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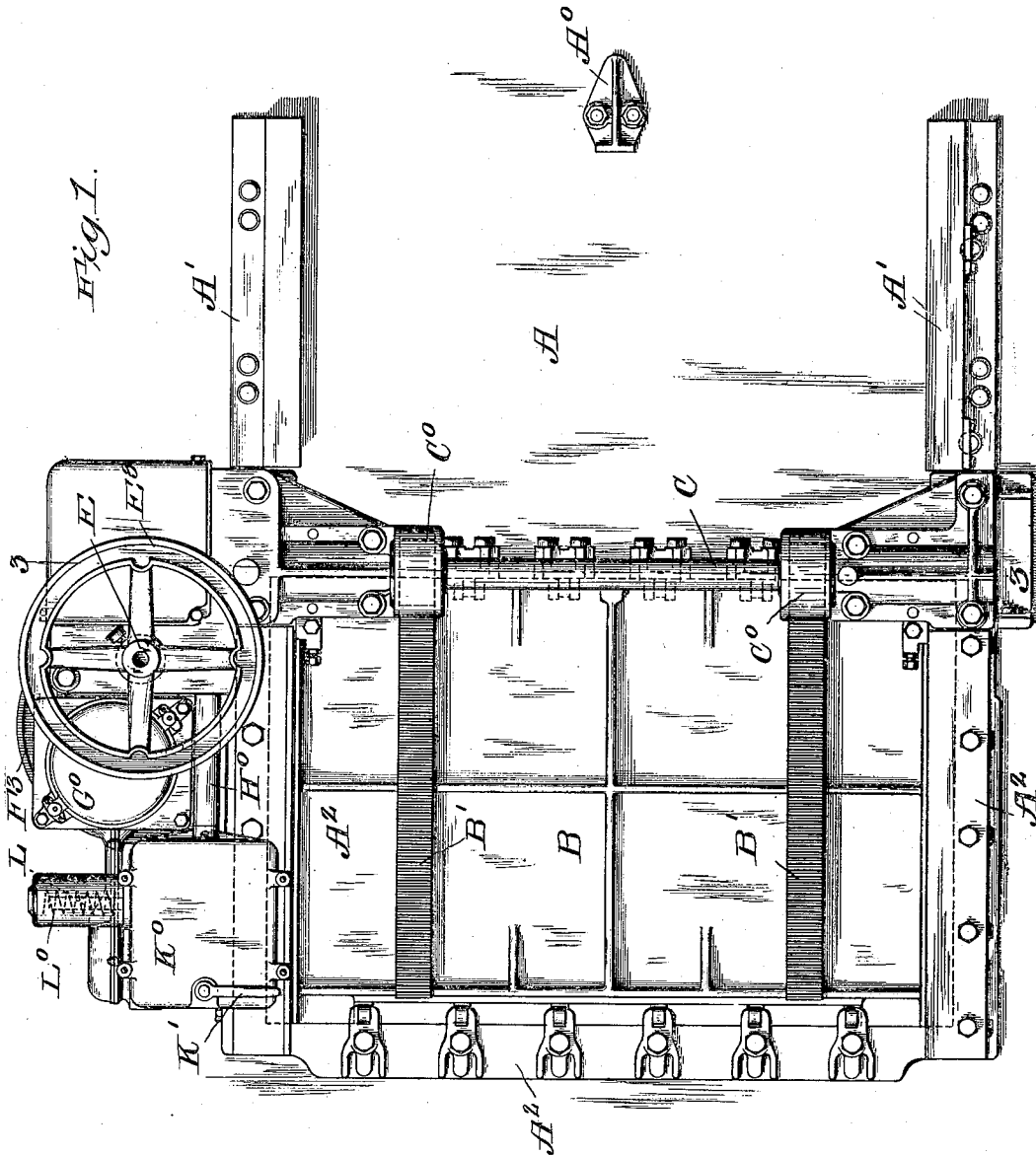
PATENTED JAN. 30, 1906.

W. B. COWLES.

AUTOMATIC CUT-OUT MECHANISM FOR ELECTRICALLY OPERATED BULKHEAD
DOORS.

APPLICATION FILED JULY 11, 1904.

3 SHEETS—SHEET 1.



WITNESSES:

E. M. Brandt
Geo. A. Ripe

INVENTOR

William B. Cowles,
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Wilkinson & Fisher
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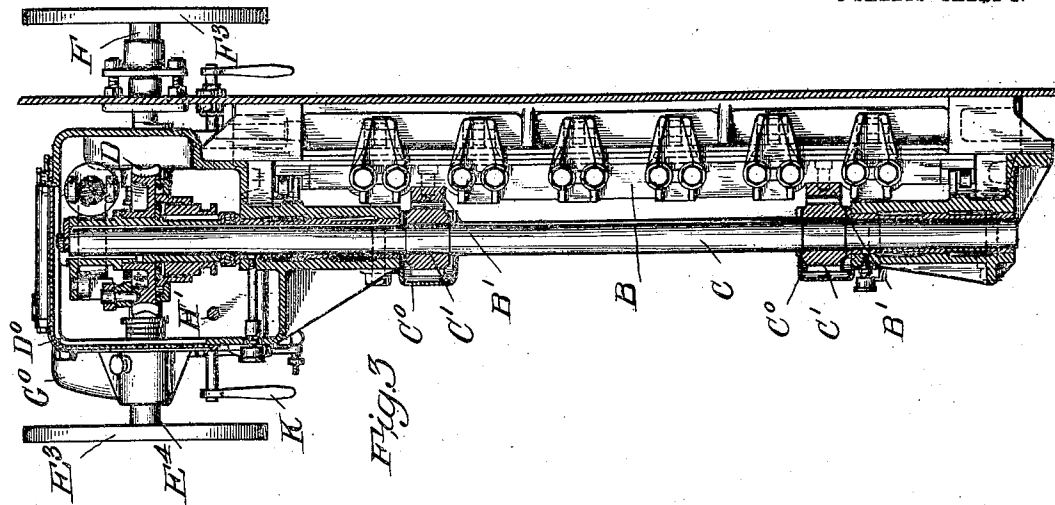
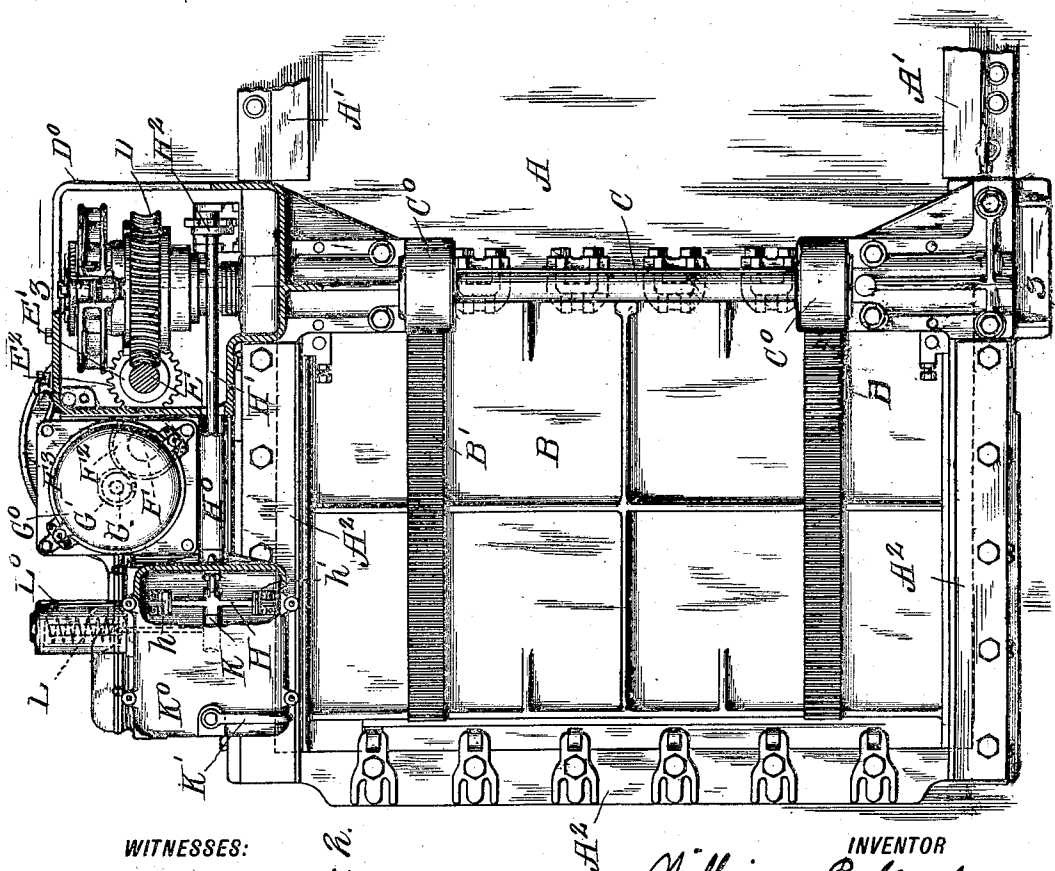
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3 SHEETS—SHEET 2.



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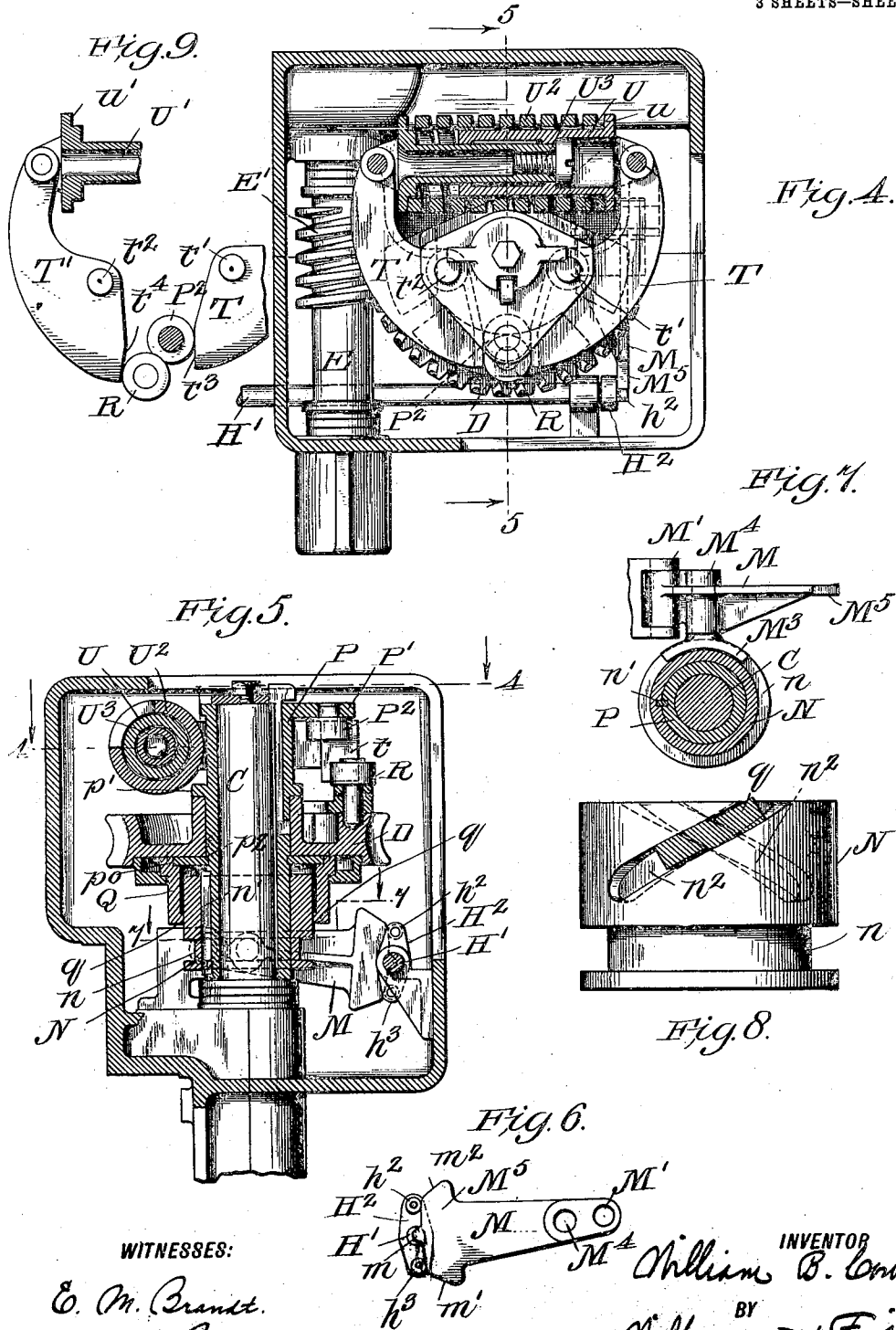
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3 SHEETS—SHEET 3.



WITNESSES:

E. M. Brandt.
Geo. T. Bepue

INVENTOR
William B. Cowles,
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UNITED STATES PATENT OFFICE.

WILLIAM BARNUM COWLES, OF CLEVELAND, OHIO, ASSIGNOR TO THE
"LONG ARM" SYSTEM COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

AUTOMATIC CUT-OUT MECHANISM FOR ELECTRICALLY-OPERATED BULKHEAD-DOORS.

No. 810,915.

Specification of Letters Patent.

Patented Jan. 30, 1906.

Application filed July 11, 1904. Serial No. 216,143.

To all whom it may concern:

Be it known that I, WILLIAM BARNUM COWLES, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Automatic Cut-Out Mechanism for Electrically-Operated Bulkhead-Doors, &c.; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to automatic cut-out mechanism primarily intended for use in the electrical operation of water-tight doors, hatches, or the like; but it is also capable of use whenever it is desired to cut off the electric current from driving mechanism when the load exceeds a predetermined limit.

My invention is especially intended for automatically cutting off the current from sliding bulkhead-doors when any obstruction to the motion of the door is encountered which would impose an excessive load on the motor and either burn out the fuse or the motor.

My invention also relates to certain improved mechanism whereby the door may be moved either by electricity or by hand-power and whereby the door may be operated either from a distance or locally at the door.

My invention will be understood by reference to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 is a front view showing the door-frame and a horizontally-sliding vertical bulkhead-door in the closed position, together with the parts for operating the same. Fig. 2 is a similar view to Fig. 1, except that the part of the casing at the top of the door is broken away. Fig. 3 shows a section along the line 3 3 of Figs. 1 and 2, parts being shown in elevation. Fig. 4 shows a section along the broken line 4 4 of Fig. 5 and looking down said figure. Fig. 5 shows a section along the line 5 5 of Fig. 4, parts being shown in elevation. Fig. 6 is a detail showing the pivoted arm for operating the yoke connected to the rod for turning the limit-switch, the view being taken on the reverse side from that shown in Fig. 5. Fig. 7 shows a section along the broken line 7 7 of Fig. 5, parts be-

ing shown in elevation. Fig. 8 shows the cam engagement for operating the arm controlling the limit-switch, and Fig. 9 is a detail showing the action of the arm for operating the limit-switch.

A represents the bulkhead, having guide-rails A' for the door to run out on, and the bulkhead carries a heavy frame A², in which the door is jammed when closed, so as to be substantially water-tight, in the manner well known in the art. The manner of tightening the door is not part of my present invention and will not be further described herein.

B represents the door-plate, to which horizontal racks B' are secured, which racks mesh with pinions C', secured to the shaft C. These pinions are preferably inclosed in boxes C^o to keep out dust, &c. Secured to the shaft C, near its head, is the worm-wheel D, which meshes with the worm E' on the counter-shaft E, which counter-shaft carries a pinion E², which meshes with the pinion F² on the shaft F. This pinion F² is driven by the pinion G' on the armature-shaft G of the electric motor, which is contained in the casing G^o. The shaft E carries the hand-wheel E³ on one side of the door, by means of which the worm D may be turned by hand, and the shaft F carries a hand-wheel F³ at the other side of the door, which may also be used to turn the worm-wheel D. Thus it will be seen that the door may be opened by hand from either side of the door. It will be obvious that both hand-wheels may be placed on the shaft E, one at either side of the bulkhead, if desired; but the interposition of the idler F² affords a more convenient arrangement for the operative mechanism at the top of the door with regard to the structure of the ship.

In order to keep out dust, &c., the operative parts at the head of the door are mounted in suitable casings D^o, G^o, and K^o, which are secured to fixed parts of the structure.

In the box K^o a suitable controller is mounted, which is operated by hand by means of the hand-lever K'. In addition to this controller contained in this box there is a solenoid L, mounted in the casing L^o for turning on the current from a distance by means of the switch L', which has been fully described in my application, Serial No. 216,142, filed July 11, 1904. In this same box K^o is

also mounted the limit-switch H, which has two contact-points h and h' , adapted to complete the circuit through the motor when it is otherwise closed. This limit-switch is rocked by means of the rod H' , which passes through the casing H^0 and carries at its end the yoke H^2 , provided with lugs h^2 and h^3 . These lugs are struck by the lug m on the head M^3 of the arm M, which head is provided with inclined faces m' and m^2 , (see Fig. 6,) which permit the shaft H' to be rocked when the lug m strikes either of the lugs h^2 and h^3 , but which normally holds the yoke H^2 against rocking when in the initial or zero position. (Shown in Figs. 5 and 6.) This arm M normally remains in this zero position and is only rocked about its pivot M' when the load on the motor exceeds a predetermined limit, and the manner in which this is accomplished will now be described. The arm M being pivoted in the casing, as at M' , is provided with a socket M^4 , in which the yoke M^3 is pivoted. This yoke projects into an annular groove n in the sleeve N, which is splined, as at n' , (see Figs. 5 and 7,) on the sleeve P, fast to the shaft C. This sleeve N is provided with cam-grooves n^2 , oppositely disposed, as shown in Fig. 8, into which cam-grooves project the lugs q from the interior of the sleeve Q. This sleeve Q is fast to or integral with the worm-wheel D, and this worm-wheel is normally held against turning on the shaft C by the spring U^2 , as will be hereinafter described, and it is also held against longitudinal movement on said shaft, as by means of the shoulders p' and the ring p^0 projecting into the groove p^2 , (see Fig. 5,) or it may be held against longitudinal motion on the shaft in any other convenient way. I have shown the sleeve Q as made separate from but attached to the worm-wheel D, this for convenience of manufacture; but the two may be integral with each other, if desired.

The worm-wheel D has mounted thereon, preferably near the periphery thereof, the roller R, which roller projects between the downwardly-projecting lugs t of the arms T and T' , which arms are pivoted, as at t' and t^2 , to the bracket P' , fast to or integral with the sleeve P. The stop P^2 projects down from this bracket between the free ends t^3 and t^4 of the pivoted arms T and T' , while the opposite ends of said arms are pivotally connected to the telescopic members U and U' , carrying the spring U^2 . These members are connected together by the screw U^3 , as shown in Fig. 4. The spring U^2 is held under compression between the shoulders u and u' , and this spring therefore causes the opposite ends t^3 and t^4 of the arms T and T' to press hard against the stop P^2 , and this stop limits the swing of the arms T and T' toward the stop. The compression of the spring U^2 is so adjusted that when the load on the motor exceeds a predetermined limit the roller

R will press against one or the other of the free ends t^3 and t^4 of the arms T and T' with sufficient force to rock that arm against the action of said spring, as shown in Fig. 9. This will cause the shaft C to lag with regard to the worm-wheel D and will cause the lugs q to cam the sleeve N up or down, rocking the arm M about its pivot, and consequently rocking the shaft H' and cutting off the current from the motor.

It will be seen that if the door is in the act of closing and encounters an obstacle—such as a bag of coal, or a piece of timber, or any other similar obstruction—the shaft C will be caused to lag slightly behind the worm-wheel D against the action of the spring U^2 , and the current will be cut off. In a similar way, if the obstruction is encountered upon opening the door—as, for instance, when the door strikes the buffer A^0 , (see Fig. 1)—the worm-wheel D will be caused to lag behind the shaft C through a small angle in the opposite direction and will cut off the current equally well. The current will remain cut off unless the obstacle is removed or unless the door is started in the opposite direction, which will restore the parts to the initial position. (Shown in Figs. 5 and 6.) Thus it will be seen that when the strain on the motor exceeds a predetermined limit, no matter whether the door is opening or closing, the current will be cut off, thus preventing the burning out of the motor or injury to the mechanical parts through excessive load. This action will take place entirely independent of whether it is turned on from a distance, and thus each door is provided with automatic protection against injury from excessive strains.

It will be obvious that various modifications might be made in the herein-described apparatus which could be used without departing from the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a system of the character described, the combination with a door or hatch, of an electric motor, and gearing driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to a member of said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and means controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

2. In a system of the character described, the combination with a door or hatch, of an electric motor, and gearing driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring un-

der compression mounted between said arms, a lug or roller connected to a member of said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and a cut-out switch controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

3. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and gearing driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected to a member of said gearing and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, and a cut-out switch controlled by the yielding of said arm against said spring, for cutting off the current from said motor, substantially as described.

4. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and gearing driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected to a member of said gearing and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, and means controlled by the yielding of said arm against said spring, for cutting off the current from said motor, substantially as described.

5. In a system of the character described, the combination with a door or hatch, of an electric motor, and gearing driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, means for adjusting the compression of said spring, a lug or roller connected to a member of said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and means controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

6. In a system of the character described, the combination with a door or hatch, of an electric motor, and gearing driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, means for adjusting the compression of said

spring, a lug or roller connected to a member of said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and a cut-out switch controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

7. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and gearing driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, means for adjusting the compression of said spring, a lug or roller connected to a member of said gearing and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, and a cut-out switch controlled by the yielding of said arm against said spring, for cutting off the current from said motor, substantially as described.

8. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and gearing driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, means for adjusting the compression of said spring, a lug or roller connected to a member of said gearing and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, and means controlled by the yielding of said arm against said spring, for cutting off the current from said motor, substantially as described.

9. In a system of the character described, the combination with a door, of an electric motor, and gearing driven by said motor for operating the door, pivoted arms with a stop therefor, a coil-spring under compression mounted between said arms, a telescopic joint for adjusting the compression of said spring, a lug or roller connected to said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and a cut-out switch controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

10. In a system of the character described, the combination with a door, of an electric motor, and gearing driven by said motor for operating the door, pivoted arms with a stop therefor, a coil-spring under compression mounted between said arms, a telescopic

joint for adjusting the compression of said spring, a lug or roller connected to said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and means controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

11. In a system of the character described, the combination with a door or hatch, of an electric motor, and a worm-wheel driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit in either direction, and means controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

12. In a system of the character described, the combination with a door or hatch, of an electric motor, and a worm-wheel driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and a cut-out switch controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

13. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and a worm-wheel mounted on said shaft and driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, and a cut-out switch controlled by the yielding of said arm against said spring, for cutting off the current from said motor, substantially as described.

14. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and a worm-wheel mounted on said shaft and driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other

of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, and means controlled by the yielding of said arm against said spring, for cutting off the current from said motor, substantially as described.

15. In a system of the character described, the combination with a door or hatch, of an electric motor, and a worm-wheel driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, means for adjusting the compression of said spring, a lug or roller connected to said worm-wheel, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, in either direction, and means controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

16. In a system of the character described, the combination with a door or hatch, of an electric motor, and a worm-wheel driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, means for adjusting the compression of said spring, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and a cut-out switch controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

17. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and a worm-wheel mounted on said shaft and driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, means for adjusting the compression of said spring, and a cut-out switch controlled by the yielding of said arm against said spring, for cutting off the current from said motor, substantially as described.

18. In a system of the character described, the combination with a door, of an electric motor, and gearing driven by said motor for operating the door, pivoted arms with a stop therefor, a coil-spring under compression mounted between said arms, a telescopic joint for adjusting the compression of said spring, a lug or roller connected to said gearing, and forcing one or the other of said arms against said spring when the load on said gear-

ing exceeds a predetermined limit, and means controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

5 19. In a system of the character described, the combination with a door, of an electric motor, and gearing driven by said motor for operating the door, pivoted arms with a stop therefor, a coil-spring under compression
10 mounted between said arms, a telescopic joint for adjusting the compression of said spring, a lug or roller connected to said gearing, and forcing one or the other of said arms against said spring when the load on said
15 gearing exceeds a predetermined limit, and a cam-sleeve controlled by the yielding of said arm against said spring, and a cut-out switch operated by said cam-sleeve, for cutting off the current from said motor, substantially as described.

20. In a system of the character described, the combination with a door or hatch, of an electric motor, and a worm-wheel driven by said motor for operating the door or hatch,
25 pivoted arms with a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against said spring when the load on
30 said gearing exceeds a predetermined limit in either direction, a cam-sleeve, cam-lugs connected to said worm-wheel and engaging said cam-sleeve, and means controlled by the motion of said cam-sleeve due to the yielding
35 of said arm against said spring, for cutting off the current from said motor, substantially as described.

21. In a system of the character described, the combination with a door or hatch, of an
40 electric motor, and a worm-wheel driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other of said
45 arms against said spring when the load on said gearing exceeds a predetermined limit, a cam-sleeve, cam-lugs connected to said worm-wheel and engaging said cam-sleeve, and a
50 cut-out switch controlled by the motion of said cam-sleeve due to the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

55 22. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or
60 racks, of an electric motor, and a worm-wheel mounted on said shaft and driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected
65 to said worm-wheel and forcing one or the

other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, a cam-sleeve movable longitudinally on said shaft, cam-lugs connected to said worm-wheel and said cam-sleeve, and a cut-out switch controlled by the
70 motion of said cam-sleeve due to the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

75 23. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and a worm-
80 wheel mounted on said shaft and driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected
85 to said worm-wheel and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, a cam-sleeve movable longitudinally on said shaft, cam-lugs connected
90 to said worm-wheel and engaging said cam-sleeve, and means controlled by the motion of said cam-sleeve due to the yielding of said arm against said spring, for cutting off the current from said motor, substantially as
95 described.

24. In a system of the character described, the combination with a door or hatch, of an electric motor, and a worm-wheel driven by
100 said motor for operating the door or hatch, pivoted arms with a stop therefor, a coil-spring under compression mounted between said arms, a telescopic joint for supporting said spring and for adjusting the compression thereof, a lug or roller connected to said
105 worm-wheel, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, in either direction, and means controlled by the yielding of said arm against
110 said spring for cutting off the current from said motor, substantially as described.

25. In a system of the character described, the combination with a door or hatch, of an electric motor, and a worm-wheel driven by
115 said motor for operating the door or hatch, pivoted arms with a stop therefor, telescopic members pivoted to said arms, respectively, a coil-spring under compression mounted between said arms over said telescopic mem-
120 bers, a screw for adjusting the compression of said spring, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined
125 limit, and a cut-out switch controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

26. In a system of the character described, 130

the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and a worm-wheel mounted on said shaft and driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, telescopic members pivoted to said arms, respectively, a coil-spring under compression mounted between said arms and inclosing said telescopic members, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, a screw connecting said telescopic members for adjusting the compression of said spring, and a cut-out switch controlled by the yielding of said arm against said spring, for cutting off the current from said motor, substantially as described.

27. In a system of the character described, the combination with a door, of an electric motor, and gearing driven by said motor for operating the door, pivoted arms with a stop therefor, telescopic members connecting said arms, a coil-spring under compression mounted between said arms, and inclosing said telescopic members, a lug or roller connected to said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, and means controlled by the yielding of said arm against said spring for cutting off the current from said motor, substantially as described.

28. In a system of the character described, the combination with a door or hatch, of an electric motor, and gearing driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, means controlled by the yielding of said arm against said spring for cutting off the current from said motor, and means for operating said gearing by hand from either side of the bulkhead, when desired, substantially as described.

29. In a system of the character described, the combination with a door or hatch, of an electric motor, and gearing driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, means for adjusting the compression of said spring, a lug or roller connected to said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, a cut-out switch controlled by the yielding of said arm against said spring for cutting off the current from said motor, and means for op-

erating said gearing by hand from either side of the bulkhead, when desired, substantially as described.

30. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with pinions meshing in said racks, of an electric motor, and gearing driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to a member of said gearing and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, a cut-out switch controlled by the yielding of said arm against said spring, for cutting off the current from said motor, and means for operating said gearing by hand from either side of the bulkhead, when desired, substantially as described.

31. In a system of the character described, the combination with a door or hatch, a rack or racks secured thereto, and a shaft with pinions meshing in said racks, of an electric motor, and gearing driven by said motor for turning said shaft, arms pivotally mounted on said shaft and a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to a member of said gearing and forcing one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, means controlled by the yielding of said arm against said spring, for cutting off the current from said motor, and means for operating said gearing by hand from either side of the bulkhead, when desired, substantially as described.

32. In a system of the character described, the combination with a door, of an electric motor, and gearing driven by said motor for operating the door, pivoted arms with a stop therefor, a coil-spring under compression mounted between said arms, a telescopic joint for adjusting the compression of said spring, a lug or roller connected to said gearing, and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, a cam-sleeve controlled by the yielding of said arm against said spring, a pivoted arm rocked by said cam-sleeve and a cut-out switch operated by said arm, for cutting off the current from said motor, substantially as described.

33. In a system of the character described, the combination with a door or hatch, of an electric motor, and a worm-wheel driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against said spring when the load on said

gearing exceeds a predetermined limit in either direction, a cam-sleeve, cam-lugs connected to said worm-wheel and engaging said cam-sleeve, a pivoted arm rocked by said
 5 cam-sleeve and a cut-out switch operated by said arm, for cutting off the current from said motor, substantially as described.

34. In a system of the character described, the combination with a door or hatch, of an
 10 electric motor, and a worm-wheel driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a spring under compression mounted between said
 15 arms, a lug or roller connected to said worm-wheel and forcing one or the other of said arms against said spring when the load on said gearing exceeds a predetermined limit, a
 20 cam-sleeve, cam-lugs connected to said worm-wheel and engaging said cam-sleeve, a pivoted arm rocked by said cam-sleeve and a cut-out switch operated by said arm, for cutting off the current from said motor, substantially as described.

35. In a system of the character described, the combination with a door or hatch, a rack
 25 or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and a worm-wheel mounted on said shaft and driven by
 30 said motor for turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing
 35 one or the other of said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, a cam-sleeve movable longitudinally on said shaft, cam-lugs connected to said worm-
 40 wheel and said cam-sleeve, a pivoted arm rocked by said cam-sleeve and a cut-out switch operated by said arm, for cutting off the current from said motor, substantially as described.

36. In a system of the character described, 45 the combination with a door or hatch, a rack or racks secured thereto, and a shaft with a pinion or pinions meshing in said rack or racks, of an electric motor, and a worm-wheel mounted on said shaft and driven by said motor for
 50 turning said shaft, arms pivotally mounted on said shaft and a stop for said arms, a spring under compression mounted between said arms, a lug or roller connected to said worm-wheel and forcing one or the other of
 55 said arms against the action of said spring when the load on said gearing exceeds a predetermined limit, a cam-sleeve movable longitudinally on said shaft, cam-lugs connected to said worm-wheel and engaging said cam-
 60 sleeve, a pivoted arm rocked by said cam-sleeve and a cut-out switch operated by said arm, for cutting off the current from said motor, substantially as described.

37. In a system of the character described, 65 the combination with a door or hatch, of an electric motor, and a worm-wheel driven by said motor for operating the door or hatch, pivoted arms with a stop therefor, a coil-spring under compression mounted between
 70 said arms, a telescopic joint for supporting said spring and for adjusting the compression thereof, a lug or roller connected to said worm-wheel, and forcing one or the other of said arms against said spring when the load
 75 on said gearing exceeds a predetermined limit, in either direction, a pivoted arm rocked by said cam-sleeve and a cut-out switch operated by said arm, for cutting off the current from said motor, substantially as
 80 described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM BARNUM COWLES.

Witnesses:

W. J. SULIS,
 H. WATSON.