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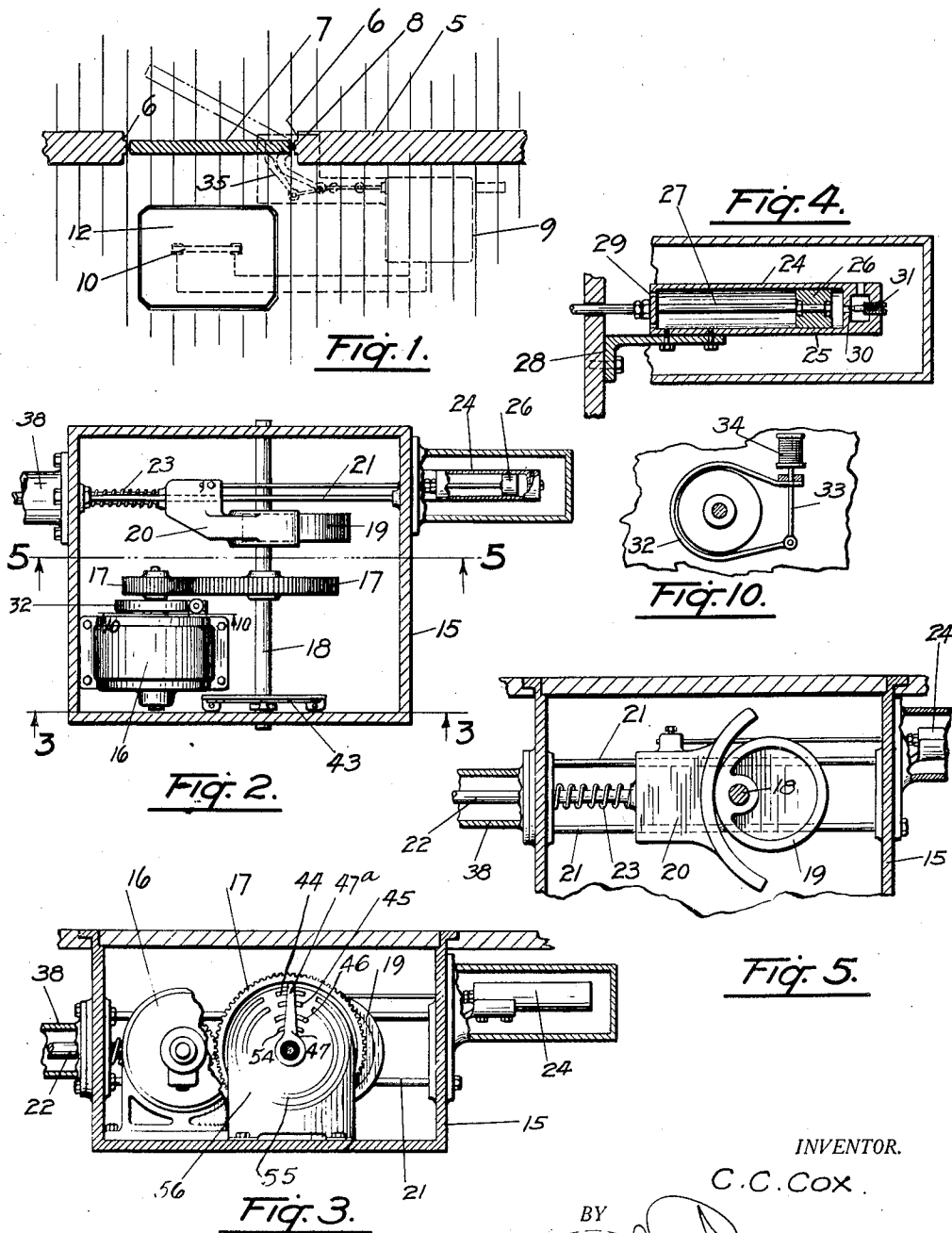
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DOOR OPERATING APPARATUS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

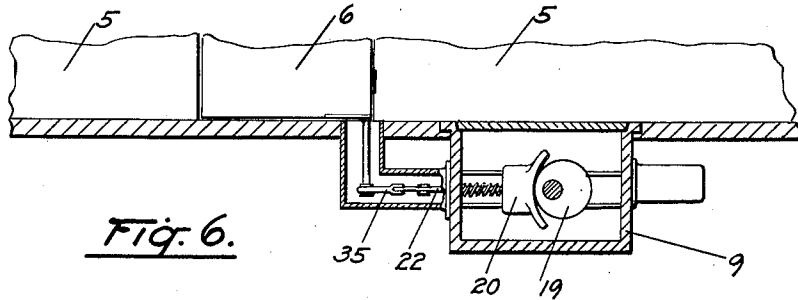


Fig. 6.

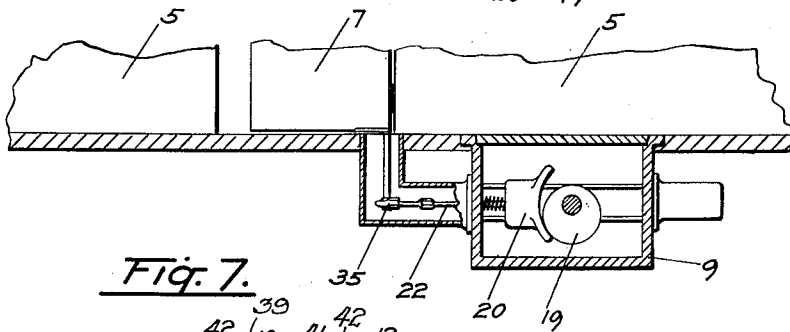


Fig. 7.

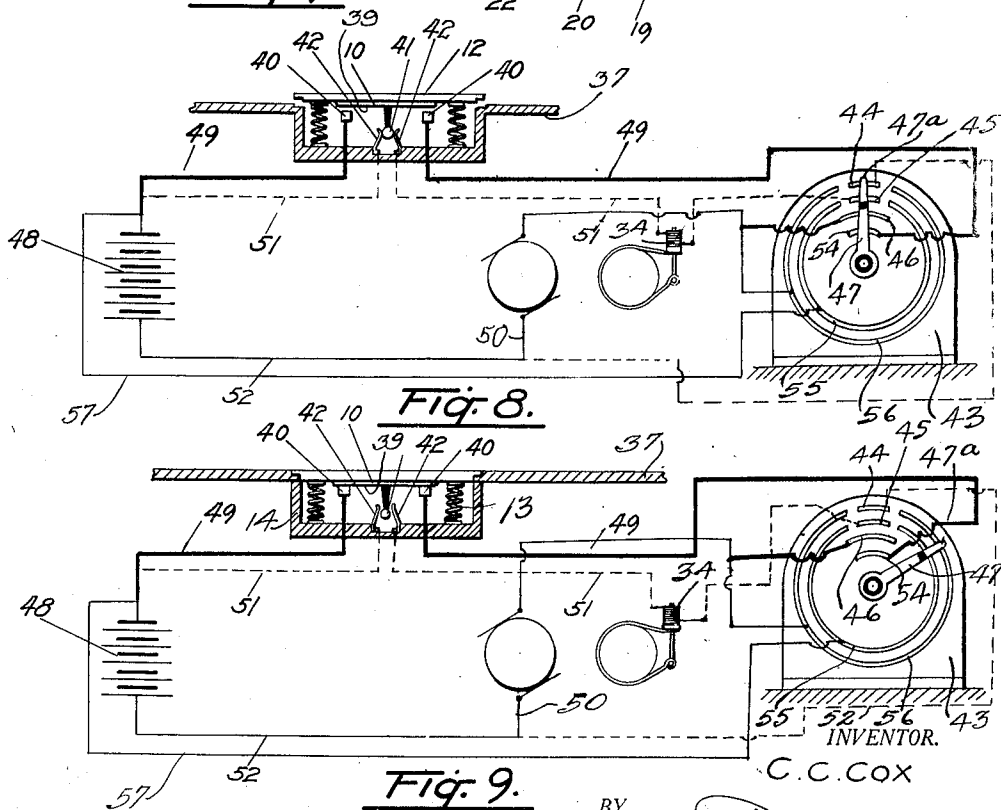


Fig. 8.

Fig. 9.

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DOOR-OPERATING APPARATUS.

Application filed September 8, 1925. Serial No. 55,085.

This invention relates to door operating apparatus and its main object is to provide a simple and practical mechanism operable by the weight of a person or vehicle approaching the door, which will automatically open the door and reclose the same after an interval sufficiently long to permit the person or vehicle to pass through the door opening.

Further objects of the invention reside in the construction and arrangement of co-operating devices by which the above described purpose is accomplished, as will fully appear in the course of the following description.

An embodiment of the invention has been illustrated in the accompanying drawings in the several views of which like parts are similarly designated and in which

Figure 1 represents a horizontal sectional view of a door and its frame, showing the relative arrangement of the operating mechanism;

Figure 2, an enlarged horizontal section through the motor-casing of the mechanism;

Figure 3, a vertical section taken on the line 3—3 Figure 2;

Figure 4, an enlarged longitudinally sectional elevation of the dash-pot included in the apparatus;

Figure 5, a fragmentary vertical section along the line 5—5, Figure 2;

Figure 6, a sectional elevation showing the parts of the mechanism directly connected with the door in the position they occupy when the door is closed;

Figure 7, a view similar to Figure 6 showing the parts in the position to which they are moved when the door is partially open;

Figure 8, a diagrammatic representation of the electrical devices and circuits included in the operating mechanism, the devices being shown in their normal relative positions;

Figure 9, a view similar to Figure 8 showing the electrical devices in their relative positions immediately upon actuation of the mechanism by a person or vehicle approaching the door; and

Figure 10, a section in the plane indicated by the line 10—10 in Figure 2.

In the illustrative embodiment of the invention the operating apparatus has been shown in connection with a single swinging door but it will be apparent that by simple changes in the power transmitting means which connect the door with the operating

mechanism, too obvious to require further illustration, the invention may be applied to sliding doors or to double doors of either type.

It is further to be understood that while the electrical circuits and connections have been shown in the simplest form at present known to me, my invention is not limited to the exact means herein disclosed since it is clearly evident that many variations in the construction, relative arrangement and electrical connections of the elements comprised in the system are possible without departing from the scope and spirit of the invention as hereinafter to be explained and defined in the appended claims.

Referring more specifically to the drawings, the reference numeral 5 designates a wall having a door opening 6 normally closed by a swinging door 7 hinged as at 8.

The improved door operating mechanism consists of a door operating unit 9 and a controlling unit 10. The last mentioned unit comprises in the construction shown in the drawings, a circuit breaking switch preferably provided in the form of a mat 12 set in an opening of the floor 37 flush with the surface of the same.

The mat is supported upon springs 13 or other convenient means to yieldingly hold it in its normal position and it is depressible in a protective and guiding casing 14 set in an excavation below the floor.

The door-operating unit of the apparatus, includes in a casing 15 set in a second excavation below the floor at a short distance from the other, an electric motor 16 which by means of a reduction gearing 17 is operatively connected with a shaft 18 supported in bearings at the sides of the casing.

The shaft carries an eccentric disk 19 in driving engagement with a curved contact-surface of a cross-head 20 which is slidably mounted upon parallel horizontally disposed guide rods 21.

The reciprocating cross-head has a stem 22 passing through an opening in a side of the casing and a spring 23 coiled around the stem between the side of the casing and a shoulder on the cross-head provides a yielding means to return the door to its closed position after it has been opened in the operation of the apparatus.

The closing movement of the door is, however, retarded to a regulatable speed by means

of a dash-pot governor 24 that provides a cushion by the compression of air each time the door is opened.

The dash-pot comprises to this end a cylinder 25, a piston 26 fitted for reciprocation therein, and a rod 27 on the piston, connected to the cross-head 20. The cylinder may be mounted on a bracket 28 exteriorly of the main part of the casing; it has at one of its ends openings 29 to prevent compression and it is provided at its opposite end with a small aperture 30 for the leakage of air from the cushion formed by its relatively receding motion.

A needle valve 31 provides an adjustable medium to regulate the size of the aperture 30 and thereby vary the rate of motion of the door in its closing movement.

The operation of the motor is controlled by a band brake 32 fixed at one end to a stationary part of the casing 15 and having its opposite end connected with the sliding core 33 of a solenoid 34.

The stem 22 of the cross-head 20 is pivotally connected as at 37 with a crank-arm 35 on a rod 36 fixed on the door substantially in alinement with the hinge thereof. The rod and the arm extend in an enclosure provided by an extension 38 of the casing 15 around the outwardly projecting portion of the stem 22 below the floor 37.

It will be apparent that by the arrangement of parts hereabove described, a movement of the reciprocating cross-head against the resistance of the spring will cause the door to open while the return movement of the cross-head by subsequent expansion of the spring under the control of the air cushion formed in the dash-pot, will re-close the door at a velocity determined by the position of the needle valve of the dash-pot relative to the escape aperture.

Referring further to the control-unit 10, the mat 12 carries a contact-member 39 normally in spaced relation to two relatively stationary contacts 40, and a second contact member 41 which normally engages with two relatively stationary contacts 42. The two sets of contacts provide switches which control two circuits hereinafter to be described and their members are relatively arranged so that when the contacts of one switch are in circuit-closing engagement, those of the other are disengaged as illustrated in Figures 8 and 9 of the drawings.

Fixed in the casing of the operating unit 9 concentric with the shaft 18, is a commutator disk 43 of non-conductive material carrying in circular alinement, a concentric series of insulated segmental contact plates. Two pair of said plates, 44 and 45, and 46 and 54 are concentrically arranged. A brush 47 on the shaft has a tip 47^a insulated from the remainder of the brush. The tip 47^a is adapted to close the circuit for the brake. The re-

mainder of the brush 47 is adapted to simultaneously engage the two contact plates 46 and 54 in the motor starting circuit. The circuits will be more fully explained later.

In circular alinement with one of these pairs of plates is a pair of circular concentric contacts 55 and 56 and adapted to be engaged by the tip 47^a of the brush during the revolution of the shaft by the driving action of the motor.

A source of electricity 48 is connected at one of its poles to the plate 54 of the commutator by a conductor 49, the continuity of which is broken beneath the mat. The two contacts 40 are connected when the mat is depressed, for they are bridged by the contact member 39.

The field of the motor is included in a conductor 50 which connects the opposite pole of the source of electricity with the contact 46. In the normal position of the brush as shown in Figure 8, when the mat 12 is depressed, the contacts 40 are bridged and by reason of the brush 47 engaging the contacts 46 and 54, a temporary circuit for the motor is closed.

Another circuit comprises a conductor 51 connecting a pole of the electricity with the plate 45 and including the coil of the brake solenoid 34. This conductor is broken when the mat 12 is depressed, since the contacts 42 are bridged by the member 41 only as long as the mat is in a raised position.

The opposite pole of the source is by means of a conductor 52 connected with the contact plate 44, thereby completing a circuit through the brake solenoid when the contacts 42 are connected by the member 41 and the tip 47^a engages the contact plates 44 and 45.

The circuit for the motor during the major portion of its revolution comprises a conductor 57 connecting one pole of the source of electricity with the contact 55. The motor is connected by the conductor 50 with the other pole of the source of electricity and with a contact 56. When the tip 47^a of the brush engages the contacts 55 and 56, as shown in Figure 9, a motor circuit, exclusive of the operation of the depressible mat, is closed.

Having thus described the mechanical construction and electric connections of my improved door-operating apparatus, its operation is as follows:

When the door is closed and the mat is in its normal raised position, the brake circuit is closed by the contact member 41 bridging the gap between the contacts 42 and the motor circuit is open owing to the separation of the bridging member 39 from the contacts 40. The brake thus holds the parts of the operating mechanism in the normal position represented in Figure 8, until the mat is depressed by the weight of a person or vehicle approaching the closed door when the brake circuit is broken by separation of the conduc-

tive member 41 from the contacts 42 and the motor circuit is completed by the engagement of the member 39 with the contacts 40.

The brush 47 is normally in engagement with the contacts 46 and 54, and the mat is normally in a raised position, as shown in Figure 8; so that normally the brake circuit is closed. When the mat is depressed the brake circuit is opened and the temporary motor circuit is closed thus starting the motor.

The motor rotates the shaft until the tip of the brush engages the contacts 55 and 56, and since the mat does not control the operation of this circuit, the motor will continue for one revolution until the brush disengages these contacts and engages the solenoid and temporary circuit contacts.

It will thus be observed that when the mat is momentarily depressed by a person or vehicle moving toward the door, the operation of the mechanism is continued during one revolution of the commutator shaft, while in case the mat is maintained in its depressed position for a longer period, the operation is indefinitely continued until the mat returns to its original position.

The rotary movement of the shaft is through the medium of the eccentric 19 converted into a movement of the cross-head 20 against the resistance of the spring 23 and the motion of the cross-head is through the instrumentality of the crank 35 converted into an opening movement of the door.

The door remains open until the rotary movement of the shaft is discontinued as hereinabove explained when under the influence of the air cushion formed in the dash-pot 24 it is slowly returned to its closed position by expansion of the spring 23. At the termination of this movement the cross-head is again in engagement with the eccentric which previously had been returned to its original position.

My invention is particularly adapted for use in connection with doors between the kitchens and public dining rooms of hotels and other eating places since it operates to open the doors upon the approach of the waiters who frequently carry trays or large quantities of dishes requiring the use of both hands.

The invention, may, however, be applied with equal facility to garages for the operation of the doors upon the approach of a motor vehicle, or it may be used in connection with farm-gates or in short with any movable barrier closing an opening or passageway.

What I claim and desire to secure by Letters Patent is:

1. In a door-operating mechanism, the combination with a normally closed door, of mechanism including an electric motor to open the same, a depressible actuating medium adapted

to energize the motor, when engaged by a person approaching the door, means controlling the movement of the mechanism after the actuating medium is released, and means to automatically reclose the door.

2. In a door-operating mechanism, the combination with a normally closed door, of mechanism to open the same, a depressible actuating medium adapted to energize the mechanism, when engaged by a person approaching the door, means to automatically continue the operative movement of the mechanism after the actuating medium is released, and means to automatically reclose the door after a predetermined period.

3. In a door operating mechanism, the combination with a door, of an electric motor, mechanism for opening the door by movement of the motor, means to automatically reclose the door, a circuit for the motor, a switch distant from the door controlling the circuit of the motor, and an electric brake appliance for the motor operated by the mechanism when the circuit of the motor is broken by the switch at a predetermined point in the movement of the mechanism.

4. In a door operating mechanism, the combination with a door, of an electric motor, mechanism for opening the door by movement of the motor, means to automatically reclose the door, a circuit for the motor, a switch distant from the door, controlling the circuit of the motor, an electric brake to arrest the motion of the motor, a circuit for the brake, and an automatic switch operated by the motor and adapted to energize the brake when the circuit of the motor is broken by the first-mentioned switch.

5. In door operating mechanism, a normally closed door, a normally idle motor, mechanism for opening the door by movement of the motor, an electric brake normally restraining the motor, circuits for the motor and the brake, a switch distant from the door, controlling the circuits to simultaneously release the brake and energize the motor, a switch operated by movement of the motor to reopen the circuit of the motor and to reclose the circuit of the brake at a predetermined point in the movement of the door-opening mechanism, and means to automatically reclose the door.

6. In door operating mechanism, a normally closed door, a rotary eccentric, a cross-head operated by the eccentric, means for converting a movement of the crosshead into an opening-movement of the door, an elastic medium to return the crosshead to its original position, an electric motor in driving connection with the eccentric, a circuit for the motor, a switch distant from the door, controlling the motor-circuit, and means to automatically stop the operation of the motor at a predetermined point in the movement of the eccentric.

7. In door operating mechanism, a nor-

5 mally closed door, a rotary eccentric, a cross-
head operated by the eccentric, means for con-
verting a movement of the crosshead into an
opening-movement of the door, an elastic me-
10 dium to return the crosshead to its original
position, an electric motor in driving connec-
tion with the eccentric, an electric brake
adapted to stop the movement of the motor,
circuits for the motor and the brake, a switch
15 distant from the door, controlling the circuits
whereby to release the brake and to energize
the motor, and an automatic switch adapted
to deenergize the motor and to reset the brake
at a predetermined point in the movement of
the eccentric.

8. In door operating mechanism, a nor-
mally closed door, a rotary eccentric, a cross-
head operated by the eccentric, means for con-
verting a movement of the crosshead into an
20 opening movement of the door, a spring to re-
turn the crosshead to its original position, a
dashpot actuated by movement of the cross-

head to control the action of the spring, an
electric motor in driving connection with the
eccentric, a circuit for the motor, a switch dis- 25
tant from the door, controlling the motor-
circuit, and means to automatically stop the
operation of the motor at a predetermined
point in the movement of the eccentric.

9. In a door-operating mechanism, the com- 30
bination with a normally closed door, of mech-
anism including an electric motor to open
same, a depressible actuating medium adapt-
ed to energize the motor when engaged by a
person approaching the door, means control- 35
ling the movement of the mechanism after the
actuating medium is released, means to auto-
matically reclose the door, and adjustable
means to predetermine the speed at which the
door is closed. 40

In testimony whereof I have affixed my sig-
nature.

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