

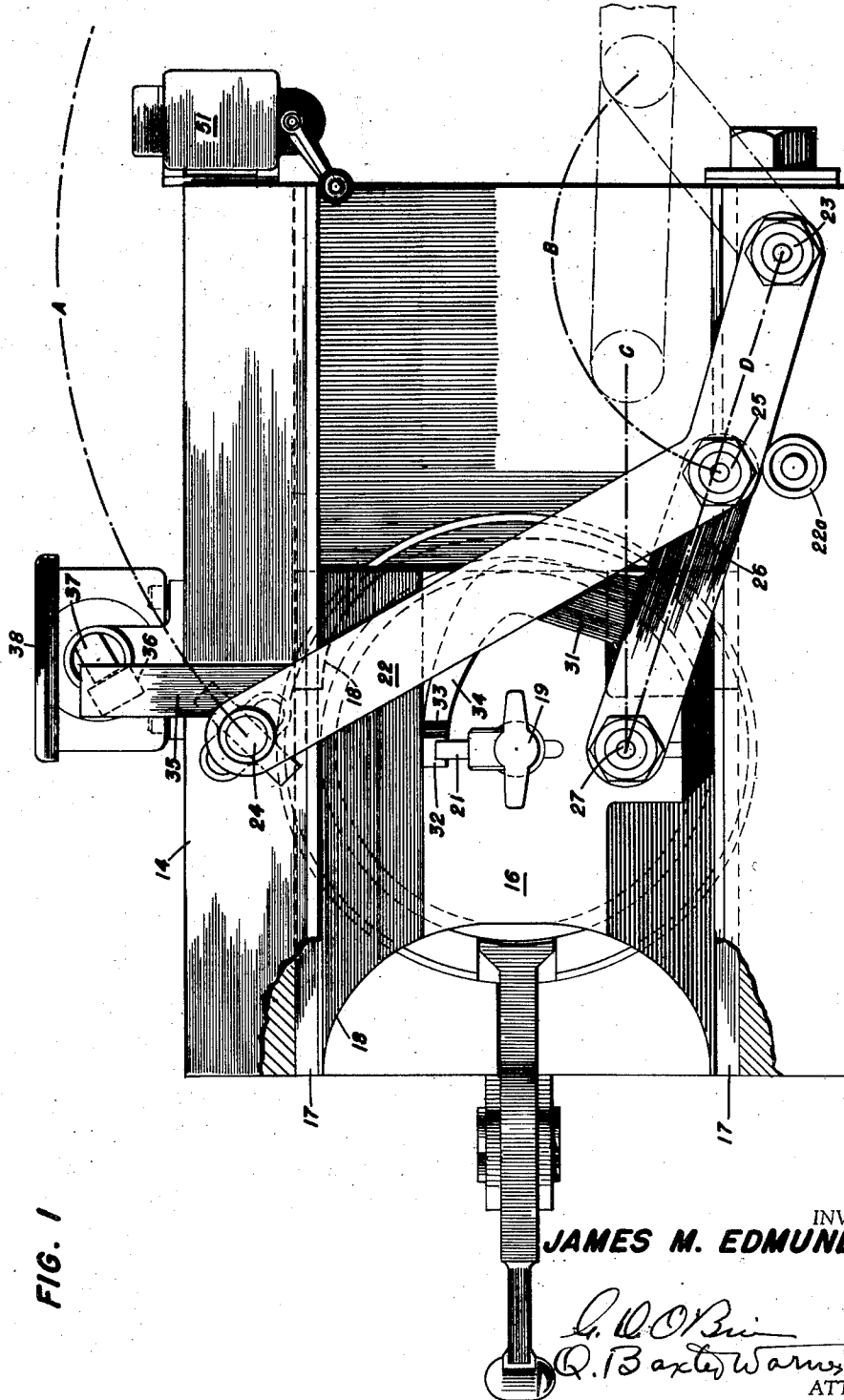
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J. M. EDMUND
BREECH MECHANISM

2,802,400

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BREECH MECHANISM

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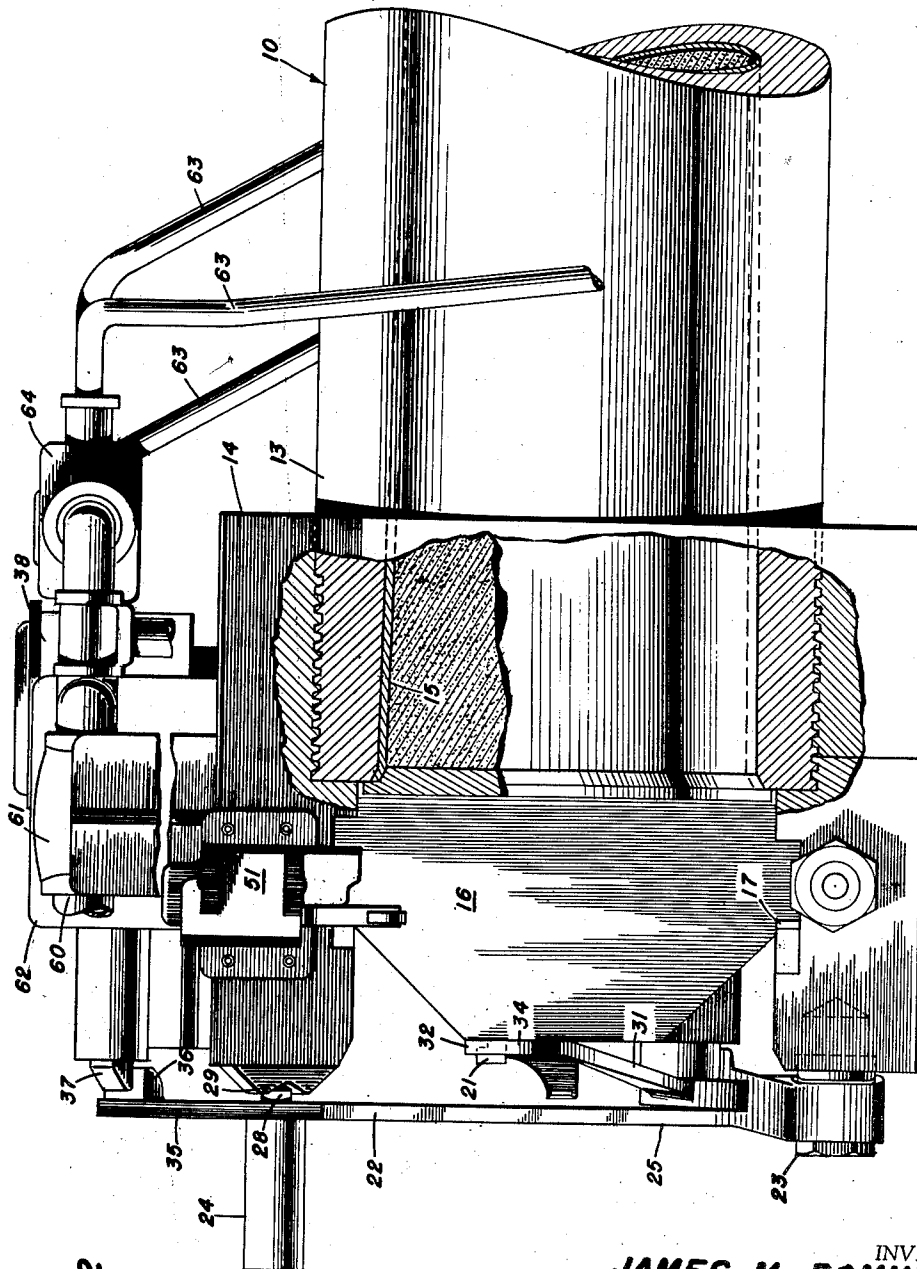


FIG. 2

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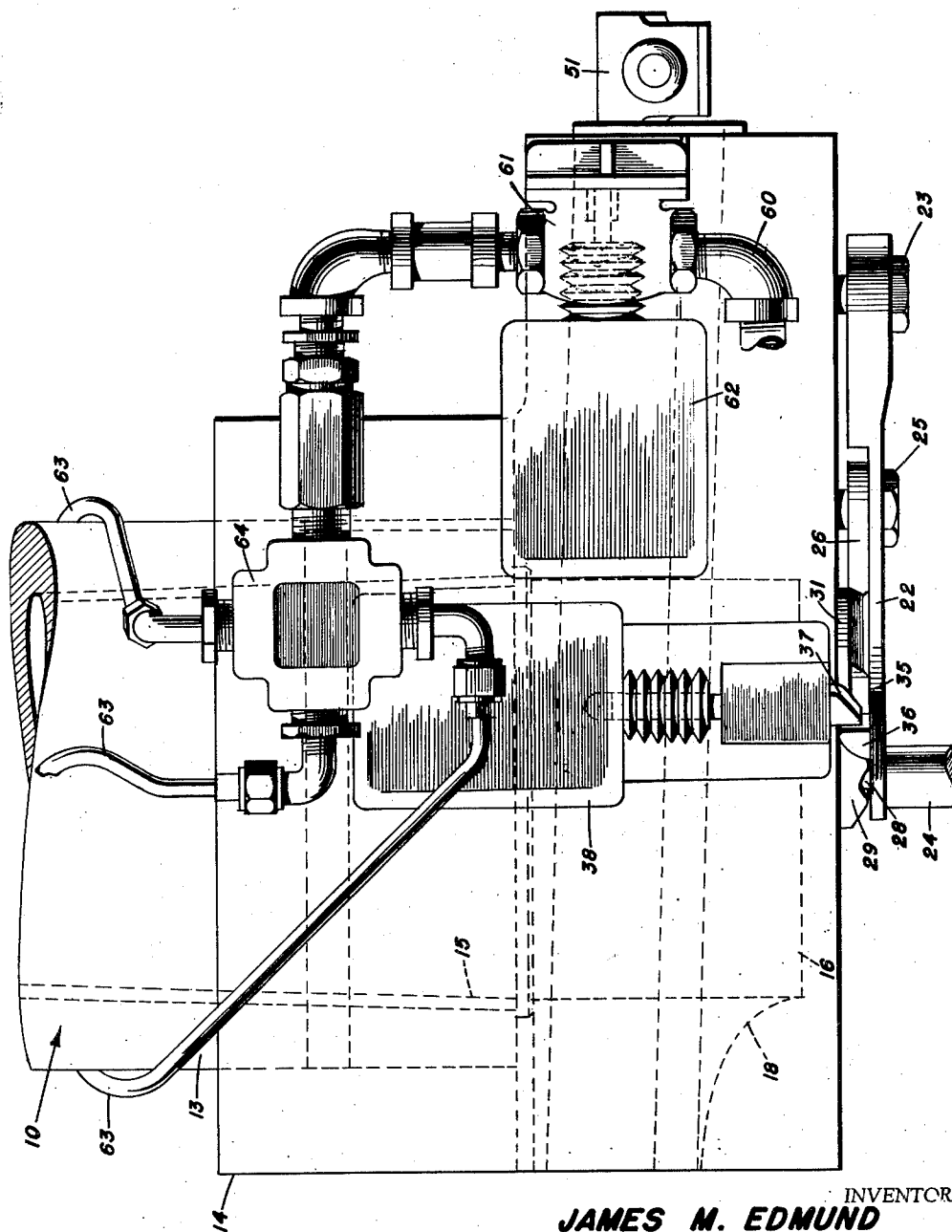


FIG. 3

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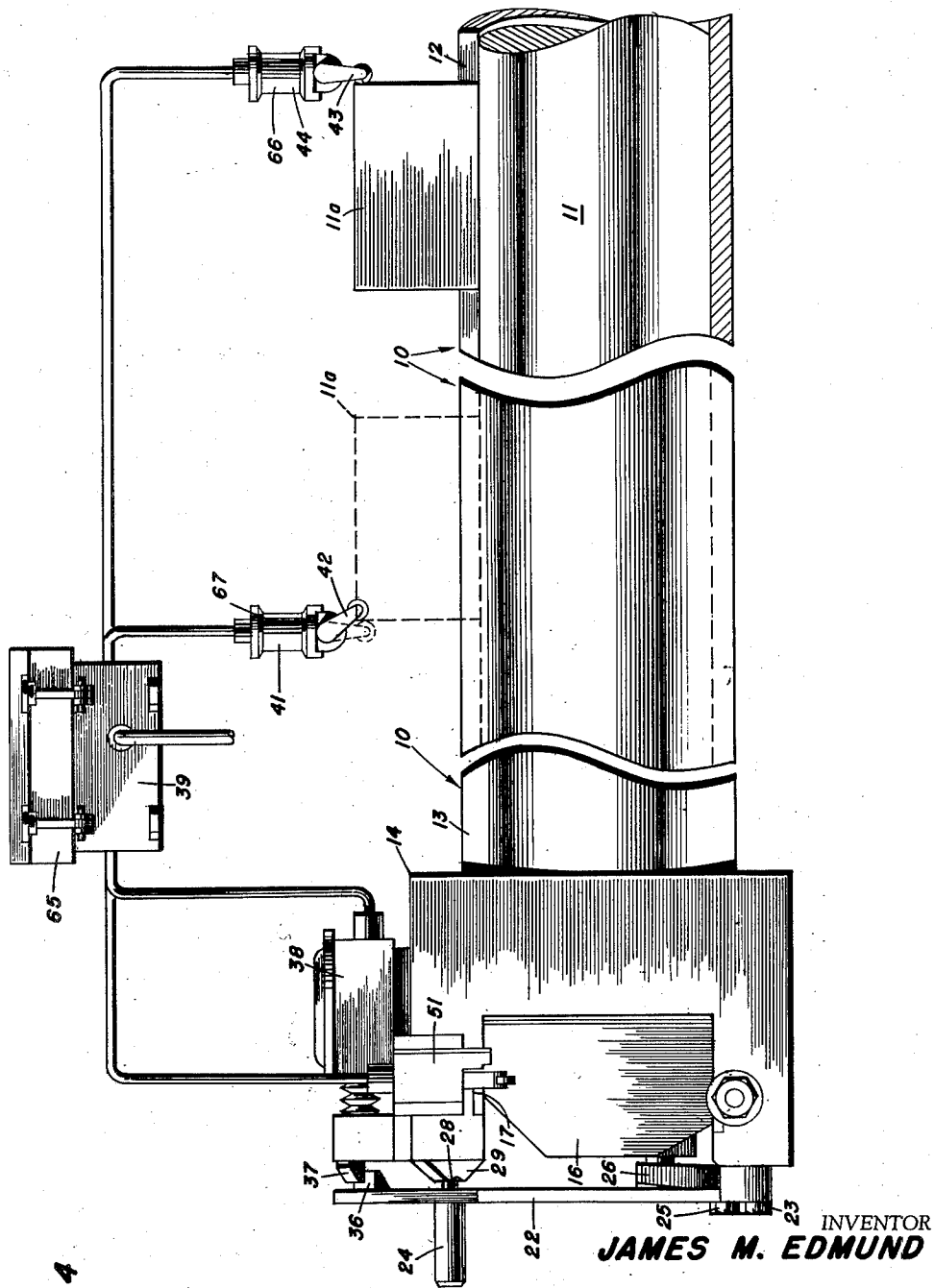
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FIG. 4



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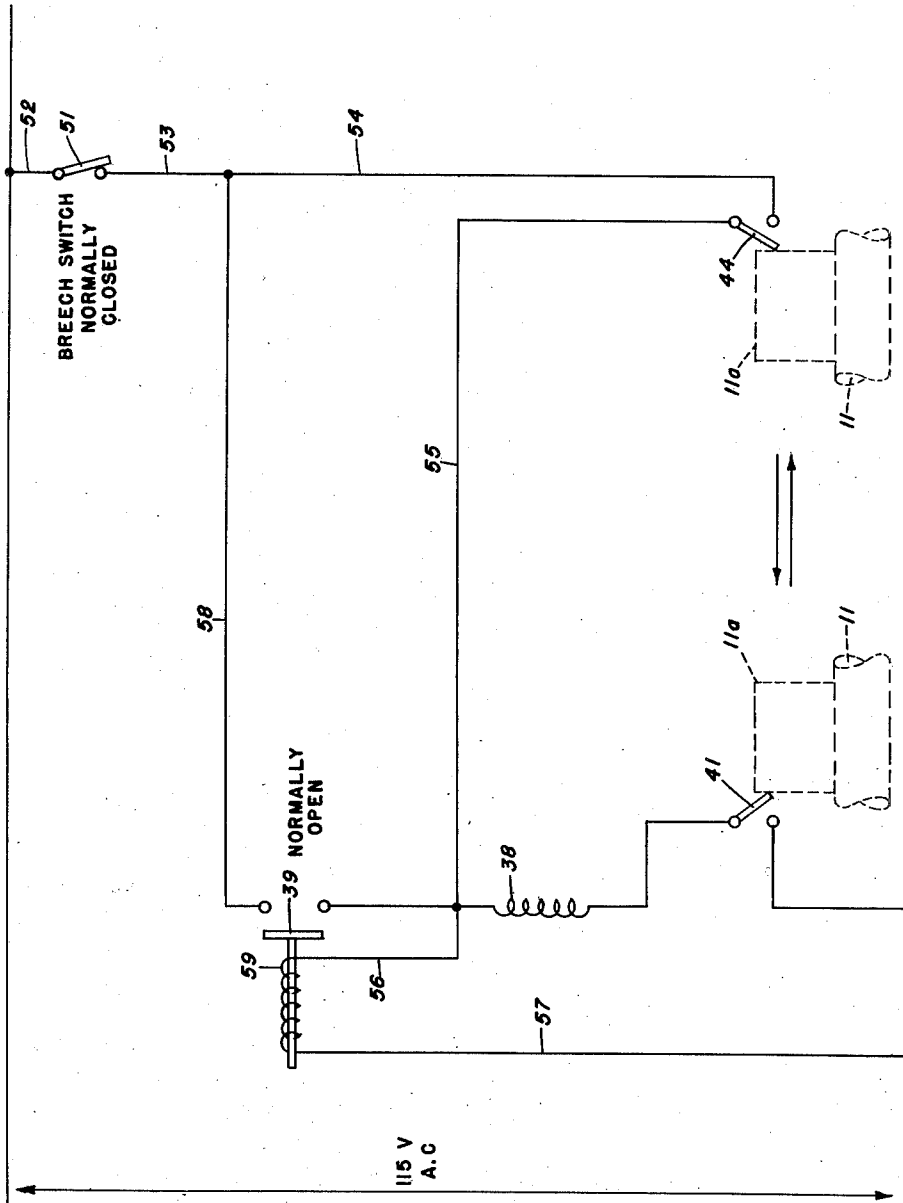


FIG. 5

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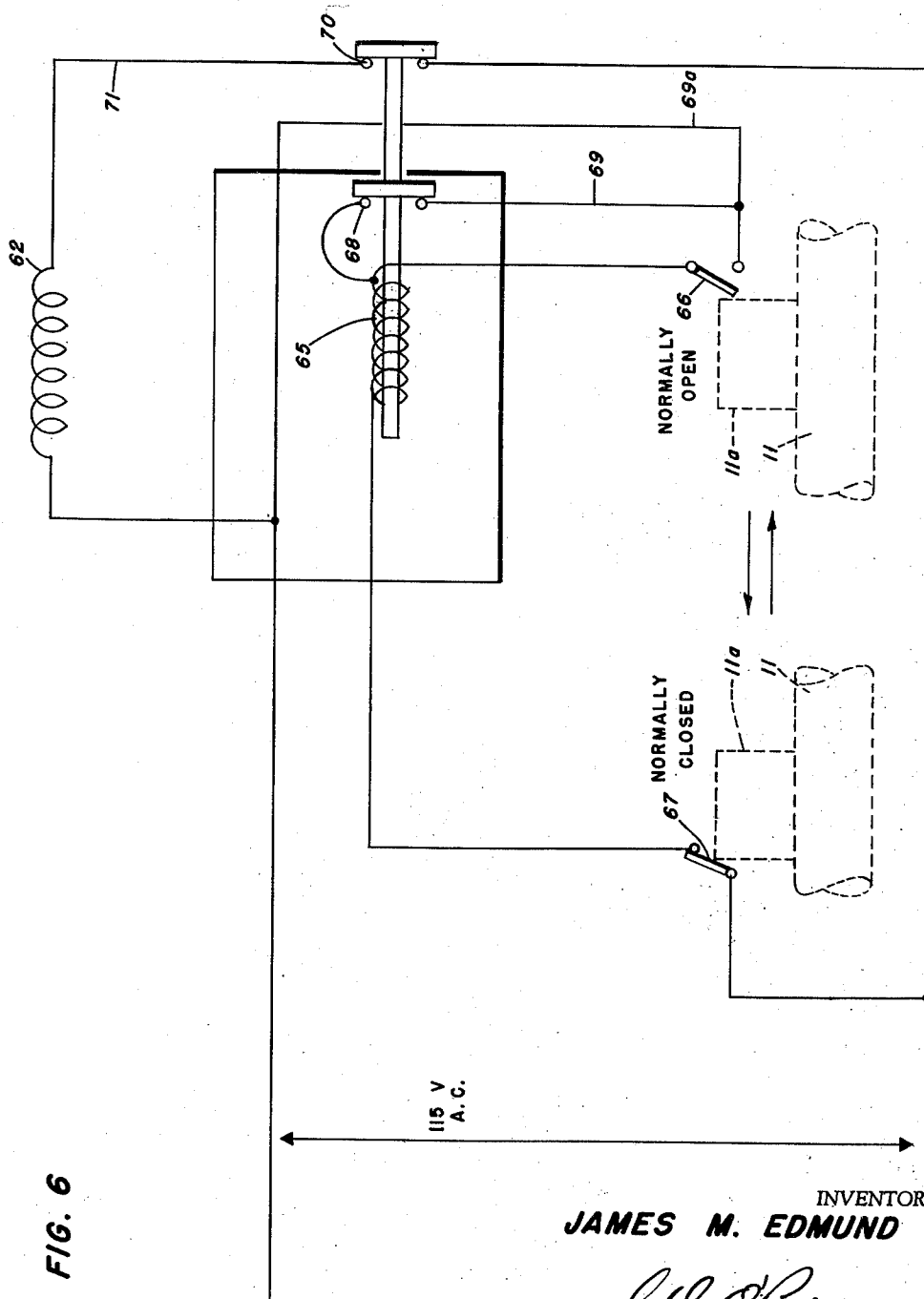
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2,802,400

BREECH MECHANISM

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6 Claims. (Cl. 89—24)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to breech mechanisms and controls and more particularly to a breech mechanism for an explosive actuated catapult together with appropriate interlocks and safety devices therefor.

Aircraft catapults and other missile launching devices wherein an explosive is burned to rapidly generate pressures for launching purposes commonly employ breechblock mechanisms to retain in place powder cases which, when fired move a shuttle car or similar device along launching ways. Thereafter, a return device is used to return the shuttle car. Such catapults are in common use both on ships at sea and at land installations.

In the device of the present invention there is provided the combination of a novel operating means for moving a breechblock into and out of breech obstructing position, a breech scavenging system automatically operated by the movement of the shuttle, a salvo latch safety control for restraining the breechblock until after firing has taken place and means for automatically immobilizing the usual firing pin to prevent firing except when the breechblock is fully closed.

It is accordingly an object of the present invention to provide a simple, reliable breech construction and operating means therefor for a catapult gun.

It is a further object to provide novel breech actuating means together with control interlocks to prevent accidental opening of the breech until after firing and to prevent firing of the catapult when the breechblock is not fully closed.

Another object is to provide a novel firing pin restraining mechanism for a breech mechanism.

Another object is to provide a scavenging system and novel controls and interlocks therefor.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a rear view of a breech embodying the present invention;

Fig. 2 is a side elevation of the embodiment illustrated in Fig. 1 with a portion broken away to show a powder case in place;

Fig. 3 is a top plan view of the embodiment of Figs. 1 and 2;

Fig. 4 is a side elevation view of the breech and associated interlock system;

Fig. 5 is a schematic circuit diagram of an electrical system for use in the present invention; and

Fig. 6 is a schematic circuit diagram of a scavenging system.

In the drawings the embodiment illustrated comprises an elongated barrel 10 which forms the gun part of the

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catapult and contains a shuttle member 11 (Fig. 4) which is driven in the direction of the arrow by the explosive pressure generated by a powder case exploded in the barrel. The upper side of barrel 10 has a longitudinal slot 12 to permit an upwardly extending lug 11a on the shuttle member to project upwardly therethrough for engagement with a shuttle car or other carrier means (not illustrated) for the device to be launched.

The breech end 13 of the barrel is provided with a housing 14 opening from the rear to receive a powder case 15. A sliding breechblock 16 closes the after end of the breech opening to secure a powder case in place. The breechblock 16 moves in grooves 17 of the housing and is provided with large notch 18 which, with the breechblock in its open position, registers with the rear opening of the barrel to permit loading a powder case therethrough. Centrally disposed in the breechblock is a firing pin assembly 19 of conventional design which as illustrated is provided with an upwardly extending lug 21 positioned in the path of a firing pin retracting cam hereinafter to be described.

Movement of the breechblock from the open to the closed position is accomplished by the use of a bell crank lever 22 which is pivotally mounted at 23 to the housing and has at its opposite end a handle 24 by means of which it may be swung through an arc indicated by dotted line A in Fig. 1. Such movement carries with it the knee 25 of a toggle joint which describes an arc illustrated by dotted line B in Fig. 1, this knee in turn is pivotally connected to the end of a link arm 26 pivoted to the movable breechblock at 27 which point moves laterally along the straight dotted line C of Fig. 1 during breech opening operation. It will be apparent that knee 25 is slightly below a dotted straight line D joining pivot points 23 and 27 when the breechblock is closed and the lever abuts stop member 22a and thus provides a toggle action to resist unintended opening of the breechblock. However, initial movement of the arm 22 by means of handle 24 swings the knee about pivot 23 along dotted line B and draws the breechblock to the open position as shown in dotted lines.

On the undersurface of lever 22 is provided a detent 28 resiliently urged against a notch in cam surface 29 to normally retain the arm in the breechblock closed position.

As shown in Fig. 1 the link 26 has an upwardly extending firing pin retracting finger 31 which is curved and formed to move the relatively thin end portion 32 thereof under the firing pin lug 21 when the breech is closed, but is provided with a slope 33 by means of which the lug 21 is cammed outwardly as the finger is moved during breech opening operation so that with the breech open a relatively thicker portion 34 is interposed behind the lug 21 and retains the firing pin 19 in retracted position so that it cannot engage the primer of the powder case to either percussively or electrically fire the powder charge.

On the operating lever 22 is mounted an upper extension 35, the rear face of which is provided with a latch engaging detent 36 inclined on one face and perpendicular on the other to engage with a solenoid operated salvo latch extension 37 as shown in Fig. 3 which locks the breech closed until the solenoid is actuated in a manner hereinafter to be described.

The solenoid 38 is electrically operated through a relay box 39 with the circuits so arranged that a normally open salvo latch switch 41 is closed when shuttle extension 11a strikes the operating lever arm 42 thereof to thereby energize solenoid 38 and retract the detent member 37 to allow opening of the breech. It will be apparent that until the shuttle member 11 reaches the rearward limit of its movement the salvo latch 38 will not be energized and

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the operating arm 22 is locked in place with the breech closed. By means of a holding circuit in relay 39 the solenoid 38 remains retracted until the shuttle member 11 returns to engage arm 43 and open a normally closed shuttle return switch 44.

With the electrical system indicated in Fig. 4 and shown diagrammatically in Fig. 5 the operation of the catapult launcher may be controlled as follows: With a powder case in place in the breech and the catapult gun ready to fire, switch 51, which is normally closed, is disengaged by the breech block and therefore closed to permit current to flow through lines 52 and 53 to the forward limit switch 44 which is normally open. When the catapult lug reaches the forward limit of its movement switch 44 is closed to permit current to flow through line 54 to line 55 and line 56 and thence through the relay coil 59 of relay 39 and line 57 to the other side of the power supply line. This action closes relay contacts 39 which are normally open and are disposed in line 58 in parallel with the contacts of switch 44 so that a holding circuit is provided to keep the relay contacts 39 closed when the forward limit switch 44 opens during the return stroke. Upon completion of the return stroke the contacts of rear limit switch 41 which are normally open are closed so that current passing through line 52 and switch 51 through holding circuit line 58 and the contacts of switch 39 pass through the coils of solenoid 38 through rear limit switch 41 to the opposite side of the line. Activation of this solenoid retracts the salvo latch mechanism afore-described to permit opening of the breech. Upon opening the breech normally closed breech switch 51 is opened to disrupt current flow through the holding circuit 58 aforesaid and relay coil 59 is de-energized to open relay contacts 39. Thereafter, when a new powder case is loaded into place and the breech closed the breech switch 51 is again closed and upon firing the powder case the afore-described series of events is repeated.

As shown in Figs. 2 and 3 a scavenging system may be provided including a source 60 of compressed air, a valve 61 controlled by a solenoid 62 and air distribution lines 63 leading from a manifold 64 to the after portion of the barrel 10. In use the solenoid valve 61 may be operated by a suitable relay 65 (Fig. 6) so connected to limit switches positioned for operation by the shuttle that a normally open switch 66 may be closed by the shuttle reaching the forward end of its stroke to open scavenging air valve 61 and a normally closed switch 67 is opened at the end of the return stroke to close scavenging air valve 61. These switches may be operated by the same shuttle engaging arms that open and close switches 41 and 44. It will be apparent that when switch 66 is closed relay 65 closes contacts 68 to establish a holding circuit through lines 69 and 69a which is interrupted only by the opening of switch 67 upon the return of the shuttle. This relay 65 also closes contacts 70 in a separate circuit 71 to the scavenging air valve operating solenoid 62.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In a breech mechanism for a catapult device wherein an explosively actuated shuttle is movable from a retracted to an extended position, the combination of: a breech housing, a closure member having a firing pin thereon, said closure member being movable into and out of breech obstructing position, closure member operating means comprising a hand lever for moving the closure member into and out of breech obstructing position, cam means actuated by operation of the hand lever for engagement with the firing pin of the breech mechanism to prevent operation of the firing pin when the closure mem-

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ber is out of breech obstructing position, a hand lever restraining latch, a scavenging system, and control means for the hand lever restraining latch and the scavenging system, said control means being conditioned by movement of the shuttle from its retracted to its extended position and back, whereby the closure member once in breech obstructing position normally cannot be moved therefrom until after explosive actuation of the shuttle and whereby scavenging action will automatically be provided during the return stroke of the shuttle.

2. In a breech mechanism for a catapult device wherein an explosively operated shuttle is movable from a retracted to an extended position and back comprising: a breech housing, a closure member movable into and out of breech obstructing position, closure member operating means for moving the closure member into and out of breech obstructing position, a restraining latch for the closure member operating means and control means for the restraining latch actuated by the completion of a cycle of movement of the shuttle from its retracted to its extended position and back, whereby the closure member once in breech obstructing position normally cannot be moved therefrom until after explosive actuation of the shuttle.

3. A breech mechanism for a catapult device comprising: a breech housing, an explosively actuated shuttle movable in said breech housing from a retracted to an extended position, a scavenging system, control means for the scavenging system conditioned by movement of the shuttle from its retracted to its extended position and back whereby scavenging action will automatically be provided during the return stroke of the shuttle.

4. In a breech mechanism for a catapult device wherein an explosively actuated shuttle is movable from a retracted to an extended position, the combination of: a breech housing, a closure member having a firing pin thereon said closure member being movable into and out of breech obstructing position, closure member operating means comprising a hand lever for moving the closure member into and out of breech obstructing position, means actuated by operation of the hand lever for engagement with the firing pin of the breech mechanism to prevent operation of the firing pin when the closure member is out of breech obstructing position, a hand lever restraining latch, and control means for the hand lever restraining latch, said control means being conditioned by movement of the shuttle from its retracted to its extended position and back such that the closure member once in breech obstructing position normally cannot be moved therefrom until after explosive actuation of the shuttle.

5. In a breech mechanism for a catapult device wherein an explosively actuated shuttle is movable from a retracted to an extended position, the combination of: a breech housing, a breechblock having a firing pin thereon said breechblock being movable into and out of breech obstructing position, breechblock operating means comprising a manually operated lever for moving the breechblock into and out of breech obstructing position, cam means actuated by operation of the lever for engagement with the firing pin of the breech mechanism to prevent operation of the firing pin when the breechblock is out of breech obstructing position, a scavenging system, and control means for the scavenging system, said control means being conditioned by movement of the shuttle from its retracted to its extended position and back such that scavenging action will automatically be provided during the return stroke of the shuttle member.

6. In a breech mechanism for a catapult device wherein an explosively actuated launcher carrier is movable from a retracted to an extended position, the combination of: a breech housing, a breechblock having a firing pin thereon said breechblock being movable into and out of breech obstructing position, breechblock operating means comprising a manually operated lever for moving the

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breechblock into and out of breech obstructing position, a firing pin retracting cam actuated by operation of the lever for engagement with the firing pin of the breech mechanism to prevent operation of the firing pin when the breechblock is out of breech obstructing position, a salvo latch for the manually operated lever, a pneumatic pressure system, an electrical operable control system for the salvo latch and the pneumatic pressure system, said electrical operable control system being activated by movement of the launcher carried from its retracted to its extended position and back such that the breechblock

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once in breech obstructing position cannot be moved therefrom until after exposive actuation of the launcher carrier and whereby the pneumatic pressure source will be open to the breech housing during the return stroke of the launcher carrier.

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