 secured to the top H of the door casing. The shaft G is preferably tubular and passing downwardly therethrough are the conductors 18*, 19* and 20* from each of which lead a plurality of branch wires connected to the contacts controlled by the operating and arresting plates or members mounted on the several door panels, as will be further described.

Arranged on the rear face of each door or panel is the operating member or push plate, indicated in the diagrammatic illustration Fig. 3 by the reference letters A', B', C' and D'. In the forward face of each door is a similar plate which may be located at any desired position to engage some portion of the body of a person with which it may be brought into contact, but preferably arranged at the lower or bottom edge of the door in such position that it may be actuated by engagement with a person's heel in the event their step is faulty or retarded. In Fig. 3 these arresting members are indicated by A², B², C² and D². The detail construction of the members just referred to is shown in Fig. 4. The operating members or push plates are preferably arranged in recesses in the rear faces of the door in which they are yieldingly supported by springs 27 normally tending to project them into engagement with the overlapping edges of the stop plates 28. Within the door recess is a block 29 of insulating material through the center of which passes a stud 30 in electrical connection with a leaf spring

having the ends 31 and 32 carrying insulating studs 33, 34, and adapted to engage the contact points 35 and 36 which are also supported on the insulating block 29. From this arrangement of the parts it will be seen that slight pressure applied upon the plate or member A' will move the latter inwardly against the tension of either or both of the springs 27 permitting the contact spring at one or both ends to engage the contacts 35 and 36. The push plate may be guided upon studs or pins, as indicated at 37.

The push plates just described are adapted to close the circuit of the door operating motor either directly or by closing an auxiliary circuit provided with an electromagnetic device for causing the operation of the motor, the latter arrangement being shown in the present instance. On referring now to the diagrammatic figure of the drawings, I have there illustrated the duplication of various contacts referred to in the description of Fig. 4 as they appear on the several door panels and in each case they are indicated by the numerals before applied, but each of these is supplied with the proper exponent *a*, *b*, *c*, or *d*, according to the particular panel A, B, C or D on which the parts are respectively located. In this illustration it will be seen that the conductor 18* is connected by the wires 180, 181, 182 and 183 respectively, with the contacts 35^a—36^a, 35^b—36^b, 35^c—36^c, 35^d—36^d of the sets of normally open contacts operated by the several push plates A', B', C', D'. The contact springs of the plate last mentioned, the ends of which are indicated in Fig. 4 by 31 and 32, are respectively connected with the conductor 19* by the branch wires 190, 191, 192 and 193.

Current for operating the motor 3 may be obtained from any suitable source supplied over the line wires X and Y, and interposed in the circuit between the source supply and the motor is a normally open switch comprising the contacts 40 and 41, the latter being mounted on the switch arm 42 pivoted on the binding post 43 and retracted into inoperative position by a spring 44. Leading from the line wire Y to the contact 40 is a conductor *y* and from the binding post 43 to one of the brushes of the motor 3 is the conductor *y'* which is continued from the other brush of the motor, as indicated at *y'*², to a contact *y'*³ which is normally engaged by a spring contact plate *y'*⁴ carried by the brake operating lever 13. The contact plate *y'*⁴ is connected to the line wire X by the conductor *x*.

The switch arm 42 for closing the motor circuit is actuated by the magnet or solenoid 45, the armature or core 46 of which is connected to the switch arm 42. One terminal of the solenoid 45 is connected to the line wire Y by a conductor *x*² and from the other

terminal thereof a conductor x^3 leads to the brush 21, which bears on the ring 18. The line wire X is connected by a conductor x^4 to the brush 22 which bears on the ring 19. The conductors 18^x-19^x leading to the contacts on the doors are, as previously described, connected to the collector rings 18 and 19, from this it will be seen that the solenoid 45 is arranged in a circuit comprising all of the various sets of contacts, so that it may be energized by pressure upon any one of the push plates, as will be understood. The energizing of the solenoid 45 effects the operation of the switch 42 and the closing of the motor circuit.

The operation of the mechanism so far described, will now be clearly understood. A person approaching the door A in the direction of the arrow indicated in Fig. 2, will naturally place his hand against the plate A' in position to push the door ahead of him. Slight pressure on the plate will cause the latter to move inwardly and close the operating circuit through either or both of the contacts $35^a, 36^a$, when the following circuit will be completed; line wire Y, conductor x^2 , solenoid 45, conductor x^3 , brush 21, ring 18, wire 18^x , wire 180, contact 35^a or 36^a , spring 31^a or 32^a , wire 190, wire 19^x , ring 19, brush 22, wire x^4 , conductor X. Current traversing the circuit just described energizes the magnet 45 closing the motor circuit switch, whereupon the armature of the motor will be rotated. Removal of pressure on the push plates breaks the contacts $35^a, 36^a$, and the motor will then stop.

The arresting members are constructed in all respects identical with the push members, and are adapted when actuated to close a circuit which will energize the solenoid 15 and break the motor circuit, at the same time applying the brake to retard the movement of the door.

In Fig. 3 I have illustrated the duplication of the contacts closed by the arresting members as they appear on the several door panels; the lettering being the same as used in Fig. 4, but with the exponents e, f, g and h according to the particular panel, A, B, C and D on which the parts are respectively located. In this illustration it will be seen that the conductor 20^x leading from the ring 20 is connected by the wires 200, 201, 202, 203 respectively with the contacts $35^e-36^e, 35^f-36^f$ and 35^h-36^h of the sets of normally open contacts operated by the several plates A², B², C² and D². The contacts springs of the last mentioned plates, are connected to the wires 190, 191, 192 and 193 which are joined to the wire 19^x , and which serve as common conductors for the circuits of both the push and arresting plates. The circuit is completed by a conductor y^5 which leads from the brush 23, engaging the ring 20, to one terminal of the

magnet 15, the other terminal of the latter being connected to the line wire Y by the conductor y^6 .

The operation of the arresting mechanism will be understood from the following: In case the person following the door A retard his step sufficiently, the arresting plate D² on the door D will be actuated by contact with his heel, and close the circuit, as follows: line wire Y, wire y^6 , solenoid 15, wire y^5 , brush 23, conductor 20^x , wire 203, contact 35^h or 36^h , spring 31^h or 32^h , wire 193, conductor 19^x , ring 19, brush 22, wire x^4 , line wire X. Current traversing this circuit will energize the magnet 15, which effects the movement of the brake operating lever 11. The intermediate result of this movement is to separate the switch contacts y^3, y^4 , thereby breaking the motor circuit and stopping the rotation of the motor. The continued movement of the lever 11 tightens the brake band on the drum 6 and arrests the motion of the door due to its momentum. If pressure on the arresting plate is removed the circuit through magnet 15 is broken, permitting the spring 16 to release the brake and close the motor circuit at the contacts y^3, y^4 , thereby continuing the motion of the door.

A main switch 50 is interposed in the main line to shut off the current in case of any failure of the controlling mechanism to operate properly, in which event the ratchet 5 will permit the doors to be rotated in the usual manner.

Door operating mechanism constructed in accordance with my invention, is simple in construction and consists of few parts which may be readily applied to structures of the character described which are now in use.

While I have described the operating and arresting members as being in the form of push plates it will be understood that they may be otherwise constructed, and also that the circuits shown may be altered so that the motor and brake mechanism may be started by opening normally closed sets of contacts without departing from the spirit of my invention.

I claim as my invention.

1. The combination with a revolving door having a plurality of panels, an electric motor for driving it, a normally open line circuit for supplying current to the motor, two sets of contacts, arranged on opposite sides of the door panels, the contacts on one side being adapted when operated to cause the closing of the motor circuit, and the contacts on the other side being adapted when operated to cause the breaking of the motor circuit.

2. The combination with a revolving door having a plurality of panels, an electric motor for driving it having a circuit leading through a normally open switch and an electromagnet for operating said switch, of

movable members on the rear sides of the panels adapted to operate manually, other movable members on the forward sides of the panels adapted to be operated by engagement with a portion of a person's body, separate sets of contacts controlled by said members, an operating circuit for the electromagnet leading through the first mentioned sets of contacts, adapted to be completed by the operation of any of the first mentioned members, a normally closed switch for breaking the motor circuit, an electromagnet for opening said switch, and an operating circuit leading through said electromagnet and through sets of contacts, closed by the operation of any of the second mentioned members.

3. The combination with a revolving door having a plurality of panels, a normally inoperative driving device having driving connection therewith, of movable members on the door panels, devices controlled by the movement of the members for starting the driving device, and other movable members also arranged on the door panels, and adapted when operated to render the devices actuated by the first named members inoperative.

4. The combination with a revolving door, a normally inoperative driving device having driving connection therewith, and a brake for arresting the movement of the door which is normally set in operative position, of movable members on the door panels, and devices actuated upon the movement of the members for actuating the brake and stopping the driving device.

5. The combination with a revolving door, a normally inoperative driving device having driving connection therewith, and a brake for arresting the movement of the door which is normally set in operative position, of movable members on the door panels, devices actuated upon the movement of the members for starting the driving device, and other movable members also arranged on the door panels and adapted when operated to stop the driving device and actuate the brake.

6. The combination with a revolving door having a plurality of panels, a tubular shaft connected to the door, an electric motor and driving connections between the shaft and motor, a line circuit leading to the motor, a switch therein and an electromagnetic device for operating it, of a plurality of movable members located on the several door

panels, contacts controlled by them and a circuit for operating the electromagnetic device comprising conductors arranged in the tubular shaft and leading through said contacts.

7. The combination with a revolving door embodying a plurality of panels, a shaft connected thereto, a motor and driving connections between it and the shaft, a brake mechanism cooperating with the shaft, of a line circuit for supplying current to the motor, a switch arranged therein, an electromagnet for operating the switch, two groups of movable members mounted on the door panels and contacts operated thereby, a circuit for said magnet extending through the contacts of one group of movable members, a switch for breaking the motor circuit, an electromagnet for operating the switch and brake mechanism, and a circuit for said magnet extending through the contacts of the other group of movable members.

8. The combination with a revolving door, a tubular shaft connected thereto, a motor and driving connections between it and the shaft, a brake mechanism adapted to cooperate with the latter, of movable members carried on the door, contacts controlled thereby, a line circuit for the motor and a normally open switch in the circuit, electromagnets for operating the switch and said brake mechanism, operating circuits for said magnets comprising conductors leading through the shaft and connected to the contacts, collector rings and brushes cooperating with them and disposed in said circuits, one of said parts being carried on the shaft.

9. The combination with a revolving door, having a plurality of panels, an electric motor for driving them, a line circuit for supplying current to the motor, and a normally open switch in said circuit, of an electromagnet for operating the switch, two groups of movable members on the door and contacts controlled by each member, an operating circuit for the magnet leading through the contacts of one group, a second switch for causing the breaking of the motor circuit, a second electromagnet for operating said second switch, and a circuit for the last mentioned magnet, leading through the contacts of the other group.

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