

G. KORYTOWSKI.
ELECTRICALLY OPERATED DOOR.
APPLICATION FILED JAN. 5, 1912.

1,018,246.

Patented Feb. 20, 1912.

4 SHEETS—SHEET 2.

Fig. 4.

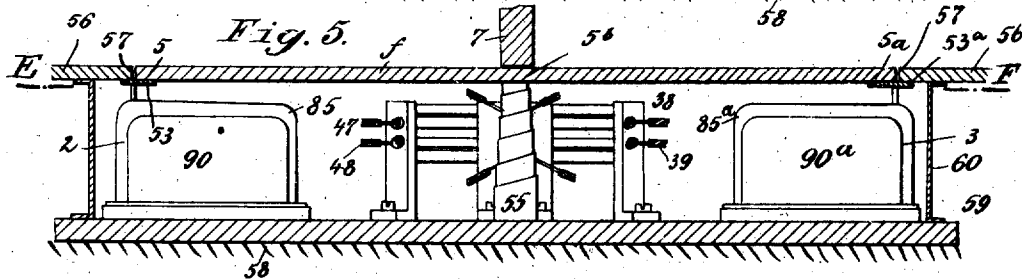
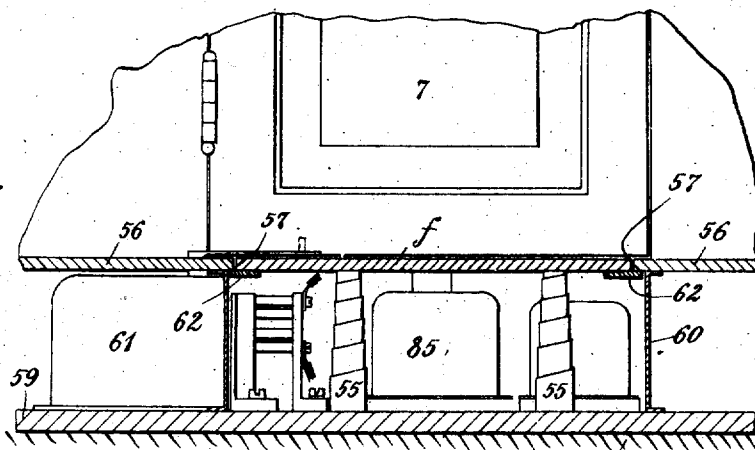
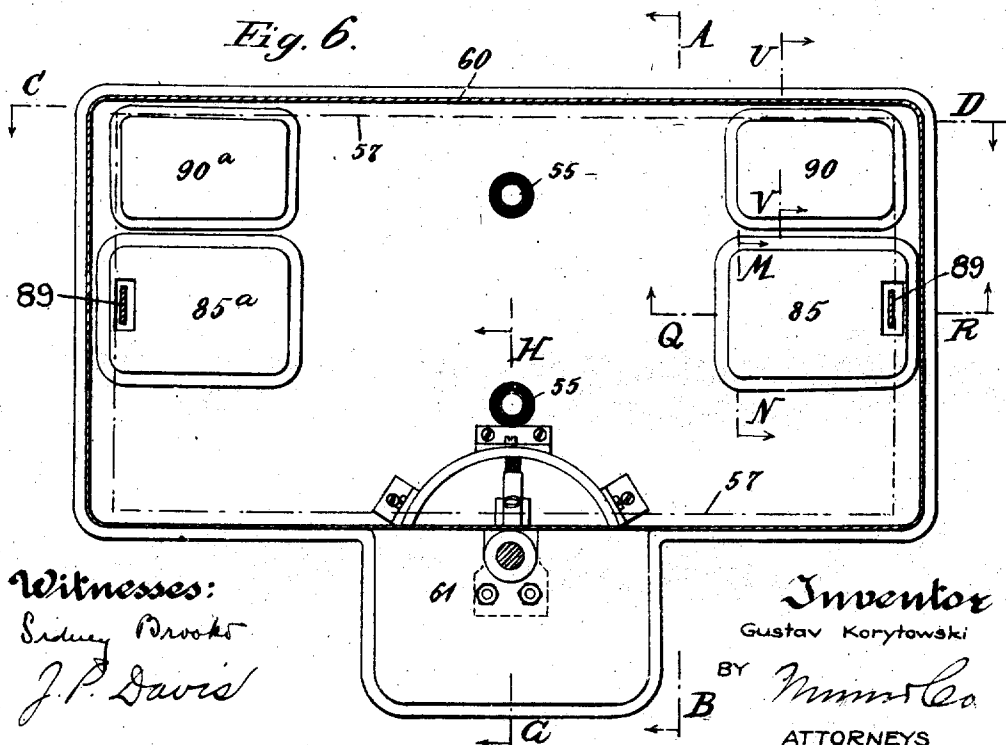


Fig. 6.



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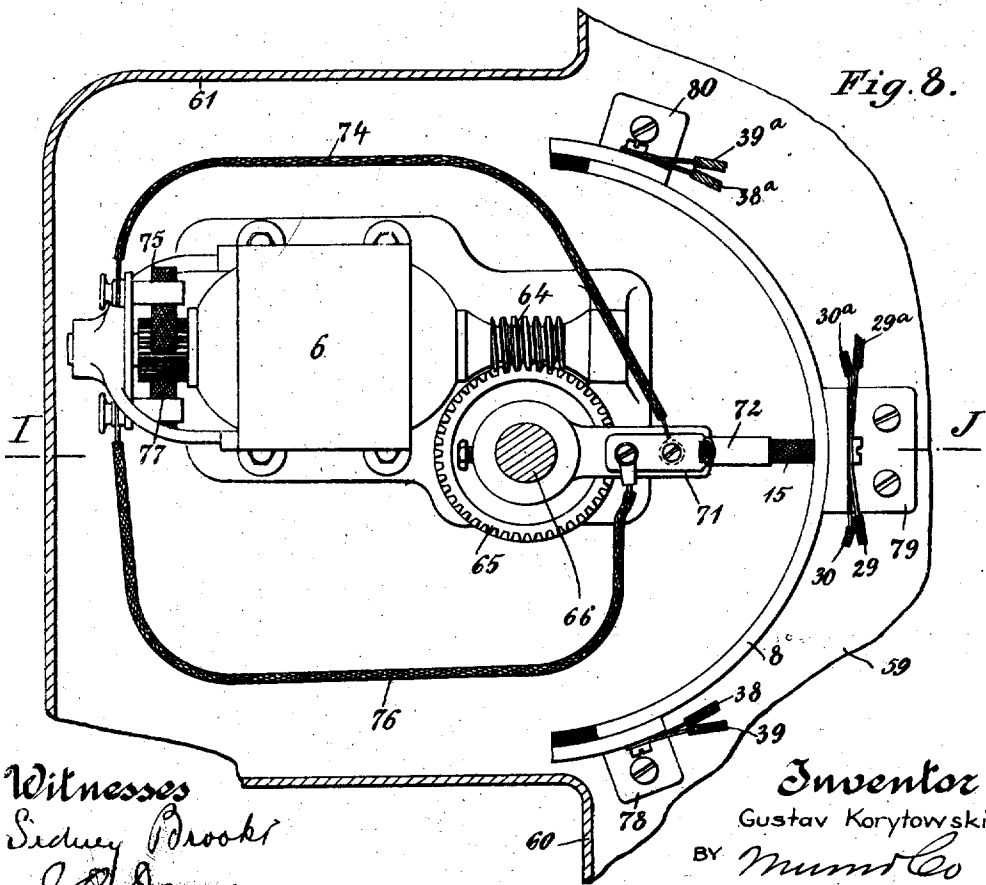
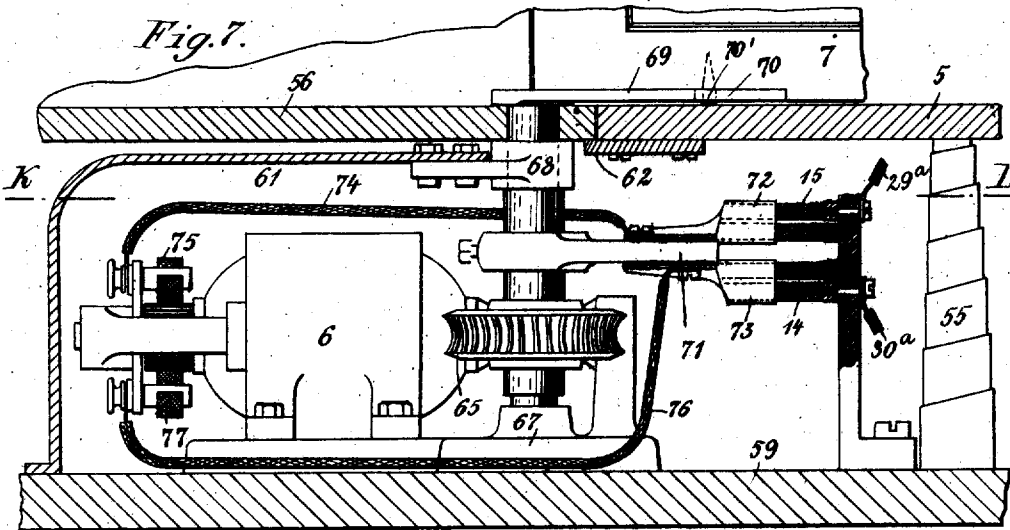
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Fig. 9.

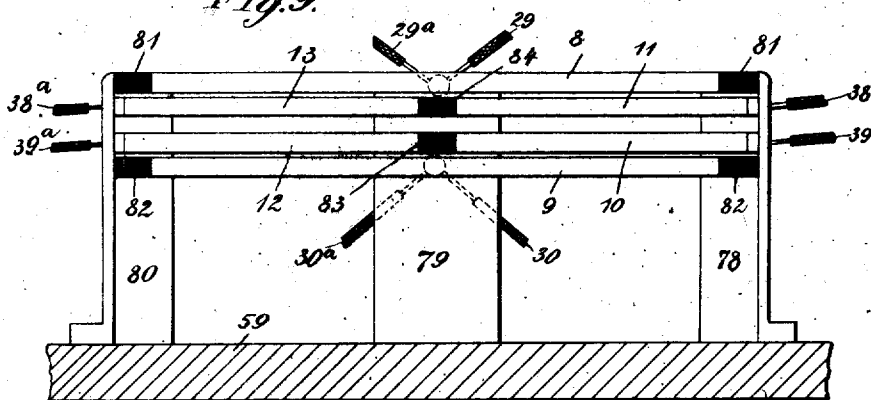


Fig. 10.

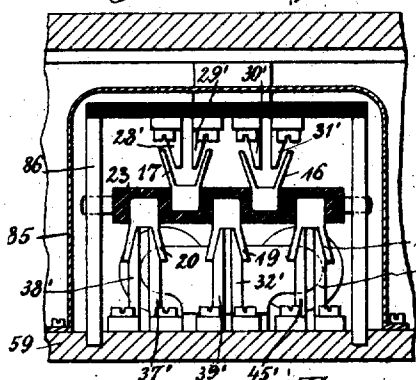


Fig. 11.

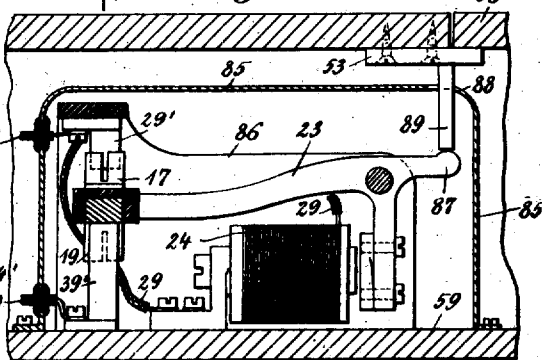


Fig. 12.

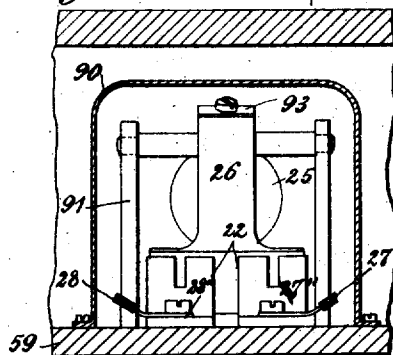
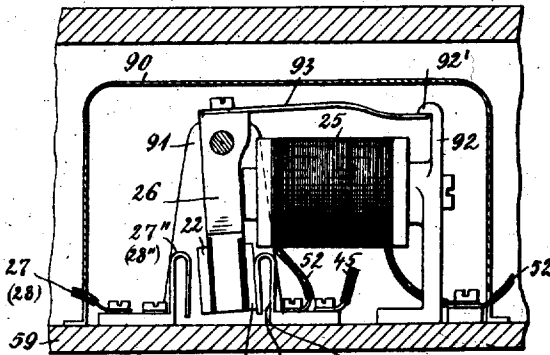


Fig. 13.



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GUSTAV KORYTOWSKI, OF BERLIN, GERMANY.

ELECTRICALLY-OPERATED DOOR.

1,018,246.

Specification of Letters Patent.

Patented Feb. 20, 1912.

Application filed January 8, 1912. Serial No. 889,608.

To all whom it may concern:

Be it known that I, GUSTAV KORYTOWSKI, a citizen of the Empire of Germany, residing at Berlin, in the Empire of Germany, have invented a new and useful Electrically-Operated Door, of which the following is a specification.

My invention relates to improvements in electrically operated doors adapted to open in either direction, whereby the following novel effects are obtained: The door is invariably opened by turning in the same direction in which one wants to pass through and when one is out of reach of the door, it is automatically returned to its normal closed position. During opening the door is obliged to first complete its full turn, before it is released and is automatically turned back. When it is desired, the door may be locked in any position. Where so preferred, the door may be permitted to operate only after the current has been closed by the porter or by means of some coin-freed apparatus. According to my invention a movable floor plate beneath the closed door and extending to both sides is adapted on being trodden to engage either of two reversing switches for closing one of two circuits, whereby an electromotor is set to rotate in one direction and to open the door by means of a worm gearing and a vertical shaft, while at the same time an electromagnet is energized for locking the reversing switch engaged and preventing it from opening the circuit on the floor plate being released. The vertical shaft carries on an arm two superposed pairs of contact brushes which are connected by conductors with the commutator brushes of the electromotor. Contact segments concentric with the vertical shaft are inserted in the two circuits and on these contact segments the four contact brushes are made to slide. After the full turn of the door the closed circuit is opened by two contact brushes coming out of contact with two long contact segments, so that the reversing switch hitherto locked is released and in returning to its initial position closes the other circuit, whereby the electromotor is set to rotate in the opposite direction for closing the door.

Other improvements will be hereinafter set forth and pointed out in the claims.
I will now proceed to describe my in-

vention with reference to the accompanying drawings, in which—

Figure 1 is a diagram of the whole apparatus, the movable floor plate being assumed to rock about an axis in the plane of the closed door and the turns of various levers being drawn exaggerated for the sake of clearness, Fig. 2 diagrammatically shows a modified floor plate, which is supported in its middle by springs and is depressed on the left, Fig. 3 diagrammatically illustrates the same floor plate when depressed in its middle, Fig. 4 is a vertical section through the line A—B in Fig. 6, seen in the direction of the arrows, and shows the lower part of a door in its closed state, the movable floor plate and a casing with the devices thereunder, Fig. 5 is a vertical section through the line C—D in Fig. 6, seen in the direction of the arrows, and shows the floor plate and the casing in section and boxes inclosing devices in elevation, Fig. 6 is a horizontal section through the line E—F in Fig. 5, Fig. 7 is a vertical section on an enlarged scale through the line G—H in Fig. 6, seen in the direction of the arrows, also through the line I—J in Fig. 8, and shows parts of the casing, the flooring and the floor plate in section and the electromotor with the worm gearing, the vertical shaft and the arm with contact brushes in elevation, Fig. 8 is a horizontal section through the line K—L in Fig. 7, Fig. 9 is an elevation of the contact segments with their supports, seen in the direction from left to right in Fig. 8, Fig. 10 is a vertical section on an enlarged scale through the line M—N in Fig. 6, seen in the direction of the arrows, also through the line O—P in Fig. 11, seen in the direction of the arrows, and shows one reversing switch, Fig. 11 is a vertical section on an enlarged scale through the line Q—R in Fig. 6, also through the line S—T in Fig. 10, seen in the direction of the arrows, Fig. 12 is a vertical section on an enlarged scale through the line U—V in Fig. 6, seen in the direction of the arrows, also through the line W—X in Fig. 13, and shows one relay in end view and its casing in section, and Fig. 13 is a vertical section through the same on the line Y—Z in Fig. 12, seen in the direction of the arrows.

Similar characters of reference refer to similar parts throughout the several views.

Beneath a closed door 7 (Fig. 4) to be op-

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erated a rectangular opening 57 (indicated by dotted lines in Fig. 6) is provided in the flooring 56, which opening extends to both sides of the door 7 in its normal closed position. Beneath this opening 57 a suitable base 58 of any known kind is provided, on which a board 59 may be disposed. A frame 60 is shown to be placed on the board 59 for supporting the flooring 56 around the opening 57. The frame 60 is shown to be made in one with a box 61 (Figs. 4, 6, 7 and 8), which will be referred to later on. A movable floor plate *f* is made to engage in the opening 57 and may in its middle be supported by two buffer springs 55, 55'. It is provided on its underside with two fingers 62, 62' (see also Fig. 7) in its middle cross line and with two ledges 53 (see also Fig. 11), 53' at its opposite edges 5, 5'. The two buffer springs 55, 55' bearing from below against the floor plate *f* press the two fingers 62, 62' and the two ledges 53, 53' against the underside of the edges of the flooring 56, whereby the floor plate *f* is prevented from projecting above the flooring.

Within the box 61 is disposed on the board 59 an electromotor 6' (Figs. 7 and 8), which carries on its armature shaft a worm 64 that meshes with a worm wheel 65 fastened on a vertical shaft 66. The shaft 66 mounted to turn in two bearings 67 and 68 is made in one with an arm 69, which has a radial slot 70. A door 7 adapted to open in either direction is provided and may be of any known construction, which I do not describe here, as it is immaterial to my invention. This door 7 is provided with a pin 70', which engages in the slot 70 of the arm 69, so that in this manner the door 7 is obliged to partake in the turn of the vertical shaft 66. On the shaft 66 is fastened an arm 71 which on its upper and lower side is connected with two brush holders 72, 73 insulated therefrom and carrying each two contact brushes 14, 14', 15, 15'. A pliable conductor 74 connects the upper brush holder 72 with one commutator brush 75 of the electromotor 6, and another pliable conductor 76 connects the lower brush holder 73 with the other commutator brush 77. Three supports 78, 79, 80 disposed on the board 59 carry two long contact segments 8 and 9 (Fig. 9) and four short contact segments 10, 11, 12 and 13, all of which are concentric with the shaft 66 and are insulated from the supports. The four contact brushes 14, 14', 15, 15' are made to come in contact with the said contact segments 8 to 13. The two long contact segments 8 and 9 extend from one outer support 78 over the middle support 79 to the other outer support 80 and one 8 is electrically connected with two conductors 29 and 29', while the other contact segment 9 is electrically connected with two conductors 30 and 30'. The

ends of the two long contact segments 8 and 9 do not extend to the outer edges of the two outer supports 78 and 80 and for this reason two fillings 81, 81' or 82, 82' of insulating material for each segment are made to fill up the gaps, so that the outer contact brushes 14, 15 can rub on them in the extreme positions of the door 7. The four short contact segments 10, 11, 12, 13 form two pairs and extend from one outer support 78 or 80 to the inner support 79 and the segments of each pair are divided by an insulation 83 or 84. The contact segment 10 is electrically connected with a conductor 39, and in a similar manner the other contact segments 11, 12, 13 are severally connected with conductors 38, 39', 38'. The two long contact segments 8 and 9 serve for opening the door 7 in either direction, the armature of the electromotor 6 running in one direction, when the current circulates in one direction, and in the other direction, when the current circulates in the opposite direction. It is evident, that the current for opening the door 7 is opened for each extreme position of the door. The two short contact segments 10 and 11 serve for closing the door 7 in one direction and the two other contact segments 12 and 13 for closing the door in the opposite direction. The current for closing the door 7 is of course opened at the moment that the two inner contact brushes 14, 15 come in contact with the insulations 83, 84.

Within the frame 60 two opposite boxes 85, 85' (Fig. 6) are disposed on the board 59, which boxes each contain a reversing switch relay shown at Figs. 10 and 11. This relay comprises a frame 86, a reversing switch 23 rocking therein and an electromagnet 24. The switch 23 has a rear arm 87, on which a projection 89 on the ledge 53 passing through a hole 88 in the box 85 can bear. The free end of the switch 23 carries on the lower side three forked contact pieces 18, 19, 20 and on the upper side two forked contact pieces 16, 17, all of which are insulated from the switch 23. Beneath the three lower contact pieces 18, 19, 20 six contact pieces 44', 45', 32', 39', 37', 38' are fastened on the board 59. Above the two upper contact pieces 16, 17 four contact pieces 31', 30', 29', 28' are fastened on the inner side of the frame 86. When the electromagnet 24 is without current, the switch 23 is by its own weight pressed downward, so that thereby the three lower forked contact pieces 18, 19, 20 are pressed on the inclined surfaces of the springy contact pieces 44', 45', 32', 39', 37', 38'. When the floor plate *f* is depressed, the projection 89 of the ledge 53 striking the arm 87 will turn the switch 23 upward and press the two upper forked contact pieces 16, 17 against the inclined surfaces of the springy contact pieces

31', 30', 29', 28'. The contact pieces 38', 37', 39', 32', 45', 44' are respectively connected with conductors 38, 37, 39, 32, 45, 44 shown at Fig. 1, and the contact pieces 28', 29', 30', 31' are respectively connected with conductors 28, 29, 30, 31 (Fig. 1). The conductors 29, 30, 38, 39 have already been mentioned above with reference to Fig. 9. The electromagnet 24 is inserted in the conductor 29, as is clearly shown at Fig. 1. Within the frame 60 also two other boxes 90, 90^a (Fig. 6) are disposed on the board 59, which boxes each contain a relay shown at Figs. 12 and 13. This relay comprises a frame 91, an armature 26 rocking therein, a support 92 and an electromagnet 25 fastened thereon. The armature 26 carries on both sides two insulated contact pieces 21, 22, of which one 21 is adapted to come in contact with two springy contact pieces 44'', 45'' and the other contact piece 22 is adapted to come in contact with two springy contact pieces 27', 28''. The contact pieces 44'', 45'', 27', 28'' fastened on the board 59 are respectively connected with conductors 44, 45, 27, 28 shown in Fig. 1, and the conductors 44, 45, 28 have already been mentioned above. The electromagnet 25 is by means of a conductor 52 shunted to the contact pieces 45'' and 27'. A spring 93 rigidly connected with the armature 26 and bearing against a nose 92' of the support 92 serves for normally pressing the contact piece 22 against the two contact pieces 27', 28'', while on the electromagnet 25 being energized the contact piece 22 will be detached from the contact pieces 27', 28'' and the other contact piece 21 will be pressed against the two contact pieces 44'', 45''.

The parts contained in the boxes 85^a and 90^a are similar to those contained in the boxes 85 and 90, but their characters of reference differ in that the index "a" is added, as is shown in Fig. 1.

The conductor 31 is joined to the conductor 32 and the conductor 37 is joined to the conductor 28. In a similar manner 31^a is joined to 32^a and 37^a to 28^a. The conductor 32 is joined to the conductor 44^a in the other casing 85^a and the conductor 32^a is joined to the conductor 44 in the casing 85, as is clearly shown in Fig. 1. A battery 4 (Fig. 1) or other source of current is disposed, one pole of which is connected with the conductor 27, while the other pole is connected with the conductor 27^a.

For the sake of simplicity in Fig. 1 the electromotor 6 is indicated by a thick circle concentric with the contact segments 8 to 13 and the floor plate *f* is assumed to rock on an edge 63, while the reversing switches 23, 23^a are replaced by two-armed levers.

The mechanism represented by the diagram in Fig. 1 operates as follows: When any one approaching the closed door 7 from the left depresses the left end 5 of the floor

plate *f*, he thereby depresses the right arm of the two-armed lever 23 in Fig. 1, that is to say, he depresses the arm 87 of the switch 23 in Fig. 11 by means of the projection 89 of the ledge 53, so that by means of the upper forked contact pieces 16 and 17 and the two pairs of contact pieces 31', 30' and 28', 29' the conductors 31, 30 and 28, 29 are electrically connected together. Then a current will pass from the battery 4 through the conductor 27, the contact pieces 27', 22, 28'', the conductor 28, the contact pieces 28', 17, 29', the conductor 29 and the electromagnet 24, the contact segment 8, the contact brush 15 (Fig. 8), the brush holder 72, the conductor 74, the electromotor 6, the conductor 76, the brush holder 73, the contact brush 14, the contact segment 9, the conductor 30, the contact pieces 30', 16, 31', the conductors 31, 32, 44^a, the contact pieces 44'', 18^a, 45^a and afterward also 44'', 21^a, 45'', the conductors 45^a, 52^a, the electromagnet 25^a and the conductor 27^a back to the battery 4. The electromagnet 24 energized attracts its armature and thus locks the reversing switch 23, in other words prevents this switch from returning to its initial (lower) position when the end 5 of the floor plate *f* is no longer depressed. The electromagnet 25^a energized attracts its armature 26^a and thereby presses the contact piece 21^a against the contact pieces 45'', 44'' (Fig. 13), so that no current can pass from the contact segment 13 through the conductor 38^a, the contact pieces 38'', 20^a, 37^a, the conductors 37', 28^a, the contact pieces 28'', 22^a, 27^a and the conductor 27^a back to the battery 4. The electromotor 6 energized turns by means of the worm 64, the worm wheel 65 and the shaft 66 the door 7 in the direction of the arrow 35 (Fig. 1), that is into the position 7^b, so that one can pass through. When now he depresses the other end 5^a of the floor plate *f* and thereby turns the left arm of the two-armed lever 23^a downward, in other words presses the upper forked contact pieces 16^a, 17^a against the contact pieces 31^a, 30^a, 28^a, 29^a, this will be of no consequence, since no current can pass from the contact segment 8 through the conductor 29^a, the contact pieces 29^a, 17^a, 28^a, and the conductors 28^a, 27^a, because this circuit is interrupted by the contact piece 22^a detached. The door 7 turning in the direction of the arrow 35 may continue to move or it may have stopped in the position 7^b, the contact brushes 15 coming out of contact with the contact segments 8, 9. At this moment the current is opened, so that the two electromagnets 24 and 25^a release their armatures and consequently the forked contact pieces 16, 17 are detached from the corresponding contact pieces 31', 30', 28', 29' and the lower forked contact pieces 18, 19, 20 are pressed against the corresponding contact pieces 44', 130

45', 32', 39', 37', 38', in other words the two-armed lever 23 in Fig. 1 assumes a position similar to the two-armed lever 23^a in Fig. 1, while at the same time the contact piece 21^a is detached from the corresponding contact pieces 44'', 45'' and the contact piece 22^a is pressed against the corresponding contact pieces 28'', 27'', in other words the two-armed lever 20^a in Fig. 1 assumes a position similar to the two-armed lever 20. Thereby another circuit is closed, so that the current passes from the battery 4 through the conductors 27, 52, 45, the contact pieces 45', 18, 44', the conductor 32^a, the contact pieces 32'', 19^a, 39', the conductor 39^a, the contact segment 12, the contact brushes 14, the brush holder 73, the conductor 76, the electromotor 6 (in a direction opposite to the previous one), the conductor 74, the brush holder 72, the contact brushes 15, the contact segment 13, the conductor 38^a, the lower contact pieces 38'', 20^a, 37'', the conductors 37^a, 28^a, the contact pieces 28'', 22^a, 27'', and the conductor 27^a back to the battery 4. The electromotor 6 energized turns the door 7 back into its normal closed position, whereupon the contact brushes 14 come out of contact with the contact segments 12, 13, so that the circuit is opened and the electromotor 6 and therewith also the door 7 stop.

Obviously a similar series of occurrences will take place when one approaching the door 7 from the right in Fig. 1 depresses the right end 5^a of the floor plate *f*.

Two switches 50 and 51 are shown to be inserted in the conductors 27 and 30 respectively, so that it is possible for the porter or other person charged with the task to open either of these switches and thereby to keep the door 7 in its closed position or in either of its two extreme positions 7^b and 7^a as no current is permitted to pass through the electromotor 6. Or when the door 7 is being moved in either direction it is possible by opening either of said switches 50, 51 to stop the door 7 in any position, for example that marked 7^c or 7^e in Fig. 1. Any of these switches might also form a part of some coin-free apparatus, so that the insertion of a coin would permit the mechanism to operate at the moment that the floor plate *f* is depressed on either side of the closed door.

The edge 63 shown in Fig. 1 presents the drawback, that when any one has in the above described manner caused the door 7 to open by depressing either end 5 or 5^a of the floor plate *f* and when he happens to stop just in the middle of the floor plate above the edge 63, the floor plate *f* may return to its normal horizontal position and the electromotor 6 may have turned the door 7 into either extreme position 7^b or 7^a and may now turn back the door 7, so that the

door may strike and hurt the person standing on the floor plate. This drawback is according to my invention avoided by replacing the edge 63 by the buffer springs 55, 55 described above. Fig. 2 illustrates the position of the so modified floor plate *f*, when it is depressed on the left end 5, when the effect produced will be much the same as described above with reference to Fig. 1. Fig. 3 on the contrary illustrates the horizontal position of the floor plate *f*, when one stands on it just above the buffer springs 55, and it will be seen, that in this case both ends of the floor plate by means of the two ledges 53, 53^a depress the inner arms of the two two-armed levers 23 and 23^a, so that both circuits are opened and no current can pass from the battery 4 through the electromotor 6. In consequence of this the door 7 will be stopped and be prevented from striking the person standing on the floor plate *f*.

The mechanism described for electrically operating the door can be varied in many respects without departing from the spirit of my invention. The electromotor 6 might be disposed on some wall or in a recess therein and may be connected by long conductors 74, 76 with the two brush holders 72, 73. The apparatus illustrated might also be disposed in the ceiling above the door to be operated.

I claim:

1. The combination with a door adapted to open in either direction, of a movable floor plate adapted to be inclined on being trodden on either side of the closed door, an electromotor adapted to turn said door in either direction, means operated from either end of said floor plate when depressed for so controlling the direction of rotation of said electromotor, the rotation of the motor serving to turn the door away from the depressed end of said floor plate, and means controlled by the movement of the door for causing the return of the open door to its closed position.

2. The combination with a door adapted to open in either direction, of a movable floor plate adapted to be inclined on being trodden on either side of the closed door, an electromotor adapted to turn said door in either direction, means operated from either end of said floor plate when depressed for so controlling the direction of rotation of said electromotor, the rotation of the motor serving to turn the door away from the depressed end of said floor plate, and means operated from said door in either extreme position for reversing said electromotor and thus returning the door to its closed position.

3. The combination with a door adapted to open in either direction, of a movable floor plate adapted to be inclined on being trodden

den on either side of the closed door, an electromotor adapted to turn said door in either direction, two circuits for alternately turning said electromotor in one or the other direction, two reversing switches in said two circuits each adapted to normally close one circuit and on being operated from the corresponding end of said floor plate when depressed to open this circuit and to close the other circuit, two electromagnets in said two circuits each adapted to lock the corresponding reversing switch when engaged, two relays severally shunted to said two circuits and each adapted to normally prepare one circuit for closing by means of the corresponding reversing switch when engaged and on being energized to open this circuit and to close the other circuit, means operated from said door in either extreme position for opening one circuit and closing the other circuit whereby the reversing switch engaged is released so that it returns to its initial position, and means operated from said door on reaching its normal closed position for opening the other circuit.

4. The combination with a door adapted to open in either direction, of a floor plate movable in an opening in the flooring and extending from the closed door to both sides, springs supporting said floor plate in the plane of the closed door, means for preventing said floor plate from projecting above the flooring, an electromotor adapted to turn said door in either direction, two circuits for alternately turning said electromotor in one or the other direction, two reversing switches in said two circuits each adapted to normally close one circuit and on being operated from the corresponding end of said floor plate when trodden to open this circuit and to close the other circuit, two electromagnets in said two circuits each adapted to lock the corresponding reversing switch when once engaged, two relays severally shunted to said two circuits and each adapted to normally prepare one circuit for closing by means of the corresponding reversing switch when engaged and on being

energized to open this circuit and to close the other circuit, means operated from said door in either extreme position for opening one circuit and closing the other circuit whereby the reversing switch engaged is released so that it returns to its initial position, and means operated from said door on reaching its normal closed position for opening the other circuit, said floor plate when trodden in the middle cross-line being adapted to so operate said two reversing switches as to simultaneously open the two circuits and consequently to prevent said door from moving.

5. The combination with a door adapted to turn in either direction, of a vertical shaft adapted to move said door, a worm wheel fastened on said shaft, an electromotor having two commutator brushes and on its armature shaft a worm meshing with said worm wheel, an arm fastened on said shaft, two superposed insulated brush holders on said arm each carrying two contact brushes, two pliable conductors connecting said two brush holders with said two commutator brushes, a support, two long insulated contact segments on said support concentric with said shaft and adapted to each come into contact with one contact brush in said two brush holders, four short contact segments in pairs on said support concentric with said shaft, the contact segments in each pair being adapted to come one after the other into contact with the other contact brush in said two brush holders, a movable floor plate adapted to be inclined on being trodden on either side of the closed door, two circuits of which one includes said two long contact segments and the other said two pairs of short contact segments, devices in said two circuits, and means operated from either end of said floor plate when trodden for engaging the corresponding devices whereby the door is first opened and afterward closed.

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