MINE, MARK 12 AND MODIFICATIONS

DESCRIPTION AND INSTRUCTIONS FOR

ASSEMBLY
HANDLING
PLANTING

30 NOVEMBER 1943

A BUREAU OF ORDNANCE PUBLICATION ISSUED NOVEMBER, 1943

RESTRICTED

ORDNANCE PAMPHLET No. 901

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This publication is RESTRICTED and will be handled in accordance with Article 76, United States Navy Regulations, 1920


UNITED STATES
NAVY
BUREAU OF ORDNANCE

NAVY DEPARTMENT

BUREAU OF ORDNANCE

WASHINGTON, D. C.

RESTRICTED

30 November 19

ORDNANCE PAMPHLET NO. 901

MINES, MARK 12 AND MODIFICATIONS

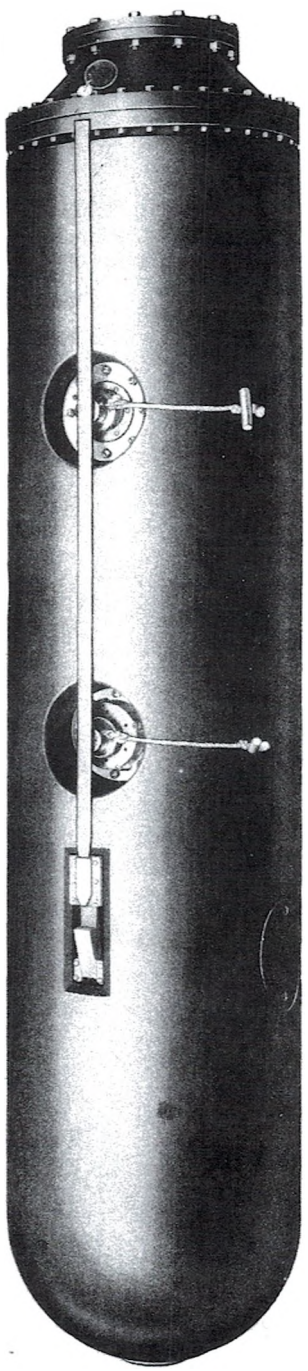
1. Ordnance Pamphlet No. 901 describes the Mark 12 Mine a Modifications and gives instructions for their assembly, testing, ha dling and planting.

2. This publication supersedes ORD 647; Bureau of Ordnanc Circular Letters No. X-682, M2-42, M9-42, M13-42, M7-43 and MV17-43; Ordnance Technical Instruction No. M9-43; and Naval Ordnance Laborat Report No. 763 which has been given limited distribution by this Bu Ordnance Circular Letters No. X-682, M2-42, M9-42, M13-42, M7-43 and MV17-43, Naval Ordnance Laboratory Report No. 763, and Ordnance Tech cal Instruction No. M9-43 should be destroyed by burning. ORD 647 to be destroyed by burning and a destruction report on Form RPS2 sub mitted to the Chief of Naval Operations (D. N. C. - Registered Publi cation Section,) Navy Department, Washington, 25, D. C.

3. This publication is RESTRICTED and should be handled accordance with the provisions of Article 76, U. S. Navy Regulation 1920.

4. It is not intended that this publication be carried in aircraft for use therein.

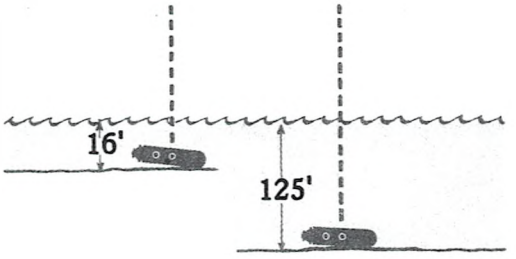
W. H. P. BLANDY
Rear Admiral, U. S. Navy
Chief of the Bureau of Ordnan

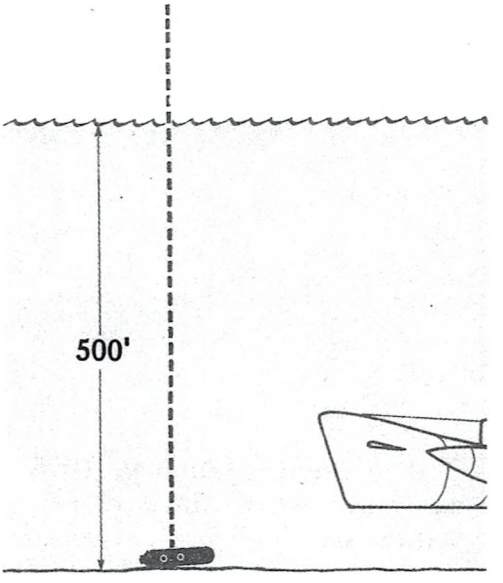


THE ASSEMBLED MINE

SUMMARY

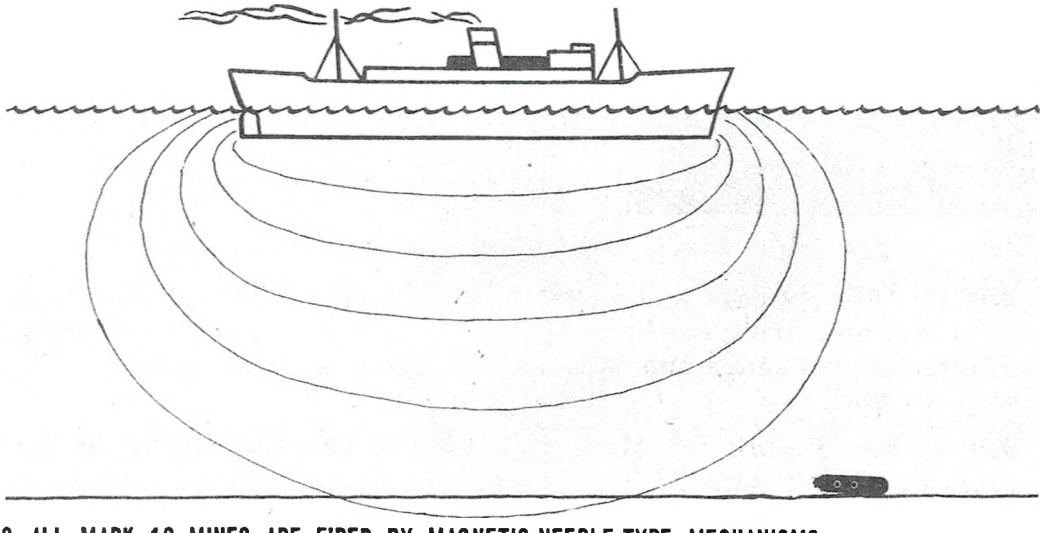
POINTS TO REMEMBER





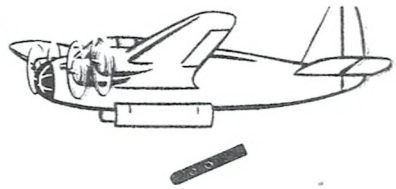
1 MARK 12 MINES ARE GROUND MINES DESIGNED FOR USE IN DEPTHS OF 16 TO 125 FEET OF WATER AGAINST SURFACE CRAFT.

2 UNDER CERTAIN CONDITIONS THEY MAY BE USED IN DEPTHS OF 500 FEET OR LESS AGAINST SUBMARINES.

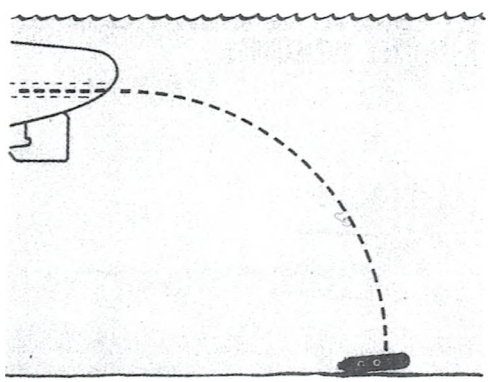


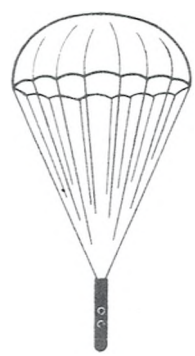
3 ALL MARK 12 MINES ARE FIRED BY MAGNETIC-NEEDLE-TYPE MECHANISMS.

LIGHT BLUE INDICATES WATER



The present (January, 1944) designations of Mark 12 type mines are:





MARK 12. Mk. 12 case assembled with M-3 type firing mechanism. Planted from 21-inch submarine torpedo tube.

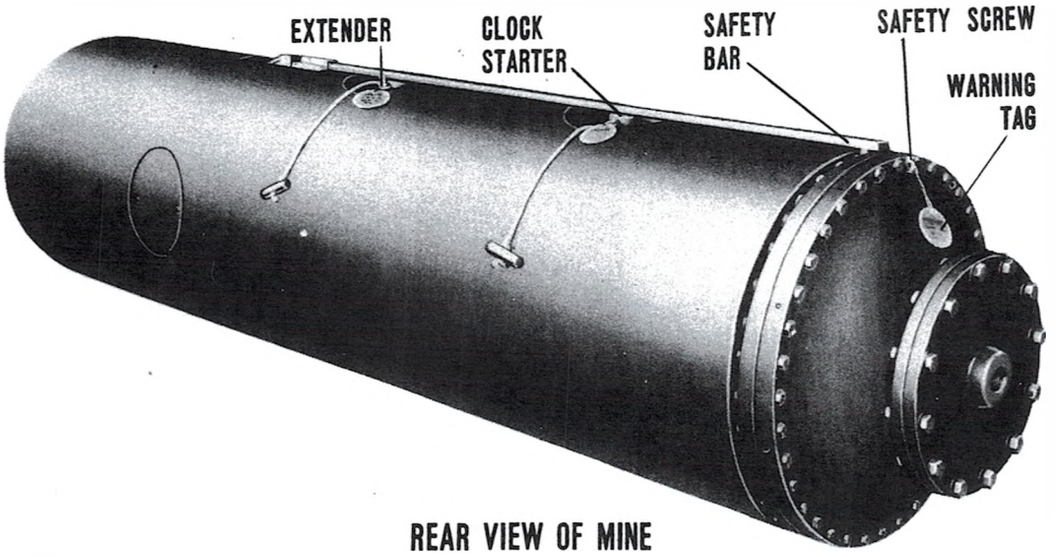
MARK 12 MOD. 3. Mk. 12 Mod. 3 case assembled with M-3 type firing mechanism. Differs from Mark 12 only in details of construction and wiring. Planted from submarine torpedo tube.

MARK 12 MOD. 1. Mk. 12 mine fitted with parachute and modified for planting from aircraft.

MARK 12 MOD. 4. Mk. 12 Mod. 3 mine fitted with parachute and modified for planting from aircraft.

LIGHT BLUE INDICATES WATER

MARK 12 MOD. 1 MINE



REAR VIEW OF MINE

SAFETY FEATURES

1. Prior to planting, operation of the hydrostatically operated extenders and clock starters in these mines is prevented by safety devices. These devices, and their operation, are described in the chapters of this pamphlet pertaining to the mines on which they are used.

HOW THE MINE WORKS

2. The safety pins are pulled out of the extender and clock starter when a mine is placed in a torpedo tube for planting. The safety bar holds the retainers on the extender and clock starter.

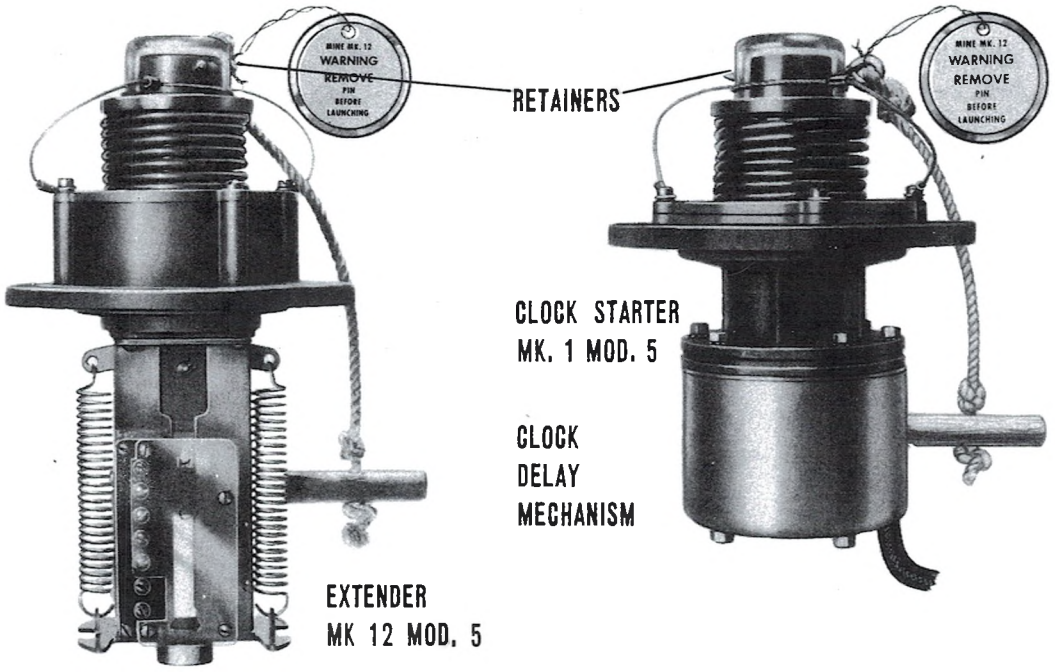
3. When the mine is ejected, the safety bar is forced off—the retainers are thrown off the extender and clock starter by the retainer springs.

4. Water pressure causes the extender to move an electric detonator into a booster charge.

5. Water pressure causes the clock starter to start the clock delay mechanism.

6. The clock delay mechanism operates switches

SAFETY FEATURES

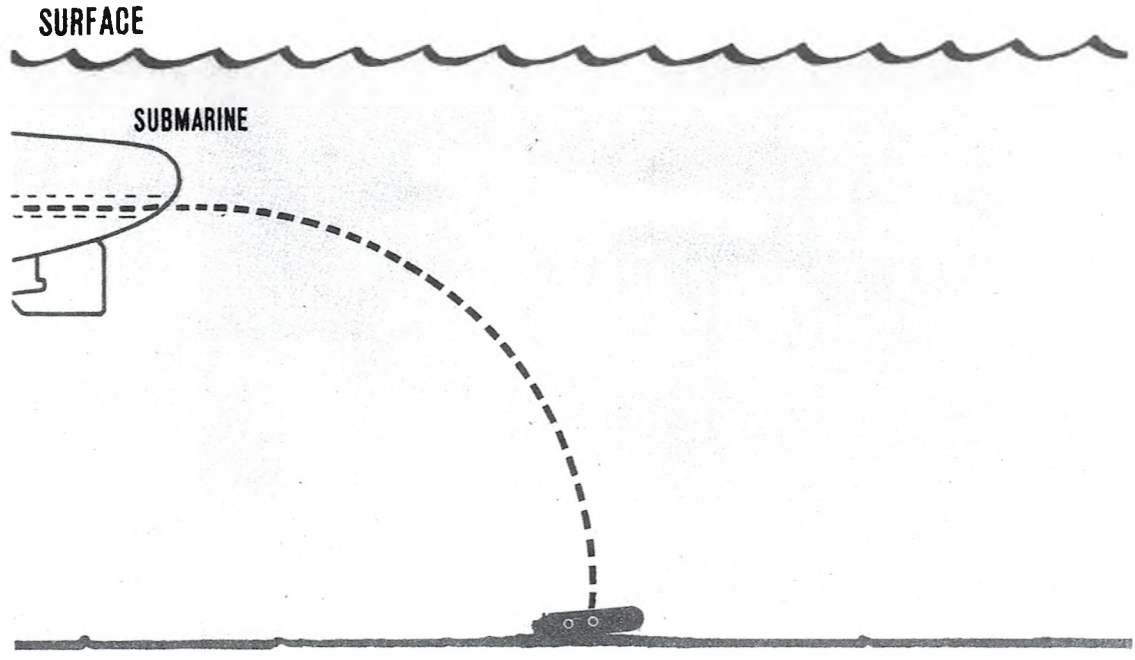


which cause the firing mechanism to become armed after a predetermined time.

7. If pressure is removed from the clock starter before the clock delay mechanism has completed its operation, the clock will stop, leaving the mine unarmed. If pressure is again applied the clock delay mechanism will resume its operation. After the clock delay mechanism has completed its operation, the firing mechanism will remain armed even if pressure is removed from the clock starter.

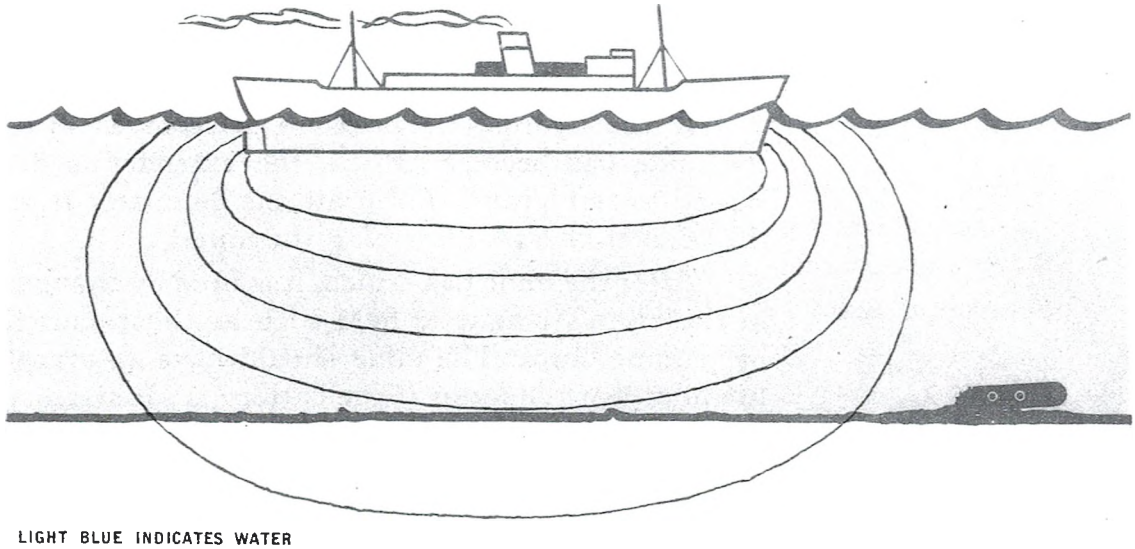
8. If the hydrostatic pressure is removed after the mine has become armed, the extender is designed to retract and withdraw the detonator from the booster charge, disarming the mine.

9. After the mine has armed, it is fired by changes in the earth's magnetic field such as those caused by passing ships. The mine should have an armed life of at least one year if the battery is satisfactory (unless a device to limit the life of the mine is included in the mine assembly).



1 SAFETY PINS REMOVED - SAFETY BAR IS FORCED OFF WHEN MINE IS EJECTED FROM SUBMARINE.

4 CHANGES IN THE EARTH'S MAGNETIC FIELD SUCH AS THOSE CAUSED BY PASSING SHIPS CLOSE FIRING CIRCUIT.

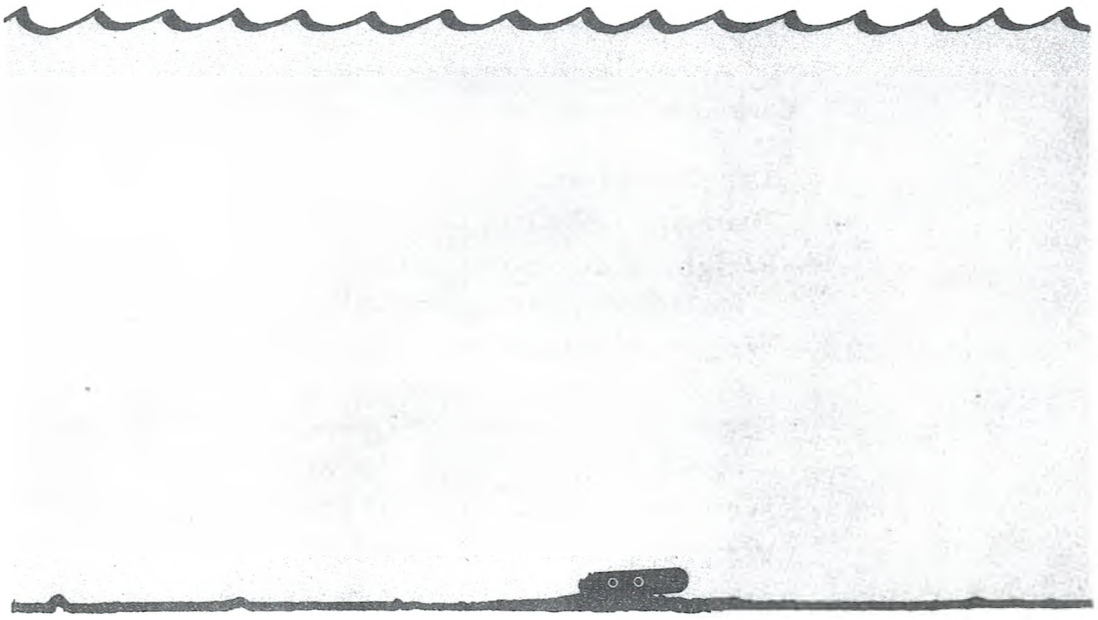


LIGHT BLUE INDICATES WATER

SUMMARY

HOW THE MINE WORKS

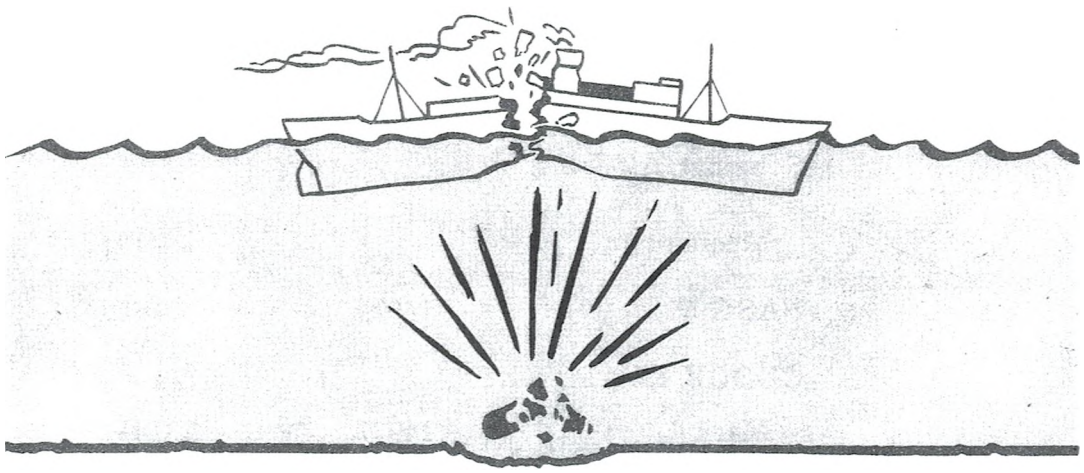
SURFACE



2 WATER PRESSURE CAUSES EXTENDER, CLOCK STARTER AND CLOCK DELAY MECHANISM TO OPERATE.

3 FIRING MECHANISM BECOMES ARMED.

5 MINE EXPLODES.



WEIGHTS AND DIMENSIONS

1.1 Approximate weights and dimensions of the Mark 12 mine are:

Length—94 inches

Diameter—20-13/16 inches.

Weight of assembled mine—1415 pounds (TNT-loaded) or 1545 pounds (Torpex-loaded).

Weight of explosive charge—1095 pounds TNT or 1225 pounds Torpex.

Negative buoyancy—335 pounds (TNT-loaded) or 465 pounds (Torpex-loaded).

Weight of empty case—247 pounds.

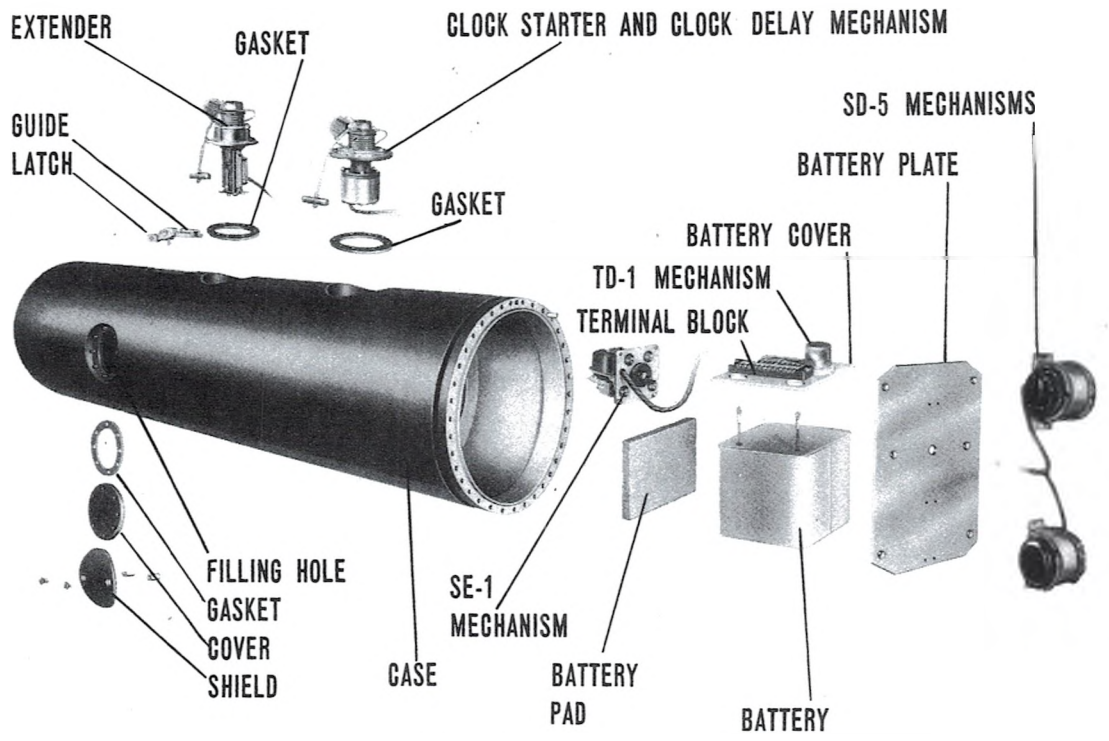
Weight of crate—282 pounds.

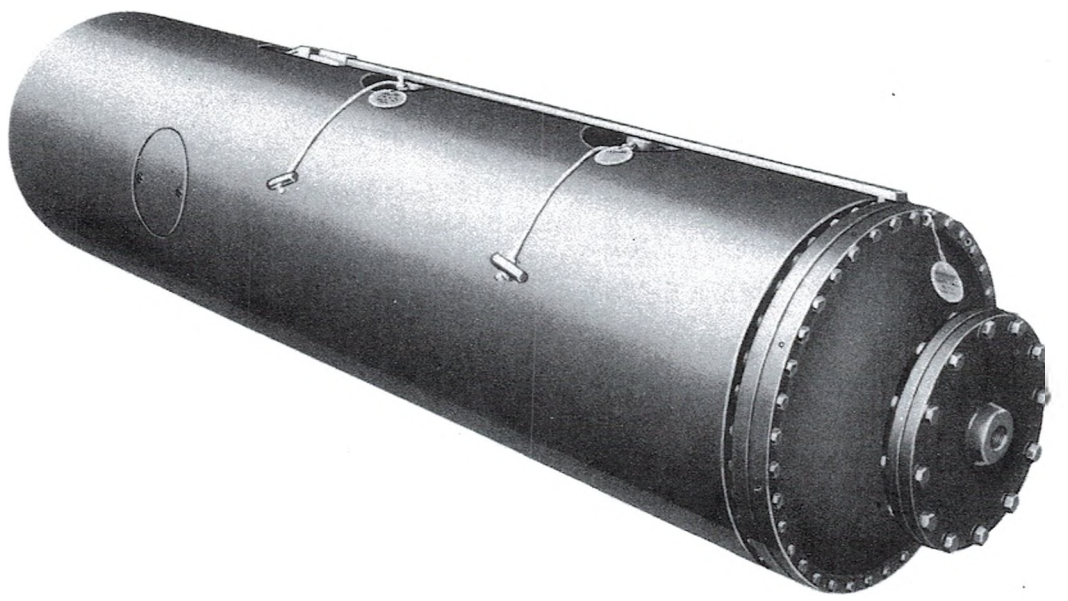
LIST OF PARTS

1.2

	LIST OF DRAWINGS SKETCH NO.	GENERAL ARRANGEMENT DWG. NO.
Mine Assembly	14973	239314
Electrical Assembly and Schematic Wiring Diagram		239256
Electrical Assembly with SE-1 Mechanism		242137
Schematic Wiring Diagram with SE-1 Mechanism		242143
CASE Mark 12	14974	231459
CLOCK STARTER:		
Mark 1, or	14977	231449
Mark 1 Mod. 5	55451	343071

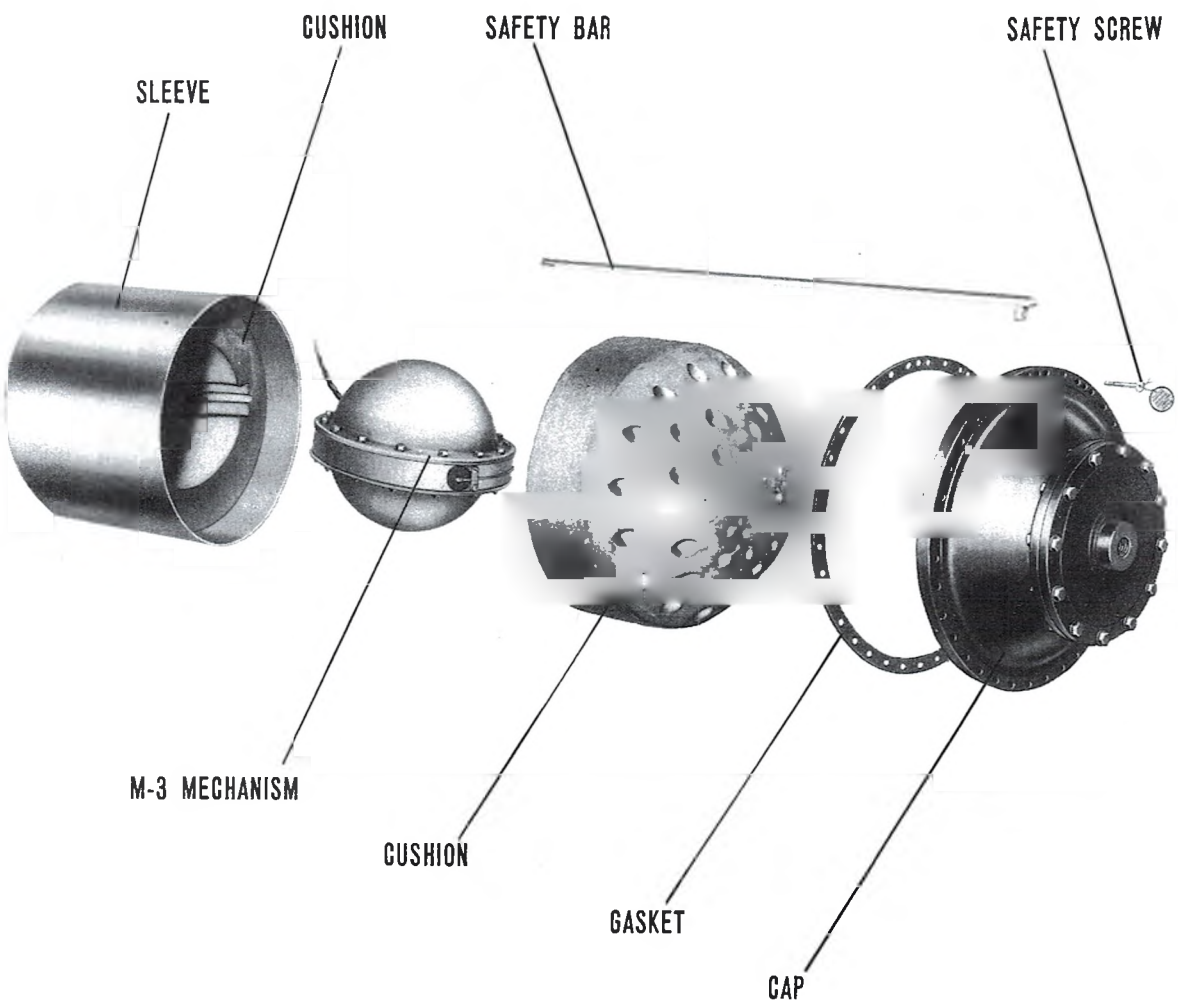
	LIST OF DRAWINGS SKETCH NO.	GENERAL ARRANGEMENT DWG. NO.
CLOCK DELAY MECHANISM:		
CD-1		239317
CD-1 Mod. 4, or		369077
CD-9 with CA-10 Cable		362709 and 383619
FIRING MECHANISM		
M-3,	14971	231476-77
M-3, Mod. 1, or	14989	242109-110
M-3 Mod. 2	55432	242189
CUSHION—Mark 1		
BATTERY		
B-3 or		231437
B-3 Mod. 1		383679
EXTENDER		
Mark 12, or	14975	231456
Mark 12 Mod. 5	55450	343070
ELECTRIC DE-		
TONATOR—Mark 1		
Mod. 1	41236	79710-11
BOOSTER—		
Mark 6 Mod. 1		134229
TERMINAL		
BLOCK—TB-1		239235
SE-1 MECHANISM		
(Optional)		242132
SD-5 MECHANISM (2) with CA-256 Cable		
(Optional)	107361	363006
TD-1 MECHANISM		239317

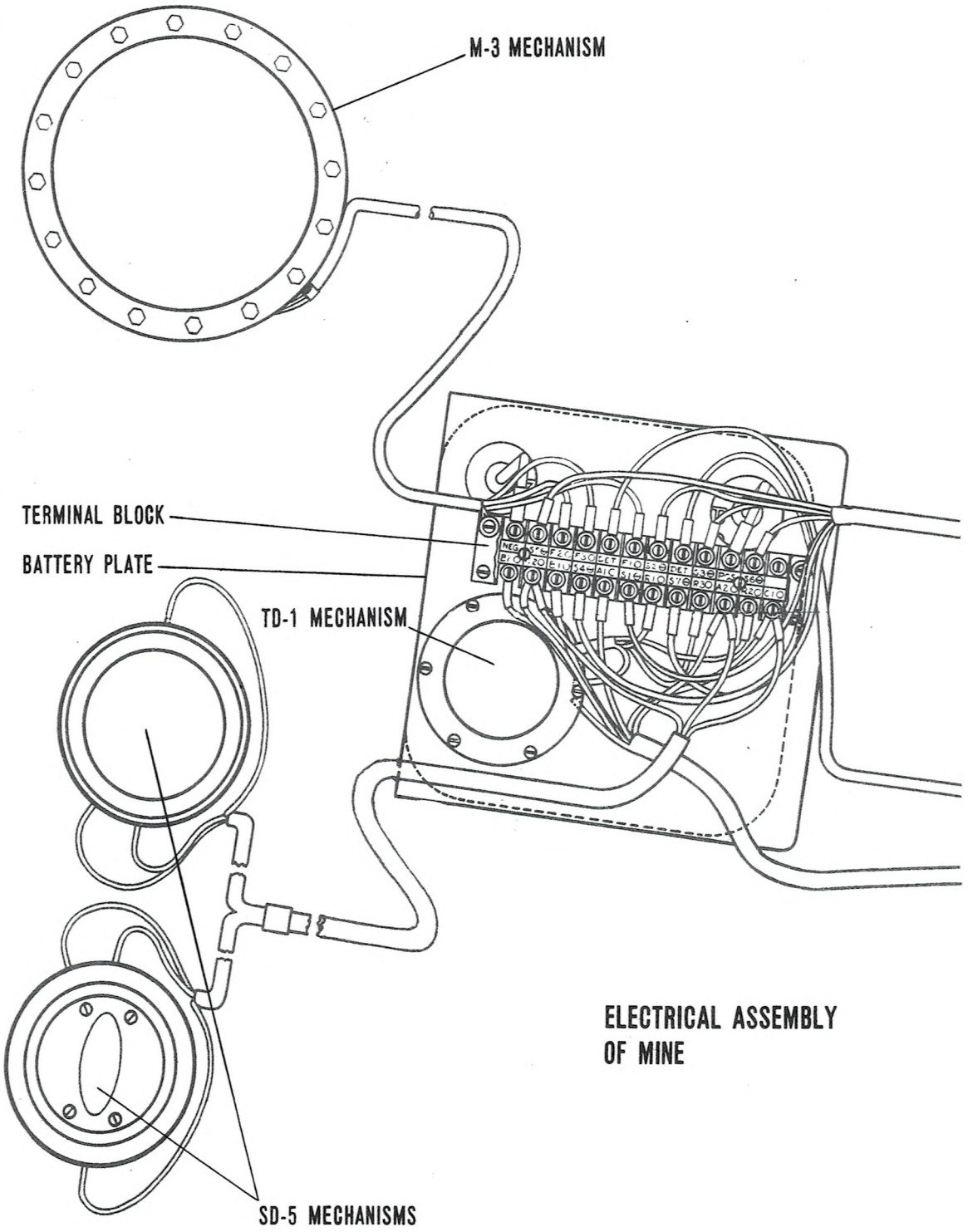




THE ASSEMBLED MINE

THE MINE DISASSEMBLED

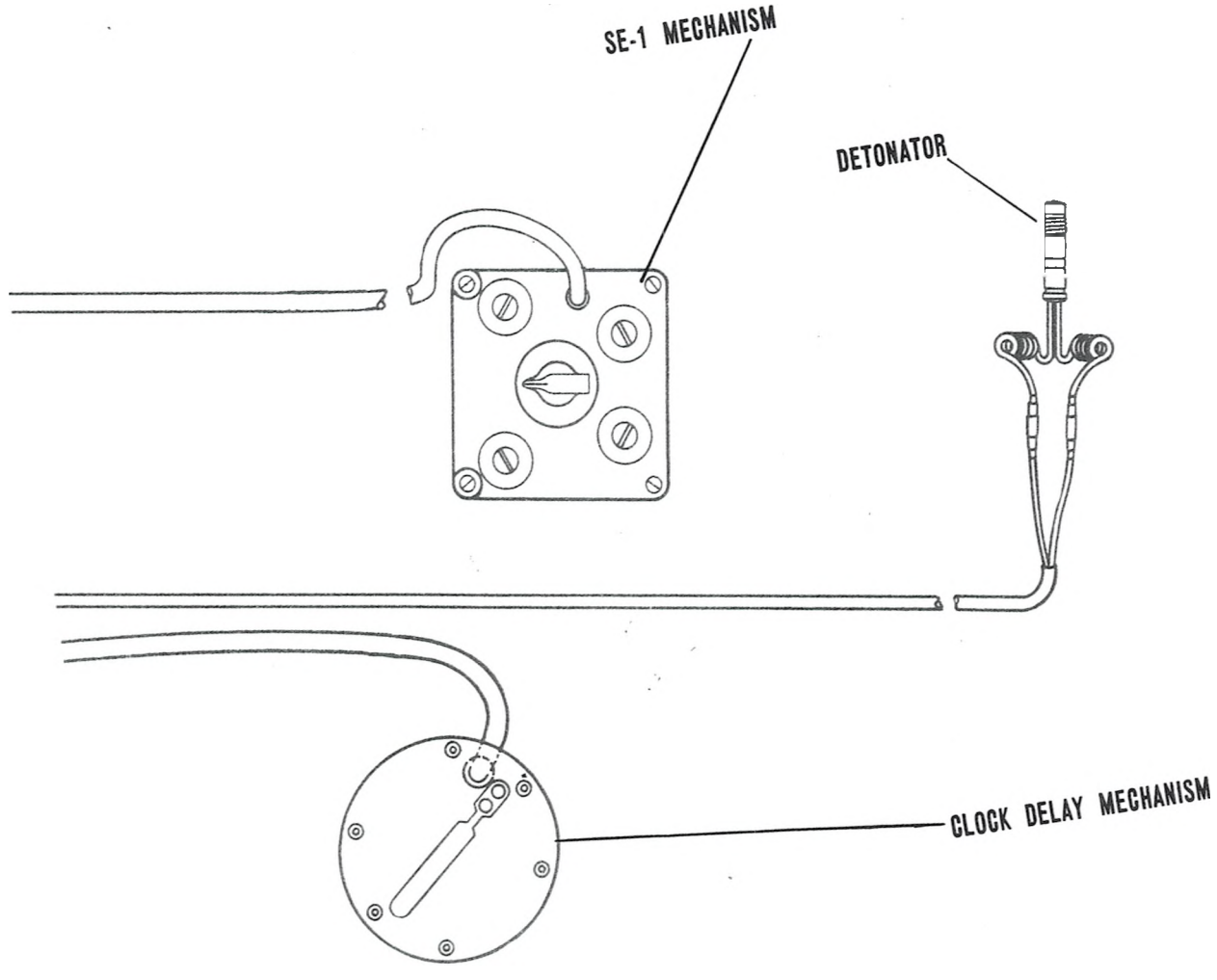


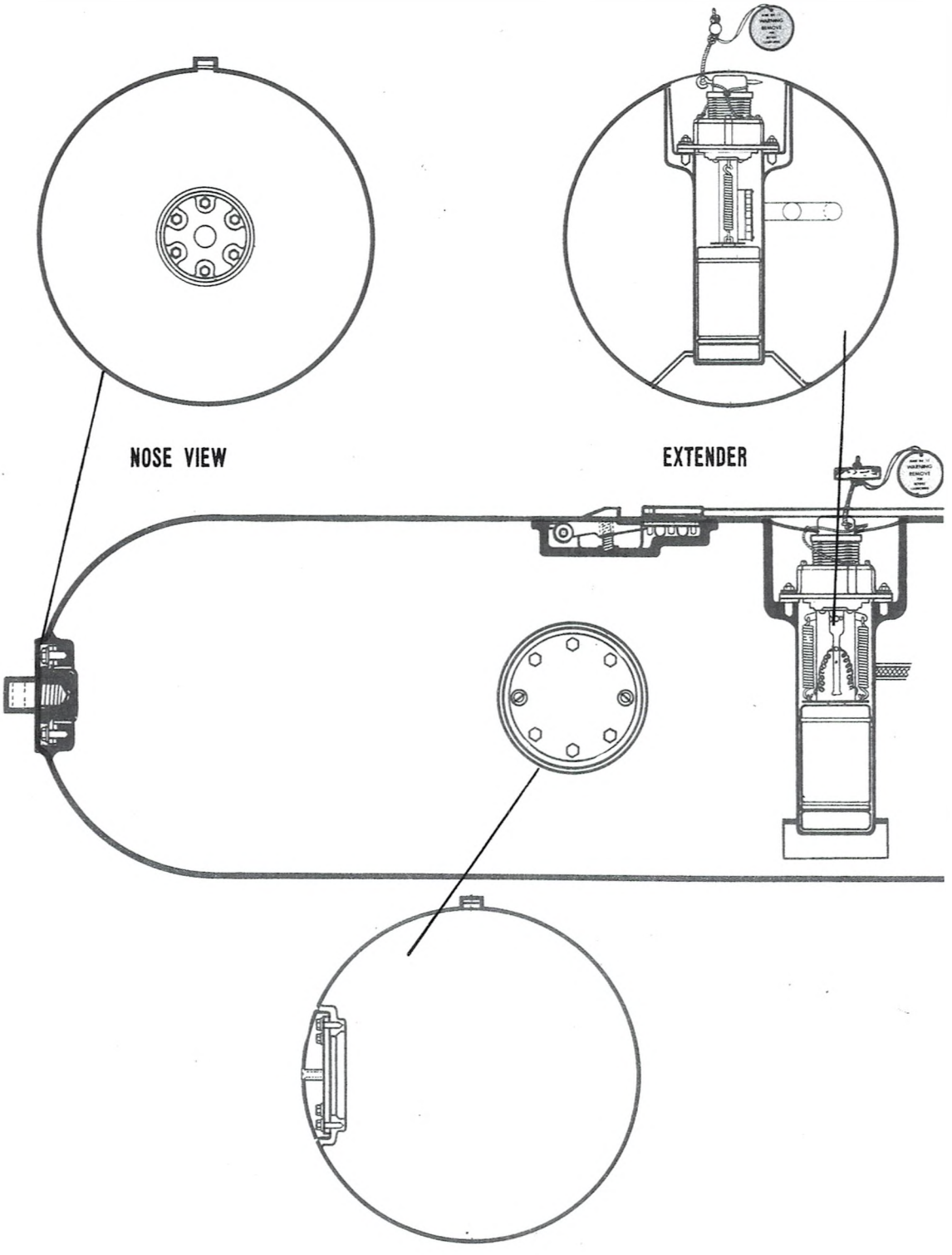


ELECTRICAL ASSEMBLY
OF MINE

PARTS

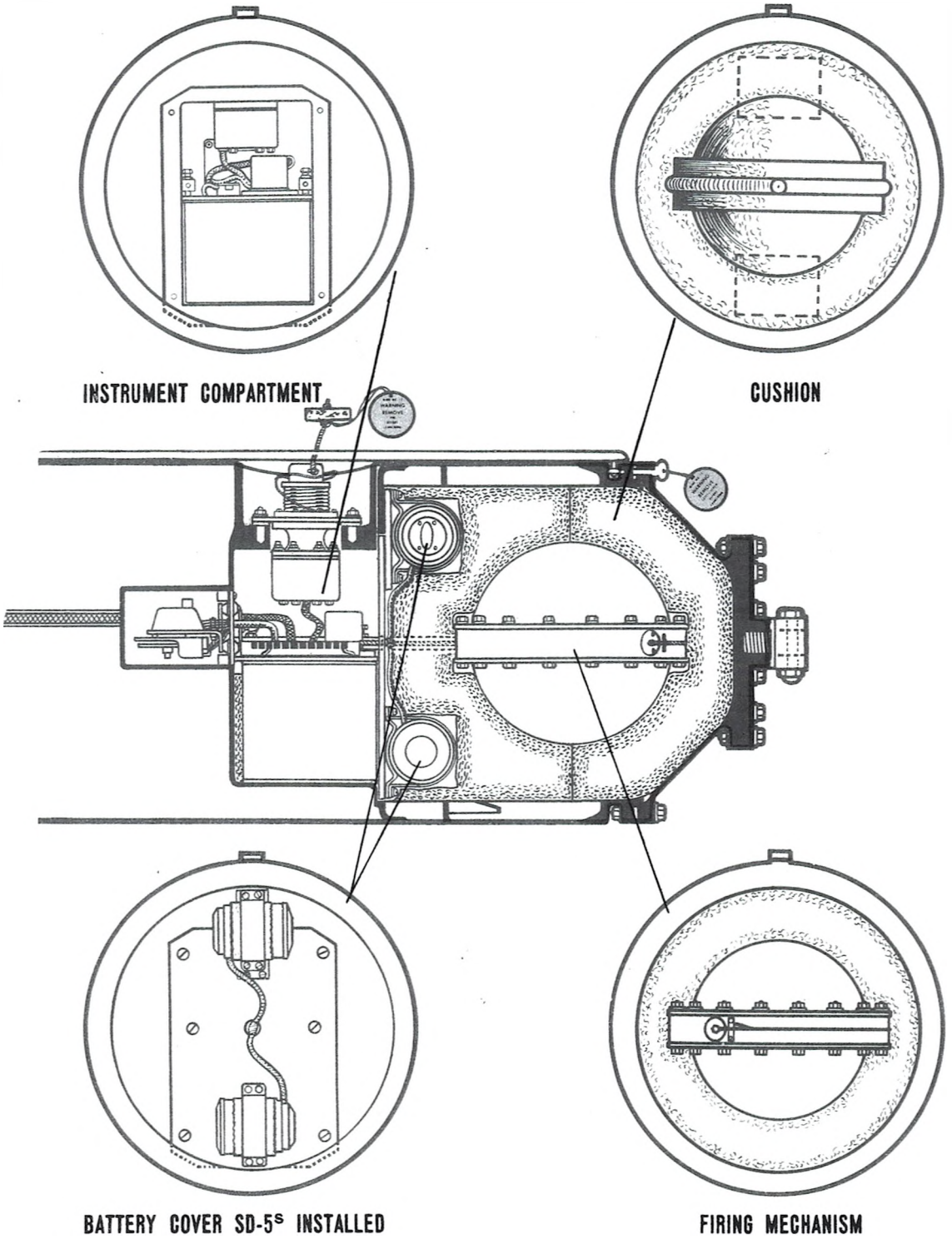
ELECTRICAL ASSEMBLY

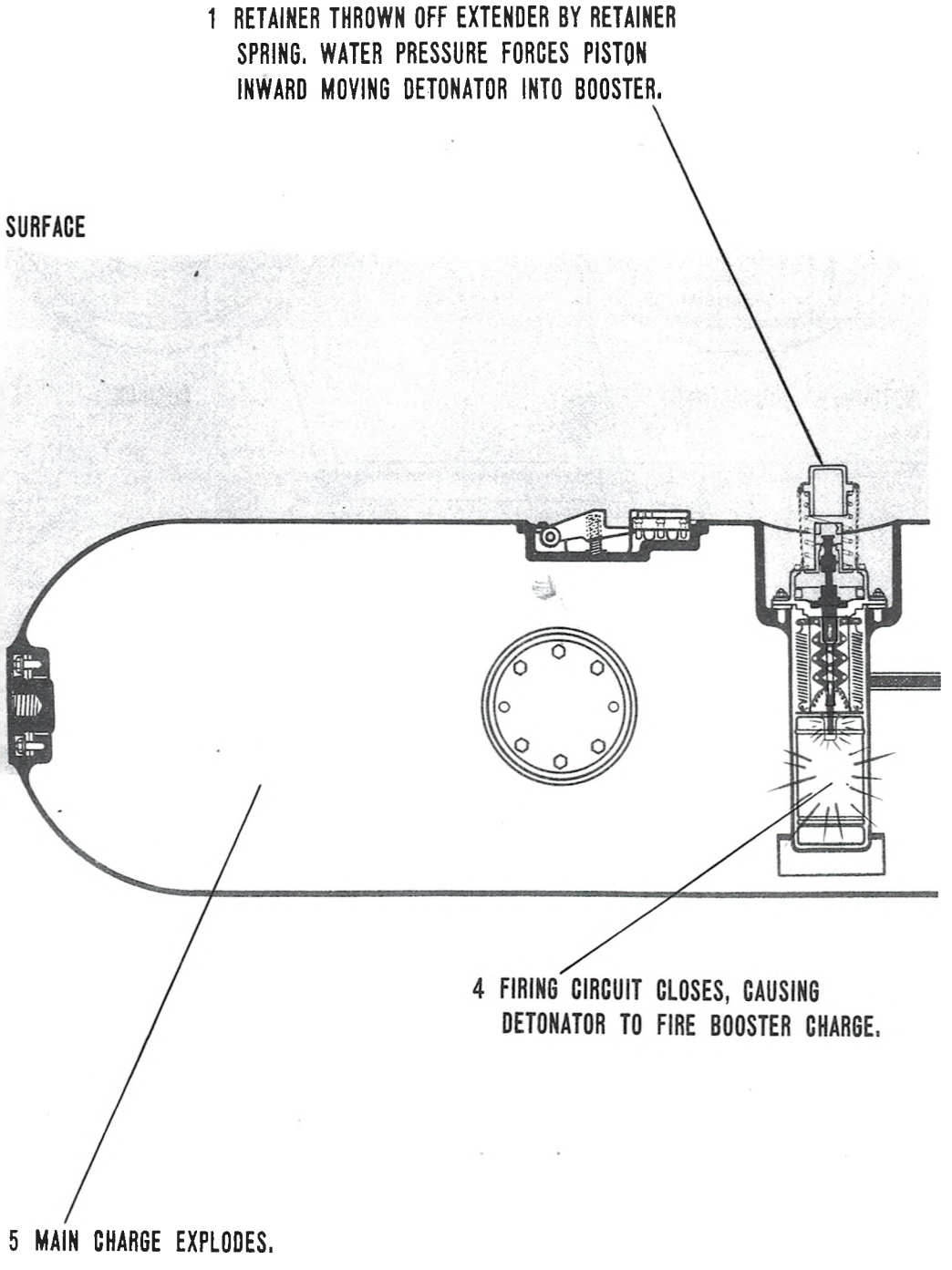




BLUE INDICATES EXTERIOR RED INDICATES INTERIOR

GENERAL ARRANGEMENT



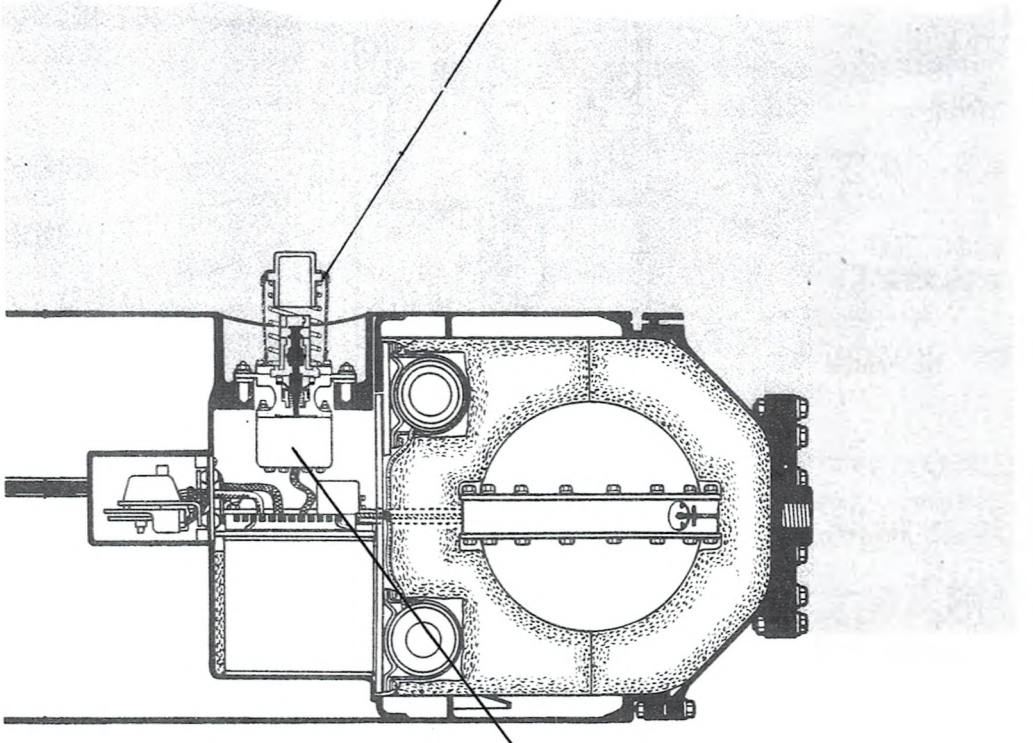


LIGHT BLUE INDICATES WATER

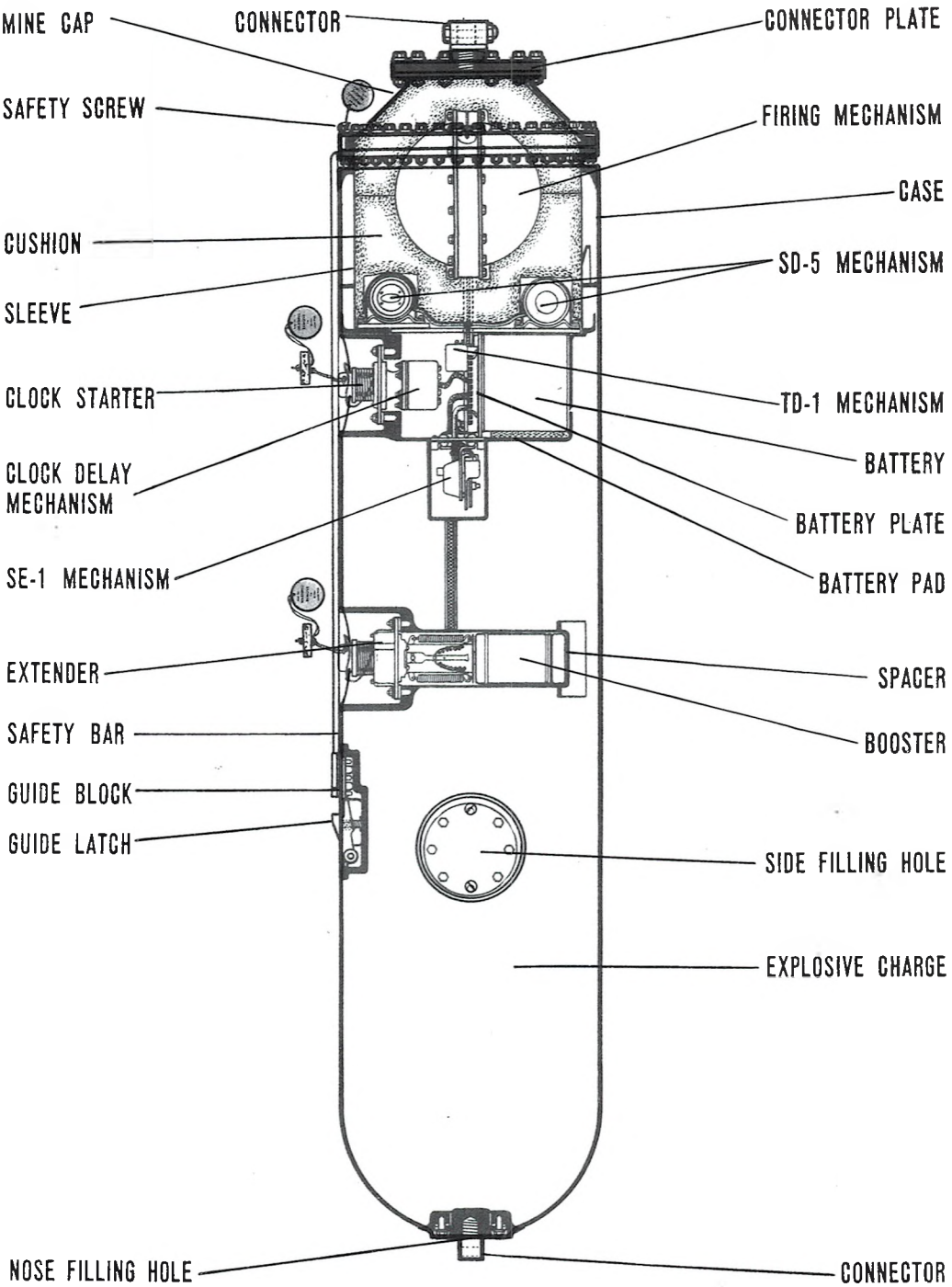
HOW THEY WORK

2 RETAINER THROWN OFF CLOCK STARTER BY RETAINER SPRING. WATER PRESSURE FORCES PISTON INWARD AGAINST STARTING BAR OF CLOCK DELAY MECHANISM, CAUSING IT TO OPERATE.

SURFACE



3 AS CLOCK COMPLETES ITS TIMING CYCLE, SWITCHES CAUSE FIRING MECHANISM TO BECOME ARMED.

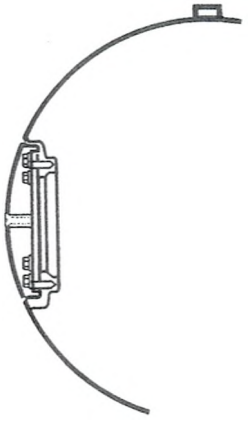


MK 12 MINE SECTIONAL VIEW

THE CASE

1.3 The case is an aluminum cylinder closed at the forward end by a hemispherical nose welded in place, and at the after end by a cap secured with bolts.

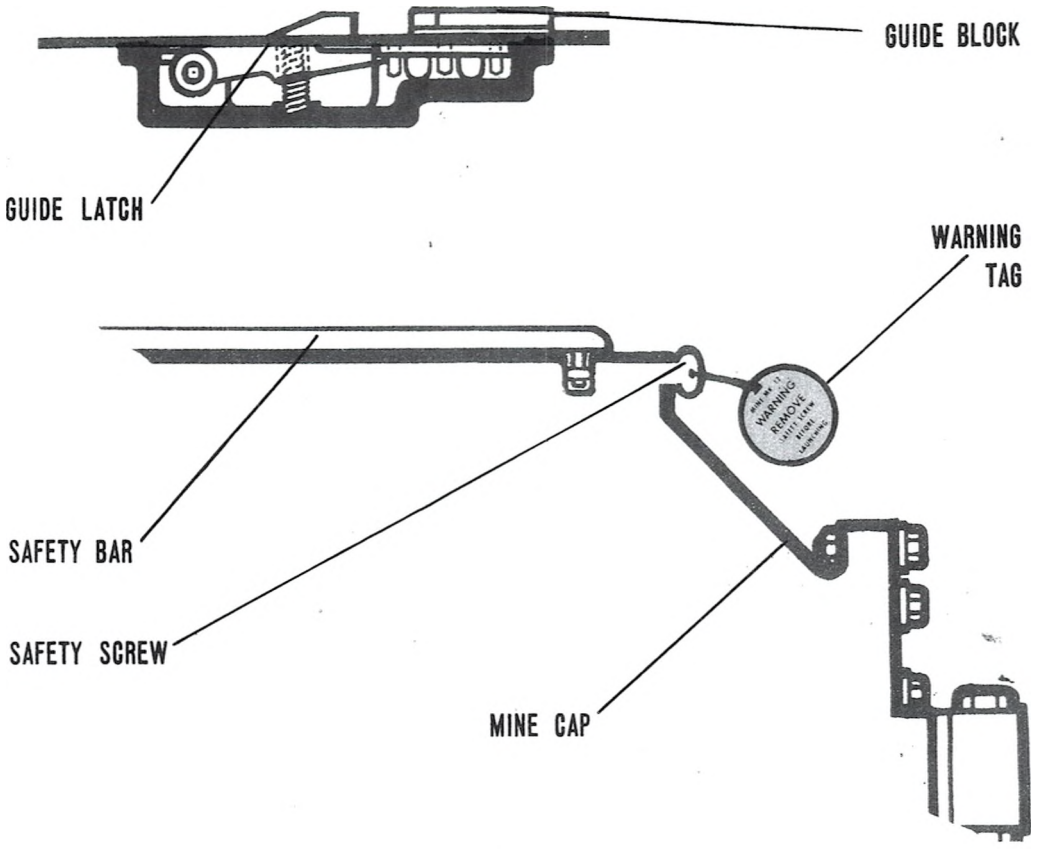
1.4 Two openings are provided in the top of the case. Inside the forward opening is a well which contains the extender, detonator and booster. The clock starter and clock delay mechanisms are installed in the after opening. The flanges of both openings are recessed so that the outer portions of the extender and clock starter will not project beyond the circumference of the case.



SIDE FILLING HOLE

1.5 A filling hole, through which the explosive charge is poured into the case, is located in the forward end. The filling hole is closed by a plate in whose center is a threaded socket. Into this socket is screwed one part of a connector, used to secure two mines together for stowage. The mating part of this connector, also part of the stowage device, screws into a socket in the cap on the after end of the case. After some Mark 12 cases had been manufactured, side filling holes were added. A case with both nose and side filling holes may be loaded through either hole. On cases after Serial No. 6200, the side filling holes are covered by shields to preserve the contours of the cases. Extra shields have been procured, and should be installed on cases of earlier manufacture whenever possible.

1.6 A guide latch assembly for controlling motion of the mine in a torpedo tube is set in a recess in the top of the case about 3 feet aft of the nose. The guide block itself, which fits a slot in the top of the torpedo tube, is secured to the case with screws. The latch is pivoted at its forward end and held up by a spring beneath it. When the mine is inserted in a tube, the latch passes under and then snaps up in front of a stop bolt, locking the mine in position

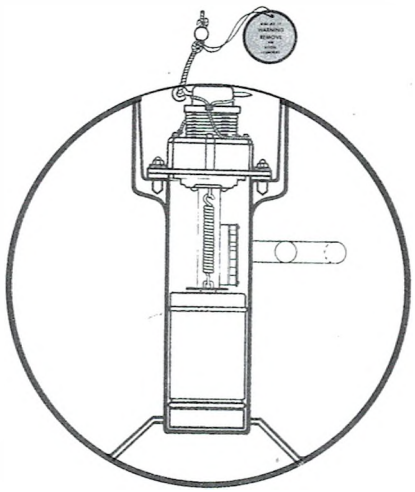


until the stop bolt is raised. Cases after Serial No. 6200 incorporate a redesigned guide latch assembly. Guide blocks on cases of earlier manufacture may require modification for stop bolt stowage if replacement guide latch assemblies are not available (see par. 3.15).

1.7 The safety bar extends aft along the top of the case across the extender and clock starter openings. Its after end is held in place by a thumb screw until the mine is prepared for planting. Its forward end fits into a recess in the after end of the guide block.

1.8 The explosive charge, cast in the forward and central portions of the mine case, surrounds the extender well. A conduit for the extender cable passes from the forward well to an instrument compart-

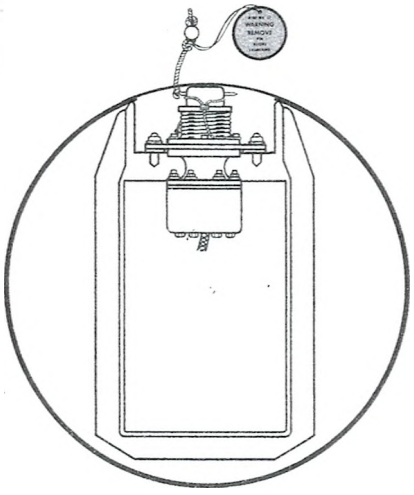
CASE



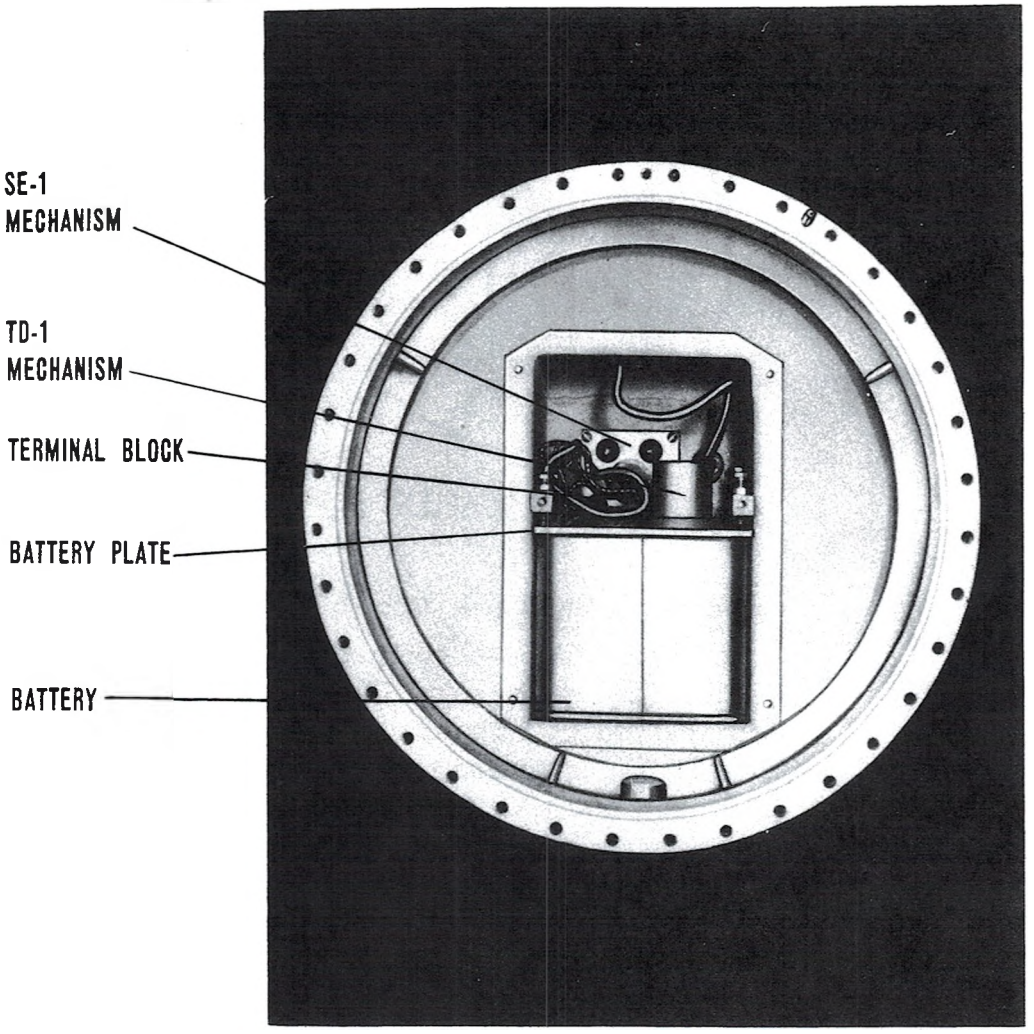
EXTENDER IN WELL

ment inside the clock assembly opening.

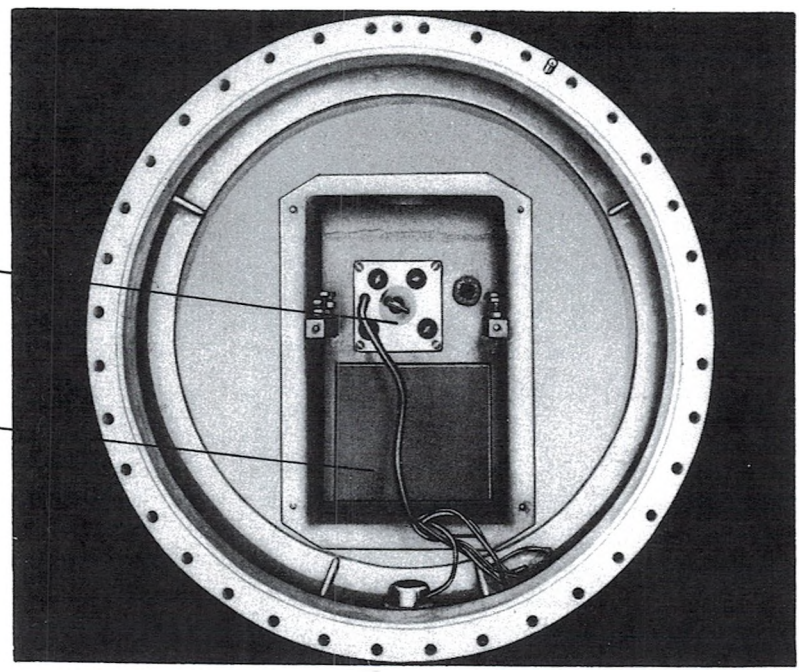
1.9 The instrument compartment provides space for the TD-1 mechanism, SE-1 mechanism (if used), terminal block, clock delay mechanism, and battery. The battery is housed in the lower part of the compartment, and a cushioning pad is placed between

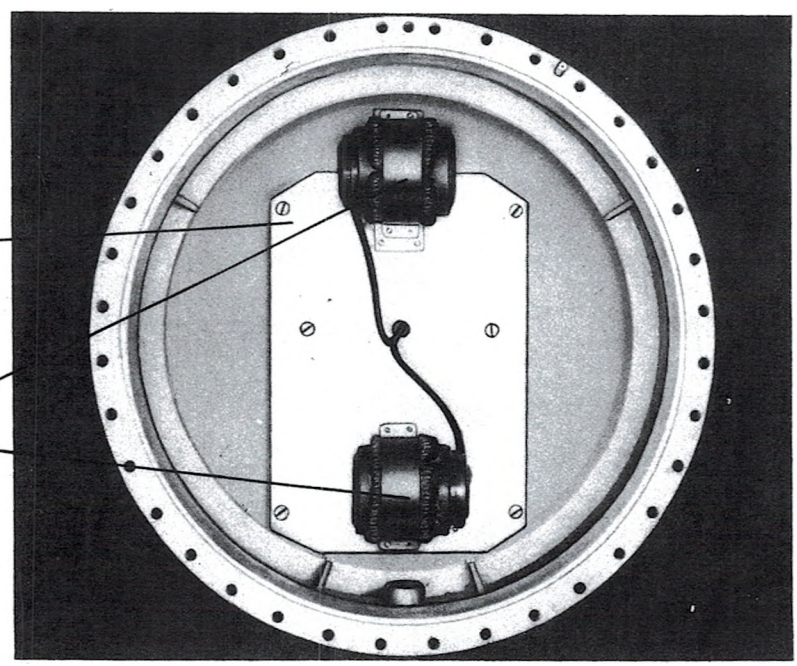


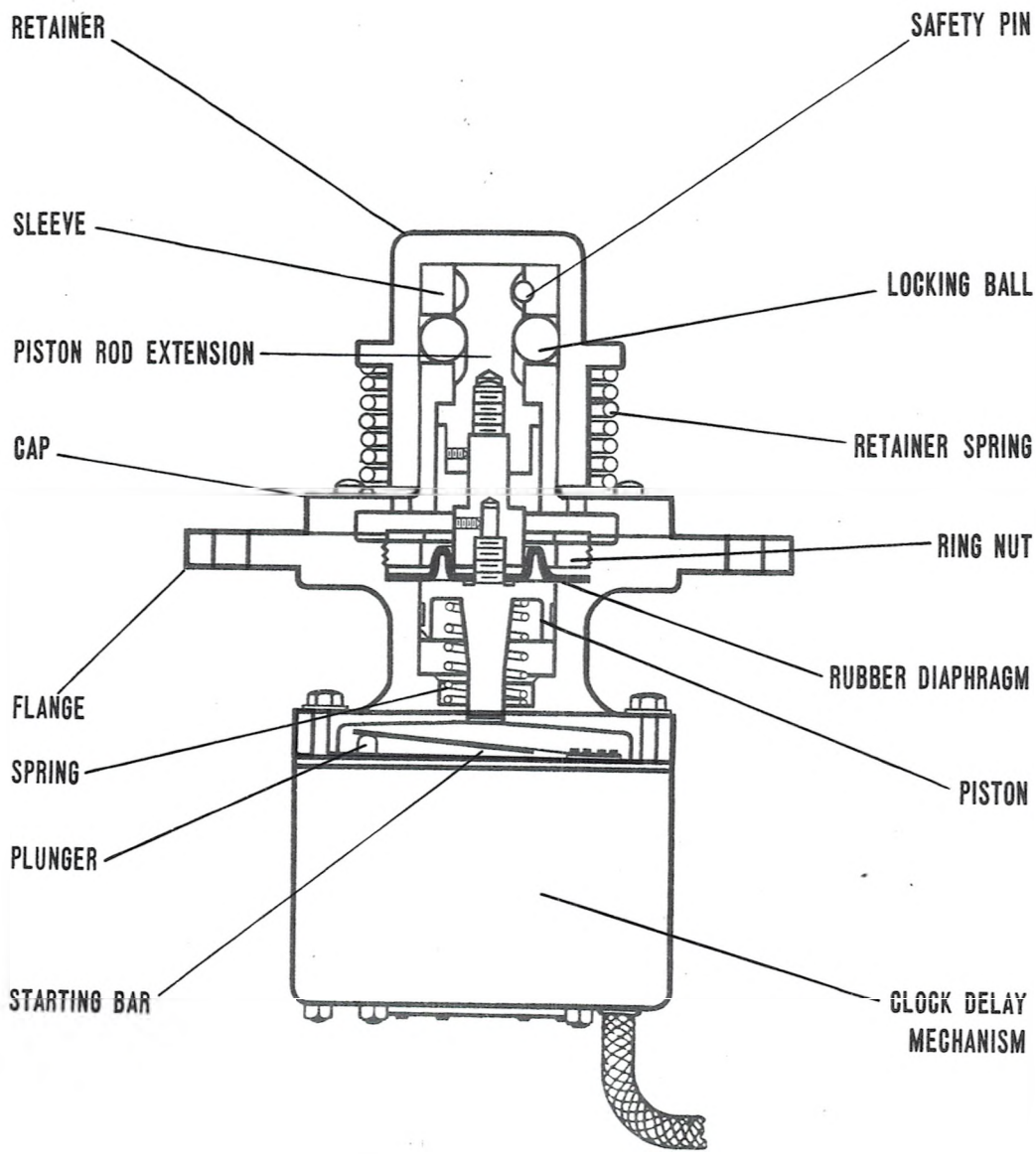
CLOCK STARTER AND CLOCK DELAY MECHANISM IN WELL



it and the bulkhead on its forward side. The terminal block and TD-1 mechanism are mounted on a plate secured over the battery. The SE-1 mechanism is mounted in a recess in the forward bulkhead. A cover secured to the bulkhead at the after side of the instrument compartment separates it from a firing mechanism chamber in the after end of the mine. If SD-5 mechanisms are used, they are mounted on the after side of this cover.


SE-1
MECHANISM
BATTERY
PAD

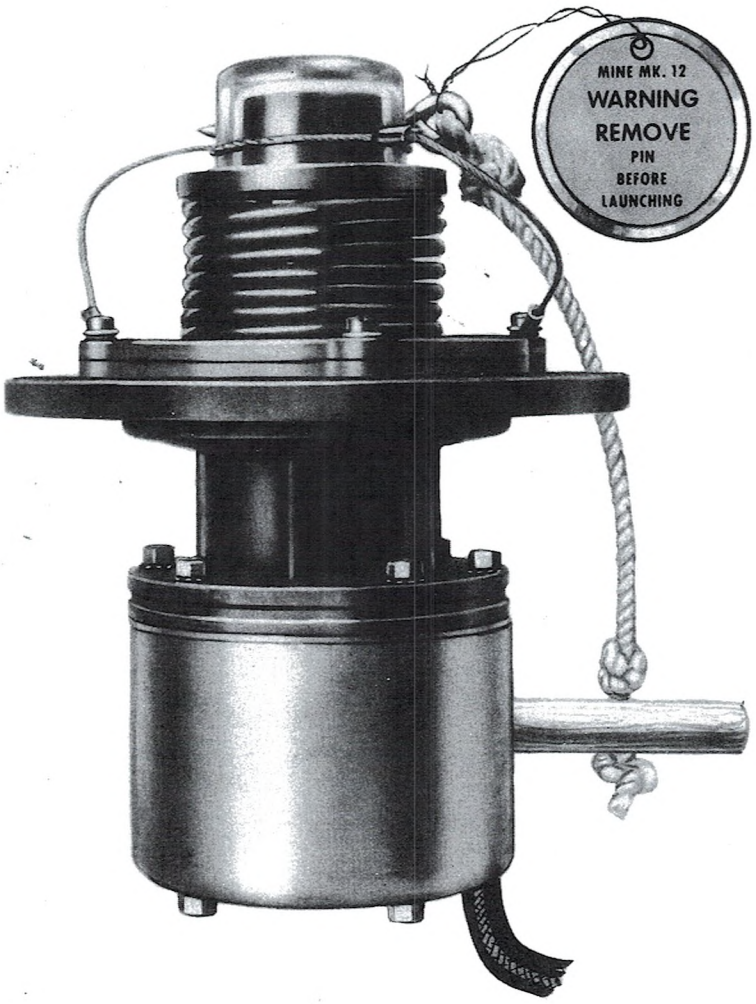

BATTERY
COVER
SD-5
MECHANISMS



MARK 1 CLOCK STARTER AND CLOCK DELAY MECHANISM

PARTS

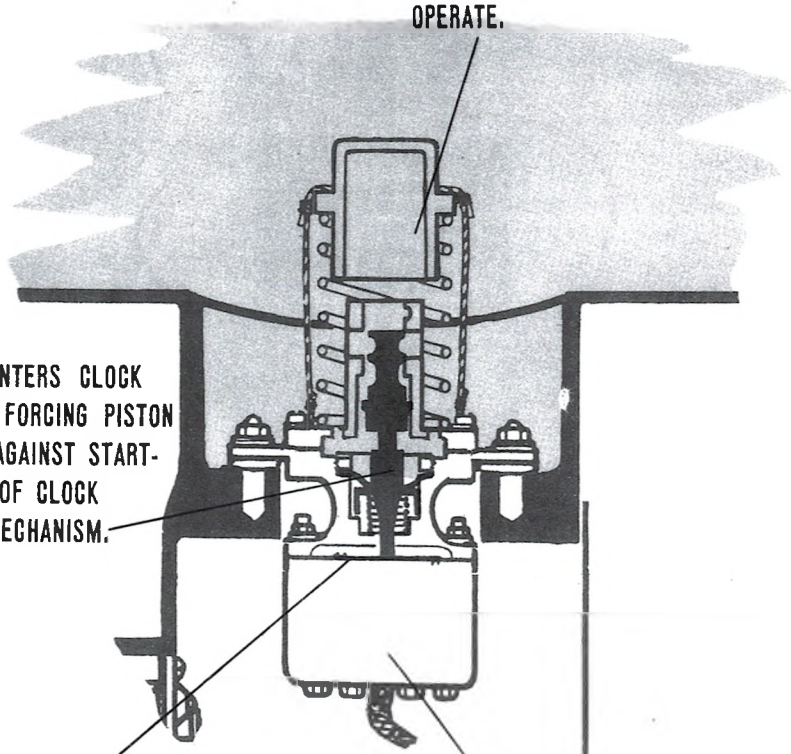
CLOCK MECHANISM ASSEMBLY



MARK 1, MOD. 5 CLOCK STARTER AND CLOCK DELAY MECHANISM

HOW IT WORKS

1 RETAINER IS THROWN OFF CLOCK STARTER BY RETAINER SPRING - LOCKING BALLS THEN FALL OUT OF HOLES IN SLEEVE LEAVING CLOCK STARTER FREE TO OPERATE.



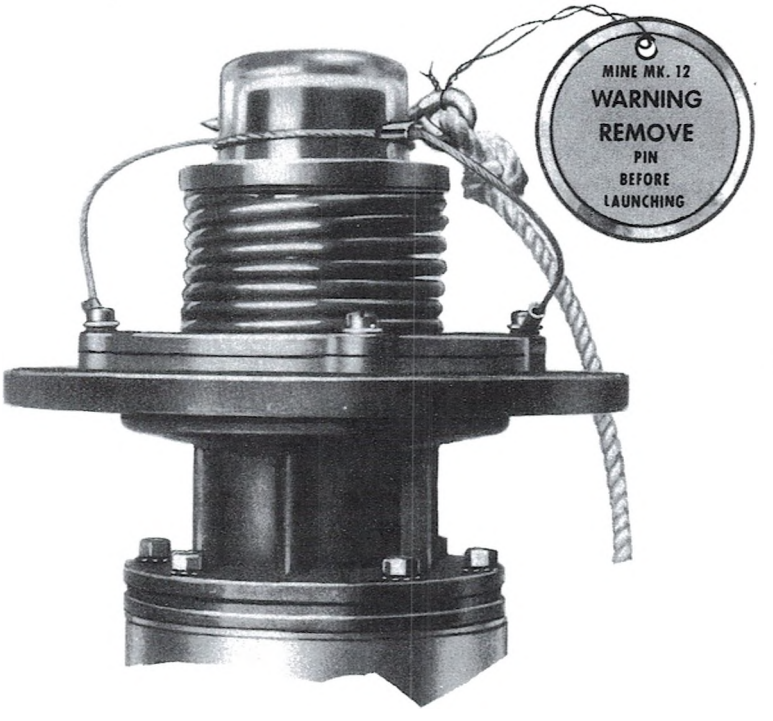
2 WATER ENTERS CLOCK STARTER FORCING PISTON INWARD AGAINST START-ING BAR OF CLOCK DELAY MECHANISM.

3 AS STARTING BAR PRESSES PLUNGER INWARD, PIN IS LIFTED FROM BALANCE WHEEL AND CLOCK IS FREE TO RUN.

4 AS CLOCK COMPLETES ITS TIMING CYCLE, SWITCHES CAUSE MINE TO BECOME ARMED.

HOW CLOCK MECHANISM ASSEMBLY WORKS

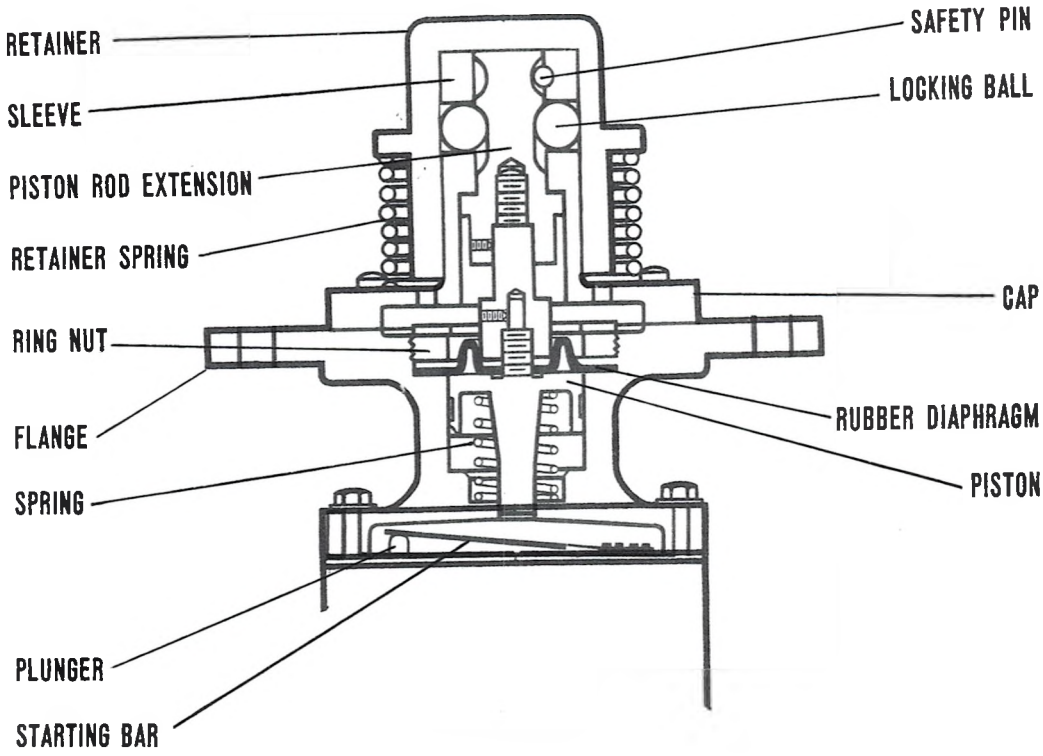
CLOCK ASSEMBLY



MK. 1, MOD. 5 CLOCK STARTER

1.10 The clock starter (CS mechanism) is a device operated by water pressure which controls a starting plunger on the clock delay mechanism. It is designed to operate in 16 or more feet of water. (Some clock starters will operate in lesser depths, but 16 feet is the minimum depth at which positive operation is assured). Its principal parts are:

A flanged housing



MARK 1 CLOCK STARTER

A rubber diaphragm

A metal piston and piston rod

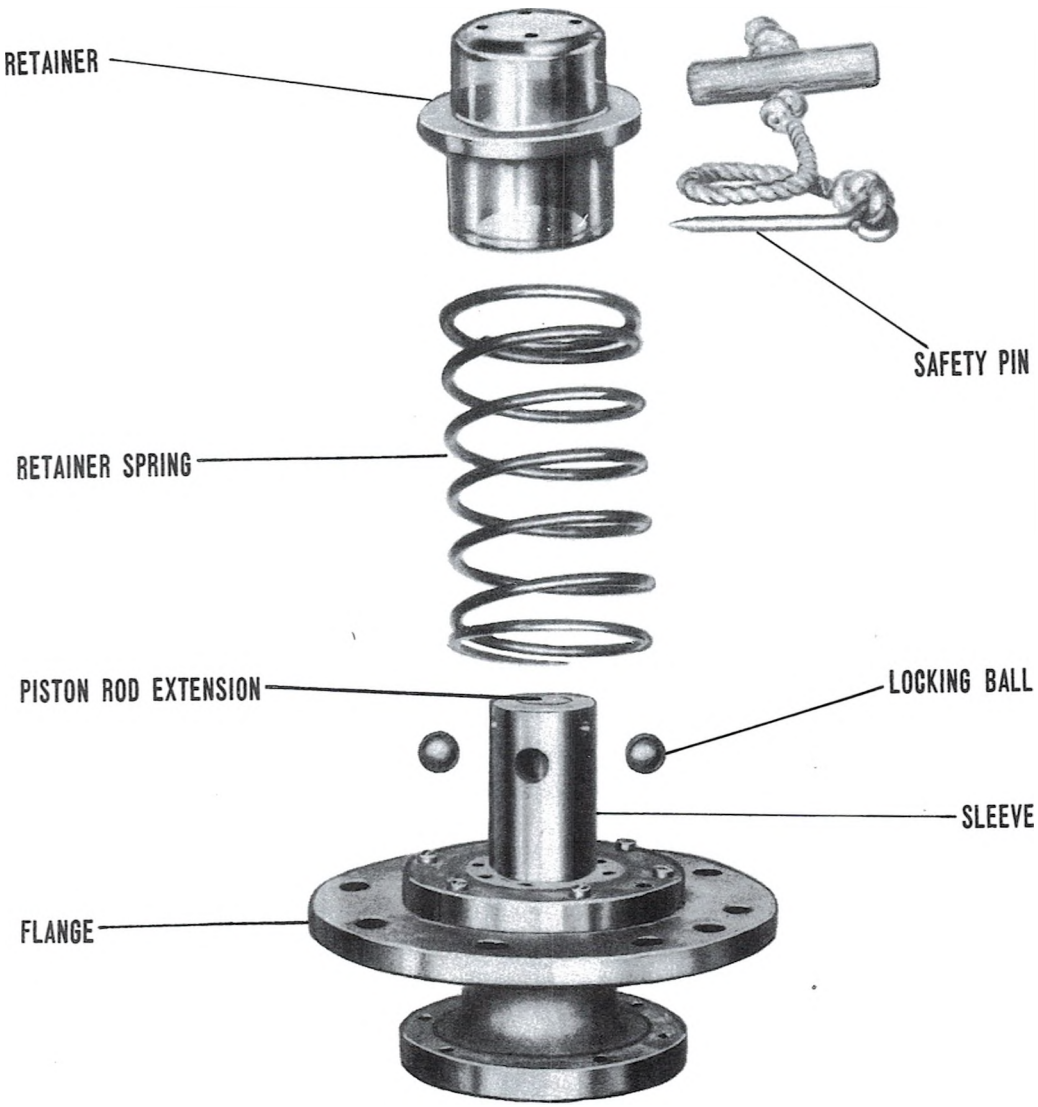
A spring to hold the mechanism in the safe position until pressure is applied to the piston rod

A ball-type locking device to keep the mechanism safe until the mine is planted.

Either a Mark 1 or a Mark 1 Mod. 5 clock starter may be used in a Mark 12 mine. The two mechanisms differ only in details of construction.

PARTS

CLOCK STARTER



MARK 1 CLOCK STARTER

1.11 The locking device consists of a transparen retainer and two balls. The retainer fits over a sleev secured to the outer surface of the flange. The tw balls are held partly in the sleeve and partly in groove on an extension of the piston rod. A spring forces the retainer off the mechanism when the min

is planted. A safety pin passes through holes in the sleeve and retainer and fits into a second groove on the piston rod extension to hold the rod and retainer in place during storage and shipment.

1.12 The safety pin is pulled out of the clock starter when the mine is placed in a tube for planting, but the safety bar on the outside of the mine case holds the retainer on the mechanism as long as the mine is in the tube. When the mine is ejected, the safety bar is forced off the mine case and the retainer is forced off the clock starter by the retainer spring. The balls are then forced out of the holes in the sleeve, leaving the mechanism free to operate. If the mine is to be planted from a submarine, the transparent retainers on the clock starter and extender mechanisms of a Mark 12 mine must be fitted with retainer cables. In the absence of retainer cables, the retainers may be sucked back into the torpedo tube when the mine is ejected.

THE CLOCK DELAY MECHANISM

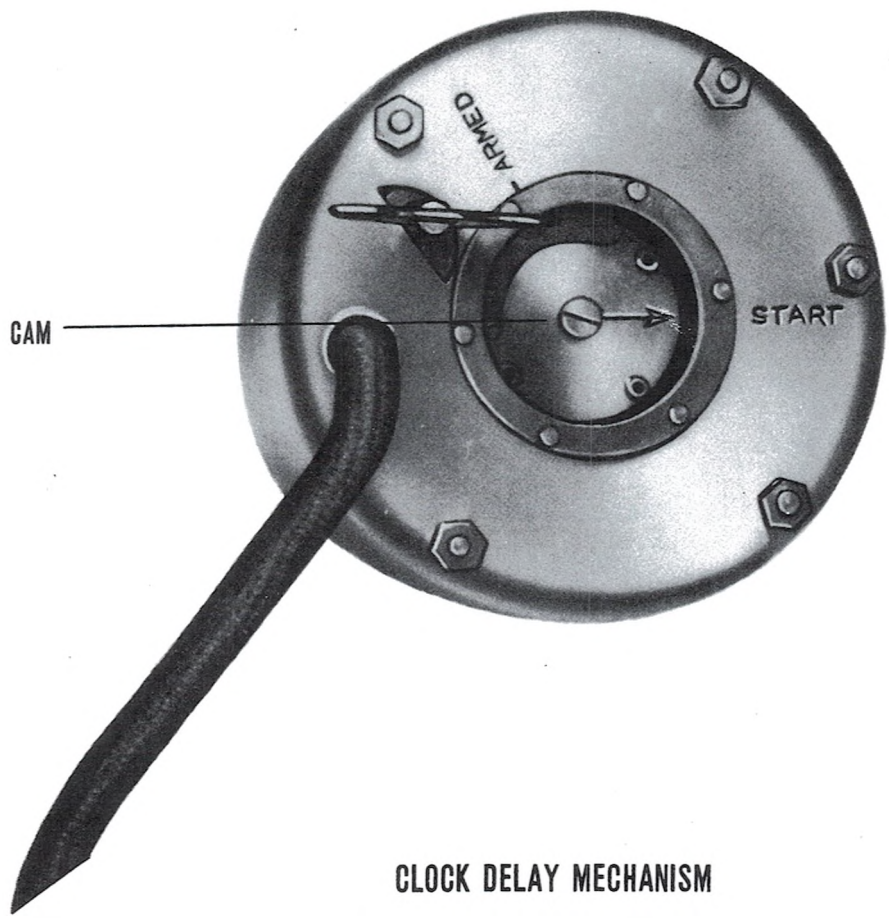
1.13 The clock delay (CD mechanism) consists of:

A clock mechanism
A cam rotated by the clock
Switches operated by the cam.

These switches control the arming cycle of the firing mechanism and are so arranged that the detonator circuit cannot be closed until the clock delay mechanism has fully armed. The CD-1 mechanism arms in 45 ± 6 minutes. CD-1 Mod. 4 and CD-9 mechanisms arm after a delay of 170 ± 25 minutes.

1.14 The clock cam can be observed through a window in the outer face of the clock housing. An arrow is scribed on the cam to indicate the condition of the clock. Two marks scribed on the clock housing beside the window are labeled "START" and

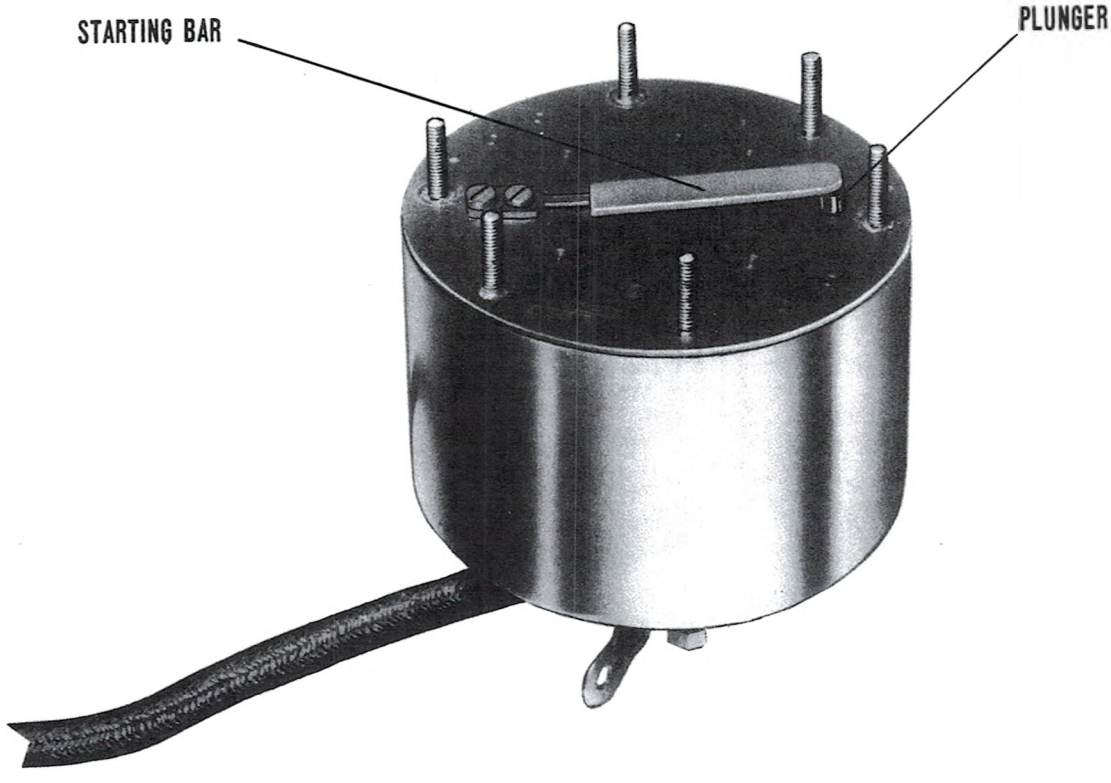
CLOCK DELAY MECHANISM



CLOCK DELAY MECHANISM

"ARMED." When the arrow on the cam points to the "START" mark the clock is fully wound and UNARMED. When it points to the "ARMED" mark, the clock is run down and ARMED.

1.15 The flat, flexible starting bar has one end fastened to the clock housing. The other end rests on a plunger which extends inside the housing. When the plunger projects about ¼ inch outside the housing, it holds a pin against the balance wheel of the clock and prevents the clock from running. When the plunger is forced inward it lifts the pin from the balance wheel and the clock is free to run.

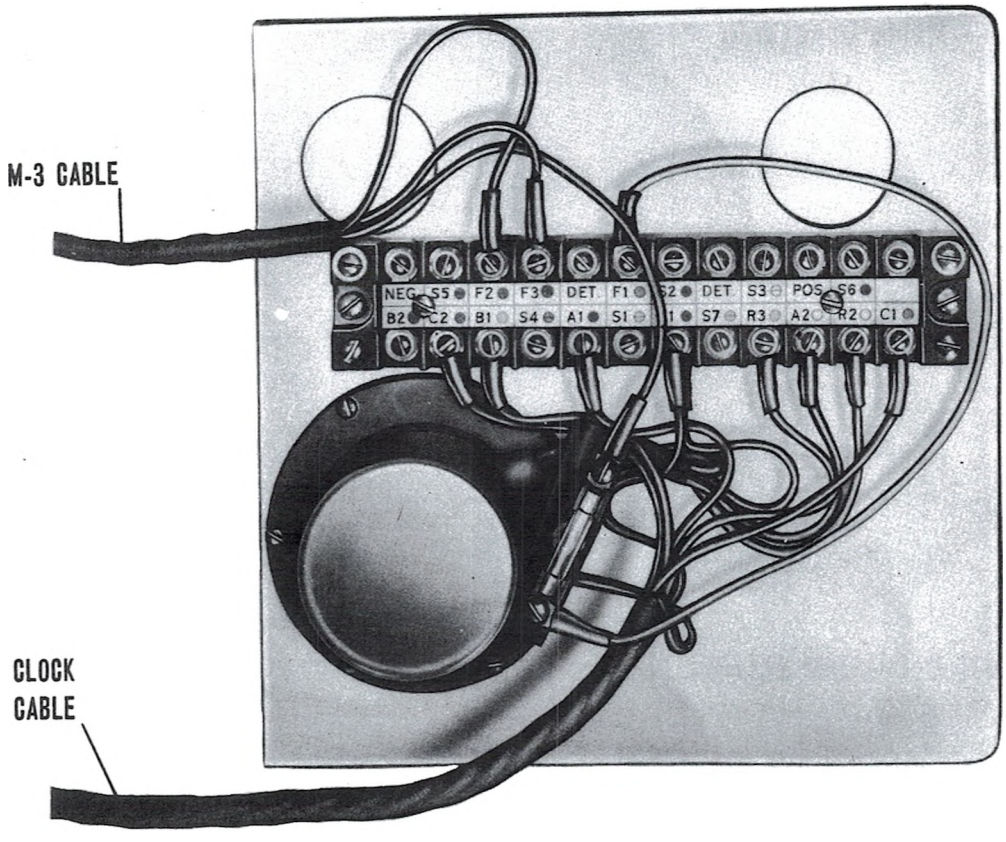


CLOCK DELAY MECHANISM

THE ANTIPREMATURE ASSEMBLY

1.16 Premature firing of a mine may be caused by faulty operation of the firing mechanism which leaves the firing switch closed when the mine becomes armed. To render such a mine inoperative rather than to allow it to fire prematurely, a CD-1 Mod. 4 or CD-9 clock delay mechanism and a one-ampere fuse may be installed in the mine in such a way that the fuse will be blown at the end of the arming period if the firing switch is closed. This installation should be made when CD-1 Mod. 4 or CD-9 mechanisms are available; it cannot be made if a CD-1 mechanism is used.

ANTIPREMATURE ASSEMBLY



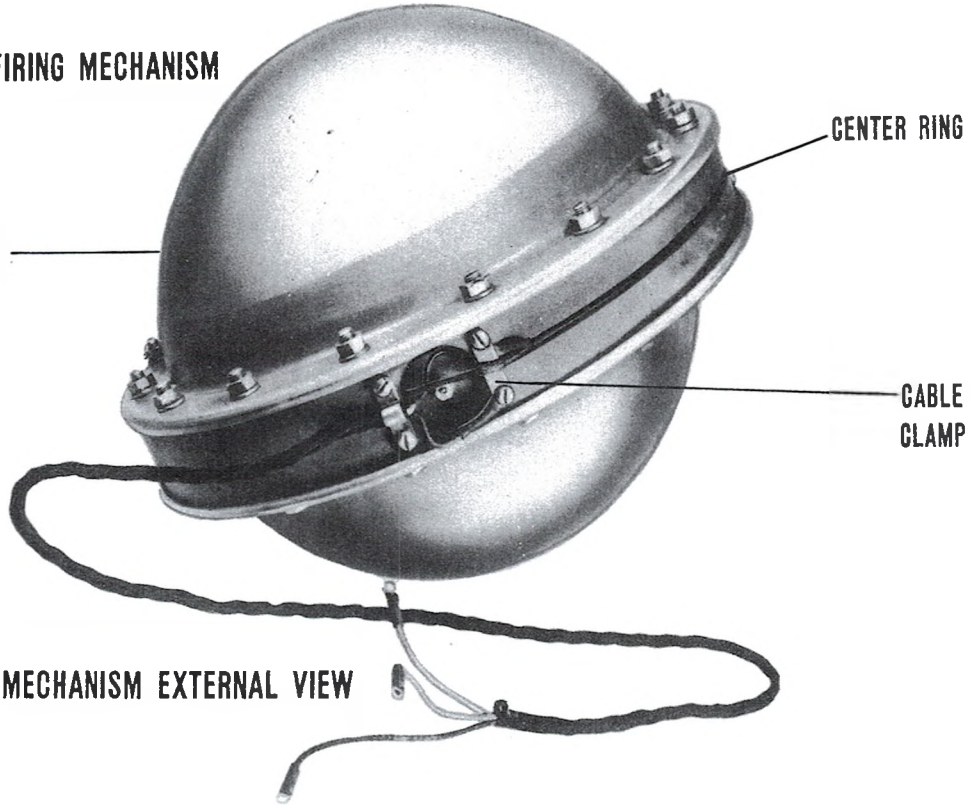
ANTIPREMATURE FUSE ASSEMBLY

THE FIRING MECHANISM

1.17 Three designs of the M-3 type firing mechanism have been produced for use in Mark 12 mines. They are the M-3, M-3 Mod. 1, and M-3 Mod. 2. All are basically alike and are made in two types designated RED (N) and BLUE (S). All are housed in spherical cases which shall be opened only by personnel authorized by the Bureau of Ordnance.

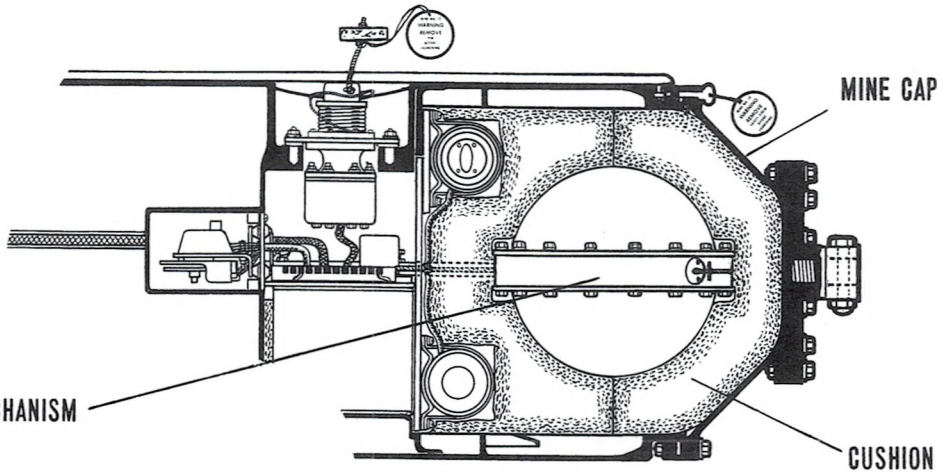
1.18 When a mine is assembled, an indication of the type and adjustment of the mechanism installed is stenciled on the outside of the mine case. The

THE FIRING MECHANISM

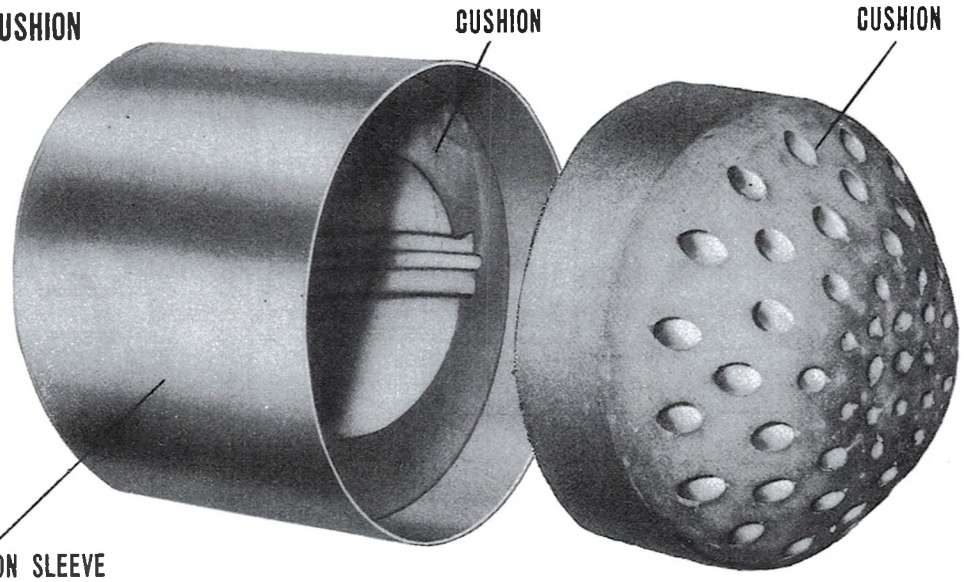


M-3 MECHANISM EXTERNAL VIEW

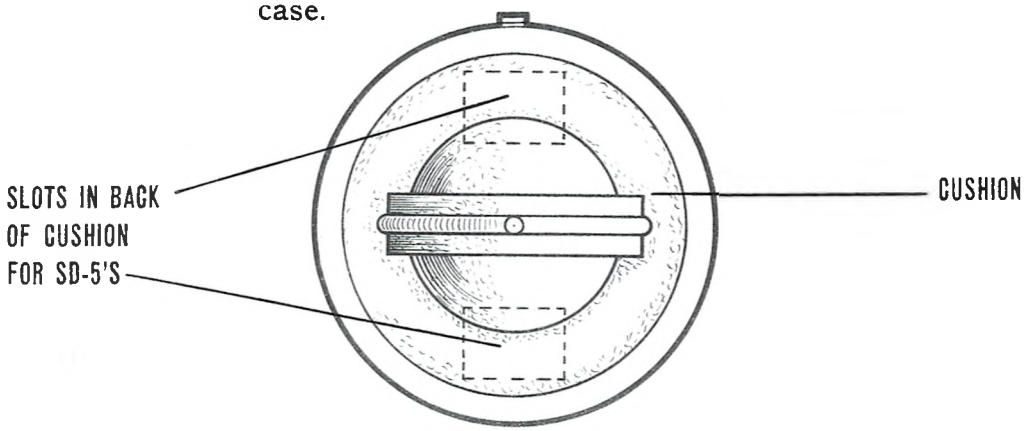
firing mechanism is marked near the serial number with the type and the words "Northern Zone," "Tropical Zone," or "Southern Zone" to indicate its adjustment.

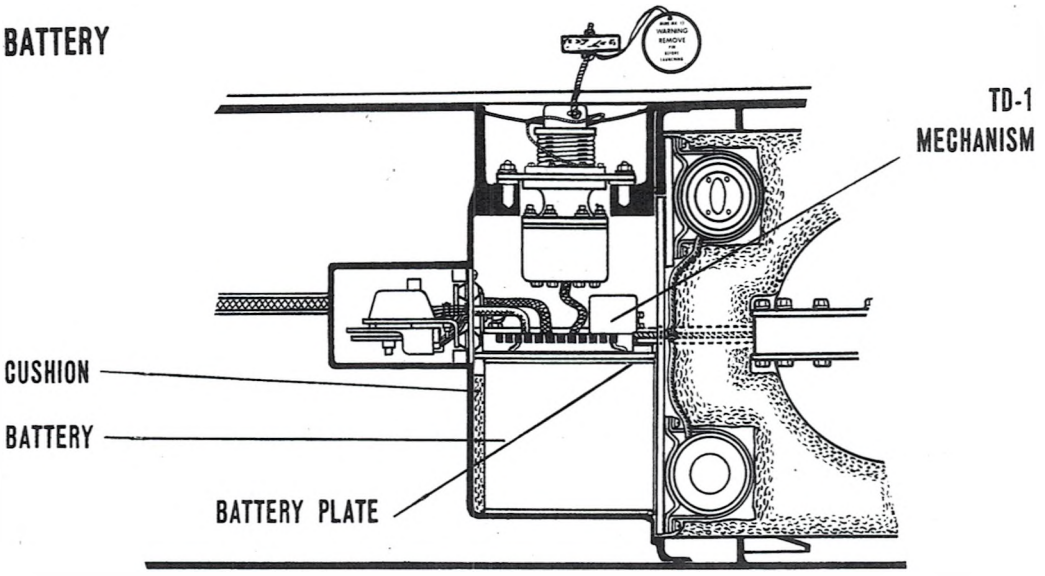


THE CUSHION



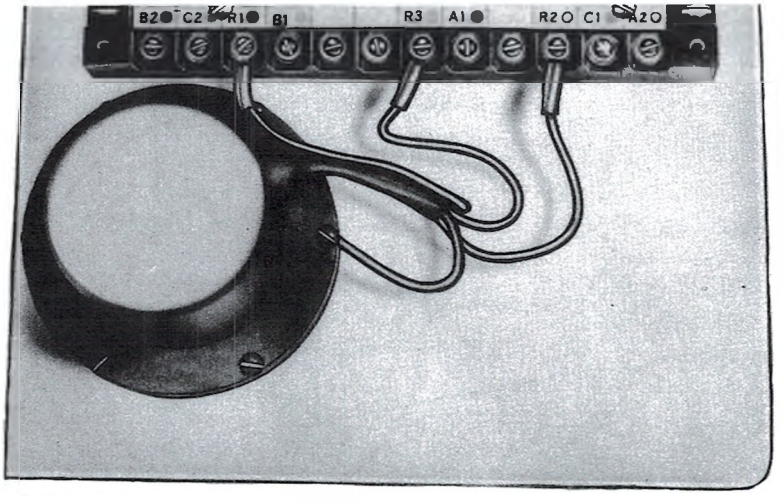
1.19 The Mark 1 cushion, which surrounds the firing mechanism to protect it from shock, is made in two parts. The part placed between the firing mechanism and the mine case bulkhead is cylindrical and has a hole through which the firing mechanism cable is carried to the terminal block. The after part of the cushion is shaped to fit the cap of the mine case. Before they are installed in a mine, th firing mechanism and cushion are assembled in a metal sleeve which fits inside the after end of the case.



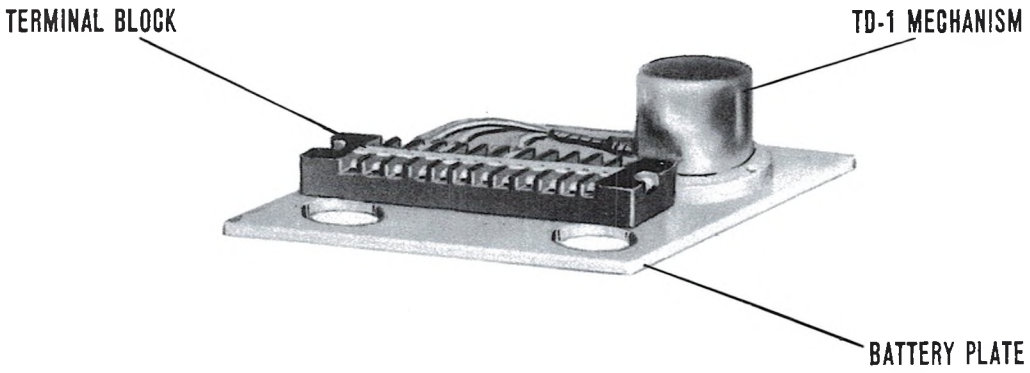


THE TD-1 MECHANISM.

1.20 The TD-1 is an electrically-operated, escapement-controlled relay used to control the operation of the firing mechanism.

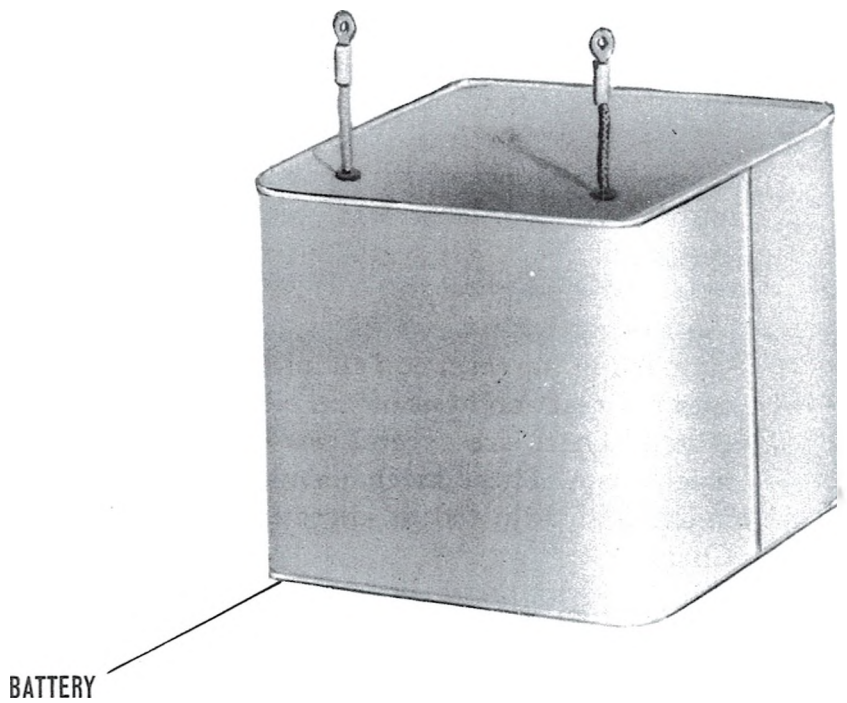


TD-1 MECHANISM

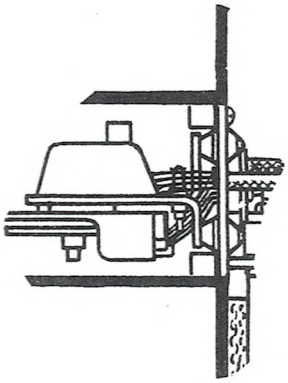


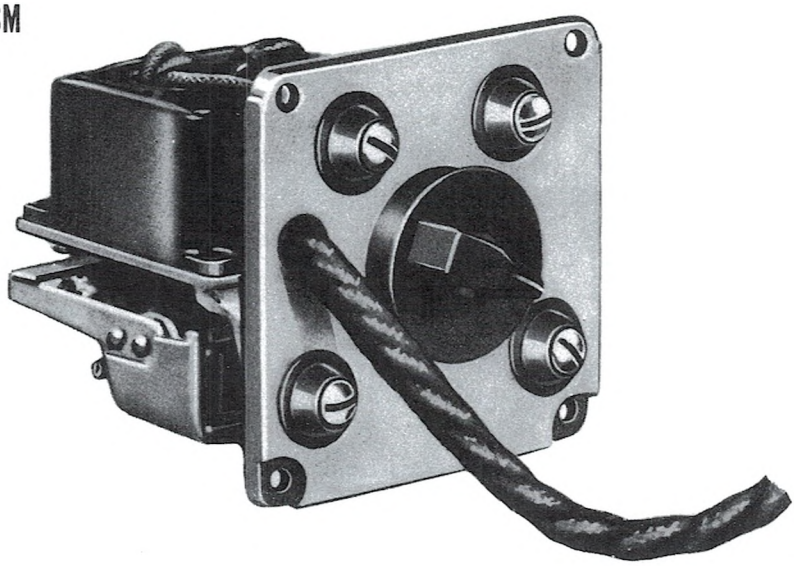
THE BATTERY

1.21 The battery consists of 9 dry cells connected in series and sealed in a brass container. The B-3 battery is made up of telephone type cells, and the B-3 Mod. 1 of general purpose cells. The B-3 Mod. 1 will give higher short circuit currents than the B-3.

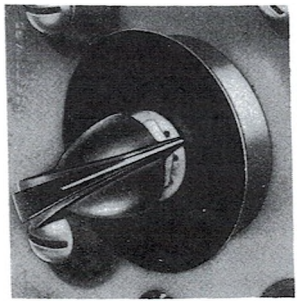


THE SE-1 MECHANISM





SE-1 MECHANISM BOTTOM VIEW

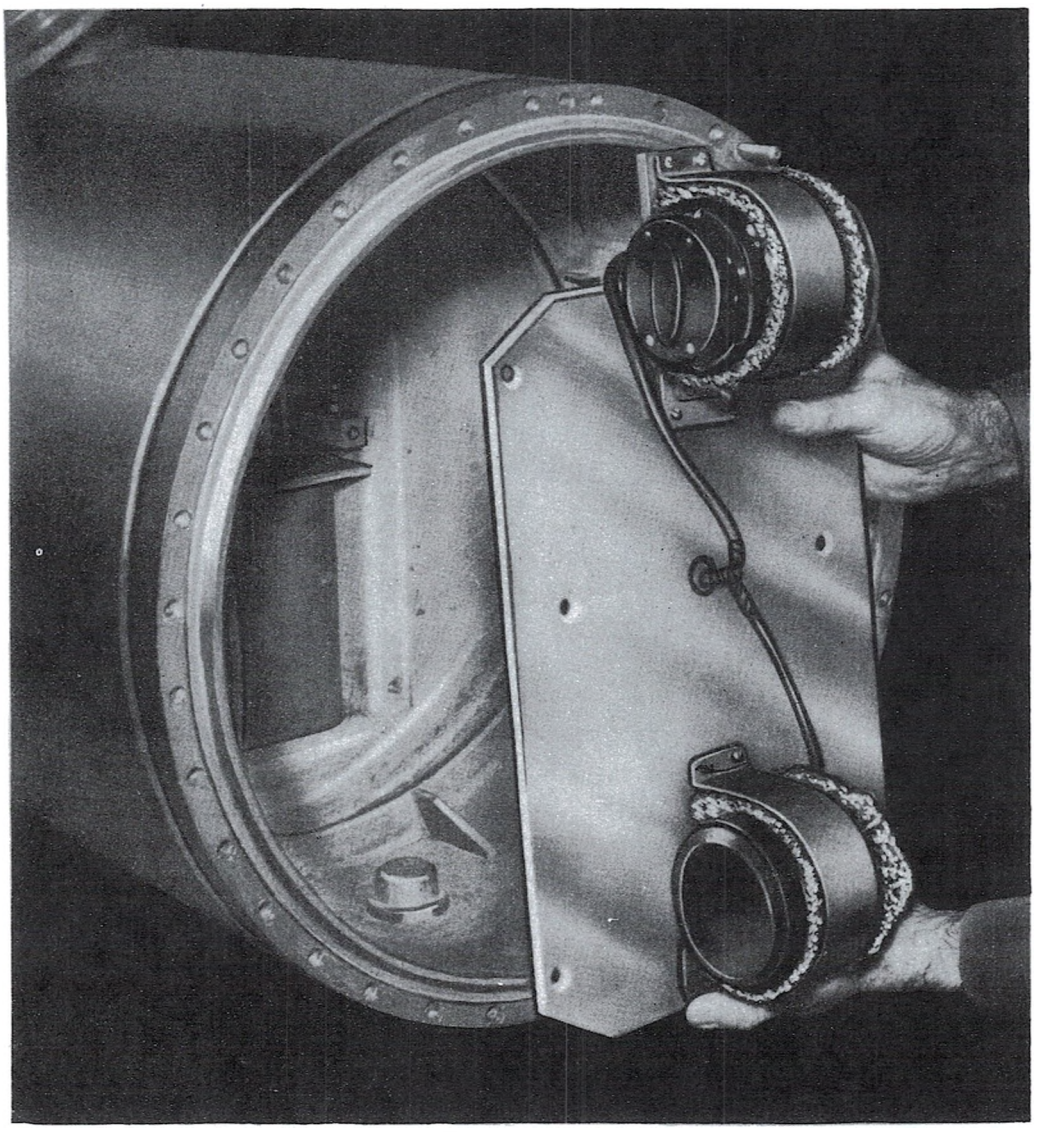


DIAL SE-1 MECHANISM

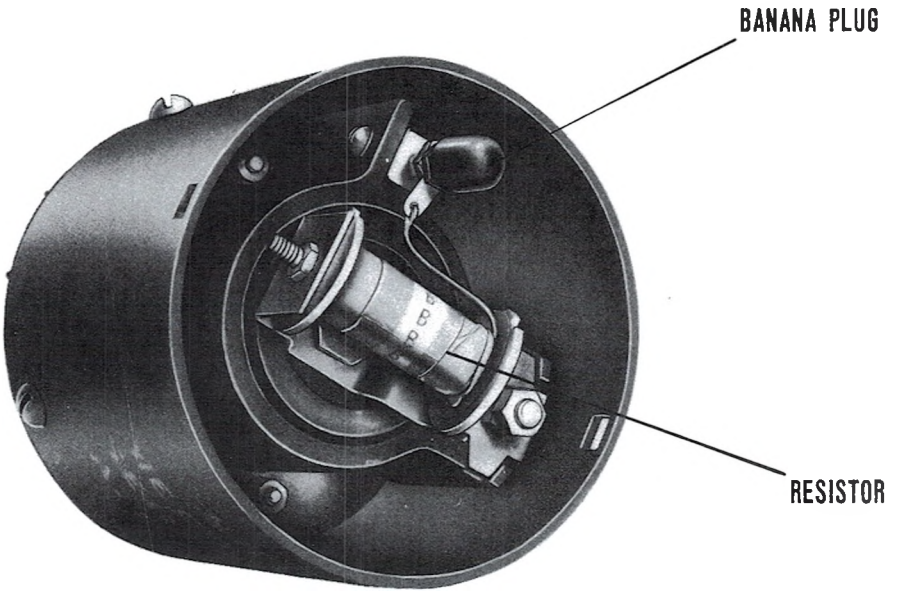
1.22 The SE-1 mechanism is a device installed in some mines to control the operation of the firing mechanism. An SE-1 mechanism includes a hand-operated selector switch and a stepping switch actuated through a time delay (1 minute, escapement) relay. The stepping switch has an operating coil and a reset coil. The reset coil is energized by the arming of the clock delay and resets a contact arm to its home position if it has been jarred away from this position during handling or planting. A fuse is included in the reset coil circuit; this fuse blows and cuts the reset coil out of the circuit after it has operated. There are several possible settings of this mechanism. These mechanisms will be installed in mines and adjusted as directed by the Officer in Charge.

1.23 When an SE-1 mechanism is installed in a mine, an indication of the number for which it is set is stenciled on the mine case.

SD-5 MECHANISMS



1.24 Two SD-5 mechanisms connected electrically in parallel may be used in a mine to control the operation of the electrical assembly.

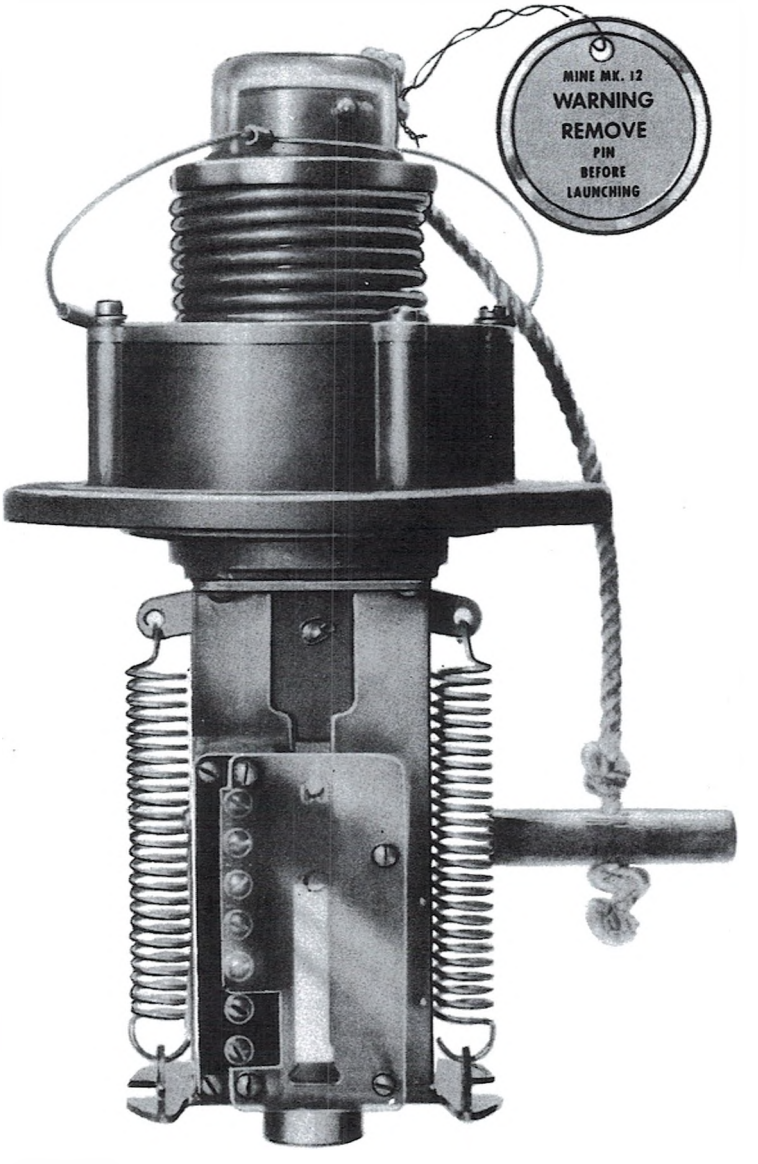


TOP VIEW SD-5 MECHANISM

1.25 A resistor is used in conjunction with each SD-5 mechanism and is installed in the top of the mechanism. The resistors available for use in the SD mechanisms are issued with the mechanisms. Each resistor is designated by a letter and a color. The table below shows which resistors may be used in SD-5 mechanisms installed in Mark 12 mines. Other resistors which may be supplied with the mechanisms are for use in other mine assemblies and are not to be used in Mark 12 mines without further instructions. RESISTORS OF THE SAME TYPE MUST BE USED IN BOTH SD-5 MECHANISMS INSTALLED IN A MINE.

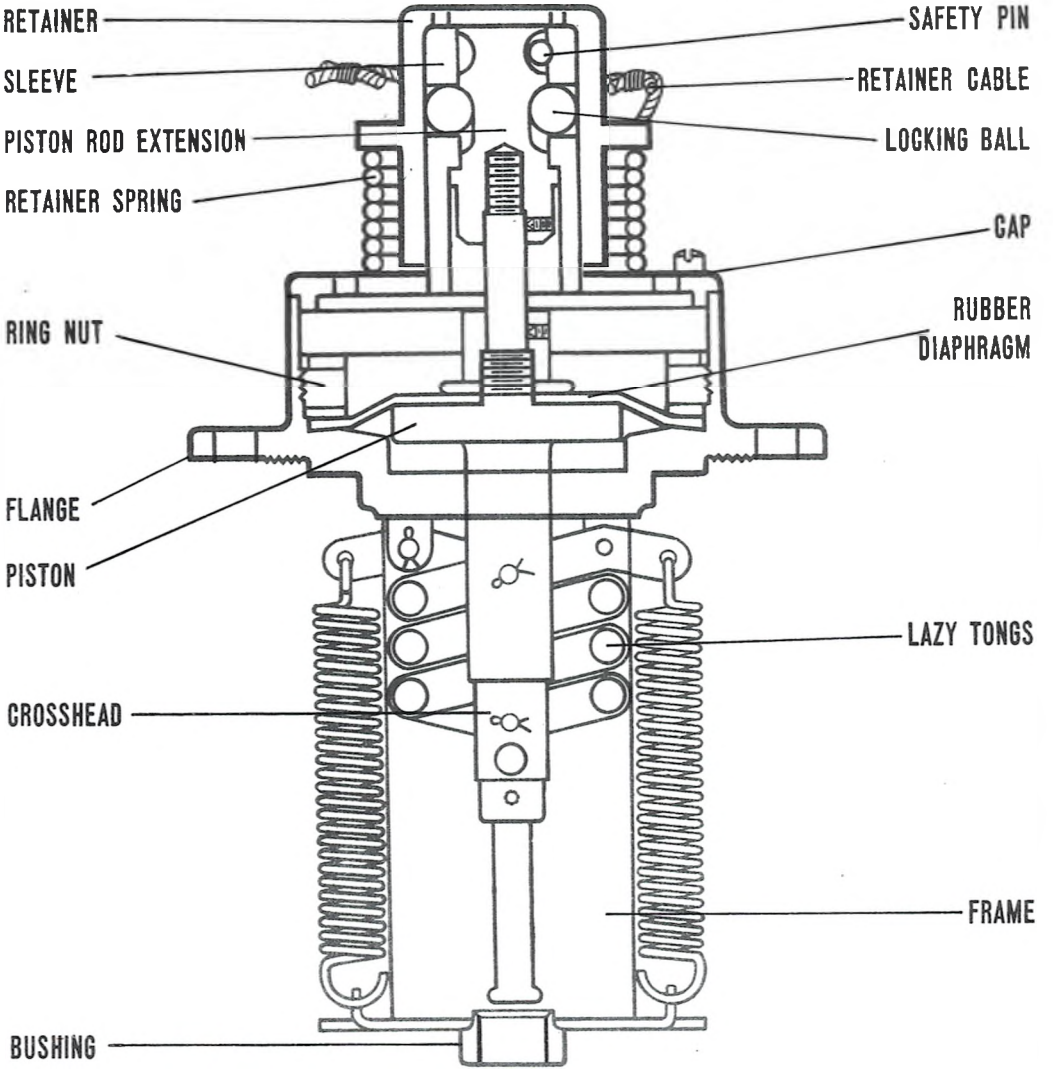
LETTER	COLOR
B	Blue
C	White
D	Red
E	Green
F	Black
H	Orange

THE EXTENDER



MK. 12 MOD. 5 EXTENDER

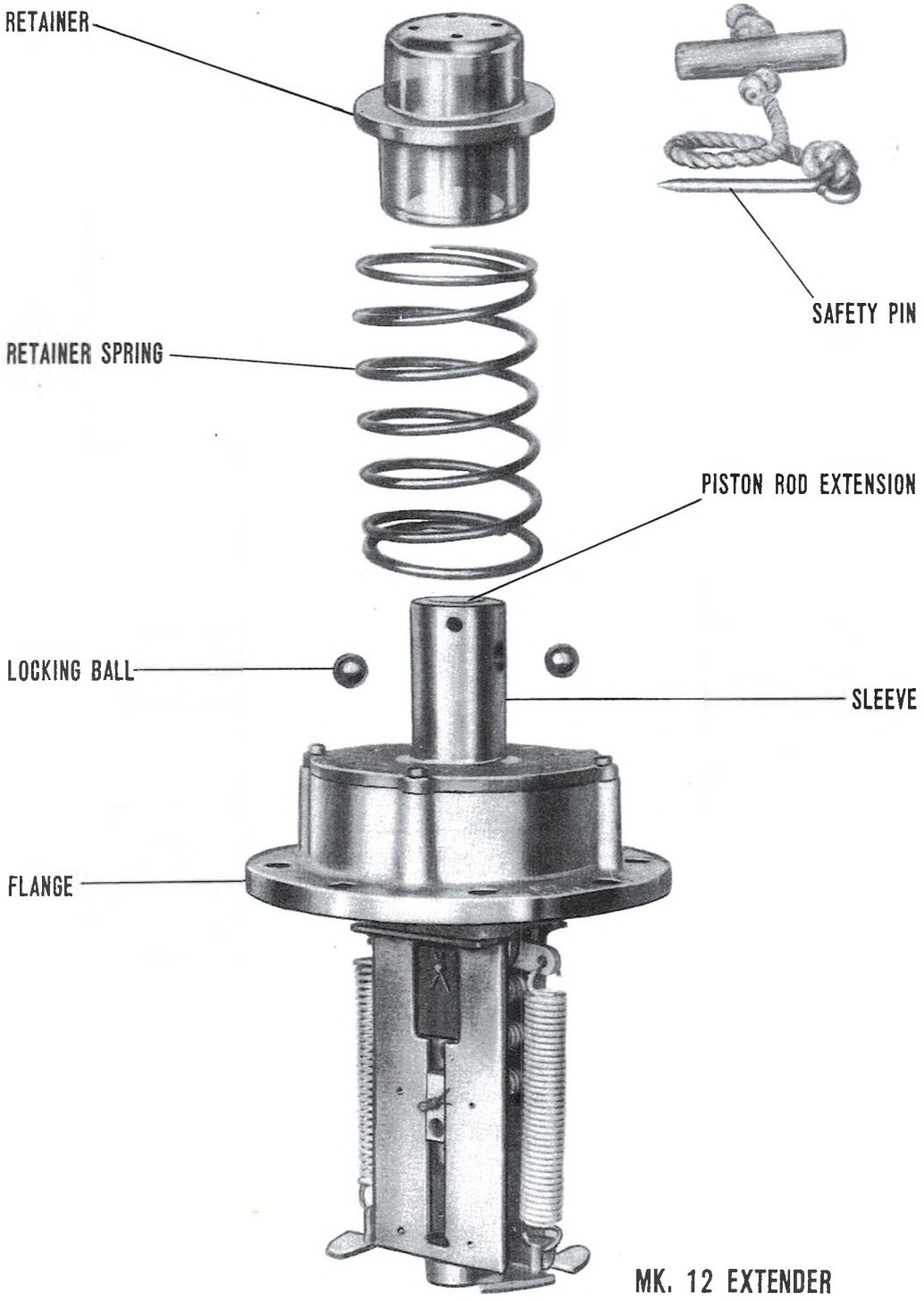
1.26 The Mark 12 and Mark 12 Mod. 5 Extender (EX mechanisms) are basically similar, the principal difference between them being a terminal block and transparent shield on the frame of the Mark 12 Mod. 5 which is not present on the Mark 12. Extenders are safety devices which hold the detonators away from the booster charges until after



MK. 12 EXTENDER

the mines are planted. When an extender mechanism is in the retracted (SAFE) position, the distance between the detonator and the booster is such that even if the detonator should explode, it would not detonate the booster or the main explosive charge. After a mine is submerged 16 feet or more,

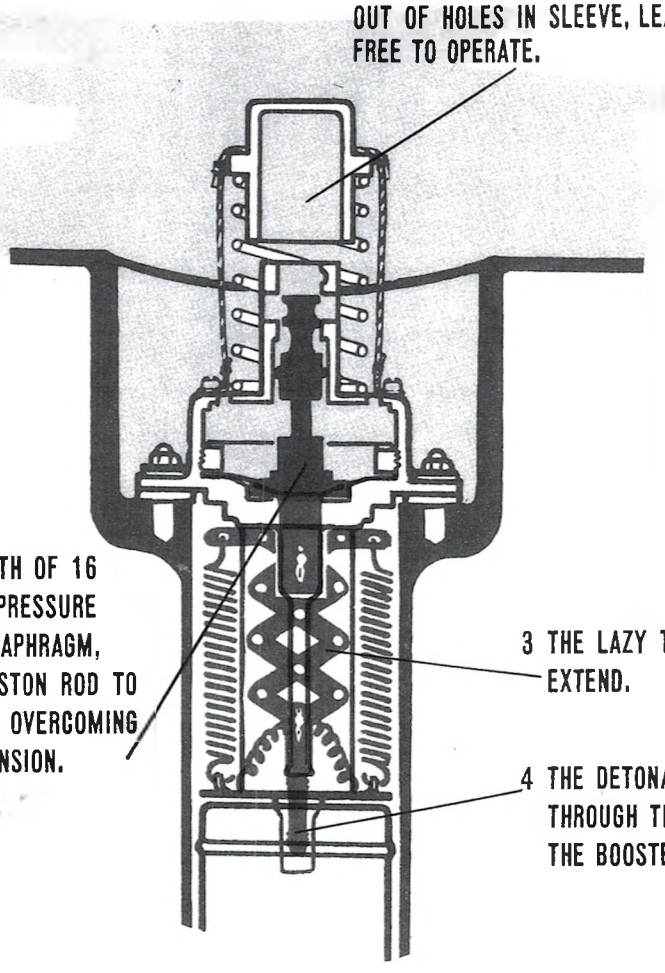
THE EXTENDER



MK. 12 EXTENDER

HOW IT WORKS

1 RETAINER IS THROWN OFF EXTENDER BY RETAINER SPRING. LOCKING BALLS THEN FALL OUT OF HOLES IN SLEEVE, LEAVING EXTENDER FREE TO OPERATE.



2 BEYOND A DEPTH OF 16 FEET, WATER PRESSURE CAUSES THE DIAPHRAGM, PISTON AND PISTON ROD TO MOVE INWARD, OVERCOMING THE SPRING TENSION.

3 THE LAZY TONGS EXTEND.

4 THE DETONATOR MOVES THROUGH THE BUSHING INTO THE BOOSTER CAN.

5 IF WATER PRESSURE IS REMOVED, THE SPRINGS RETRACT AND WITHDRAW THE DETONATOR, THUS DISARMING THE MINE.

HOW THE EXTENDER WORKS

LIGHT BLUE INDICATES WATER

hydrostatic pressure causes the mechanism to move the detonator into the booster can. (Some extenders will operate in lesser depths, but 16 feet is the minimum depth at which positive operation of the mechanisms is assured.) A Mark 12 Mod. 5 extender may have an antirecovery switch mounted on the extender frame beside the terminal block. If it is necessary to use an extender issued with an antirecovery switch in place, the switch should be removed prior to assembly.

1.27 The portion of each extender which projects outside of the extender opening in the mine case is similar to the outer portion of the clock starter. It consists principally of a ball-type locking device and a flange housing a rubber diaphragm, a metal piston and piston rod.

1.28 The inner portion of the extender includes a set of lazy tongs which are attached to the inner end of the piston rod to amplify its motion. A socket for the detonator is provided in a crosshead secured to the inner side of the tongs. A frame, secured to the inner side of the flange, guides the tongs and holds the booster away from the detonator when the mechanism is in the safe position. A bushing on the inner end of the frame fits into a socket in the booster can. Two springs connected to the lazy tongs and the frame of the mechanism hold the tongs in the safe position until sufficient pressure is applied to the diaphragm and piston to overcome the spring tension. When this pressure is applied, the diaphragm, piston and piston rod move inward, extending the lazy tongs, and the detonator is moved through the bushing in the extender frame and into the pocket in the booster can. If the pressure on the mechanism is subsequently removed, the springs are designed to retract the lazy tongs,

withdrawing the detonator from the booster and disarming the mine. (If the mine has been planted a long time, however, the mechanism may be fouled and may not retract when pressure is removed.)

1.29 A Mark 14 extender has been designed and may be issued for use with these mines. The Mark 14 extender is similar to the Mark 12 Mod. 5, except for the lazy tongs device. In the Mark 14 extender, pressure acting on the diaphragm causes the piston to move forward the entire distance necessary to insert the detonator in the booster. In this design, the detonator is installed in a socket in the inner end of the piston rod.

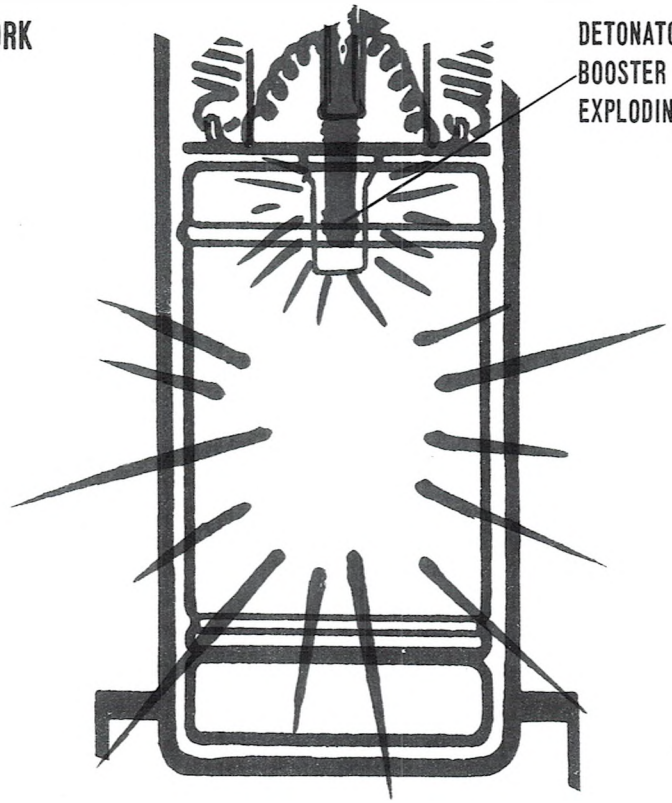
THE DETONATOR AND BOOSTER

1.30 The Mark 1 Mod. 1 electric detonator is used in this mine. It contains 65 grains of mercury fulminate and is designed to fire instantaneously on application of a current of 0.5 to 0.7 ampere.

CAUTION: Mercury fulminate is comparatively unstable and susceptible to shock. Consequently, Mk. 1 Mod. 1 detonators must be handled with extreme caution at all times and must not be dropped, pounded, bent or deformed in any way, or they may explode prematurely, with resulting injury to personnel and damage to materiel.

THE DETONATOR AND BOOSTER

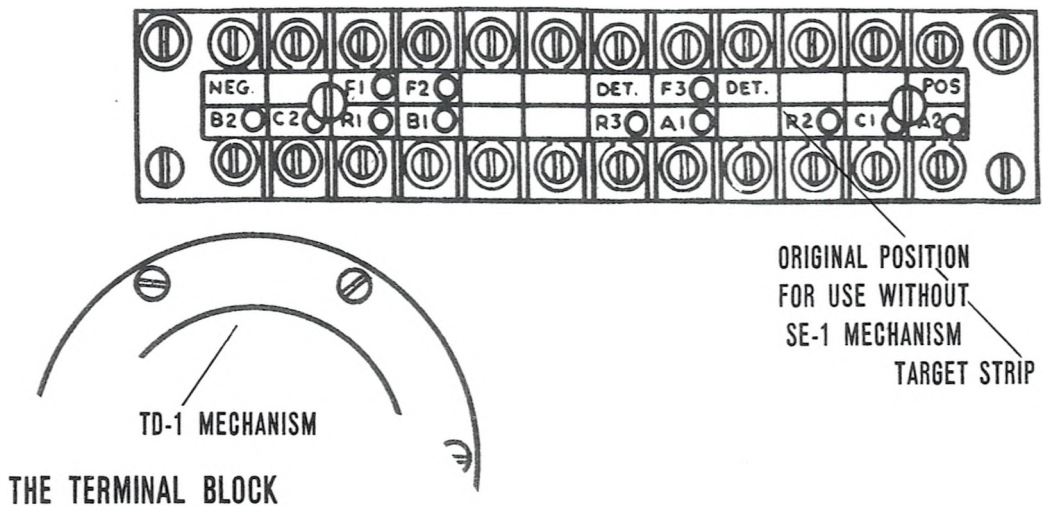
HOW THEY WORK



THE MK. 6 MOD. 1 BOOSTER

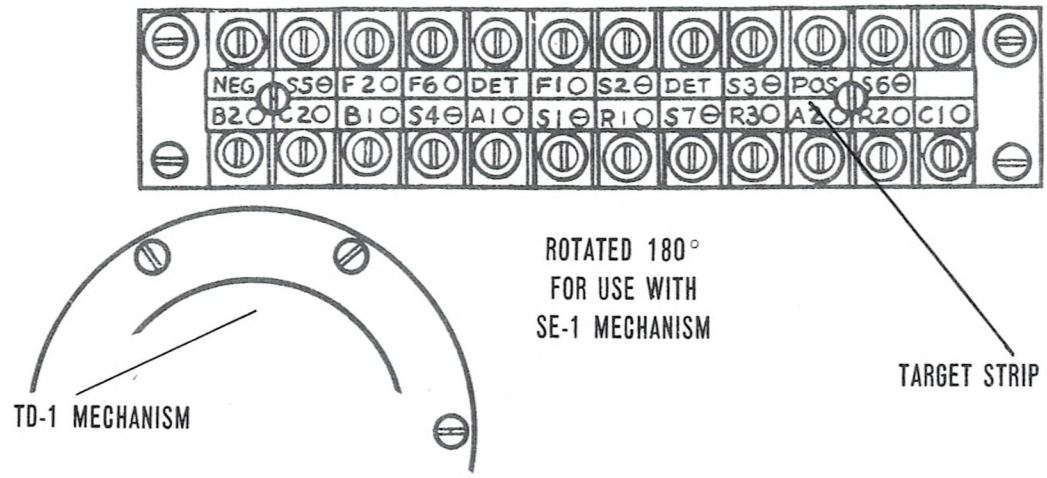
1.31 The Mark 6 Mod. 1 booster, containing 2½ pounds of granular grade A TNT, is used in this mine. A spacer must be placed beneath it in the extender well to position it correctly. A flat spring is fitted to one end of each booster can to hold it against the extender frame.

1.32 Since this booster was designed for use in other mines in which it was necessary to lead wires through the booster can, it is fitted with an off-center, longitudinal cable conduit which is not used in the Mark 12 mine.



THE TERMINAL BLOCK

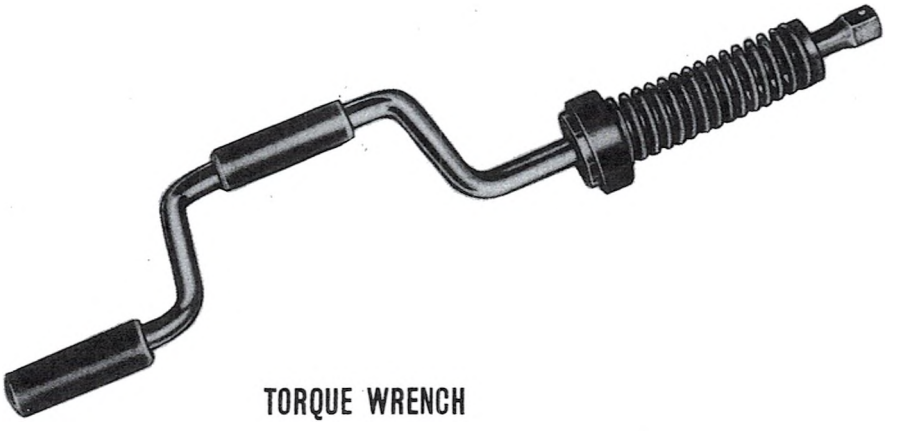
1.33 The TB-1 terminal block is provided to simplify the electrical assembly of the mine. As supplied to assembly stations, this block is fitted with a 'target' strip indicating by letters, numbers, and colored dots the leads which should be attached to the various terminals. If an SE-1 mechanism is installed in a mine, the original target strip on the terminal block must be replaced by a strip supplied with the SE-1 mechanism and the terminal block must be rotated 180° from its original position.



INSTRUCTIONS FOR ASSEMBLING THE MARK 12 MINE

2.1 Mark 12 mines are generally made up at assembly stations and issued completely assembled except for detonators. Detonators are usually installed immediately before mines are delivered to the vessels by which they will be planted.

2.2 A check list based on the instructions herein shall be prepared by the assembly depot to insure proper assembly of mines. Before the mine is issued for service each assembled mine shall be inspected, and a copy of the check list shall be initialed by the inspector. A suggested assembly check list is given in the Appendix. A copy of the assembly record should be placed in the instrument compartment of the mine to serve as a history of the mine and inform personnel working on the mine of the type and condition of the mine components. Any subsequent tests, modifications or adjustments made on the mine should be noted on this copy of the assembly record and the record returned to the compartment. There shall be stenciled on the outside of each assembled mine, in accordance with instructions issued by the Bureau of Ordnance, the following information: (1) The place and date of assembly, (2) the type and adjustment of the firing



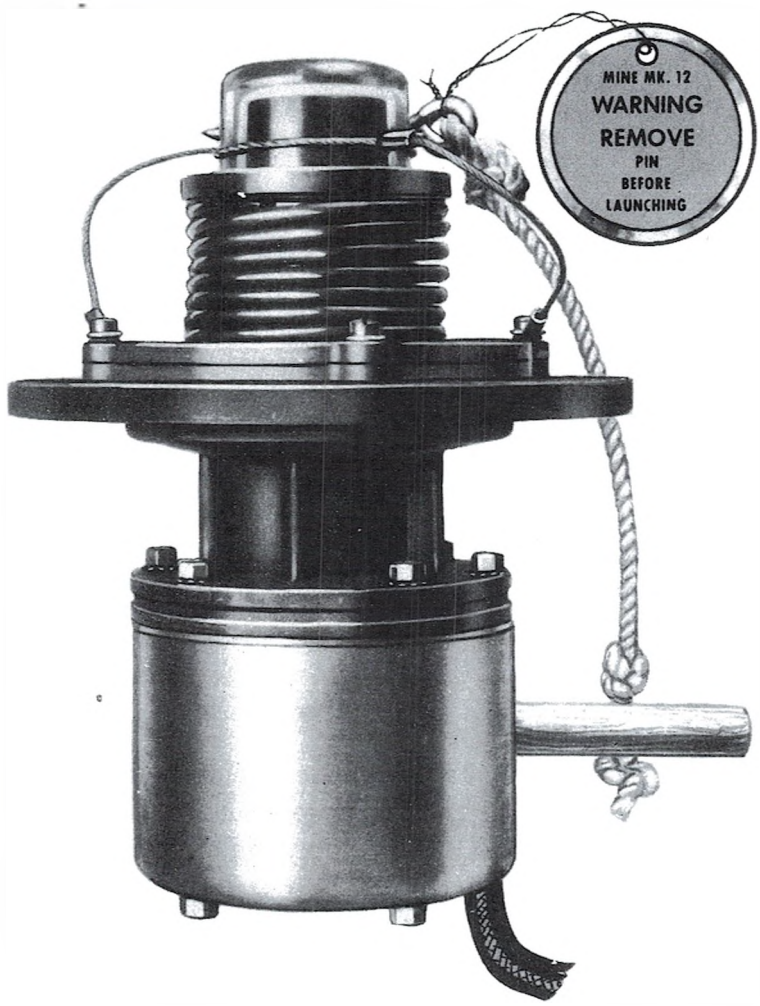
TORQUE WRENCH

mechanism, (3) the settings of the SE-1 and SD-5 mechanisms (if installed), and (4) a note to indicate whether or not a detonator is installed.

2.3 Necessary assembly tools are contained in the Mark 12 Mine Tool Set. These include an adjustable-torque speed wrench with sockets to fit the nuts used on the mine. This wrench must be used on all aluminum studs to avoid tightening nuts sufficiently to break the studs or strip their threads. Caution must be observed in handling the torque wrench to avoid damage or excessive wear. When a nut has been tightened to the full extent of the torque control, the pin will tend to slip out of the groove in the sleeve. The operator should cease turning the wrench when the pin starts to slip. Otherwise, there will be excessive wear on the faces of the groove, and the pin will bend as it snaps into the recess after a complete turn around the sleeve. The wrench should be checked against a master wrench every six months, or oftener if it is believed to be out of adjustment. The proper adjustment for a torque wrench used on a Mark 12 mine is 10 to 12 pound-feet. (This is equivalent to a force of 25 to 30 lbs. applied to the offset of the torque wrench supplied in the tool set). This pressure must be applied in the direction of rotation of the wrench, and at right angles to the arms between the offset handle and the stem of the wrench. Other speed wrenches in the tool set, supplied without torque control, are for use in removing the mine from its crate and disassembling the mine.

2.4 A motor-driven torque wrench, available at some depots, is also recommended for use on the mine. However, when such a wrench is used, all nuts must be checked by hand after assembly of a mine is completed to make sure they are set up to the proper torque.

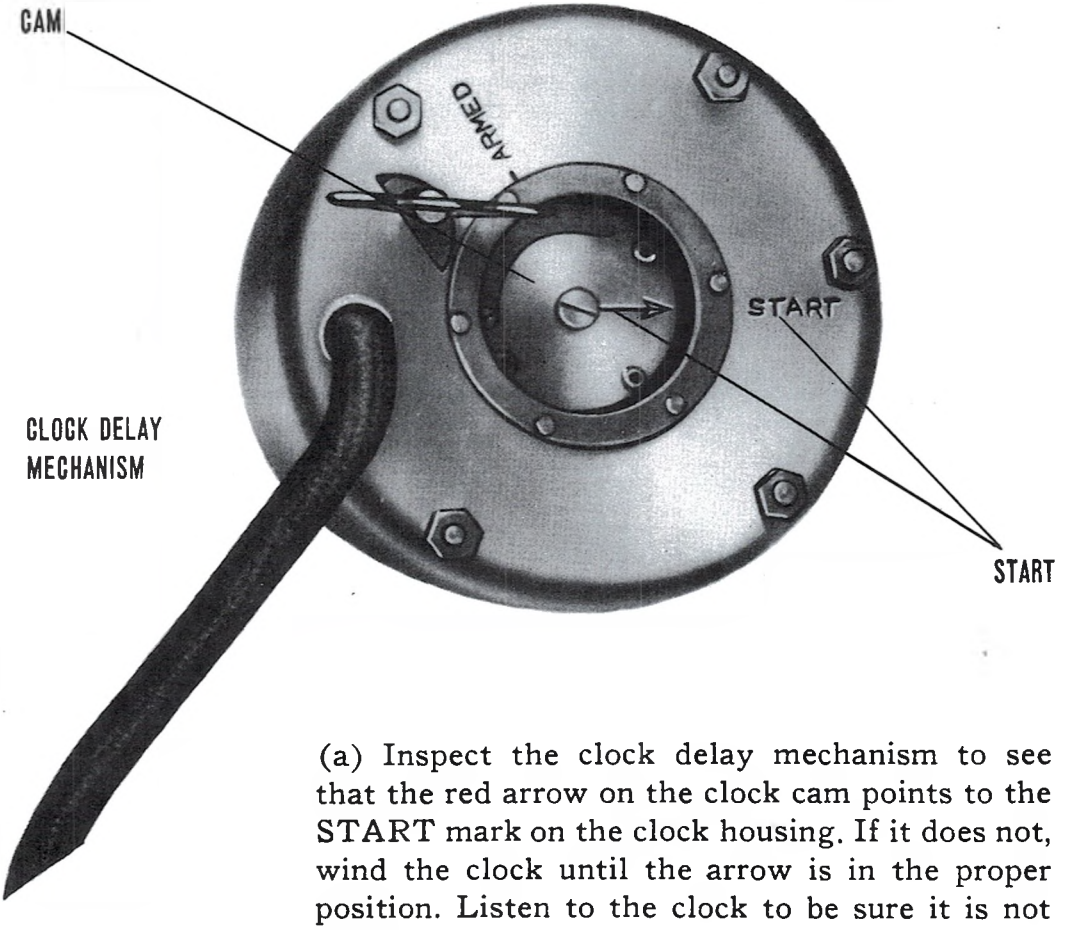
TESTS PRIOR TO ASSEMBLY AND SUBASSEMBLY OPERATIONS



MK. 1 MOD. 5 CLOCK STARTER AND CLOCK DELAY MECHANISM

CLOCK STARTER AND CLOCK DELAY MECHANISM

2.5 CLOCK STARTER AND CLOCK DELAY MECHANISM. If a CD test set is available, test the clock delay mechanism as directed in the instructions for the test set. Test the clock starter and the clock delay mechanism as follows:

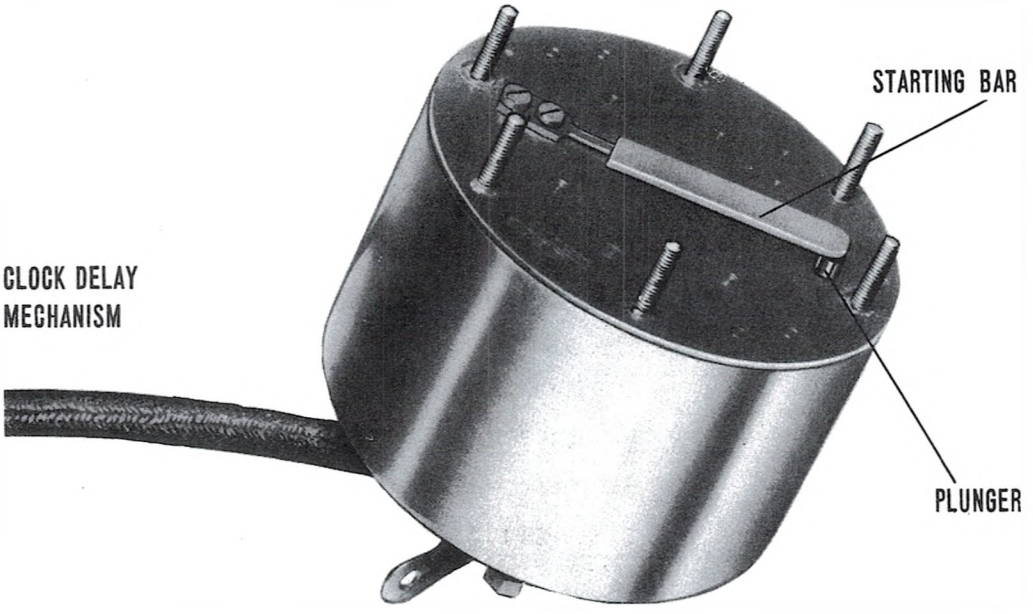


(a) Inspect the clock delay mechanism to see that the red arrow on the clock cam points to the START mark on the clock housing. If it does not, wind the clock until the arrow is in the proper position. Listen to the clock to be sure it is not ticking.

(b) Press the plunger on the bottom of the clock inward until its outer end is flush with the housing. The clock should start ticking. Release the plunger. It should move out of the housing until its outer end projects about ¼ inch outside of the housing, and the clock should stop.

(c) Check the zero setting of a standard ohmmeter by touching its leads together. Adjust the ohmmeter, if necessary, as directed in the instructions attached to it. Test the clock cable leads with the ohmmeter.

CLOCK STARTER AND CLOCK DELAY MECHANISM



(1) If the clock is a CD-1, the ohmmeter indications should be as follows:

OHMMETER ACROSS	OHMMETER INDICATION
Red lead and white lead	Open circuit.
Blue lead and black lead	Open circuit.
Yellow lead and green lead	Open circuit.

(2) If the clock is a CD-1 Mod. 4 or a CD-9 (with CA-10 cable), the ohmmeter indications should be as follows:

OHMMETER ACROSS	OHMMETER INDICATION
Red lead and white lead	Open circuit.
Blue lead and green lead	Open circuit.
Green lead and yellow lead	Open circuit.
Yellow lead and black lead	Resistance of less than 1 ohm.

NOTE: Instruments for making these and other electrical tests called for in the assembly of a Mk. 12 mine (excepting the milliammeter needed to test an SD-5) will be included in the Mk. 2 test set. This set contains the following:

Standard ohmmeter (to be used for all resistance tests unless otherwise specified);

High-current ohmmeter (¼-ampere);

Voltmeter (0-15 volts);

Ammeter (0-50 amperes);

Test leads.

(d) If the ohmmeter readings do not agree with the above instructions, the switches or leads are faulty and the UNIT MUST BE REJECTED.

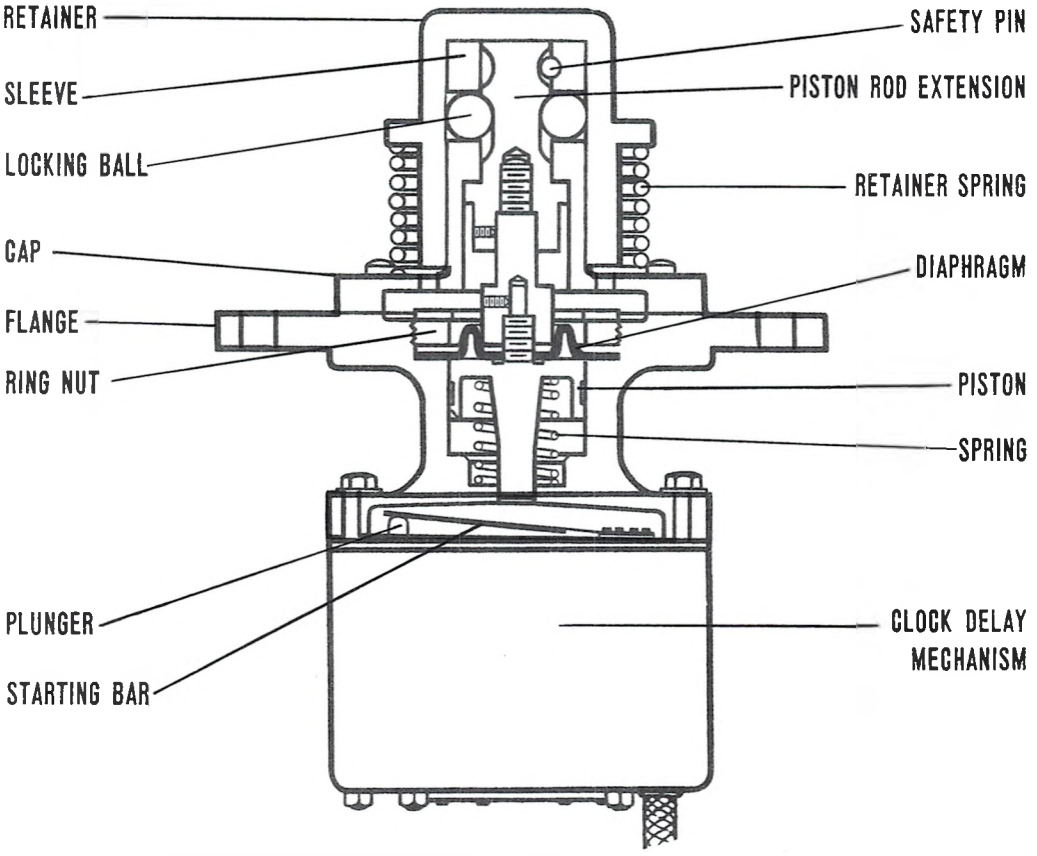
(e) Press down the locking ball retainer on the clock starter far enough to free the safety pin. Remove the pin and allow the retainer to rise slowly until the spring beneath it is expanded to its full length or until it is stopped by the retainer cable (if already installed). Remove the retainer and retainer spring, and the locking balls.

(f) Remove the six nuts and lock washers from the bottom of the clock housing (the surface through which the plunger projects).

(g) Place the clock delay mechanism against the base of the clock starter flange. See that the clock cable is on the opposite side of the assembly from the orienting hole in the clock starter flange. Replace the clock mechanism lock washers and nuts. Set the nuts up tight.

(h) Place the assembled clock mechanism and clock starter on a test pot with the clock upward.

CLOCK STARTER



MK. 1 CLOCK STARTER AND CLOCK DELAY MECHANISM

(i) Apply pressure to the pot slowly and listen to the clock. It should not start ticking until the pressure is 4 pounds per square inch (equivalent to the hydrostatic pressure at a depth of 9 feet). It should start ticking before the pressure reaches 7 pounds per square inch (equivalent to the hydrostatic pressure at a depth of 16 feet).

(j) Raise the pressure in the pot to at least 60 lbs. per square inch and close the air supply valve. Watch the pressure gauge for at least two minutes. The pressure should NOT drop during this period. If it does, inspect the clock starter and test assembly to locate the leak. A clock starter

which leaks in this test must NOT be installed in a mine until the fault has been corrected.

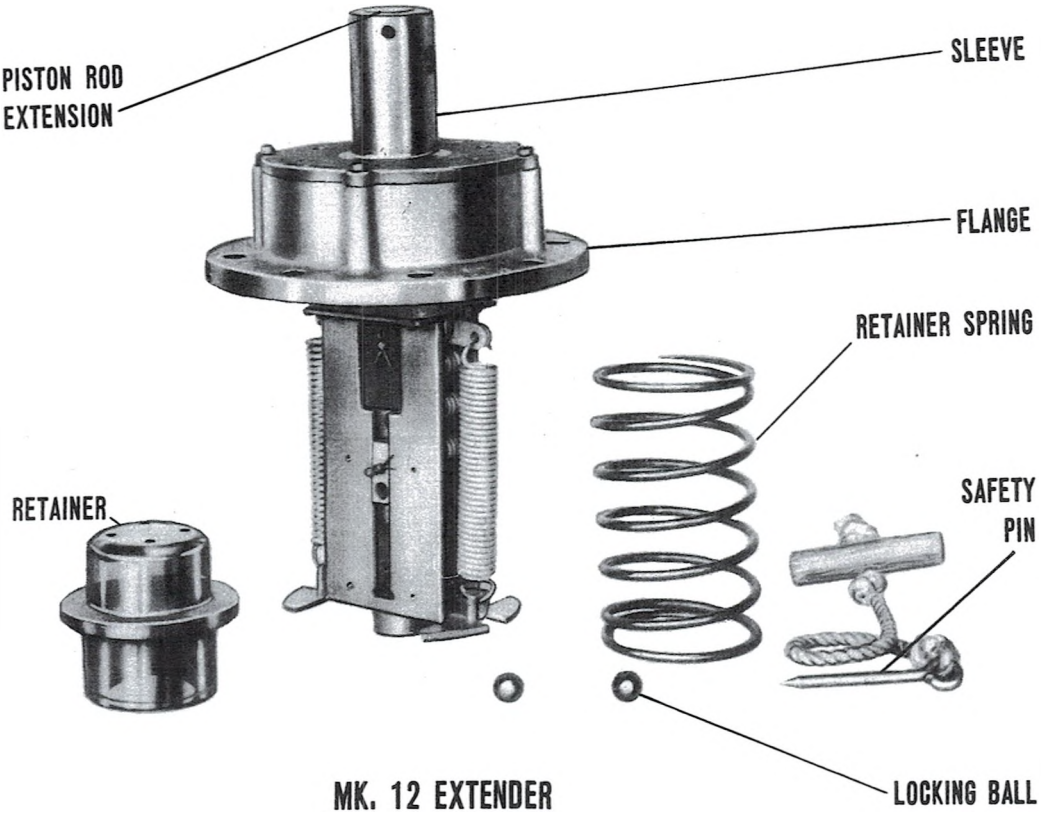
(k) Reduce the pressure in the pot slowly. The clock should stop ticking before the pressure is reduced to 1½ pounds per square inch (equivalent to the hydrostatic pressure at a depth of 3½ feet).

(l) Remove the assembly from the test pot.

(m) Weight or clamp the clock starter so that the clock will run down.

2.6 If the assembled clock mechanism and clock starter function properly in the above tests, the assembly should be marked "O.K.", and initialed by the inspector. If they do not function properly, either the clock mechanism or the clock starter MUST BE REPLACED until a satisfactory combination is obtained. Any clock starter or clock mechanism which does not function properly shall be marked "UNSATISFACTORY," tagged to indicate the reasons for which it was rejected, and set aside. Unsatisfactory clock starters may be overhauled at assembly stations. Unsatisfactory clock delay mechanisms shall be set aside, and the Bureau of Ordnance shall be notified of their condition. CLOCK MECHANISMS AND CLOCK STARTERS WHICH ARE NOT SATISFACTORY IN EVERY RESPECT MUST NOT BE INSTALLED IN MINES. A CLOCK MECHANISM WHICH COULD RUN DOWN AND REACH AN ARMED CONDITION PREMATURELY COULD CAUSE THE FIRING MECHANISM TO BECOME ARMED. THIS MIGHT RESULT IN A PREMATURE EXPLOSION OF THE DETONATOR. WHILE THE DETONATOR SHOULD BE HELD AWAY FROM THE BOOSTER CHARGE UNTIL AFTER THE MINE IS PLANTED, THERE IS STILL A HAZARD TO PERSONNEL.

EXTENDER TEST



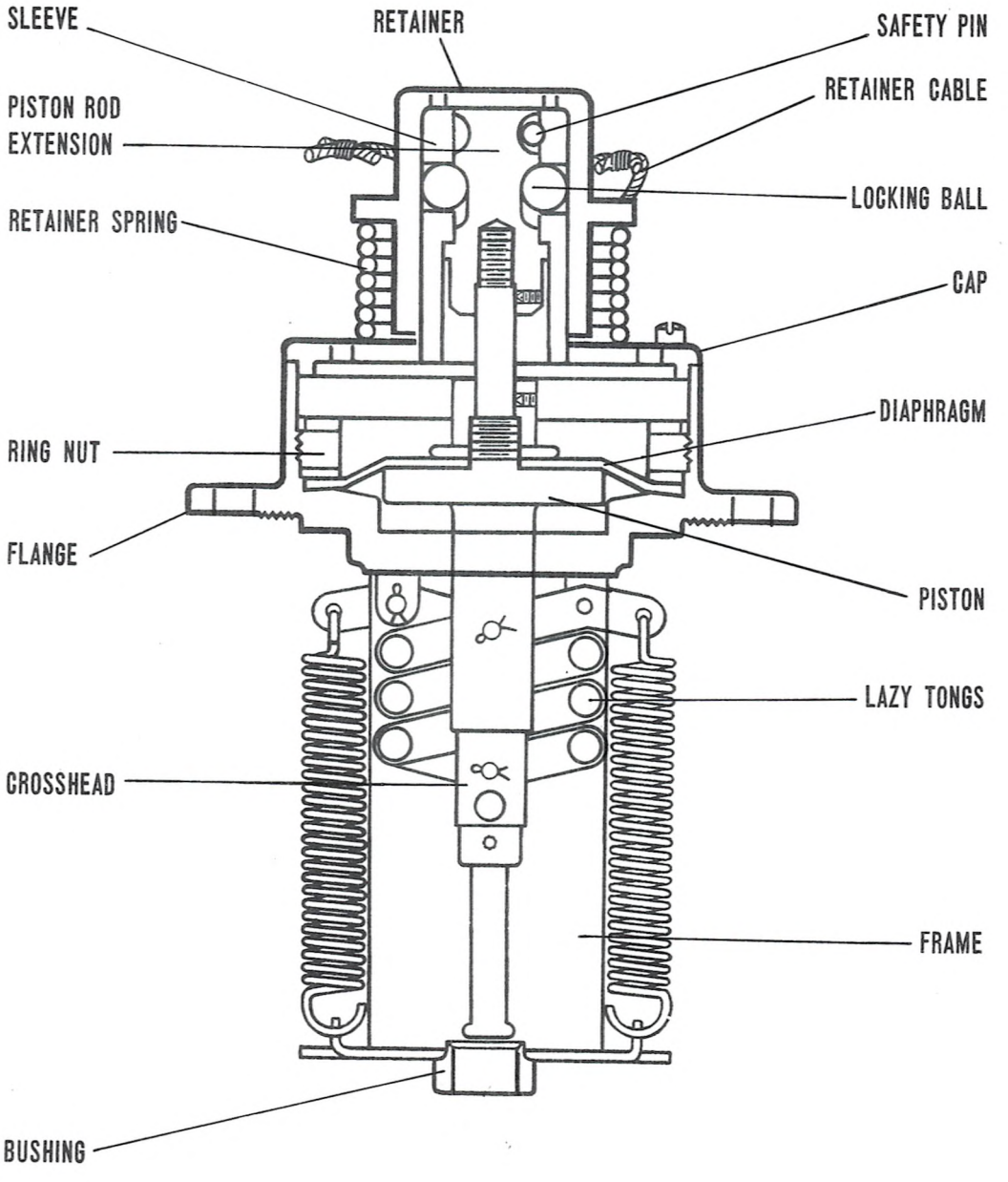
MK. 12 EXTENDER

2.7 EXTENDER. Test the extender as follows:

(a) Remove the ball-lock parts of the mechanism in the same manner as those of the clock starter were removed (subpar. 2.5(e)).

(b) If there is an antirecovery switch on the extender, remove it.

(c) Place the extender on a test pot, with the lazy tongs upward, and apply air pressure to the pot slowly. Observe the action of the lazy tongs. They should extend evenly and without pronounced jerks. They should not be completely extended until the pressure is more than 4 pounds per square inch, and should be completely extended before the pressure is 7 pounds per square inch.



MK. 12 EXTENDER

(d) Raise the pressure in the pot to at least 60 lbs. per square inch and close the air supply valve. Watch the pressure gauge for at least two minutes. The pressure should NOT drop during this period. If it does, inspect the extender and test assembly to locate the leak. An extender which leaks in this test must NOT be installed in a mine until the fault has been corrected.

(e) Reduce the pressure in the pot slowly. The lazy tongs should retract evenly and should be completely retracted before the pressure is reduced to 1½ pounds per square inch.

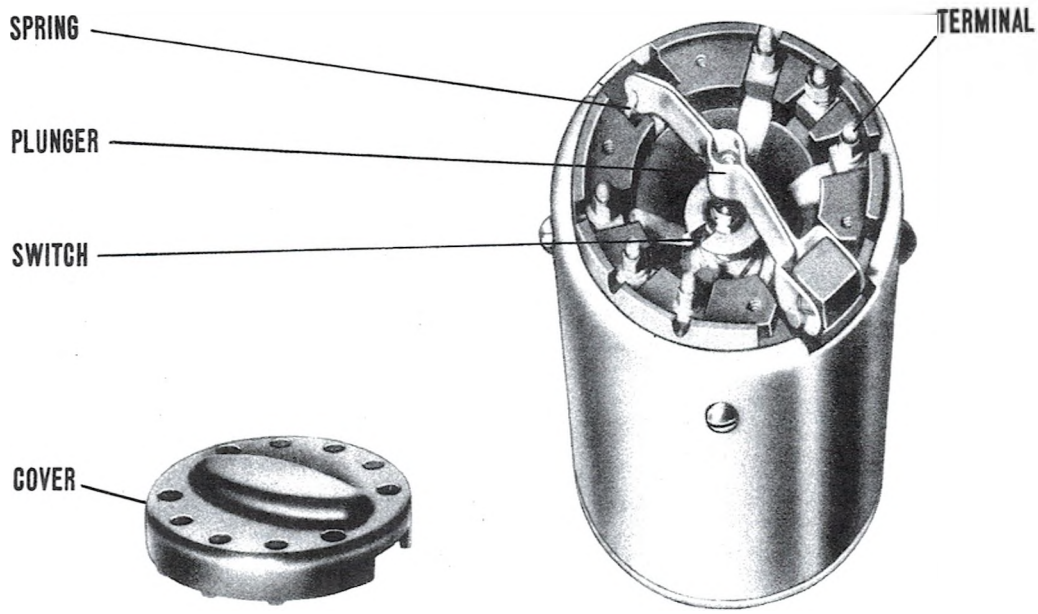
(f) Release all pressure from the pot and remove the extender. Inspect the detonator lead hole in the crosshead. It should be smooth and free of burrs and sharp edges. If it is not, scrape or file it smooth.

WARNING TAG

(g) Replace the retainer, retainer spring, and locking balls, after first greasing the balls and the inside of the retainer lightly with vaseline or a similar lubricant.

(h) Push the retainer down, locking the extender in the retracted position, and insert a safety pin to hold the retainer in place. See that a REMOVE BEFORE LAUNCHING warning tag is attached to the safety pin.

(i) Install a retainer cable if one is not already in place.



SD-5 MECHANISM BOTTOM VIEW

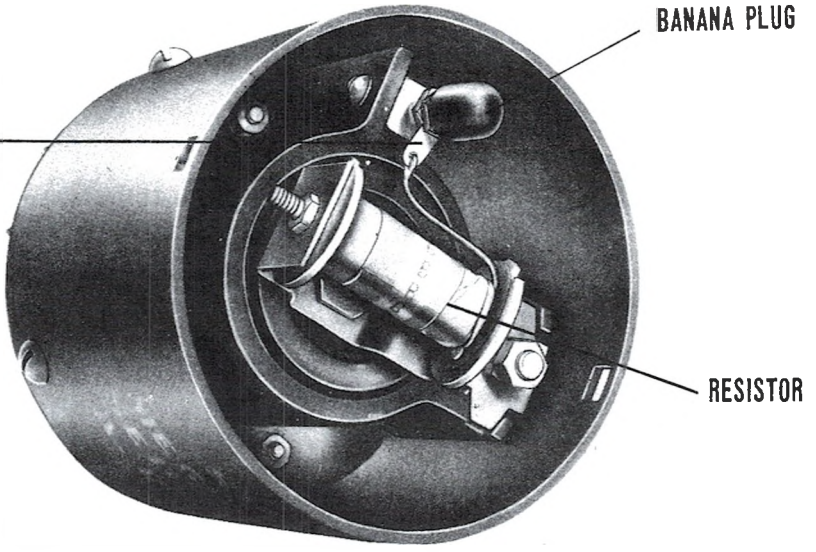
2.8 If the extender fails to respond properly to any part of the above test, mark it "UNSATISFACTORY" and set it aside for overhaul. If it functions properly, it should be marked "O. K." and initialed by the inspector. Unsatisfactory extenders may be overhauled at assembly stations.

SD-5 MECHANISMS

2.9 SD-5 Mechanisms. If SD-5 mechanisms are to be installed in the mine, inspect each SD-5 as follows:

(a) Remove the terminal block cover from the bottom of the mechanism and the lid from the top of the mechanism housing. The terminal block cover is secured with screws; the lid is held on by friction, and can be pried off with a screw driver. When the terminal block cover is off the mechanism, avoid any pressure on the spring lever arm which would push the plunger inward.

SD-5 MECHANISMS



TOP VIEW OF SD-5 AND BANANA PLUG

(b) See that all parts are intact, that the bakelite body and cover are not chipped or cracked, that there is no leakage of the electrolyte, and no corrosion of any parts. See that all securing nuts are tight, paying special attention to the lock nut on the spring adjusting screw (see par. 2.10). This adjusting screw projects through the body of the mechanism beside the resistor bracket. Make sure the insulating disc is attached securely to the inside of the lid.

(c) See that the resistor bracket is tight (will not turn under hand pressure) and that the banana plug with which the resistor lead is connected to the mechanism makes a firm contact with its socket.

(d) See that the resistor lead is not broken and is soldered securely to the terminal lug. See that the wire connected to one lip of the resistor spool is soldered securely.

(e) See that the proper resistor is installed (see par. 2.13 for instructions for changing resistors).

(f) Check the clearances between the switch contacts and the split contact disc. These clearances must be between 0.035 and 0.075 inch, and are to be checked with gauges made from suitably bent No. 65 and No. 48 drill rods, respectively.

(g) See that the contact springs do not touch each other or the adjacent metal parts.

(h) See that the edge of the anode support (the concave bakelite cup in which the plunger and split contact disc are located) is approximately flush with the bottom of the slot in the housing below the end of the lever to which the spring is attached. See that this slot lines up with the lever so that the lever will not be stopped part way through its movement when the mechanism operates. The bottom of the lever must be at least 9/32 inch above the bottom of the slot.

(i) If the mechanism is not satisfactory in all respects (except as noted in paragraph 2.10), it must be rejected. No attempt should be made to adjust an SD-5 mechanism without the proper gauges, equipment and instructions.

2.10 If, in the inspection in paragraph 2.9(b), it was discovered that the lock nut on the spring adjusting screw was NOT tight, tighten the nut and test the spring tension as follows:

(a) If a test jig is available, test the tension of the plunger spring as follows:

(1) Apply a pull of 24.5 pounds to the spring lever at the two holes in its center, and insert a 0.01-inch feeler gauge between the plunger and the plunger push button.

(2) Ease the weight off and reapply it gradually. The feeler gauge should be lightly gripped.

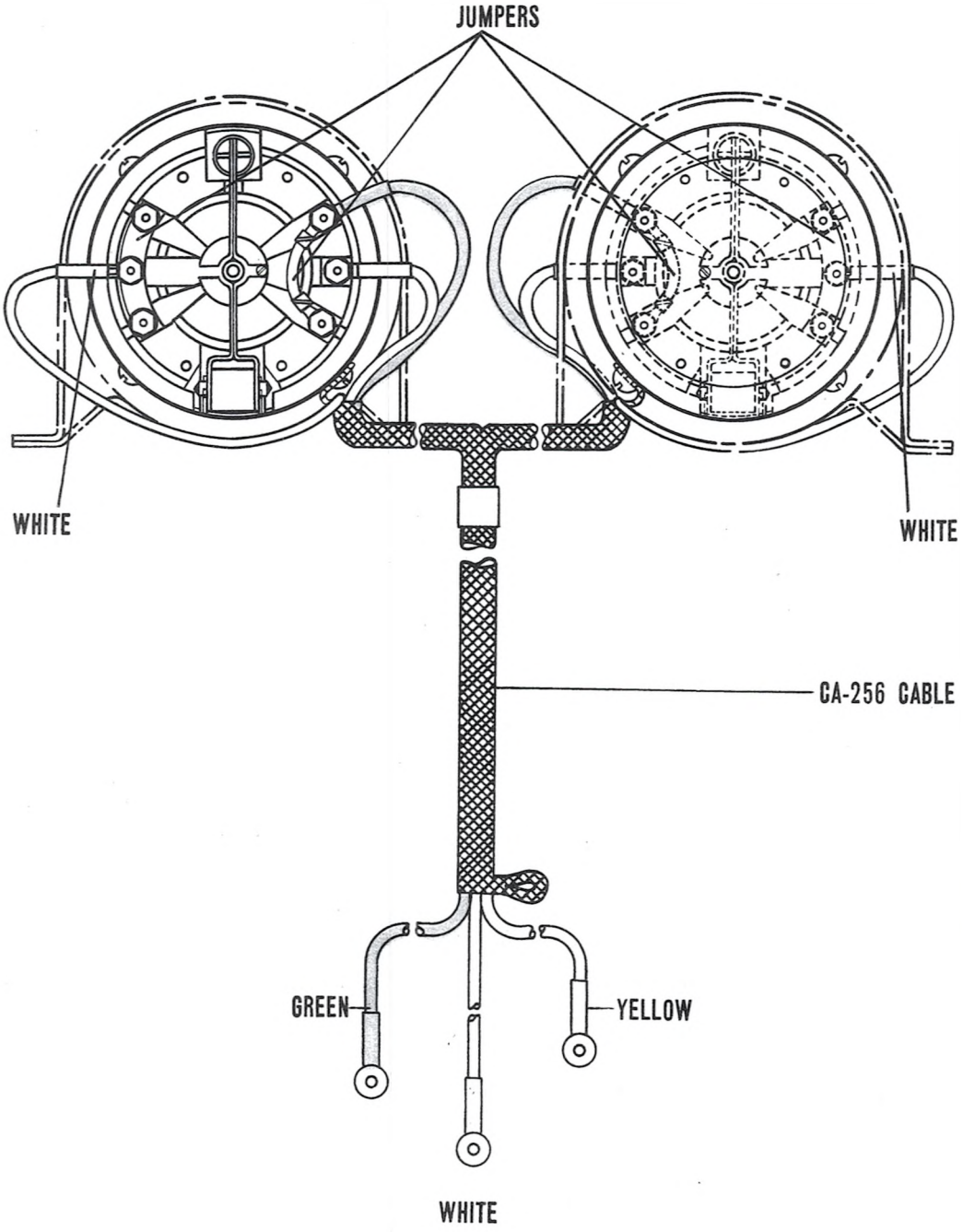
(3) Add an extra 1-pound pull to the lever. The feeler gauge should now be free.

(4) If the spring tension does not meet the requirements of (2) and (3) above, adjust the tension and retest.

(b) If the proper equipment for (a) above is not available, but a spring scale or other means of applying a measurable load is, a less accurate test of spring tension may be made by connecting the scale or other equipment to the spring lever (at the two holes in the center) and applying a load. The tension of the spring should be balanced when the load is 24.5 ± 2 pounds. If the spring tension does not meet this requirement, adjust the tension and retest.

(c) If the spring tension cannot be made to meet the requirements of (a) or (b) above, the mechanism must be rejected.

2.11 After inspecting both SD-5 mechanisms as directed above, install jumpers on, and connect the leads of the CA-256 cable to, the terminals of both SD-5's as shown on following page. Secure the cable



SD-5 WIRING ASSEMBLY

sheath loops under the SD-5 body mounting screws. Replace the terminal block covers and lids on the SD-5's. Using an ohmmeter, test between the green and white leads of the cable. The ohmmeter should indicate an open circuit; if it does not, there is a fault in one of the mechanisms or the cable which must be located and corrected before proceeding.

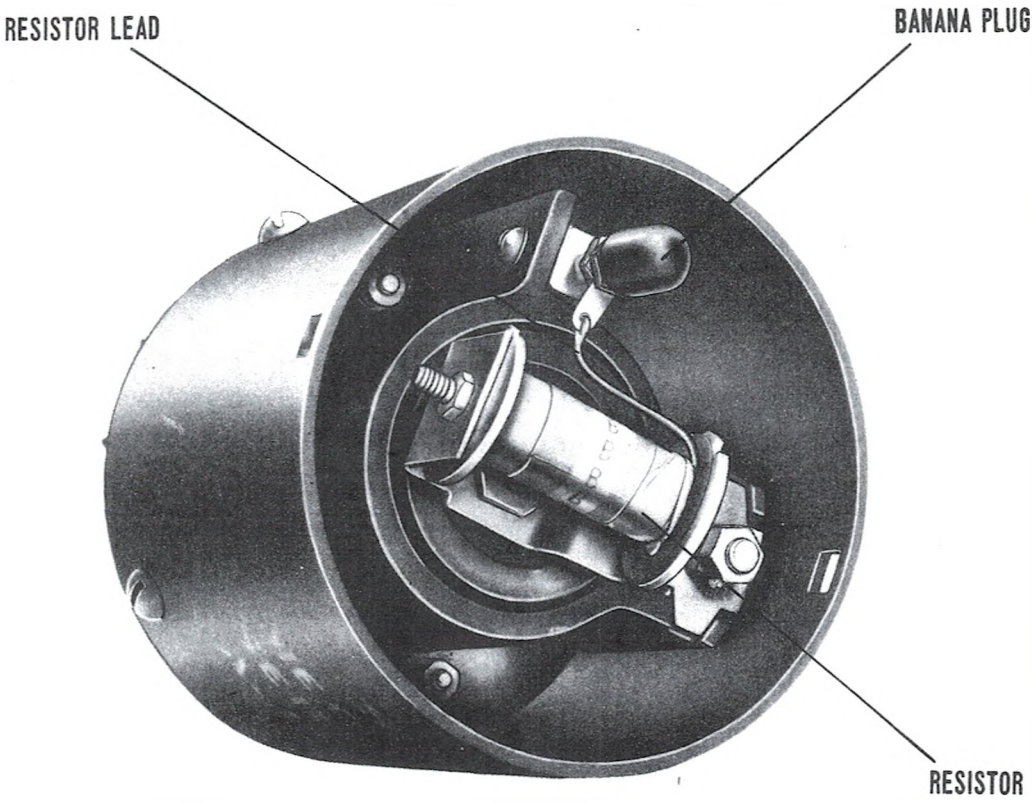
NOTE: The CA-256 cable was originally designed with red and blue leads in place of the white and green leads. In the event that any of these early cables are discovered in the field, the red lead is to be used in place of the white lead and the blue lead in place of the green lead.

2.12 If so directed, test the SD-5 subassembly before installation as directed by the Officer in Charge.

2.13 To change the resistor in an SD-5 mechanism, proceed as follows:

(a) Pry the lid off the mechanism housing.

(b) Insert a screw driver through the hole in the housing in line with the head of the screw securing the resistor in the bracket. Unscrew the screw from its nut and remove the screw, nut, and lock washer. The screw can be pulled out through the hole through which the screw driver was inserted.

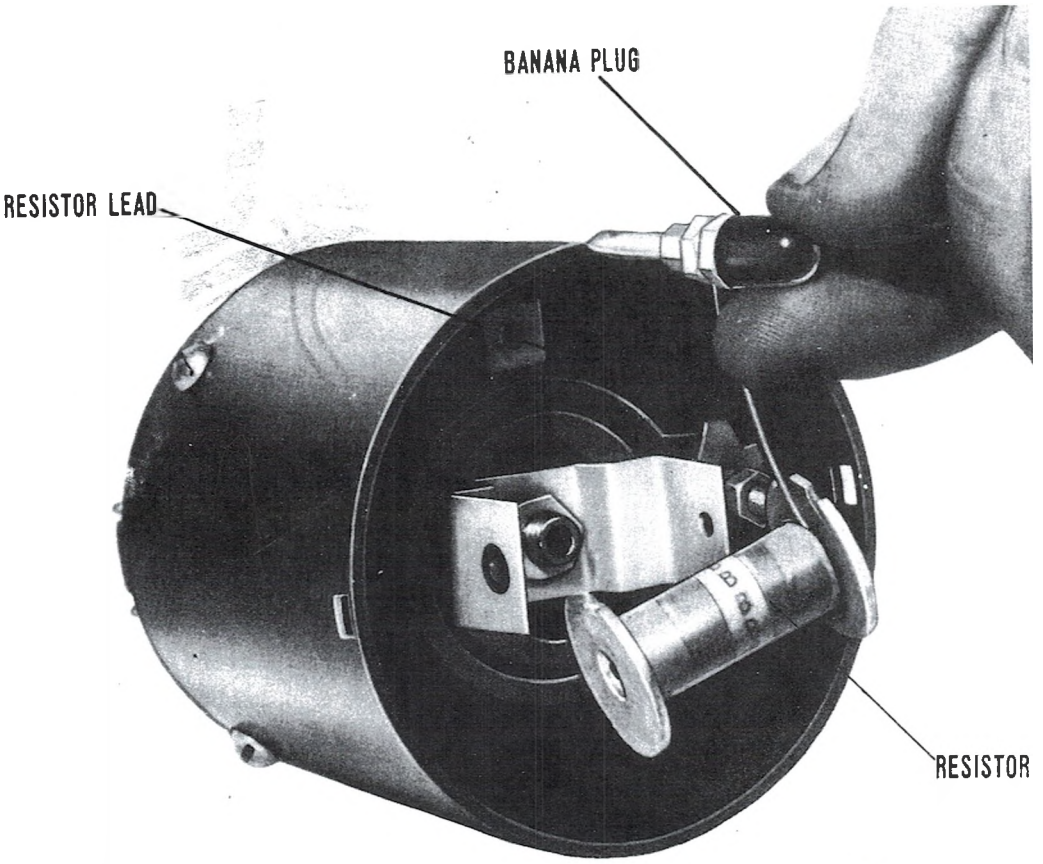


TOP VIEW OF SD-5 MECHANISM

(c) Pull the banana plug on the resistor lead out of its socket and remove the resistor and plug from the mechanism.

(d) Disconnect the resistor lead from the plug and replace it with the lead of the new resistor to be installed.

(e) Insert the plug in its socket and insert the resistor in the bracket.

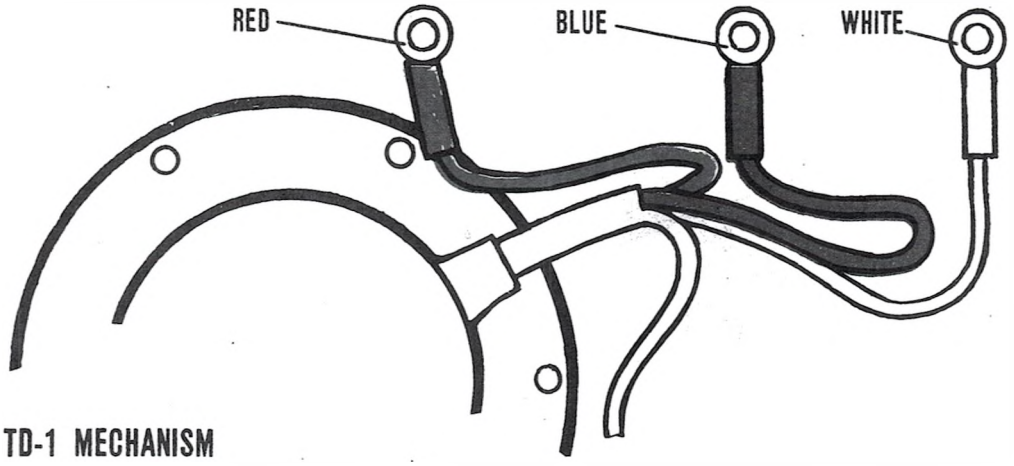


SD-5 MECHANISM

(f) Replace the securing screw, lock washer, and nut. See that the screw is tight, that the insulating piece has been replaced on the end of the plug, and that the lead from the resistor to the plug is undamaged.

(g) Replace the lid on the housing.

TD-1 MECHANISM TEST



TD-1 MECHANISM

2.14 TD-1 MECHANISM. Test the TD-1 mechanism leads with an ohmmeter. The ohmmeter indications should be as follows:

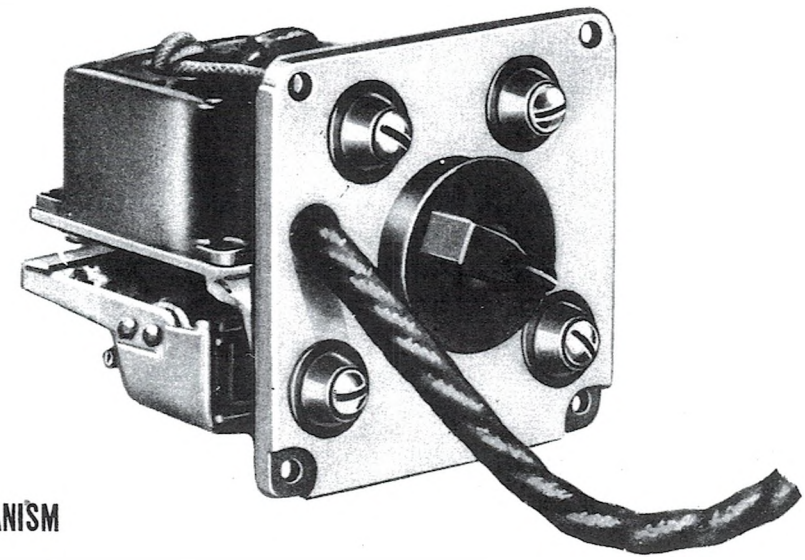
OHMMETER ACROSS	OHMMETER INDICATION
Red lead and white lead	Resistance of approximately 25 ohms.
Red lead and blue lead	Open circuit.
Blue lead and white lead	Open circuit.

If these tests are not satisfactory, reject the mechanism.

215 SE-1 MECHANISM. If an SE test set is available, test the SE-1 as directed in the test set instructions. If a test set is not available, inspect the mechanism for loose screws, poor connections, etc. Then test the mechanism leads with an ohmmeter. The ohmmeter indications should be as follows:

OHMMETER ACROSS	OHMMETER INDICATION
Blue lead and red lead	Resistance of less than 1 ohm.
White lead and yellow lead	Resistance of approximately 3 ohms.

SE-1 MECHANISM TEST

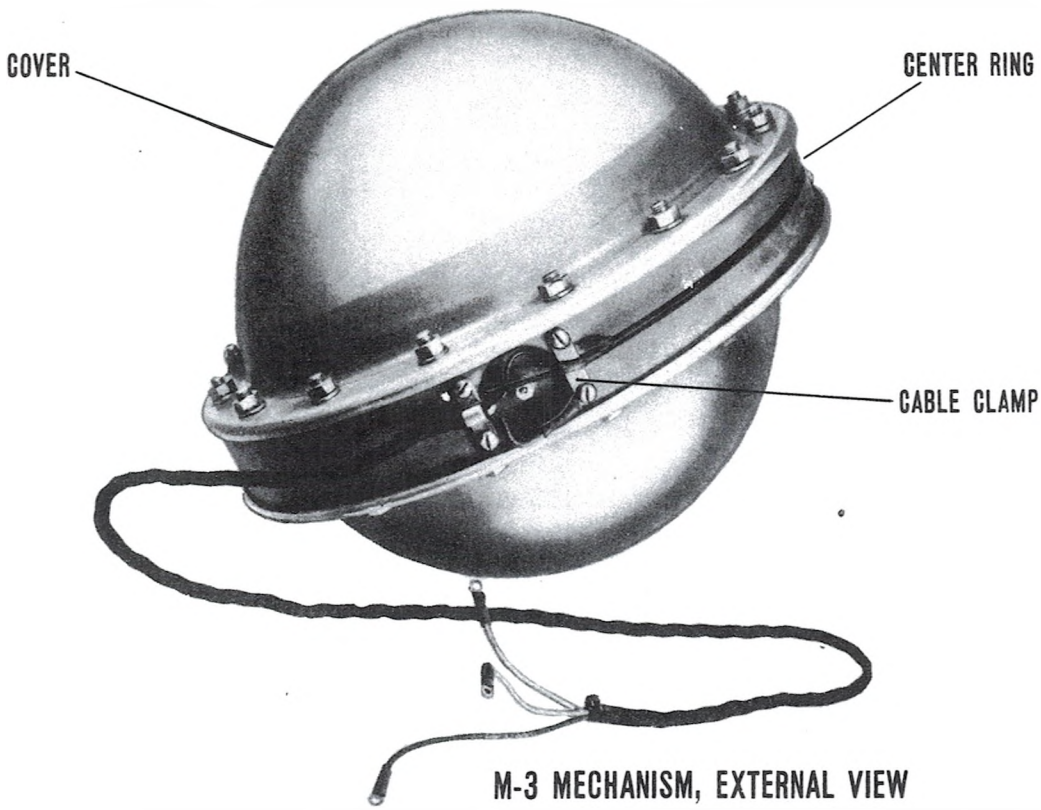


SE-1 MECHANISM

Yellow lead and green lead	Resistance of approximately 19 ohms.
Yellow lead and brown lead	Open circuit.
Brown lead and violet lead	Open circuit. If the circuit is not open, turn the selector switch one position and test again. The circuit should now be open.

If these tests are not satisfactory, reject the mechanism.

NOTE: Early SE-1 mechanisms were manufactured with a paper insulating sheet between the TD-7 mechanism and its mounting plate. This paper insulator often warps causing the TD-7 to 'hang up.' Consequently later SE-1 mechanisms have been manufactured with a linen bakelite sheet between the TD-7 and its mounting plate. Extra linen bakelites heets have been distributed and should be used to replace



M-3 MECHANISM, EXTERNAL VIEW

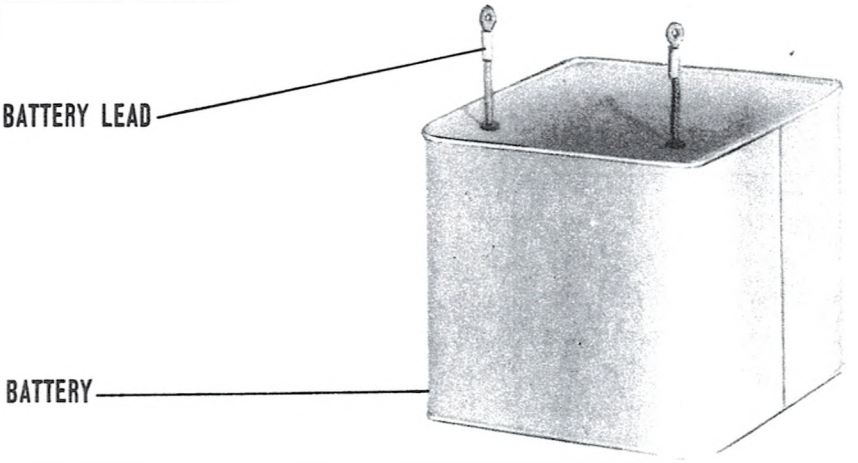
the paper insulating sheet in any SE-1 mechanisms found with paper insulating sheets.

2.16 FIRING MECHANISM. Test the firing mechanism as directed by the Officer in Charge. After the mechanism has been refused and replaced in its case, test the mechanism leads with a high-current (about ¼-ampere) ohmmeter. The ohmmeter indications should be as follows:

OHMMETER ACROSS	OHMMETER INDICATION
Green lead and black lead	Resistance of 12 ohms or less.
Black lead and yellow lead	Open circuit.
Yellow lead and green lead	Open circuit.

NOTE: The high-current ohmmeter is used

BATTERY TEST

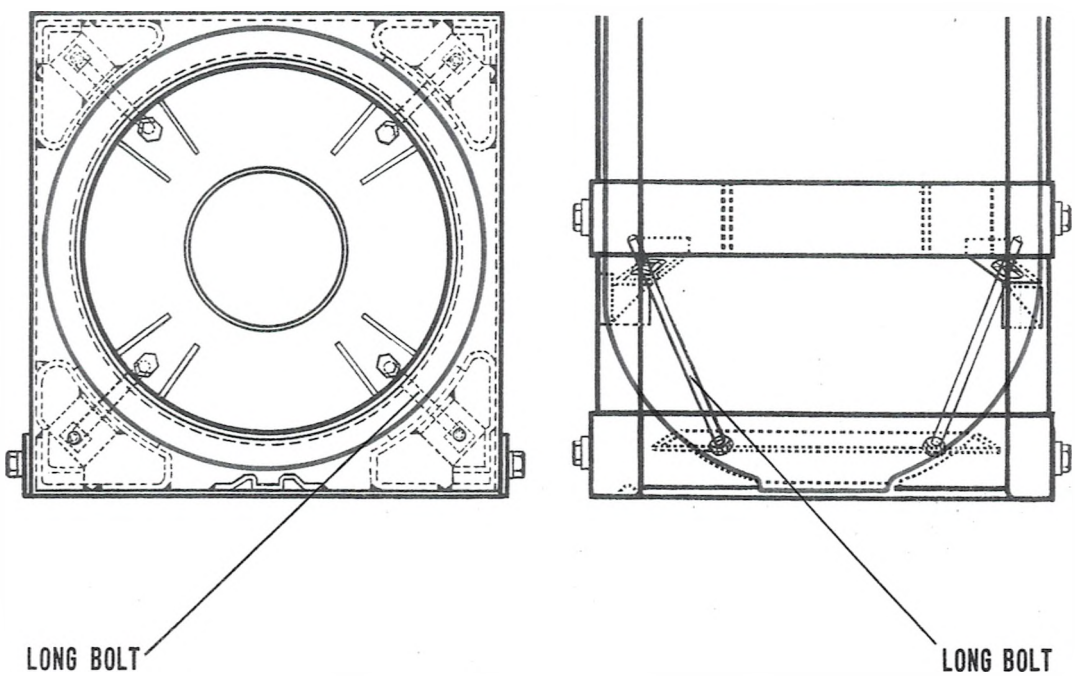


ONLY in the tests of the M-3 type mechanism. The high-current ohmmeter supplied in the Mark 2 test set does not have a calibrated scale, but has a red line at the 12-ohm point.

2.17 BATTERY. Test the battery for short-circuit current with a low-resistance ammeter (having not more than 0.01 ohm total resistance, including the leads). Do not allow current to flow ANY LONGER THAN IS NECESSARY to obtain a reading. Discard all batteries which do not meet the minimum requirements given in the table below or which are more than 12 months old (unless they have been kept in cold storage).

TEMPERATURE AT WHICH BATTERIES ARE TESTED (°F.)	MINIMUM ACCEPTABLE SHORT-CIRCUIT CURRENT (AMPERES)
B-3 BATTERIES	
10	8
30	11
50	14
70	16
90	18
B-3 MOD. 1 BATTERIES	
10	16
30	23
50	27
70	32
90	36

CRATING AND LOADING THE MINE CASE

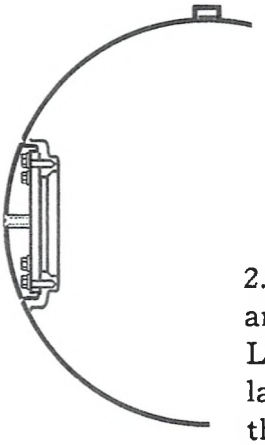


MARK 12 CRATE

2.18 Cases and crates may be delivered to loading depots separately. Cases should be gauged to see that they conform to the specifications on the drawings pertaining to them. They should then be secured in crates before the explosive charges are loaded into them.

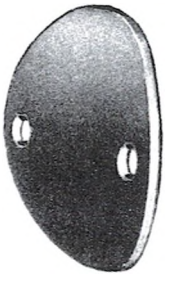
NOTE: Mark 12 Crates may have either copper or aluminum rivets securing the pads to the frame. Corrosion of mine cases resulting from electrolytic action between the aluminum mine

case and the copper rivets in the crate may occur. The pads and rivets of Mark 12 crates fitted with copper rivets shall be cleaned and painted with two coats of asphaltum varnish, paint No. 4 in Ordnance Standard No. 52, or Bureau of Ships formula No. 47. This paint has good resistance to abrasion and corrosion. During overhaul of Mark 12 mines, it is recommended that the cases be inspected for evidences of electrolytic action. If such action is found, the case should be cleaned and painted. Before mines are replaced in crates, the pads and rivets should be repainted.



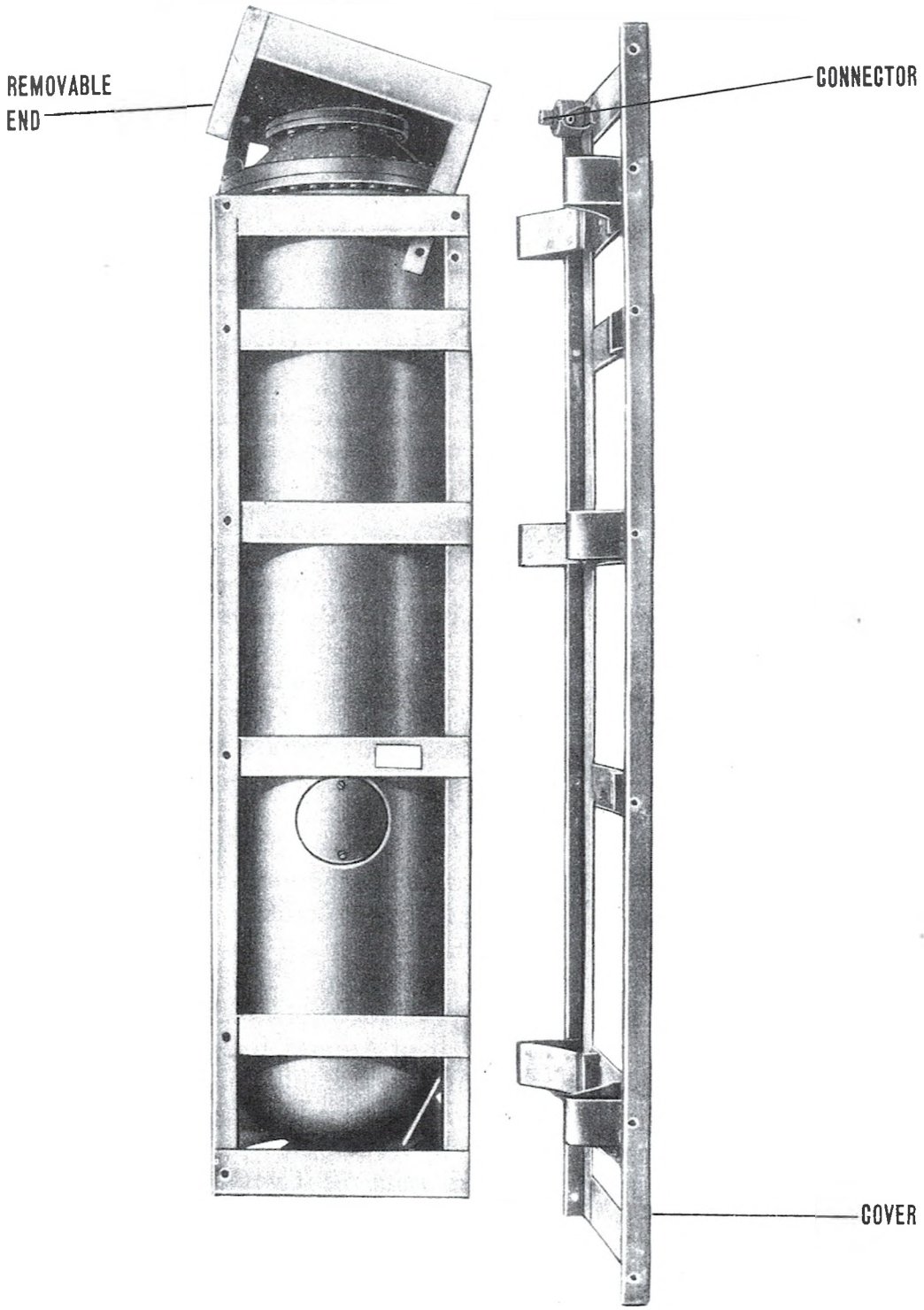
FILLING HOLE

2.19 To crate a mine case, remove the crate cover and the ring from the forward end of the crate. Lower the mine case into the crate so that the guide latch assembly and safety bar are uppermost. Push the mine against the after end of the crate. Replace the ring in the forward end of the crate and tighten the nuts on the four long bolts with which the ring is secured against the nose of the mine case. Replace the cover on the crate.



SHIELD

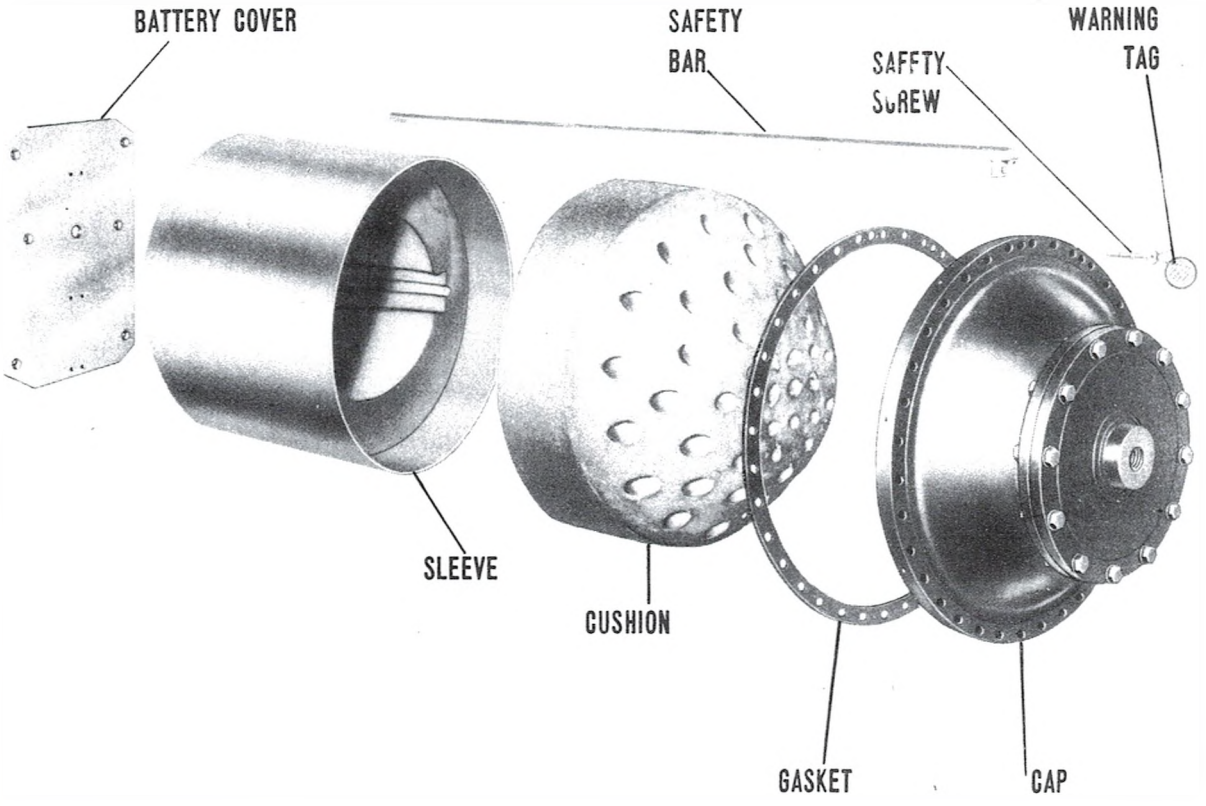
2.20 The explosive charge may be loaded into the case through the nose hole or the side hole if the case has both. Be sure to fill the case completely, eliminating air pockets so that the charge will remain tightly packed in the case and will provide a maximum amount of support for the case. Be sure that all studs around the filling hole opening are free of explosive before replacing the filling hole cover. Secure the cover in place, with a gasket, and tighten the nuts securing it with a torque wrench. Place the long hex nuts on the fore and aft studs of the side filling hole and secure a filling hole shield in place with two flat head screws inserted in the tops of the long hex nuts.

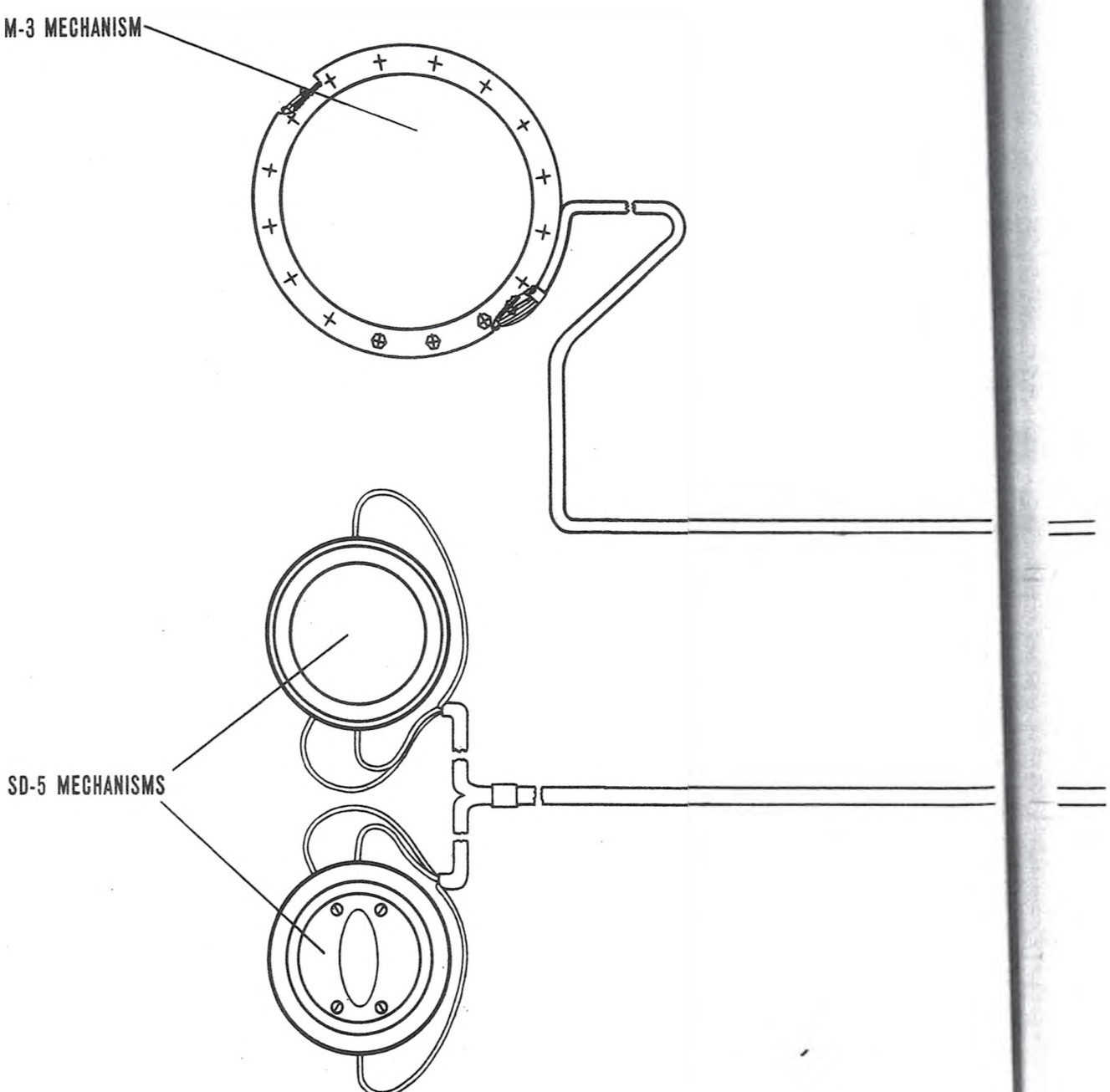


MARK 12 MINE IN MARK 12 CRATE

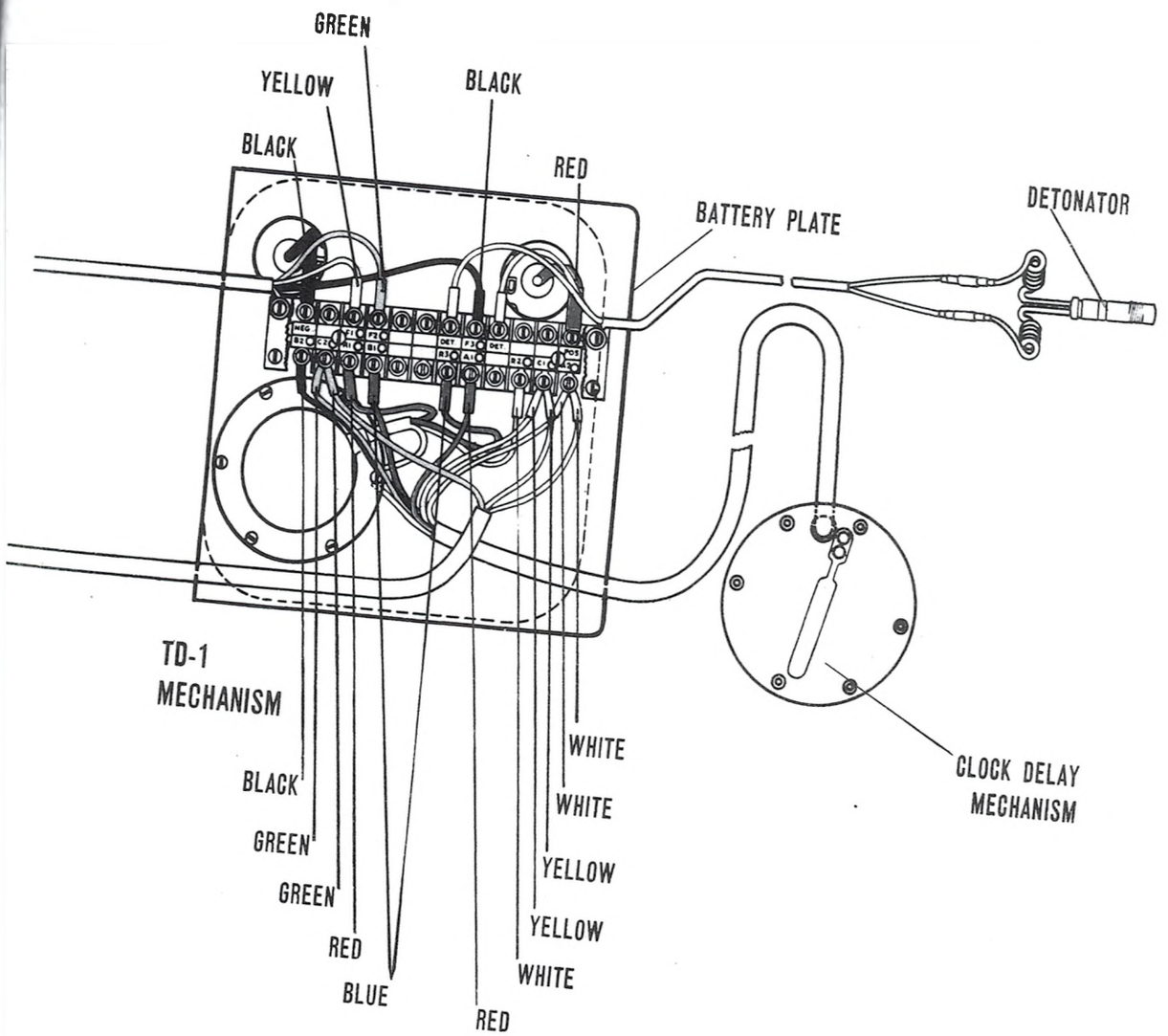
ASSEMBLING THE MINE

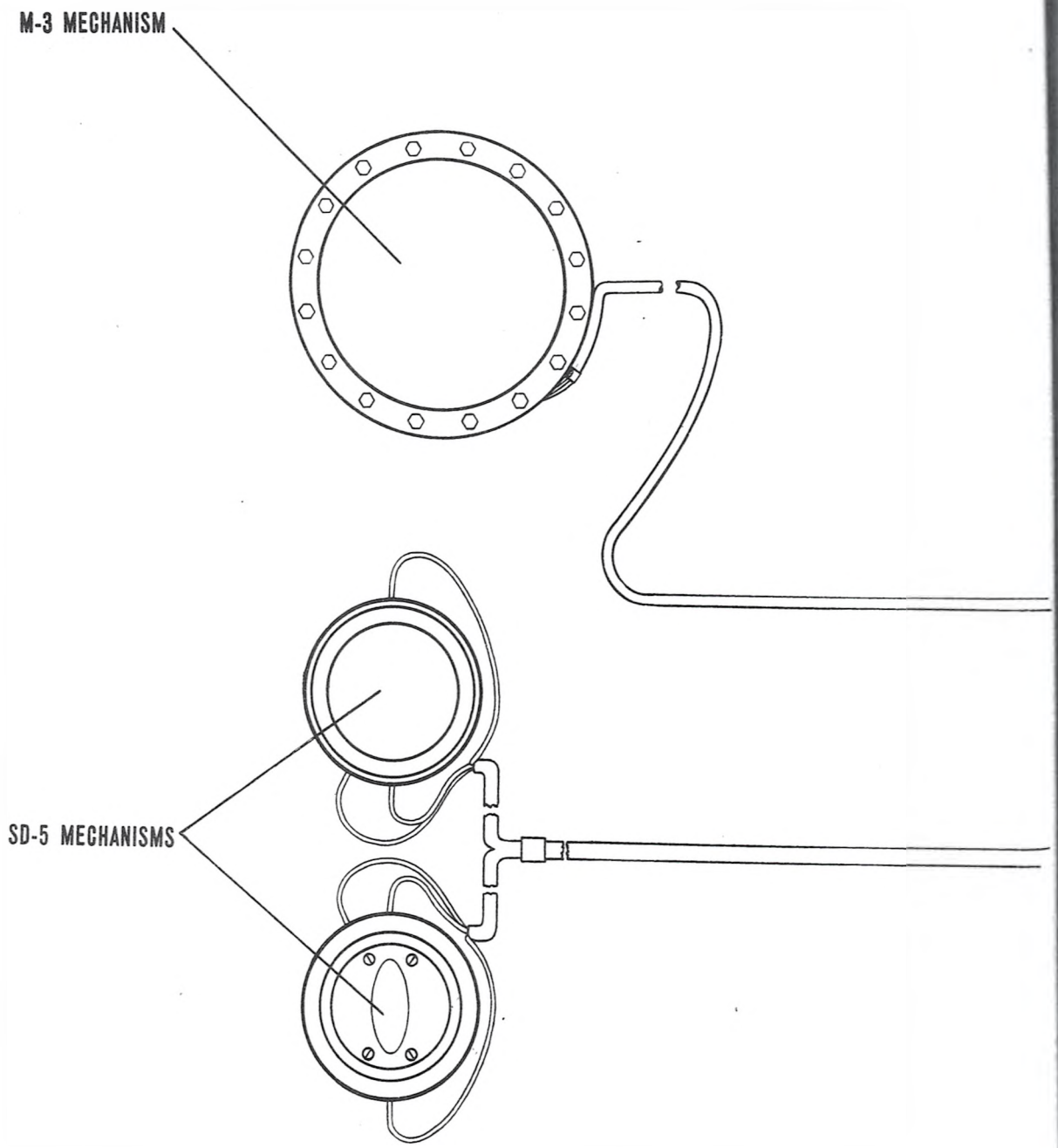
2.21 PREPARING THE CASE. When preparing to install the firing mechanism and accessories in the loaded mine case, remove the crate cover and take off the removable (after) end. Do this by removing the bolts through its side extension. Remove the safety bar thumb screw and detach the bar from the case. Remove the cap from the after end of the mine. Slide the sleeve for the rubber cushion out of the firing mechanism compartment. Remove the wooden shipping covers from the extender and clock assembly openings. Remove the battery cover and take the battery plate out of the clock compartment and set it on a clean surface.




M-3 MECHANISM
SD-5 MECHANISMS

ELECTRICAL ASSEMBLY
FOR MARK 12 AND MARK 12 MOD. 1 MINES WITHOUT SE-1

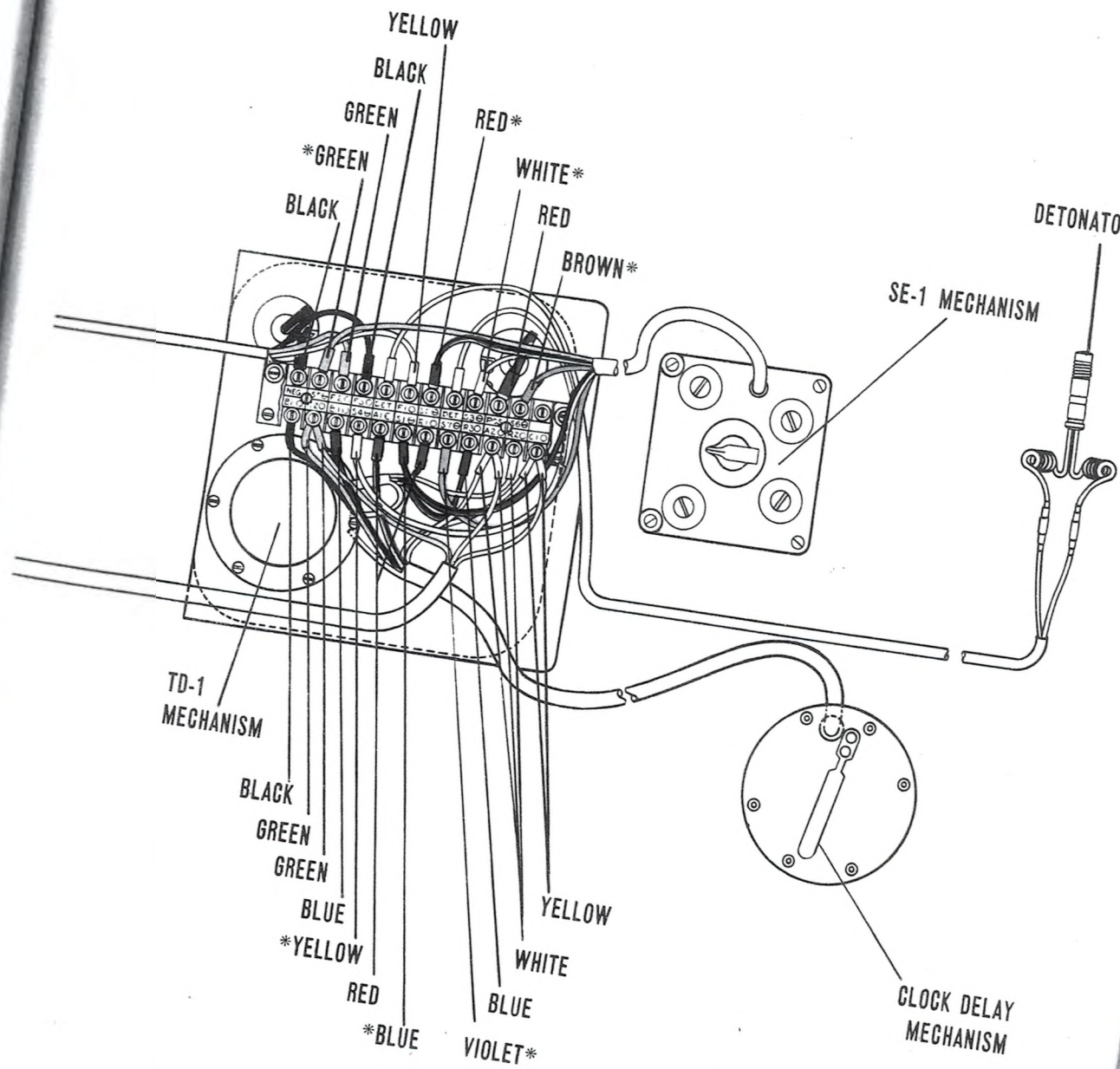


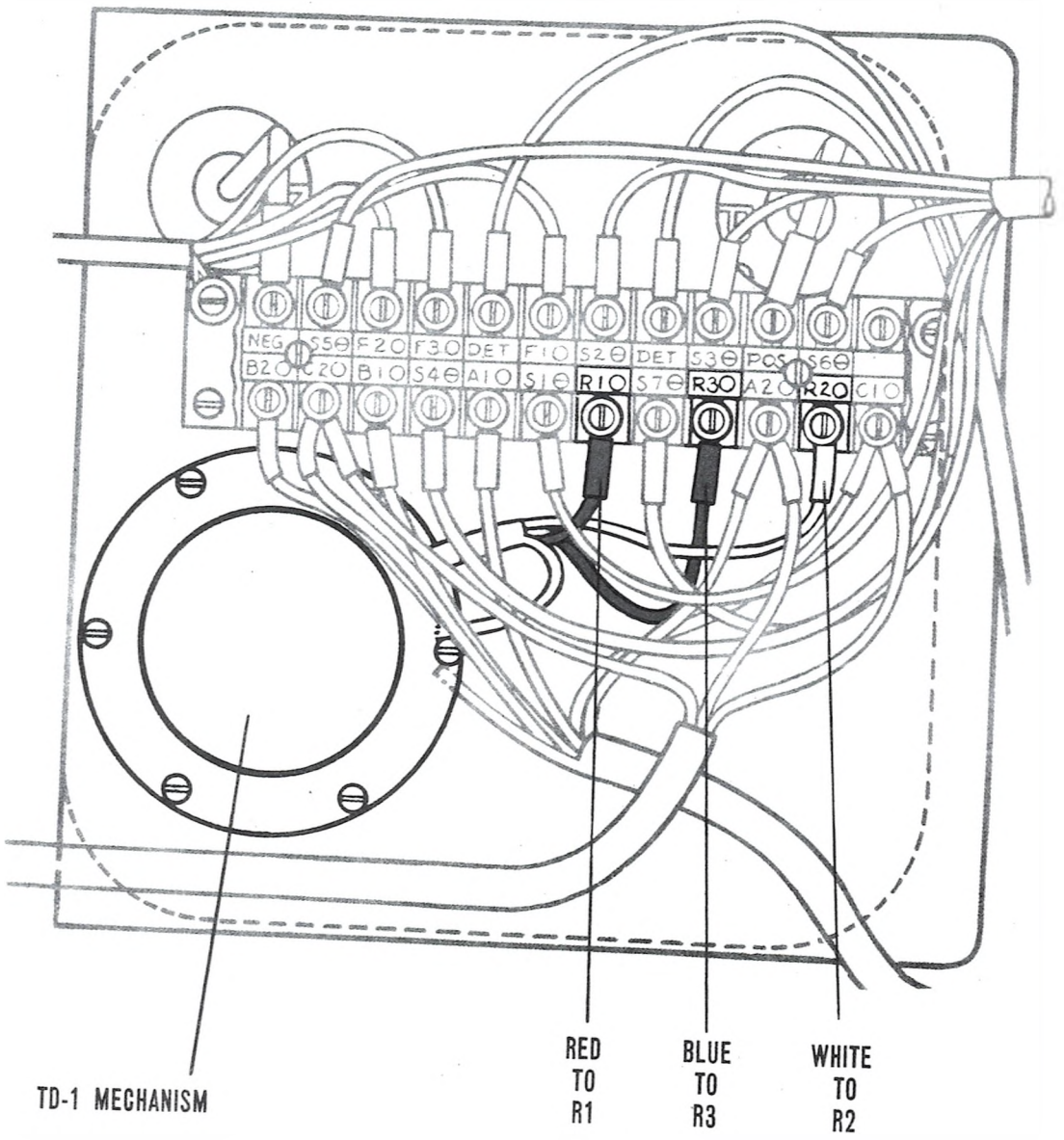


*THESE WIRES HAVE BLACK TRACERS

ELECTRICAL ASSEMBLY

ELECTRICAL ASSEMBLY FOR MK. 12 AND MK. 12 MOD. 1 MINES WITH SE-1 MECHANISM



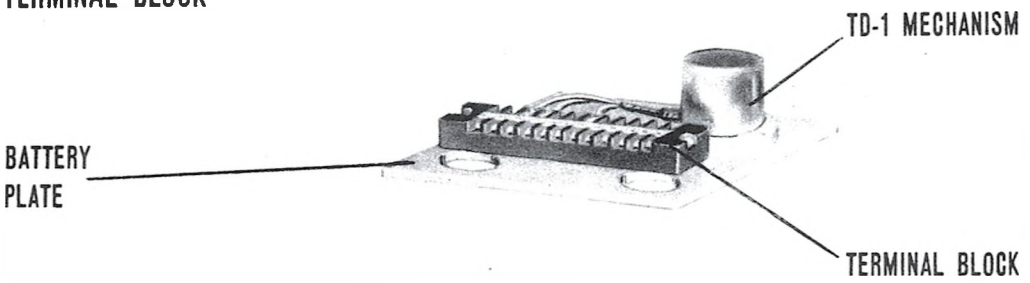


TERMINAL BLOCK FOR SE-1 INSTALLATION

TD-1 MECHANISM

2.22 TD-1 MECHANISM. Seat a rubber gasket around the flange of a TD-1 mechanism which has been tested (par. 2.14), with the wide side of the gasket toward the base of the mechanism. Hold the leads of the mechanism upwards and fit the mounting ring over the mechanism, with the leads in the cut out section of the ring. Work the ring over the gasket as far as possible, using a small screw driver if hand pressure is not sufficient. With the cable pointing to the center of the battery plate, attach the mechanism loosely to the plate in position over the six screw holes.

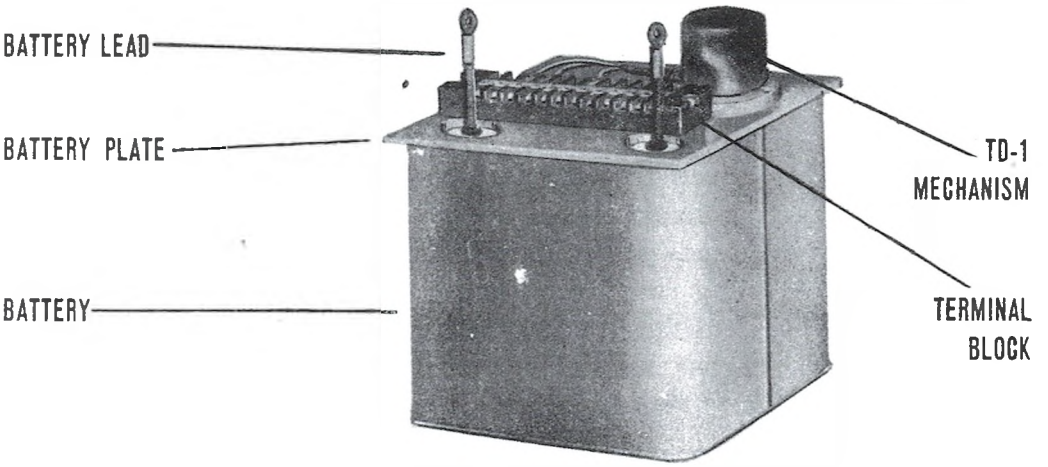
TERMINAL BLOCK



2.23 TERMINAL BLOCK. Remove the terminal block cover. If installing an SE-1, replace the target strip (the paper strip bearing the terminal designations) of the terminal block with the strip furnished with the SE-1. Fasten the terminal block to the battery plate with the two attaching screws so that the terminal designations read from the TD-1 side. Attach the colored leads of the TD-1 cable to the terminal block terminals as follows:

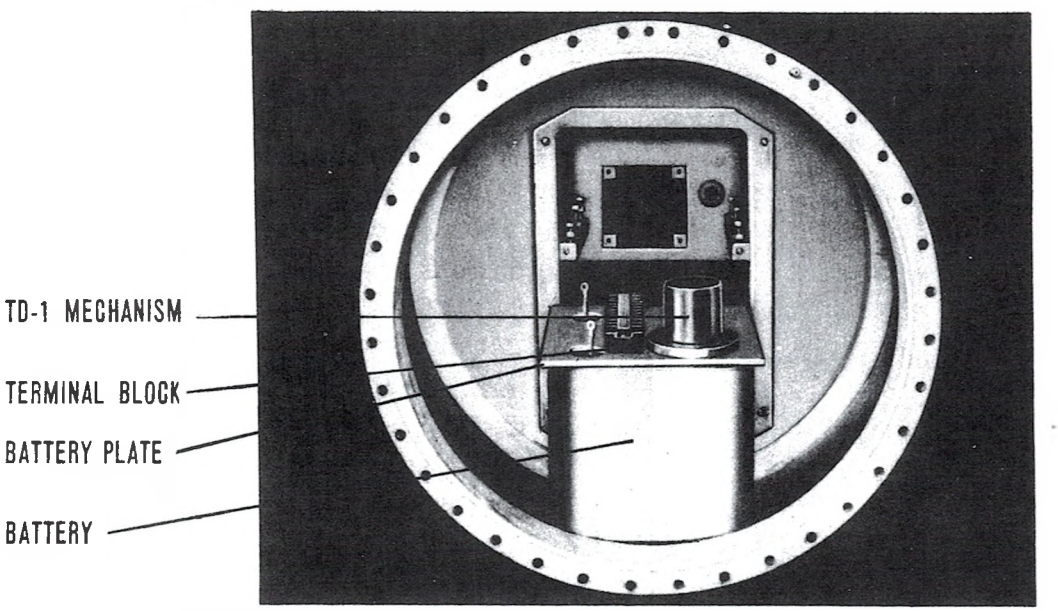
Red lead to terminal R1 (red dot)
White lead to R2 (white dot)
Blue lead to R3 (blue dot).

Be sure that the rubber sleeves on the leads cover the soldered joints but do not extend beyond the shoulders on the terminal lugs.

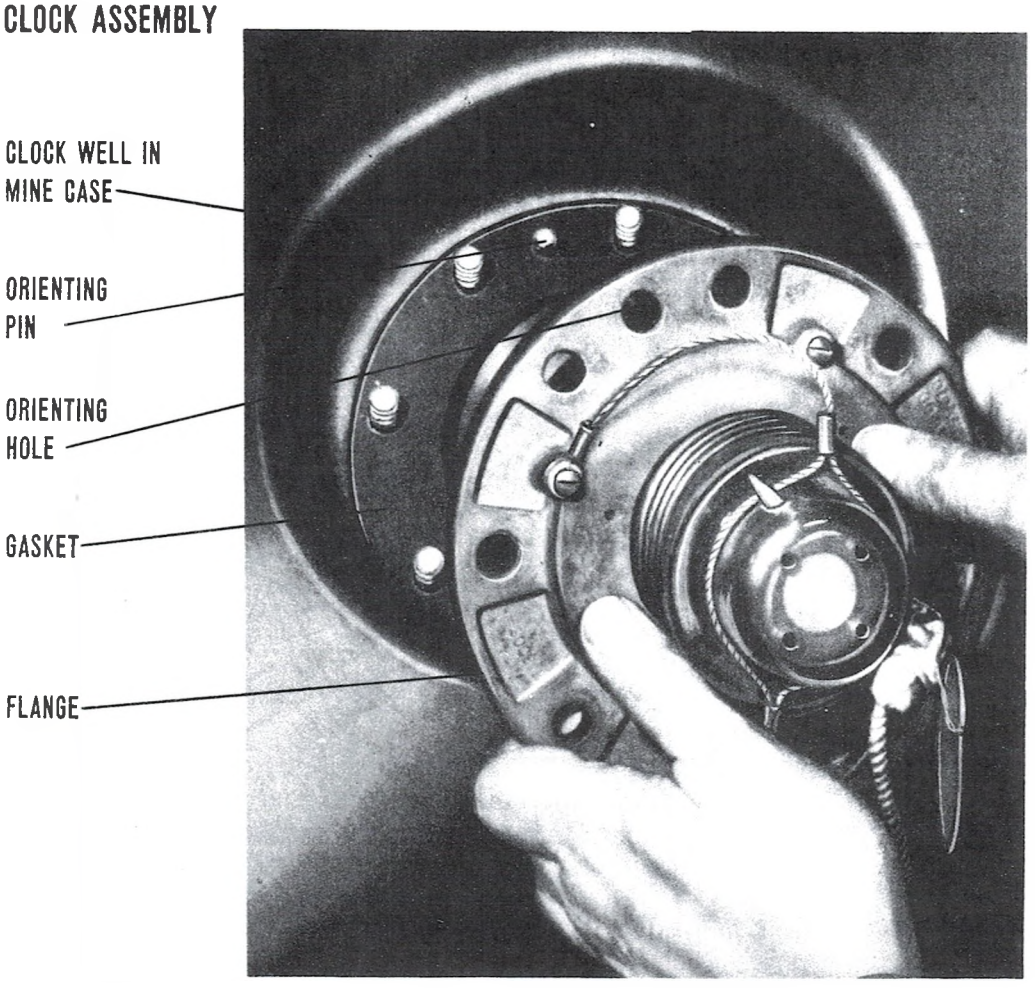


BATTERY

2.24 BATTERY. Tape one lead of a battery which has been tested (par. 2.17). Place the battery plate on the battery and thread the battery leads through the holes in the plate. Set the battery in the after part of the firing mechanism compartment with the battery leads on the left when viewed from the after end of the mine case.

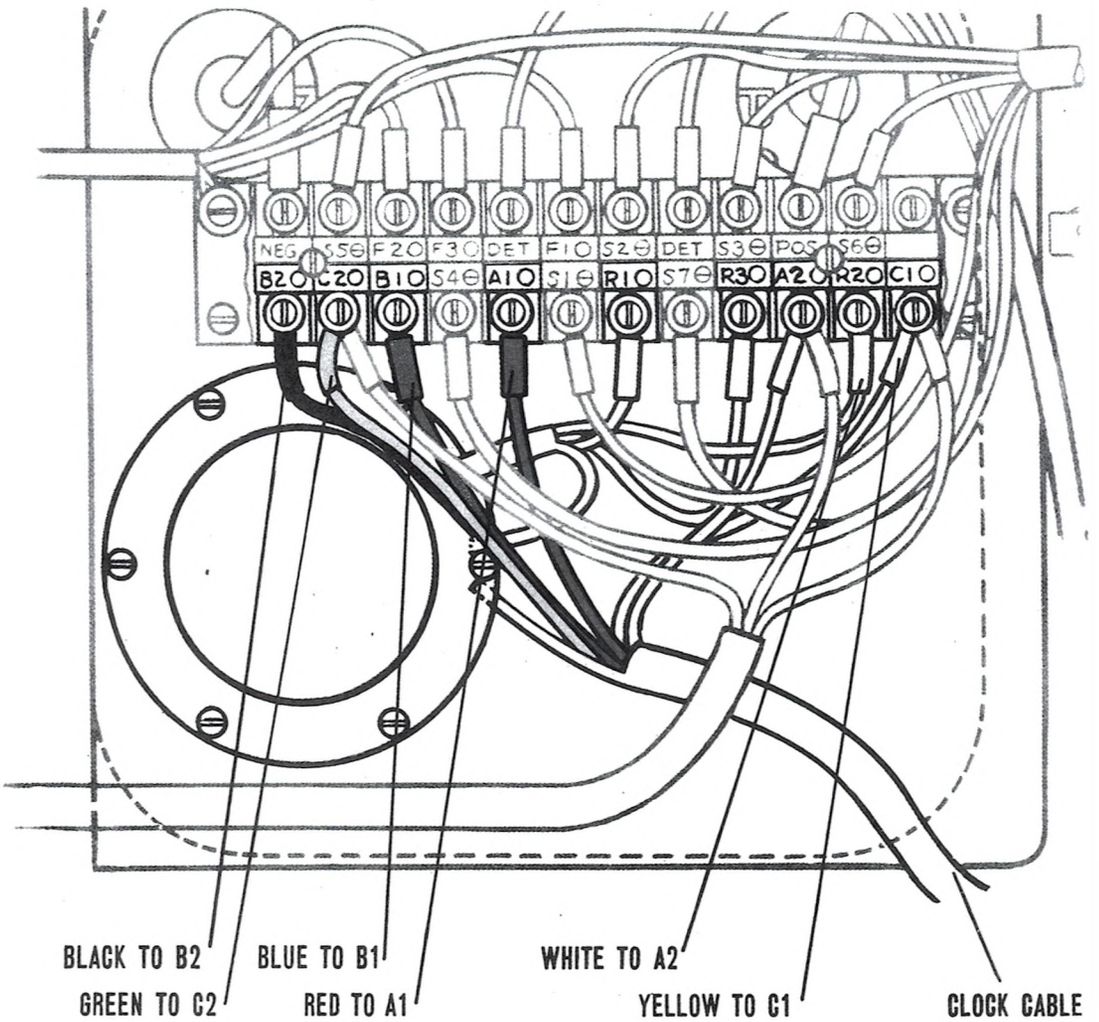


CLOCK ASSEMBLY



MARK 12 MOD. 5 CLOCK ASSEMBLY

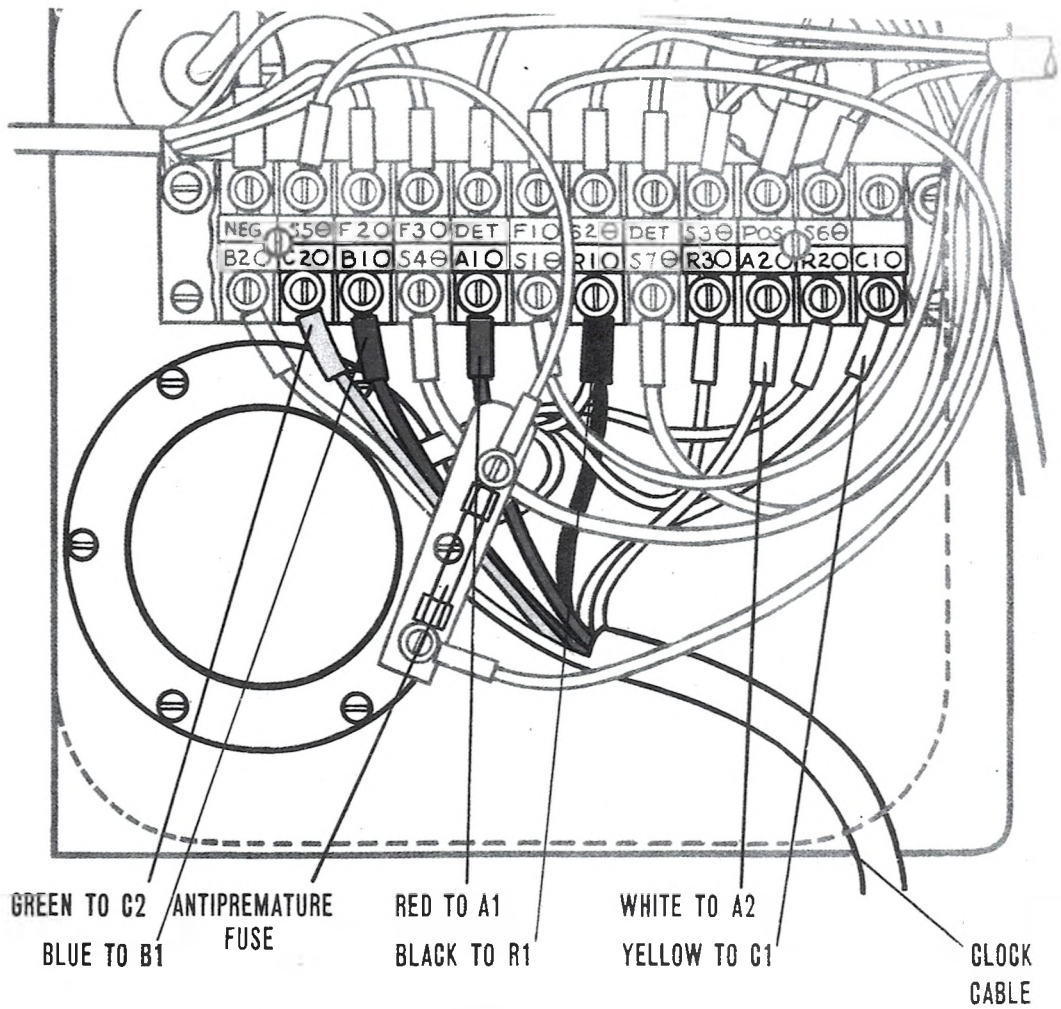
2.25 CLOCK ASSEMBLY. See that a proper gasket is installed on the clock starter opening flange. Then pass the cable of a clock assembly which has been tested (pars. 2.5-2.6) through the opening and seat the clock starter on its flange. Do not fasten it in place. Connect the colored leads of the clock delay mechanism to the terminal block as follows:



ELECTRICAL ASSEMBLY FOR CLOCK DELAY MECHANISM

(a) If the clock is a CD-1 (no antipremature assembly), connect the clock leads as follows:

Red lead to A1 (red dot)
White lead to A2 (white dot)
Blue lead to B1 (blue dot)
Black lead to B2 (black dot)
Yellow lead to C1 (yellow dot)
Green lead to C2 (green dot).

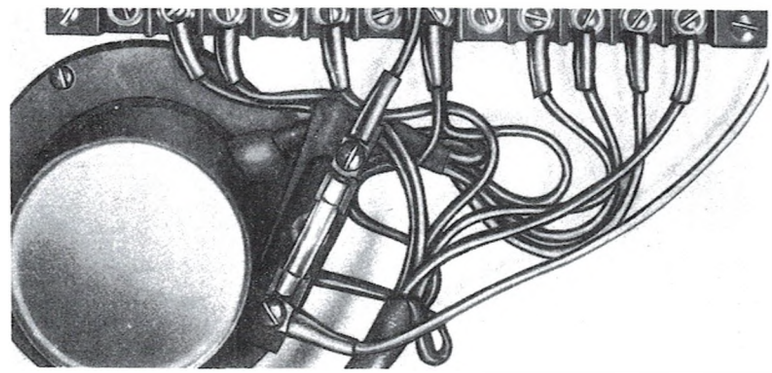


ANTIPREMATURE ASSEMBLY

(b) If the clock is a CD-1 Mod. 4 or CD-9 (with antipremature assembly), connect the clock leads as follows:

Red lead to A1 (red dot);
White lead to A2 (white dot);
Blue lead to B1 (blue dot)
Black lead to R1 (red dot) on top of red lead from TD-1
Yellow lead to C1 (yellow dot)
Green lead to C2 (green dot).

2.26 Be sure the rubber sleeve on each wire covers its soldered joint. To prevent a pull on the cable from injuring the terminal block connections, insert the cloth extensions on the cables of the CD and TD-1 mechanisms under the mounting ring of the TD-1 mechanism. Fasten the TD-1 mechanism to the battery plate by tightening the screws on its mounting ring.



ANTIPREMATURE ASSEMBLY

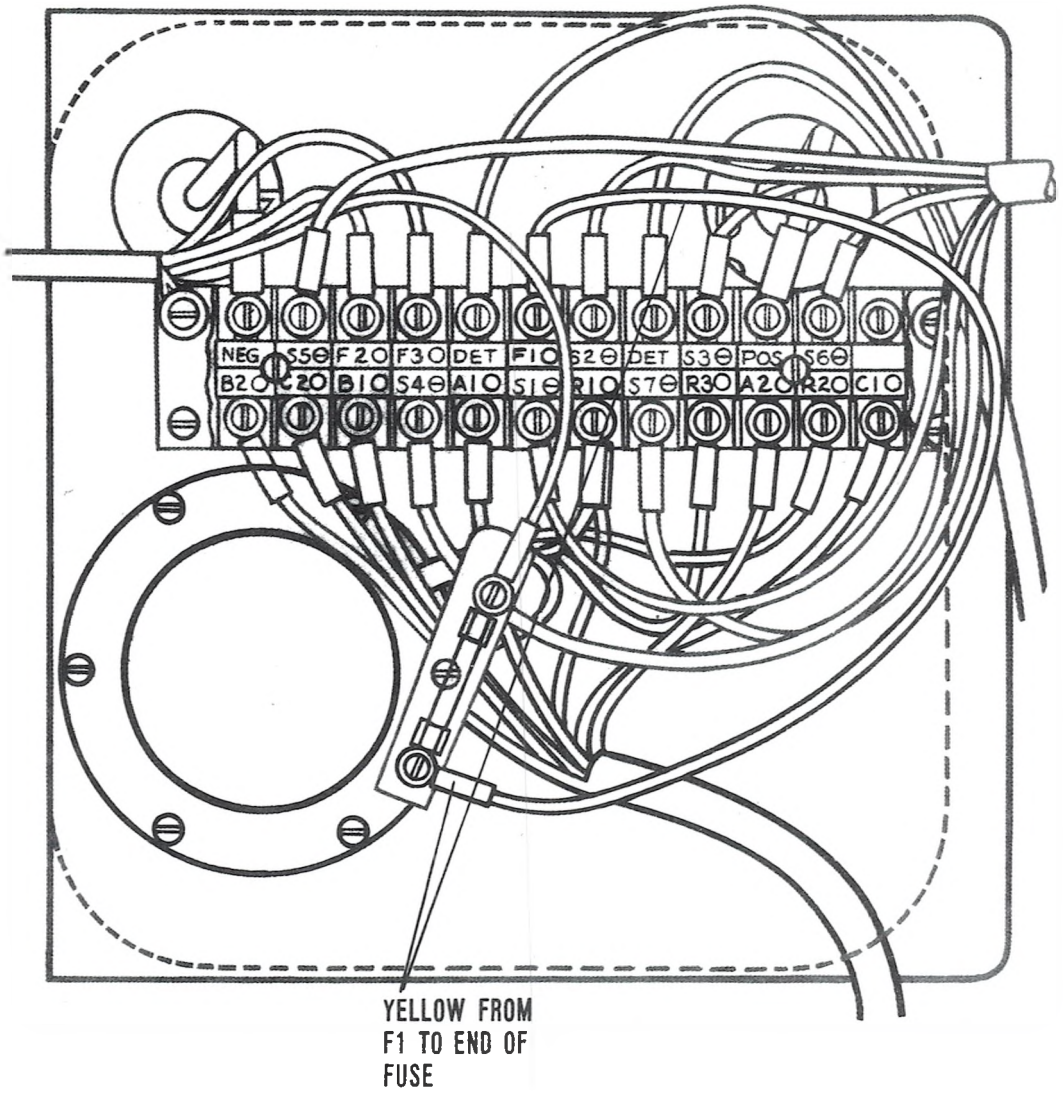
2.27 ANTIPREMATURE ASSEMBLY. Each CD-1 Mod. 4 or CD-9 clock delay will be shipped with the other parts necessary to its installation and proper operation to prevent premature firing. These are:

Fuse mounting block.
One-ampere Littelfuse.
One-inch 6/32 brass screw with washer.
Fish-paper insulator.
12-inch connector wire (yellow insulation).

2.28 Install the fuse mounting block and its accessories as follows:

(a) Mount the fuse mounting block on top of the TD-1 mounting ring, substituting the one-inch screw for the one removed from the mounting ring. (See illustration for location and orientation of the fuse mounting block.)

ANTIPREMATURE ASSEMBLY

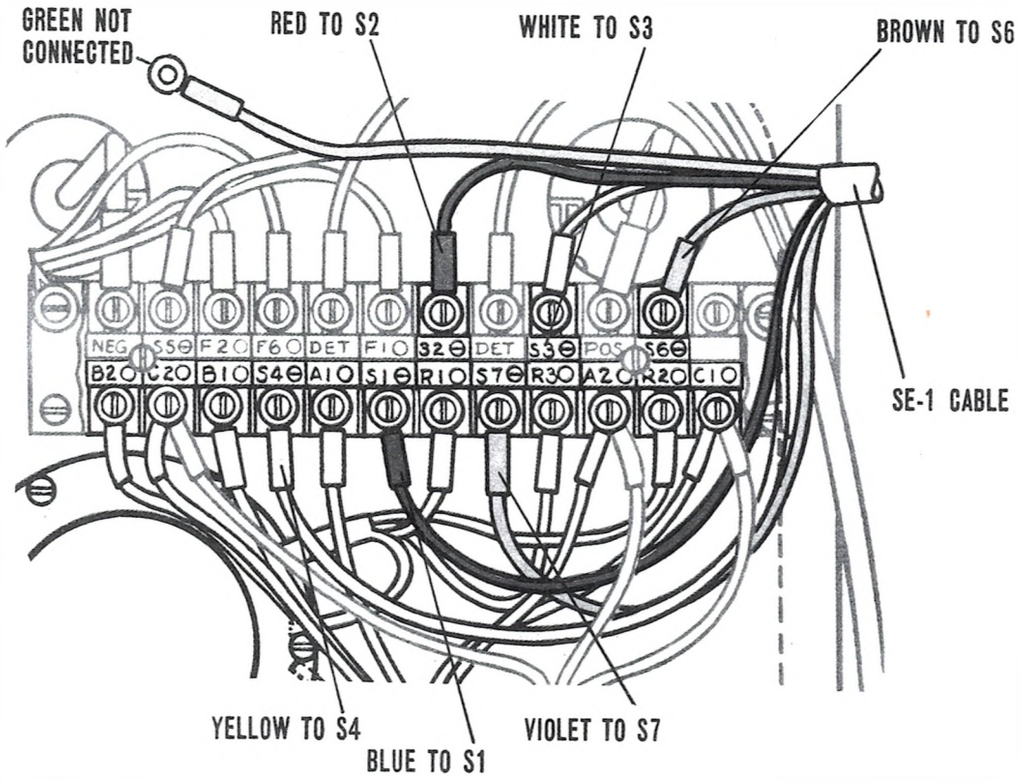


ANTIPREMATURE ASSEMBLY

(b) Bend the fish-paper insulation in a right angle and place it between the fuse mounting, the mounting ring and the TD-1 housing.

(c) Attach one end of the yellow connector to the end of the fuse mounting farthest from the terminal block. Attach the other end of the connector to terminal F1 (yellow dot) of the terminal block.

(d) Insert the one-ampere Littelfuse.

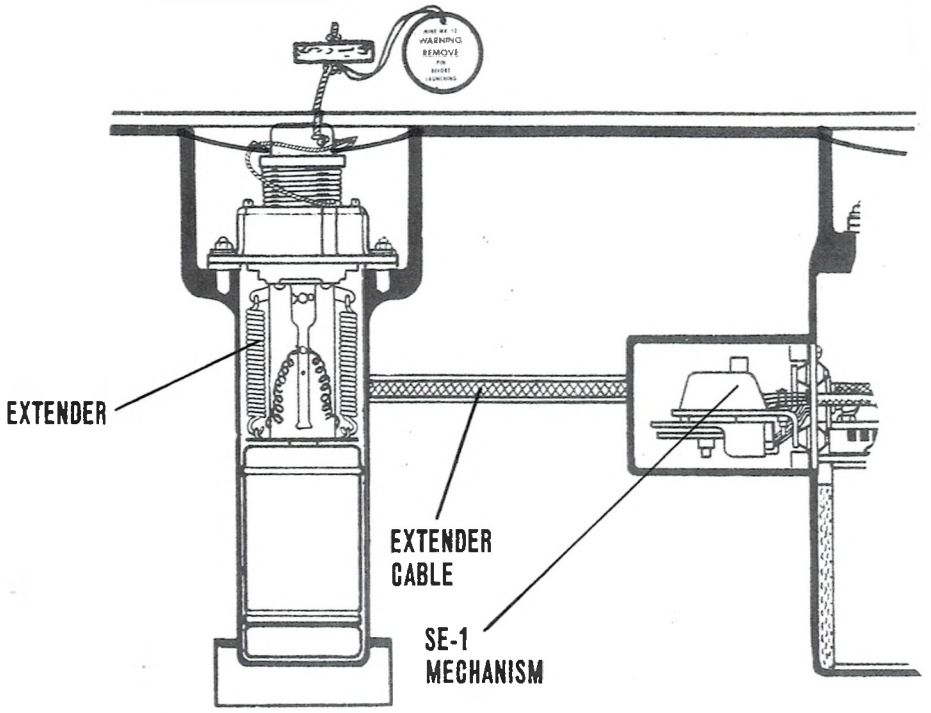


SE-1 MECHANISM

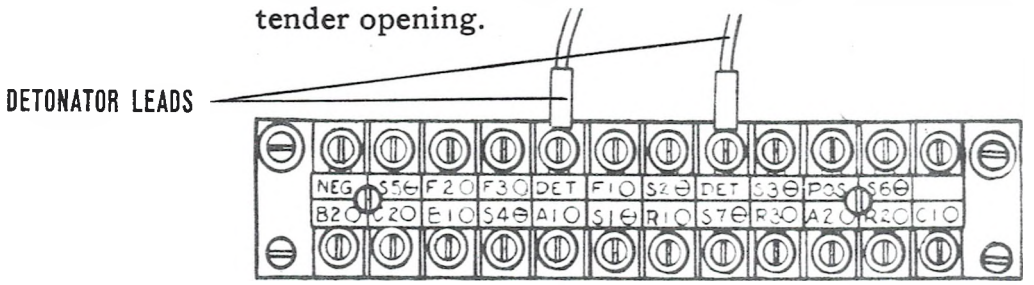
2.29 SE-1 MECHANISM. If installing an SE-1, see that the proper target strip is in place on the terminal block. Then connect the leads of an SE-1 which has been tested (par 2.15) to the terminal block as follows:

Blue lead to S1 (blue dot)
Red lead to S2 (red dot)
White lead to S3 (white dot)
Yellow lead to S4 (yellow dot)
Brown lead to S6 (brown dot)
Violet lead to S7 (violet dot).

Do NOT connect the green lead. (All the SE-1 leads have black tracers and the dots by the terminals have black lines across them).

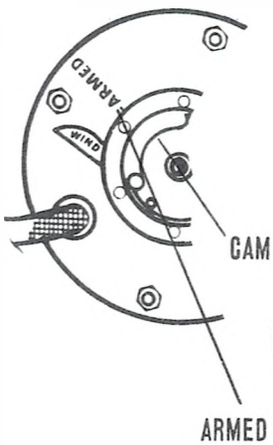


2.30 BOOSTER AND EXTENDER CABLE. See that the extender well is clean and free of obstructions, then place a spacer in the bottom of the well. Place the booster can (Mark 6 Mod. 1) with its spring end down on top of the spacer. Thread the extender cable through the cable conduit between the extender well and the battery compartment, with the end having two terminal lugs in the battery compartment. Attach the cable terminals to the terminals marked DET. on the terminal block, either lead to either terminal. See that rubber sleeves cover the soldered joints, then tighten the terminal screws. Pull the excess cable into the extender opening.



TERMINAL BLOCK WITH DETONATOR LEADS

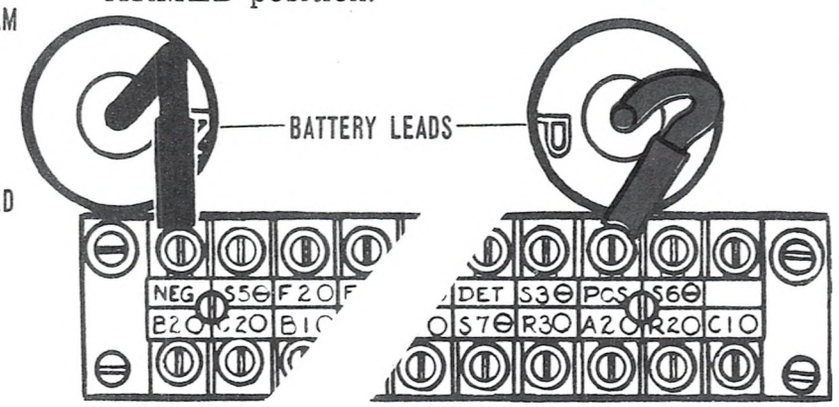
ELECTRICAL SUBASSEMBLY TEST



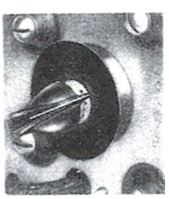
CLOCK DELAY MECHANISM

2.31 ELECTRICAL SUBASSEMBLY TEST. Test the electrical subassembly at this point as follows:

(a) See that the clock is run down to the ARMED position.



TERMINAL BLOCK



DIAL SE-1 MECHANISM

(b) Connect the battery leads to the terminal block—the black lead to the NEG. terminal and the red lead to the POS. terminal.

(c) Set the SE-1 knob at figure 2.

(d) See that the SE-1 is reset. This may be done by either of two methods.

(1) Touch the green lead of the SE-1 to terminal S5 for not less than one second and not more than 2 seconds. After the green lead is removed from the terminal, check with an ohmmeter across the green lead and the yellow lead (attached to terminal S4). The resistance should be approximately 19 ohms. If the circuit is open, the fuse is blown and must be replaced.

ELECTRICAL SUBASSEMBLY TEST

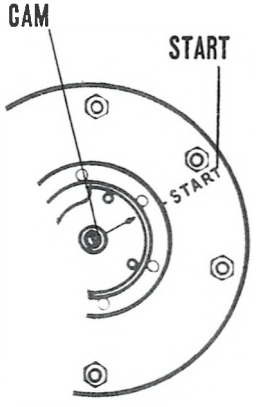
(2) Remove the fuse from the SE-1 and short across the fuse clips. Touch the green lead to terminal S5 for several seconds. Remove the green lead from terminal S5 and remove the short across the fuse clips. Replace the fuse.

(e) Connect a center-reading voltmeter or a 15-volt test lamp to the leads of the extender cable in the extender well to serve as a voltage indicator.

(f) Connect terminals F1 and F3 on the terminal block. Hold the connection for about 3 seconds (until the TD-1 has operated), then break it.

(g) After about 1 minute (after the SE-1 has finished operating) repeat step (f). Voltage should appear at the voltage indicator in the extender well.

(h) Reset the SE-1 (step (d)). The voltage should disappear from the voltage indicator.



CLOCK DELAY MECHANISM

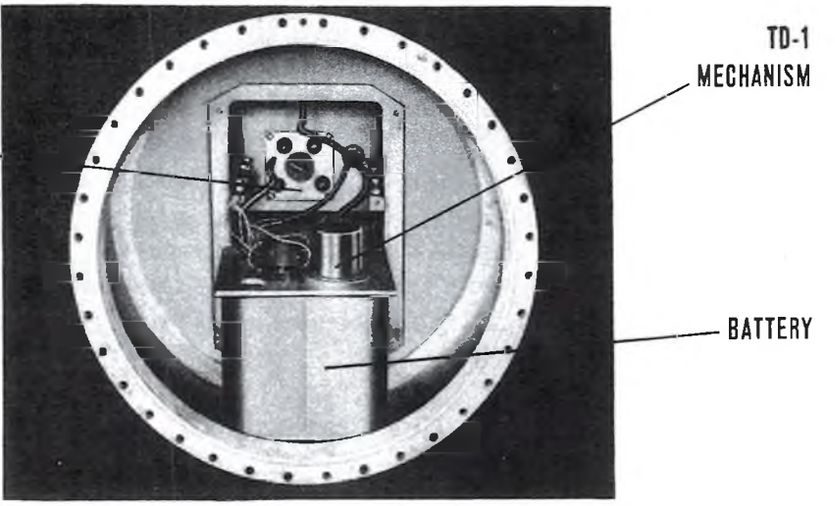
(i) Disconnect the battery.

(j) Connect the green SE-1 lead to terminal S5 (green dot).

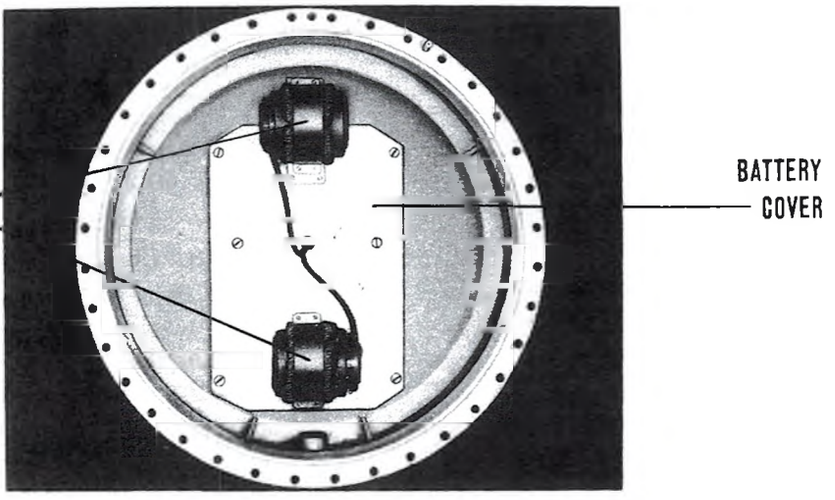
(k) WIND THE CLOCK FULLY (UNTIL THE ARROW POINTS TO START).

(l) Secure the safety device on the clock starter in the same manner as on the extender (subpars. 2.7 (g), (h) and (i)). Listen to the clock to make sure that it is not ticking.

(m) If the test results are not satisfactory, there is a fault in one of the mechanisms or the wiring which must be located and corrected before proceeding with assembly.



2.32 Secure the SE-1 mechanism in the recess in the forward bulkhead of the instrument compartment with the four screws furnished for that purpose. Be sure that the mechanism is oriented as directed on its mounting plate. Adjust the selector knob as directed by the Officer in Charge.

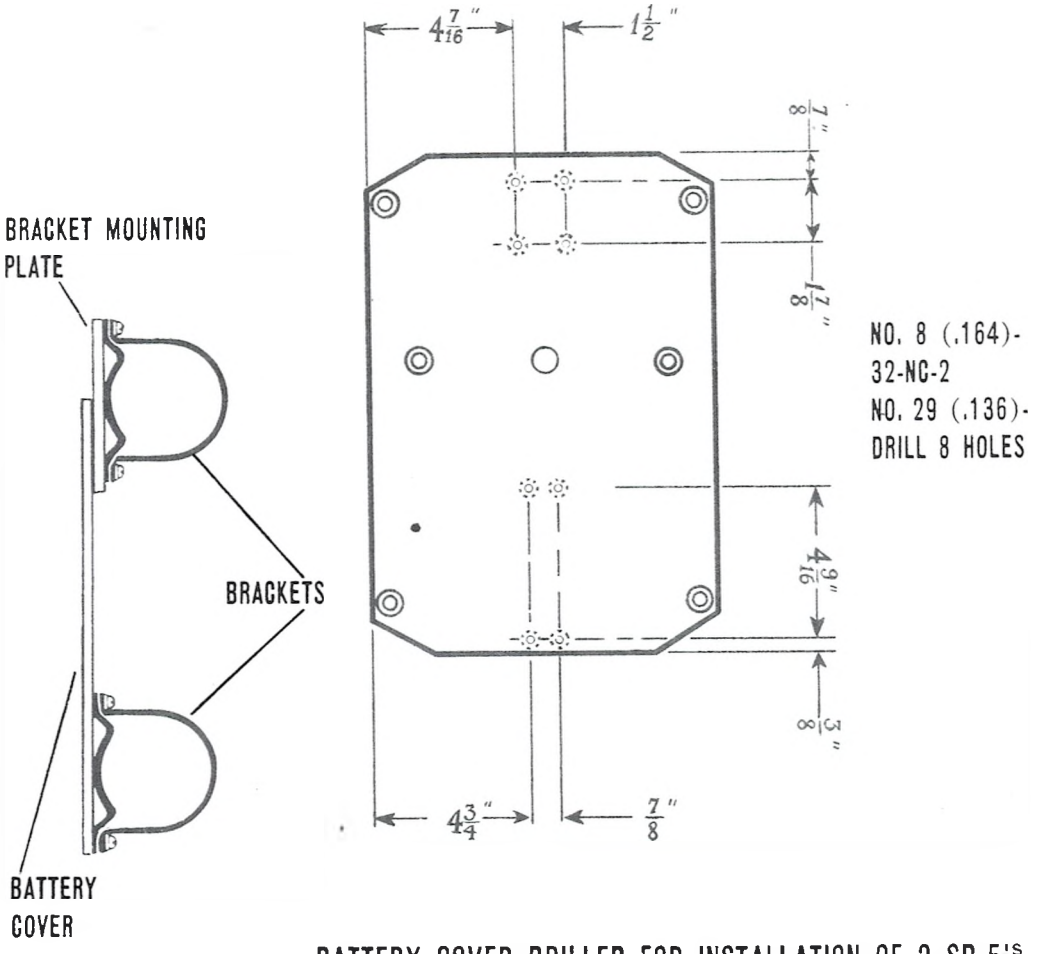


SD-5 MECHANISMS

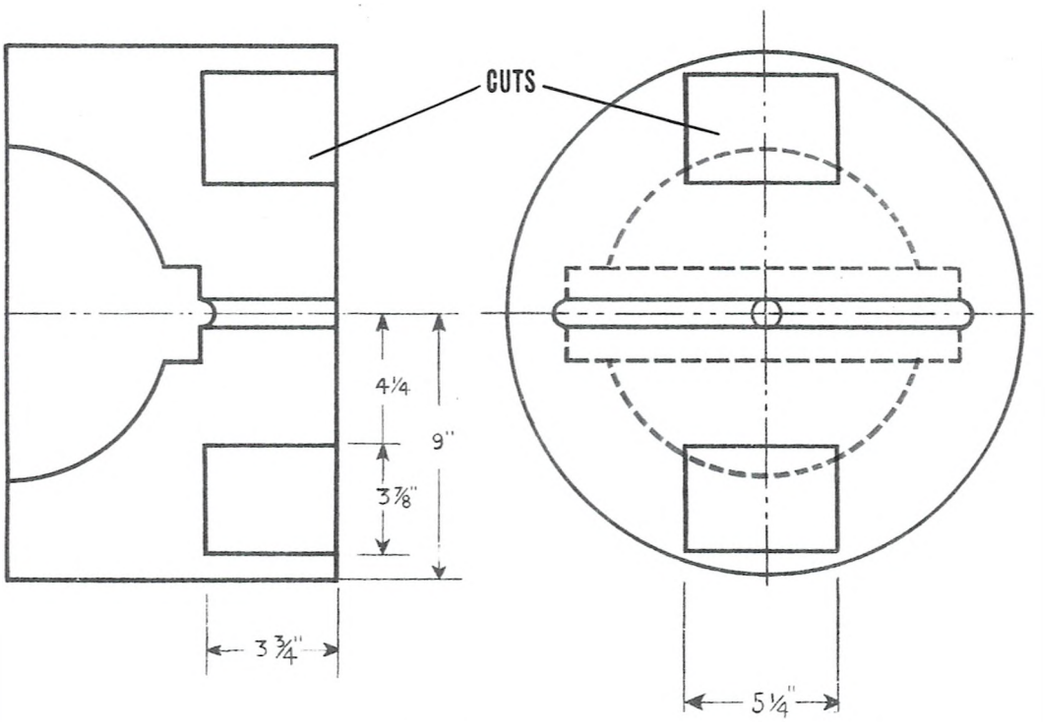
2.33 SD-5 MECHANISMS. If SD-5 mechanisms are being installed in the mine, modify the battery box cover and the cushion as follows:

(a) Drill and tap the battery cover.

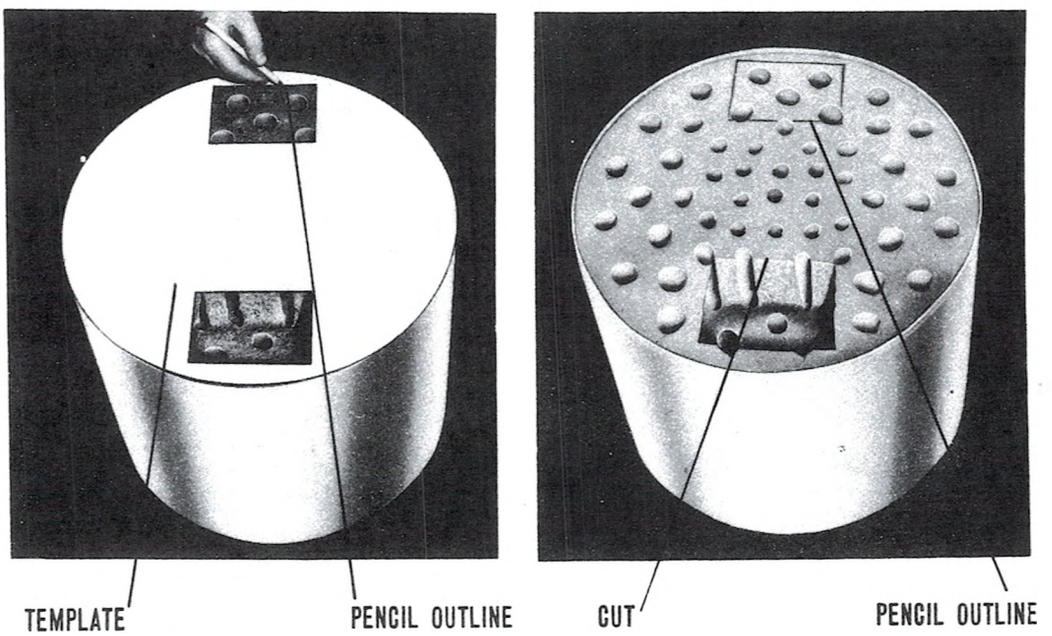
(b) Secure the bracket mounting plate to the battery cover with four ½-inch, 8-32 round head screws and lock washers.



BATTERY COVER DRILLED FOR INSTALLATION OF 2 SD-5'S



MK. 1 CUSHION MODIFIED FOR INSTALLATION OF 2 SD-5's



SD-5 MECHANISMS

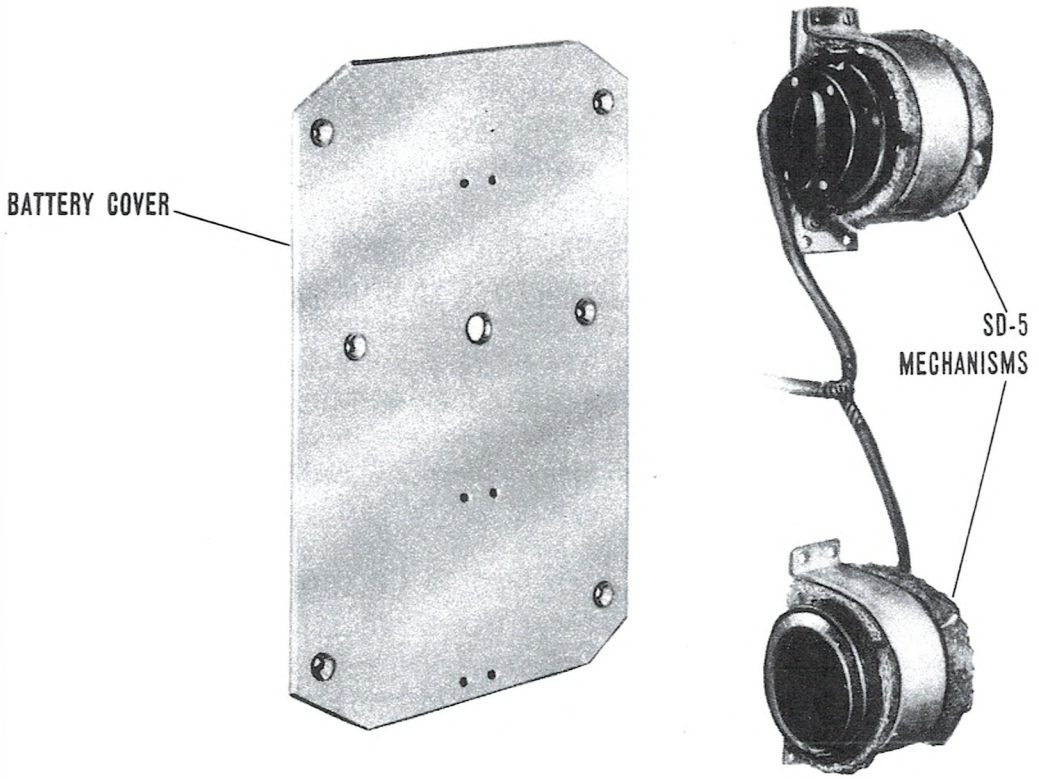
(c) Cut two sections out of the cushion. The use of a cardboard template will make it easier to cut the holes to the correct dimensions and in the correct orientation.

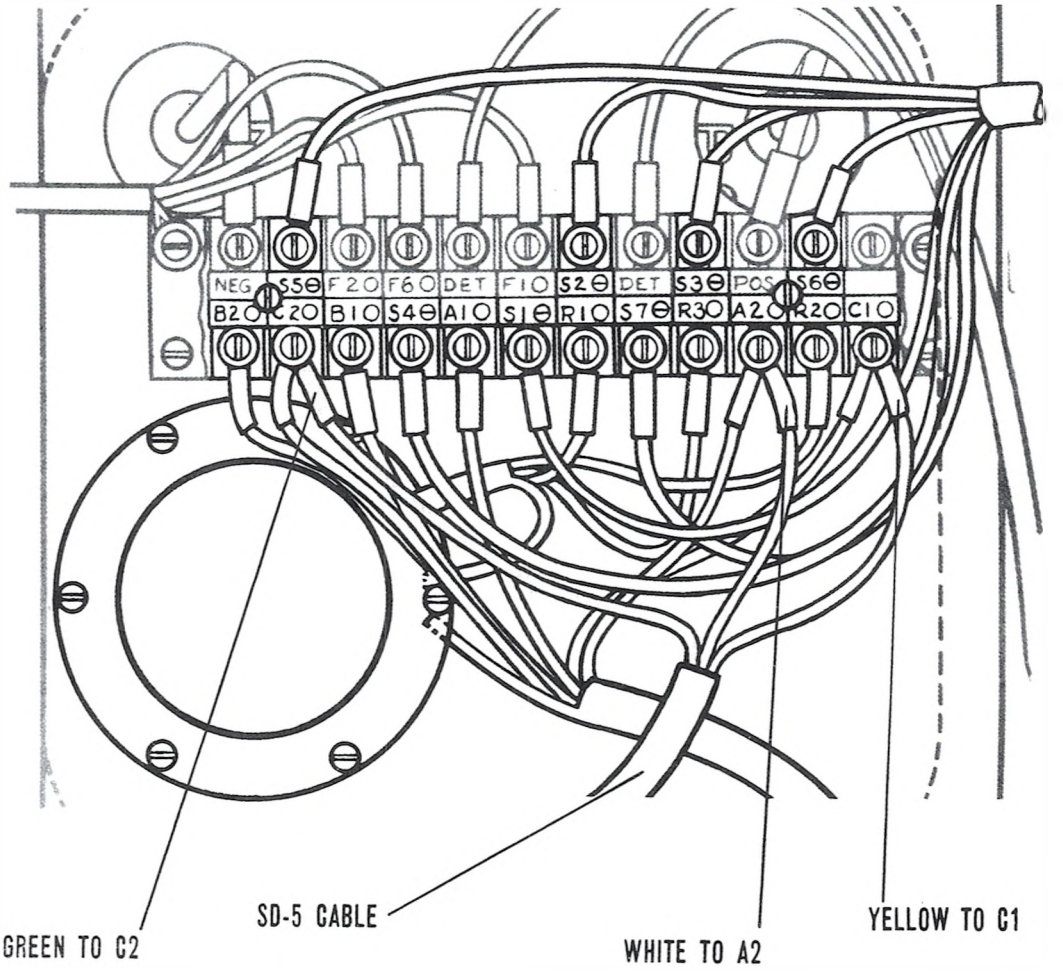
2.34 Install two SD-5 mechanisms which have been tested (par. 2.9-2.12) as follows:

(a) Wrap the felt cushions around the SD-5's and insert each assembly between the two portions of a mounting bracket.

(b) Mount each of the assemblies on the battery cover, by means of four ⅜-inch, 8-32 brass round-head screws and lock washers. The two SD-5's must be oriented in opposite directions.

(c) Feed the SD-5 cable through the hole in the





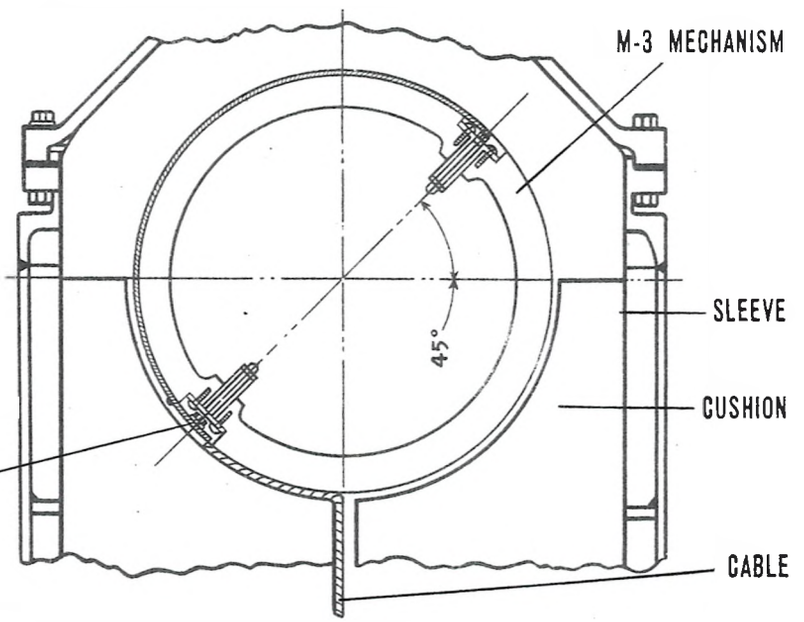
ELECTRICAL ASSEMBLY FOR SD-5 MECHANISMS

center of the battery cover and connect the leads to the terminal block as follows:

(1) White lead to A2 (white dot) with white clock lead.

(2) Green lead to C2 (green dot) with green clock lead.

(3) Yellow lead to C1 (yellow dot) with yellow clock lead.

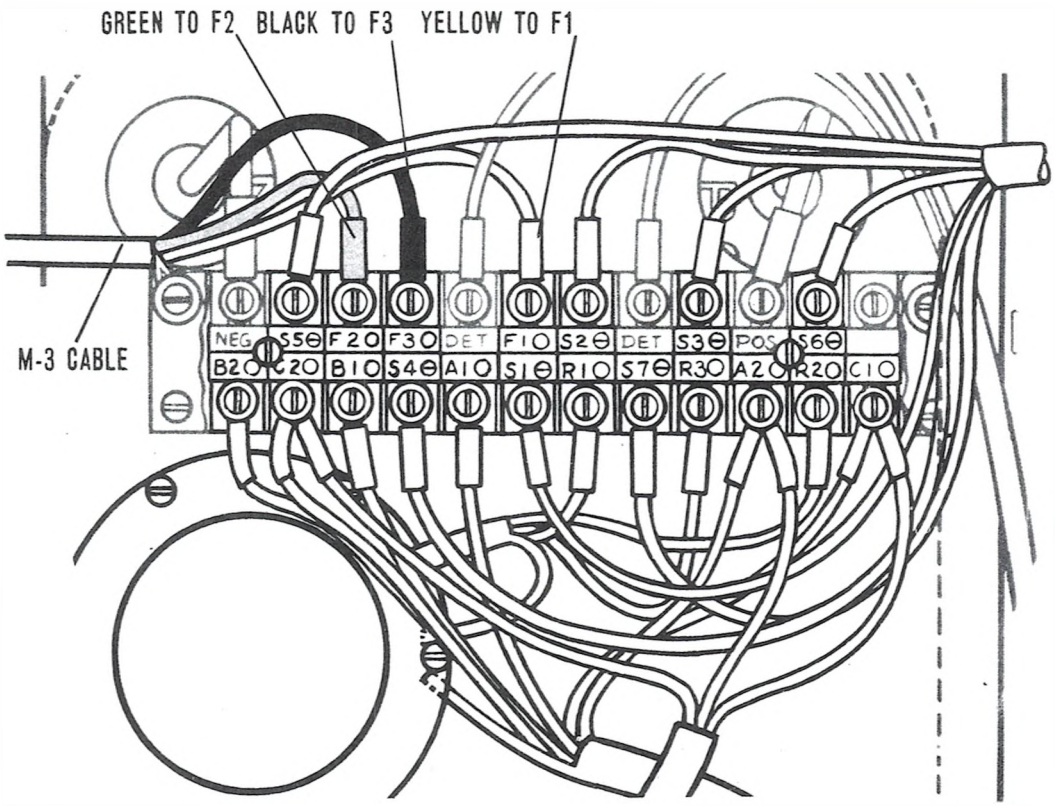


HORIZONTAL SECTION SHOWING ORIENTATION OF M-3 TYPE MECHANISM

FIRING MECHANISM

2.35 FIRING MECHANISM. Place the cylindrical half of the firing mechanism cushion in its sleeve, with the flat surface of the cushion flush with the tapered end of the sleeve. Thread the cable of a firing mechanism which has been tested (par. 2.16) through the hole in the rubber cushion. Place the sleeve with its tapered end down and position the firing mechanism so that the grooved side of the center ring is facing up, away from the cushion. The firing pivot (adjacent to the cable clamp) MUST be at a point midway between the cable hole and the rim of the cushion, and the ring must rest in the channel. Pull the cable through the hole in the cushion. There must not be any slack between the mechanism and the cushion.

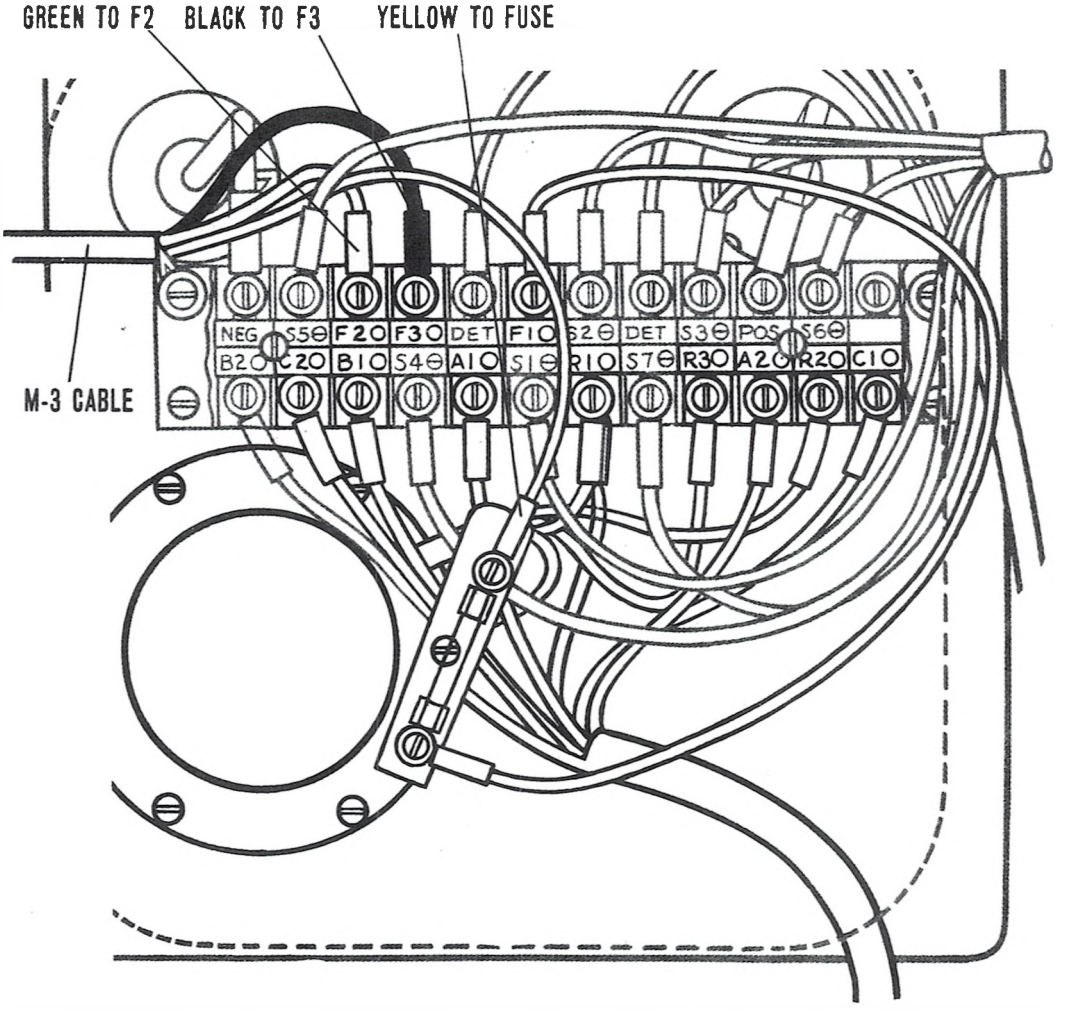
2.36 Fit the after half of the rubber cushion into the sleeve so that the channel in the rubber encloses the ring on the firing mechanism case. Work the cushion in as far as it will go.



ELECTRICAL ASSEMBLY FOR M-3 WITHOUT ANTIPREMATURE ASSEMBLY

2.37 Place the sleeve on a stand as close as possible to the tail opening of the mine case. Thread the cable through the center hole in the cover with the surface of the battery cover having countersunk holes facing the sleeve. Place the rubber sleeves of the three firing mechanism leads over their soldered joints, and connect the leads as follows:

(a) If no antipremature assembly is included in the mine
Connect the black lead to terminal F3 (black dot)
The green lead to F2 (green dot)
And the yellow lead to F1 (yellow dot).



ELECTRICAL ASSEMBLY FOR M-3, WITH ANTIPREMATURE ASSEMBLY

(b) If an antipremature assembly is included in the mine,
Connect the black lead to terminal F3 (black dot),
The green lead to F2 (green dot),
And the yellow lead to the end of the fuse nearest to the terminal block.

2.38 COMPLETING THE ASSEMBLY. Place an ohmmeter across the block terminals marked POS. and NEG. to be sure there is no closed circuit between them. If the ohmmeter indicates a closed circuit, the entire mine circuit must be investigated. If the circuit is open, attach the negative battery lead (black) to the terminal marked NEG. on the terminal block and the positive battery lead (red), to the terminal marked POS. See that the rubber sleeves cover the soldered joints.

2.39 Test the extender cable leads by connecting the ohmmeter leads to the extender cable leads in the extender opening. Connect the ohmmeter leads as follows:

(a) To one extender cable lead and a bare spot of metal on the mine case.

(b) To the other extender cable lead and a bare spot of metal on the mine case.

(c) To both extender cable leads.

(d) Reverse the ohmmeter leads and repeat (a), (b), and (c).

If the ohmmeter indicates a closed circuit in any of these tests, the mine circuit must be investigated until the fault is found.

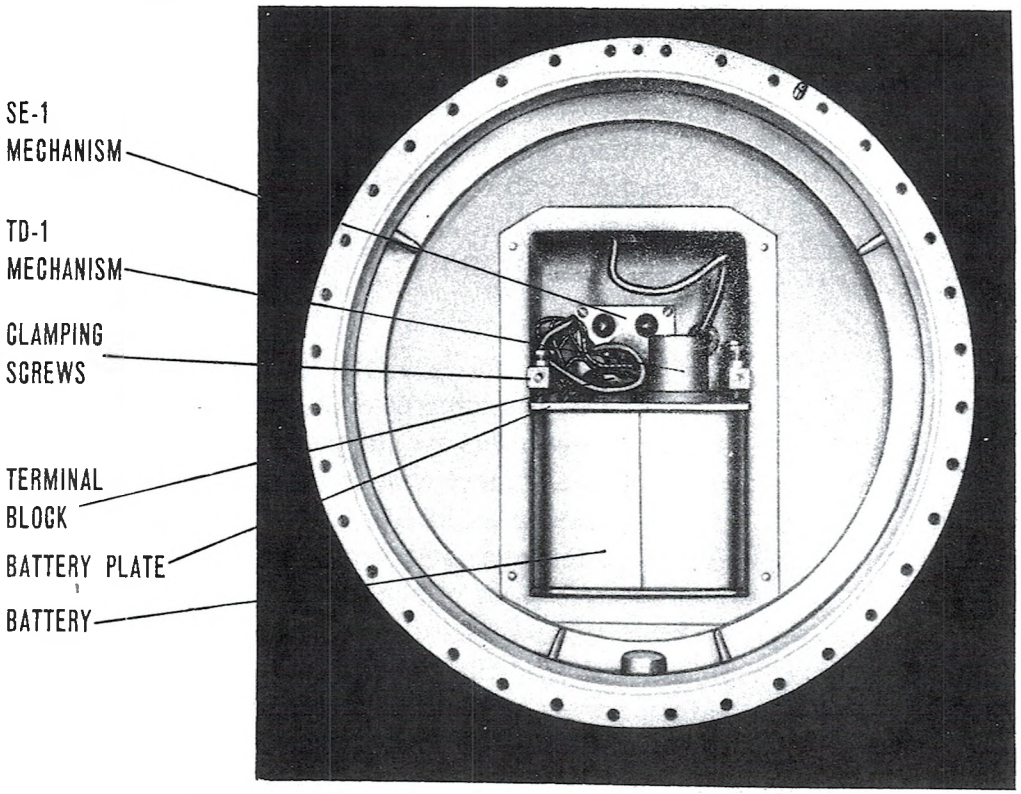
2.40 Test the installed SD-5's as directed by the Officer in Charge.

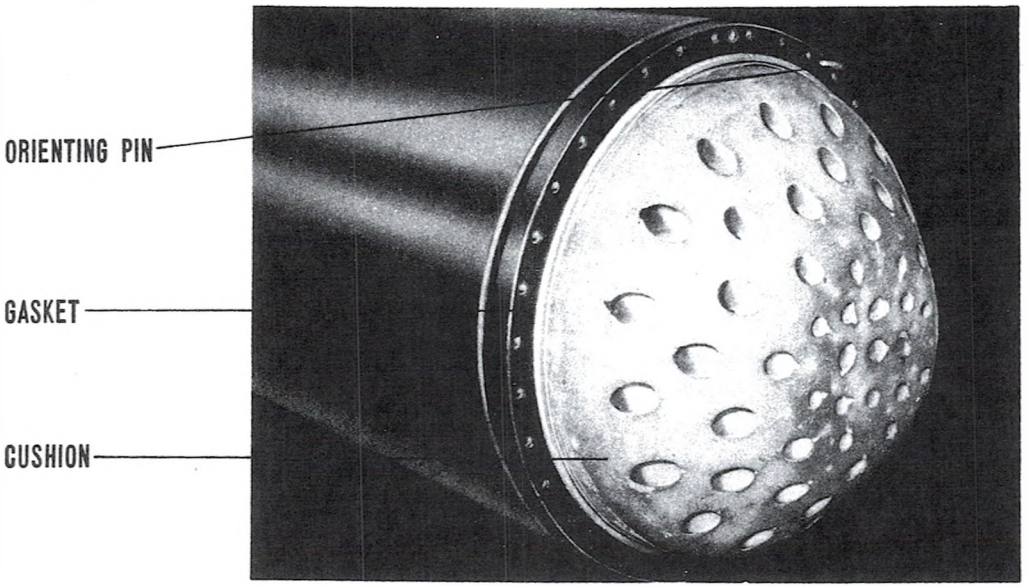
2.41 Inspect the terminal block to see that all leads are connected to the proper terminals. See that the soldered joints are covered by rubber sleeves, and that the terminal screws are tight. Replace the terminal block cover and tighten the two screws on

COMPLETING THE ASSEMBLY

the TD-1 side of the terminal block. Place the woven extensions of the firing mechanism and extender cables under the washers on the remaining screws. Then tighten the screws.

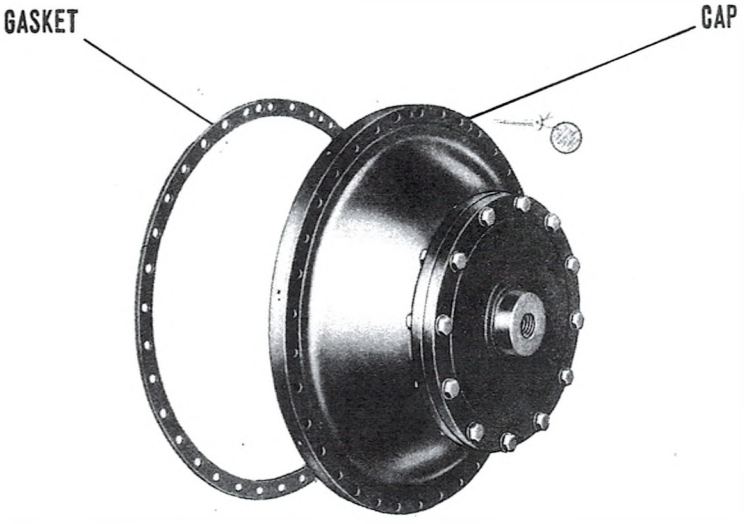
2.42 Place the battery, with the battery plate on top and the battery leads on the left, in its compartment with the rubber pad between the battery and the forward end of the compartment. Lift the clock assembly out of its opening and lock the battery and battery plate in place with the clamping screws in the securing bars slightly more than hand tight. Tighten the locking nuts against the bars.





2.43 Put the battery cover in place and secure it. Slide the sleeve containing the cushion and firing mechanism into the case. Pull the slack of the firing mechanism cable into the instrument compartment before the sleeve is finally seated. See that the SD-5's (if used) fit into the holes cut for them in the cushion.

2.44 Line up the gasket over the cap seat on the after end of the mine case so that the dowel pin and safety screw holes are properly located. (The dowel pin hole is 30° clockwise from the safety screw hole, which must be in line with the extender and clock starter openings and the guide latch assembly.) Hold the cap in place over the gasket with the clamps furnished. Place washers under the bolt heads and seat the bolts in the cap rim, leaving the safety screw hole free. Place nuts in the fastener groove, then align and start the bolts into the nuts by hand. Tighten diametrically opposite bolts alternately with the torque wrench, so that the cap will seat evenly and with a water-tight seal.



2.45 If a Mark 12 extender is being used, tape the ends of the extender cable leads, and pull the cable back into the battery compartment until only a few inches remain in the extender well. If the extender is a Mark 12 Mod. 5, connect the extender cable leads to the extender terminal block terminals indicated with yellow dots. (If the extender terminal block is not fitted with the correct target strip, connect the cable leads to the two terminals adjacent to the terminals market DET. 1 and DET. 2.) Polarity is not important.

2.46 See that a proper gasket is in place and that the cable conduit in the booster can is diametrically opposite to the orienting pin in the extender well flange. Then install the extender in its well with the orienting pin in the proper hole. See that the extender bushing fits in the detonator pocket in the booster can. Make sure the extender cable is not pinched between the booster can and the extender frame. See that the cable conduit in the booster can is beside the flange at the end of the extender frame and not beneath it. (If the extender is a Mark 12 Mod. 5, pull the slack of the extender cable into the

instrument compartment as the extender is lowered into the well.) Place a fiber washer, an aluminum washer, and a nut on each stud. Set the nuts up tight with the torque wrench, tightening diametrically opposite nuts alternately, so that the flange will seat evenly and with a watertight seal.

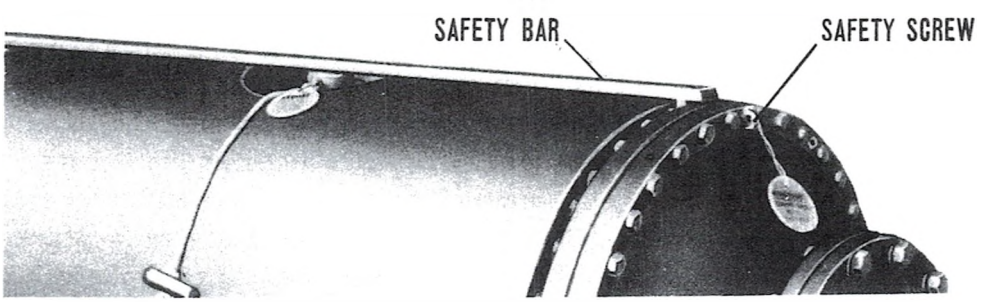
2.47 Seat the clock assembly on its studs, with the orienting pin projecting through the proper hole. When installing the clock, coil the clock cable in a large loop and see that it is not caught between the clock delay mechanism and the TD-1 mechanism. Place a fiber washer, an aluminum washer, and a nut on each stud. Set up opposite nuts alternately, so that the assembly will seat evenly and with a watertight seal.

2.48 Lay the safety bar on the mine case with the tapered end in the recess in the guide and the retainer clip in the mine case cap fastener groove. Screw the thumb screw into the after end of the mine case as far as it will go, to hold the safety bar in place.

WARNING TAG

2.49 See that "REMOVE BEFORE LAUNCHING" tags are attached to the safety pins in the clock starter and extender and to the safety screw on the after end of the mine.

2.50 Stencil the outside of the mine case to indicate the operating characteristics of the mine as directed by the Officer in Charge.



INSTALLING AN SE-1 MECHANISM IN AN ASSEMBLED MK. 12 MINE

2.51 To install an SE-1 mechanism in an assembled Mark 12 mine, proceed as follows:

(a) Remove the top and after end of the crate.

(b) Remove the mine cap.

(c) Slide the sleeve housing the firing mechanism and cushion out of the mine case. Do not strain the firing mechanism cable.

SE-1 MECHANISM

(d) Remove the battery cover.

(e) Remove the clock assembly and place it on top of the mine case in such a position that it will not fall off. Do not strain the clock cable.

(f) Loosen the clamping bolts and slide the battery and battery plate aft as far as they will go without straining either the extender or clock cables.

(g) Remove the cover from the terminal block and disconnect all leads.

(h) Remove the terminal block from the battery plate.

(i) Replace the target strip on the terminal block with the target strip furnished with the SE-1 mechanism.

(j) Replace the terminal block on the battery plate, oriented so that the designations read from the TD-1 side.

(k) Reconnect leads with regard to the new target strip.

(l) Secure the SE-1 mechanism in the recess in the forward bulkhead of the instrument compart-

ment, orienting it as directed on the mechanism mounting plate.

(m) Adjust the selector knob as directed by the Officer in Charge.

(n) Complete the reassembly, following the regular assembly proceduce.

INSTALLING SD-5 MECHANISMS IN AN ASSEMBLED MK. 12 MINE

2.52 Install two SD-5 mechanisms in an assembled Mark 12 mine as follows:

(a) Disassemble the mine as directed in subparagraphs 2.51 (a) through (f).

SD-5 MECHANISMS

(b) Remove the cover from the terminal block and disconnect the firing mechanism leads.

(c) Remove the firing mechanism from its cushion and place it on a stand.

(d) Test each SD-5 and assemble the wiring as directed in paragraphs 2.9-2.12. (If the installation is made at an advanced base, the tests in paragraphs 2.9 (f), 2.9 (h), and 2.10 may be omitted.)

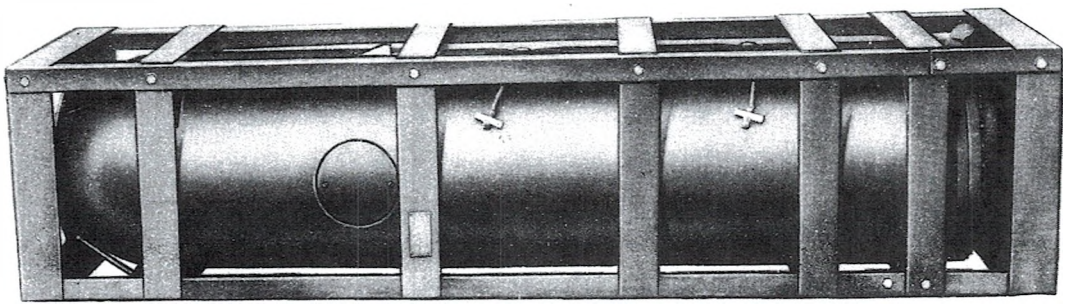
(e) Modify the battery cover and the cushion as directed in paragraph 2.33.

(f) Install the SD-5's as directed in paragraph 2.34.

(g) Proceed with reassembly as directed in paragraphs 2.35-2.50, disregarding irrelevant sections.

GENERAL

CHAPTER III



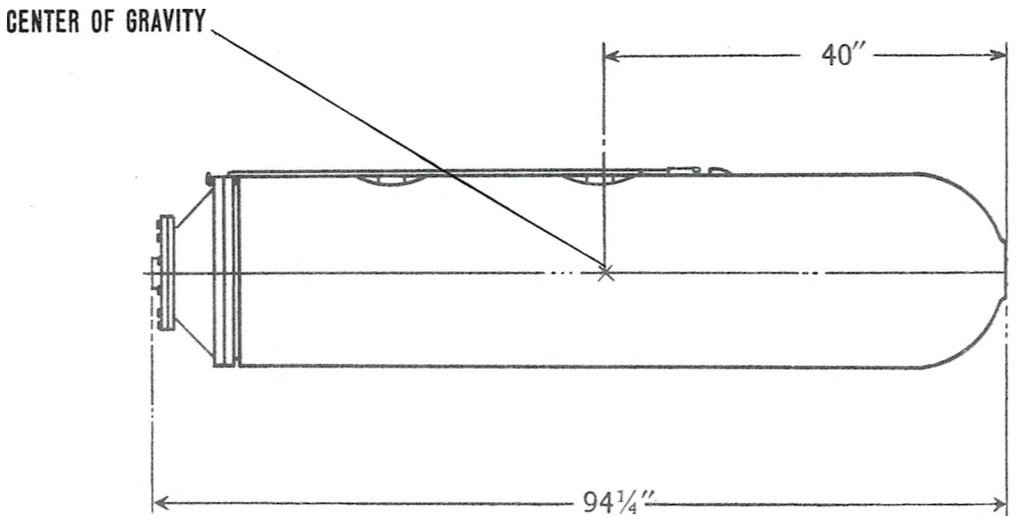
MARK 12 MINE IN CRATE

3.1 Mark 12 mines will be made up as fixed ammunition at assembly depots or aboard specially equipped vessels, and will be issued to planting submarines in 'ready' condition. The only operations on the mines required aboard the planting submarines will be removal of safety appliances.

3.2 Assembled mines shall be kept in their shipping crates until they are loaded aboard submarines. The cases of these mines are comparatively soft, and care should be taken to avoid injuring the mines. Crated mines may be stacked (in a horizontal position) on wooden two-by-four studs. They may be stacked three deep if necessary, with wooden studs between each crate.

3.3 Approximate dimensions and weights of a Mark 12 crate (List of Drawings, Sk. No. 14991; General Arrangement, Dr. No. 231473) are as follows:

Height 21-11/16 inches
Width 21⅛ inches
Length 96 inches
Weight of assembled mine and crate—1697 pounds (TNT-loaded) or 1827 pounds (Torpex-loaded).
Weight of crate without mine case—282 pounds.



3.4 When removing a mine from a crate, take off the crate cover and the after end. Loosen the bolts which hold the ring on the nose of the mine. Be sure that safety pins are in place on the clock starter and extender mechanisms and that the cords on the pins are prevented from fouling. Remove the safety bar screw and the safety bar. The safety bar is stamped with the same number as the mine case to which it belongs and must be replaced on the same mine.

3.5 Place a sling around the mine case at its center of gravity (approximately 40 inches from the nose) and lift it from its crate. A mine may also be lifted by a line passed through an eyebolt screwed in the nose or the tail of the mine case.

ADVANCE BASE INSPECTION

3.6 Each mine should be given a field operational test and/or inspection before the detonator is installed, as directed by the Officer in Charge of mining operations. A field inspection should include

(1) a visual inspection of the mine components and wiring,

(2) a check on the condition of gaskets and diaphragms, and

(3) tests to determine the condition of the battery and of the fuses in the SE-1 and firing mechanisms.

(a) Check the battery for short-circuit current with a low-resistance ammeter (having not more than 0.01 ohm total resistance, including the leads). Discard all batteries which do not meet the minimum requirements given in the table below, or which are more than 18 months old (unless they have been kept in cold storage).

TEMP. AT WHICH BATTERIES ARE TESTED (° F.)	MINIMUM ACCEPTABLE SHORT-CIRCUIT CURRENT (AMPERES)
B-3 BATTERY	
10	7
30	9
50	12
70	14
90	15
B-3 MOD. 1 BATTERY	
10	15
30	22
50	26
70	31
90	35

(b) Test to make sure the SE-1 fuse is intact by removing the green SE-1 lead from terminal S5 and placing an ohmmeter between this lead and terminal S4. The resistance should be 19 ohms. If the fuse is broken, it must be replaced.

(c) Test the M-3 fuse by connecting the leads of a high-current (about ¼ ampere) ohmmeter to terminals F2 and F3 (green and black leads from

the M-3). The resistance should be 12 ohms or less. If the fuse is not intact, it must be replaced.

(d) Replace the green SE-1 lead on terminal S5.

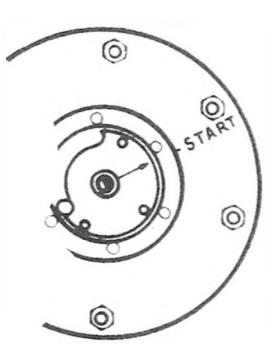
(e) Examine all gaskets to see that they have not been damaged or lost their elasticity, and replace if necessary.

(f) If there is any question as to the condition of the diaphragms of the clock starter and extender, these mechanisms should be given pressure-pot tests. If the diaphragms leak, the diaphragm clamping nuts should be tightened and the mechanism retested.

(g) A suggested check list for advance base inspection of Mark 12 mines is given in the Appendix.

DETONATOR INSTALLATION

3.7 Detonators should be installed in mines before they are removed from their crates and before the mines are issued to submarines for planting. Install a detonator as follows:

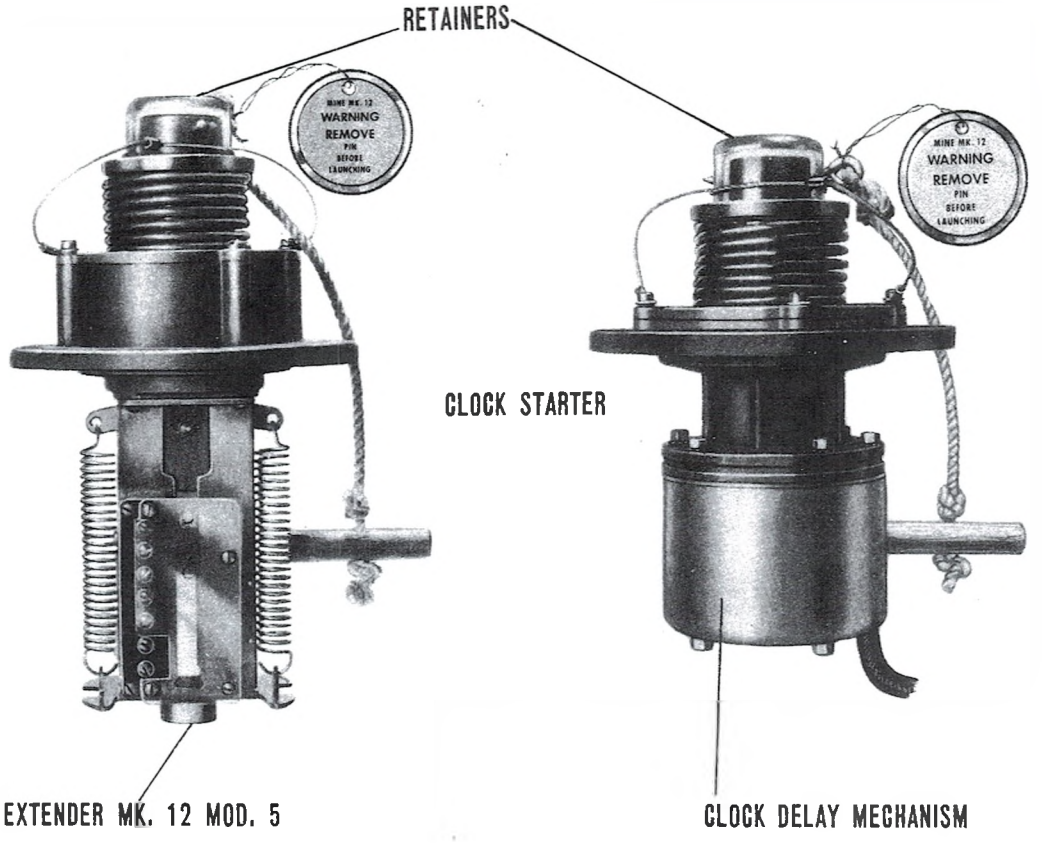


(a) Remove the top of the crate, and the safety bar on the mine.

(b) Remove the clock assembly and the extender from the mine case, taking care not to strain their cables.

(c) Inspect the clock starter and extender gaskets. Replace them if necessary.

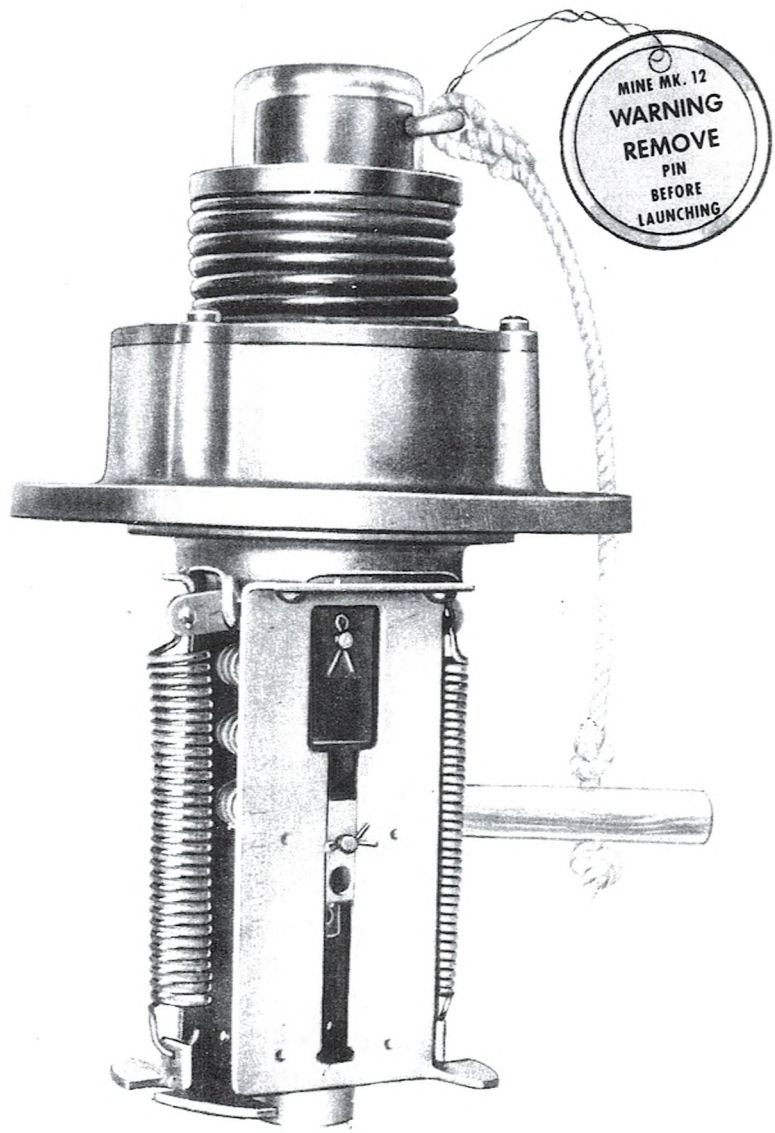
(d) Inspect the clock delay mechanism. The arrow on the clock cam MUST point to the



"START" mark. If it does not, do not install a detonator in the mine until it has been overhauled and tested.

(e) If the mine is fitted with a Mark 12 extender, pull the end of the extender cable out through the booster well opening and untape the leads. If the mine is fitted with a Mark 12 Mod. 5 extender, these leads will be connected to the extender terminal block.

(f) Assemble test leads on an ohmmeter and adjust the meter as directed in the instructions attached to it.



MARK 12 EXTENDER

DETONATOR INSTALLATION

(g) Connect the ohmmeter leads as follows:

(1) To one extender cable lead and to a bare spot of metal on the mine case.

(2) To the other extender cable lead and to a bare spot of metal on the mine case.

(3) To both extender cable leads.

(4) Reverse the ohmmeter leads and repeat (1), (2), and (3).

(h) The ohmmeter should NOT indicate a closed circuit in any of these tests. If it does, the mine is faulty and the detonator MUST NOT be installed until the fault has been found and corrected. There is danger that a detonator might explode if installed in a mine with a faulty electrical assembly. Do not test a detonator with an ohmmeter, or the detonator may fire.

(i) Twist the ends of the detonator leads together and install the detonator in the extender as follows:

(1) Examine the hole in the crosshead and remove any burrs on the inside. See that the set screws in the detonator socket are backed clear of the inside of the socket.

(2) Thread the detonator wires through the crosshead.

(3) Hold the detonator so that it will not strike against any parts of the mine case or extender. Then push it gently into the detonator seat of the extender crosshead, at the same time pulling the leads through the hole in the side of the crosshead.

(4) One or both of the extender springs may be unhooked if desired, or the extender may be placed in the operated position, to facilitate this operation. Be sure the detonator is well seated (the center one of the three annular grooves in the end of the detonator should be flush with the face of the detonator socket.) Then tighten the two screws in the crosshead until the detonator is firmly clamped. See that the heads of the set screws are flush with or below the surface of the detonator socket after tightening.

(5) Coil the detonator leads spirally by winding them around a pencil, screw driver, or similar instrument. If the extender is a Mark 12, pass one lead through each extender spring eye where the springs are attached to the extender frame. Secure the leads to the eyes with string or friction tape. If the extender is a Mark 12 Mod. 5, pass both leads through the eye of the extender spring next to the terminal block and secure them with string or tape. Be sure that the detonator leads will not interfere with the action of the extender.

(j) Remove the insulation from the last half-inch of the detonator leads. Be careful not to cut partially through the wire when removing the insulation. Also, avoid bending the leads more than is necessary.

(k) Connect the detonator leads (polarity is not important):

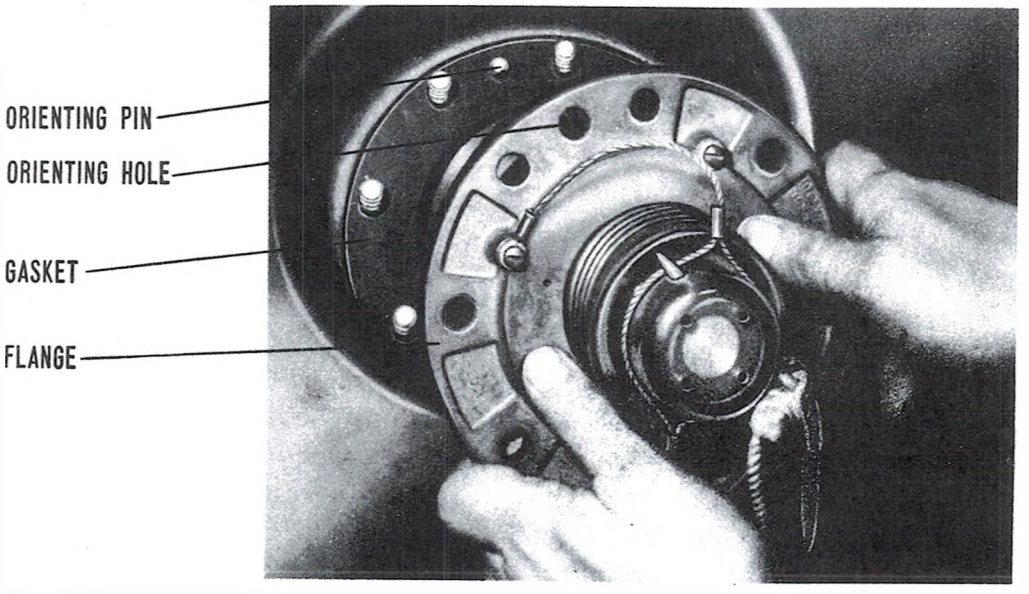
(1) If the extender is a Mark 12, splice the detonator leads to the extender cable leads and tape the joints carefully.

(2) If the extender is a Mark 12 Mod. 5, connect the detonator leads to the terminals of the extender terminal block marked DET. 1 and DET. 2.

(l) Be sure that the extender is locked in the safe position and that the extender springs are properly installed. Then replace the extender in the extender well as follows:

(1) See that the cable conduit in the booster can is diametrically opposite the dowel pin in the extender well flange.

(2) Lower the extender into the well, pulling the extender cable aft into the battery compartment. Be sure that detonator leads are not fouled between the extender frame and booster can as this would prevent the extender from seating properly.



(m) Replace the clock assembly. Guide the cable from the clock mechanism away from the dowel pin in the clock starter opening, so that it does not jam between the TD-1 mechanism and the clock mechanism.

(n) When seating extenders and clock starters, try to center the studs in their holes so that contact between the flanges and studs is eliminated as far as possible.

(o) Replace extender and clock starter washers and nuts, fiber washers first and then aluminum washers. Then tighten diametrically opposite nuts alternately with the torque wrench, so that the mechanisms will seat evenly on their flanges, forming watertight seals.

(p) Check the mine cap bolts to make sure they are tight.

(q) Take black paint and paint out the word "NOT" in the "DETONATOR NOT INSTALLED" note on the mine case.

(r) Replace the safety bar and screw.

SHIPPING AND STOWING ON TORPEDO RACKS

3.8 Mark 12 mines may be shipped aboard submarines using standard torpedo shipping skids and snubbing lines. Since the mines may be stowed either singly or two on each cradle, there are two corresponding procedures.

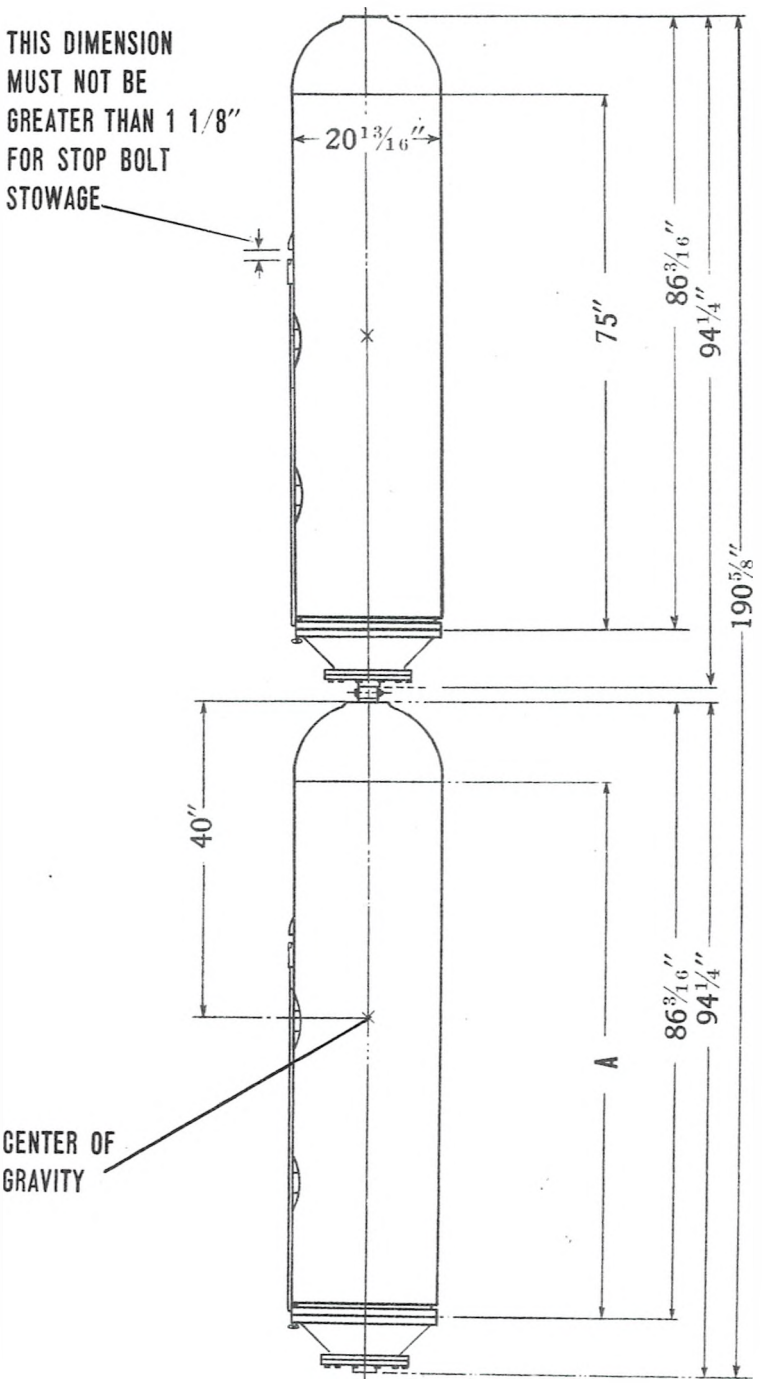
SINGLE STOWAGE

3.9 SINGLE STOWAGE. Be sure safety pins are in place in the clock starter and extender, then remove the safety bar from the mine case and transfer it to the submarine by hand. A safety bar bears the same serial number as the mine on which it was issued and must be replaced on that mine. Place a sling about the center of gravity of the mine (about 40 inches from the nose). Hoist the mine into position on the torpedo skid with its nose toward the hatch and with the guide block on top. Do not allow the full weight of the mine to rest on any sharp projection. Maintaining tension on the hoisting cable, hook two torpedo snubbing lines to a nose cap (or into an eyebolt screwed into the nose of the mine, if a nose cap is not available). Pull the snubbing lines back along the mine on opposite sides, and snub them on the cleats at the end of the slide. Remove the sling and allow the mine to slide down close to the bottom end of the torpedo cradle. Secure the mine to the cradle with a belly band, unhook the snubbing lines, lower the raised end of the cradle and place it on the tracks as desired.

3.10 If possible, secure the belly band around the forward part of the mine where it will not bear on the safety bar, then replace the safety bar. If the location of the belly band is such that it would bear on the safety bar (and when tightened deform either the bar or the mine case), stow the safety bar conveniently so that it may be installed when the mine is loaded into a torpedo tube. Replace the safety bar securing screw in the mine case.

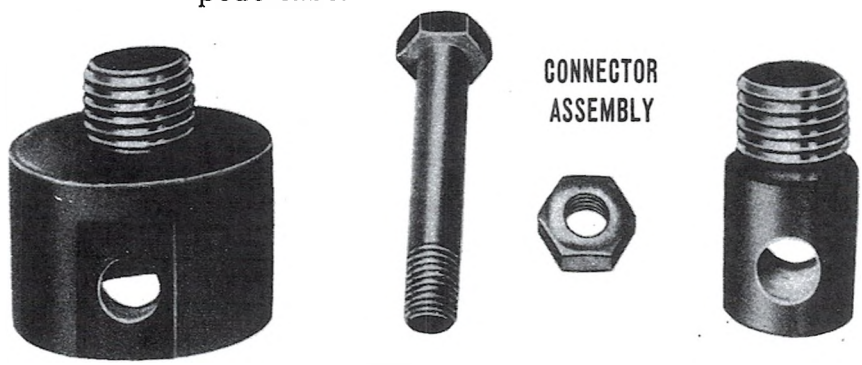
DOUBLE STOWAGE

3.11 DOUBLE STOWAGE. To stow two mines on a torpedo cradle, follow the procedure given



STOWAGE DIMENSIONS FOR MK. 12 MINE

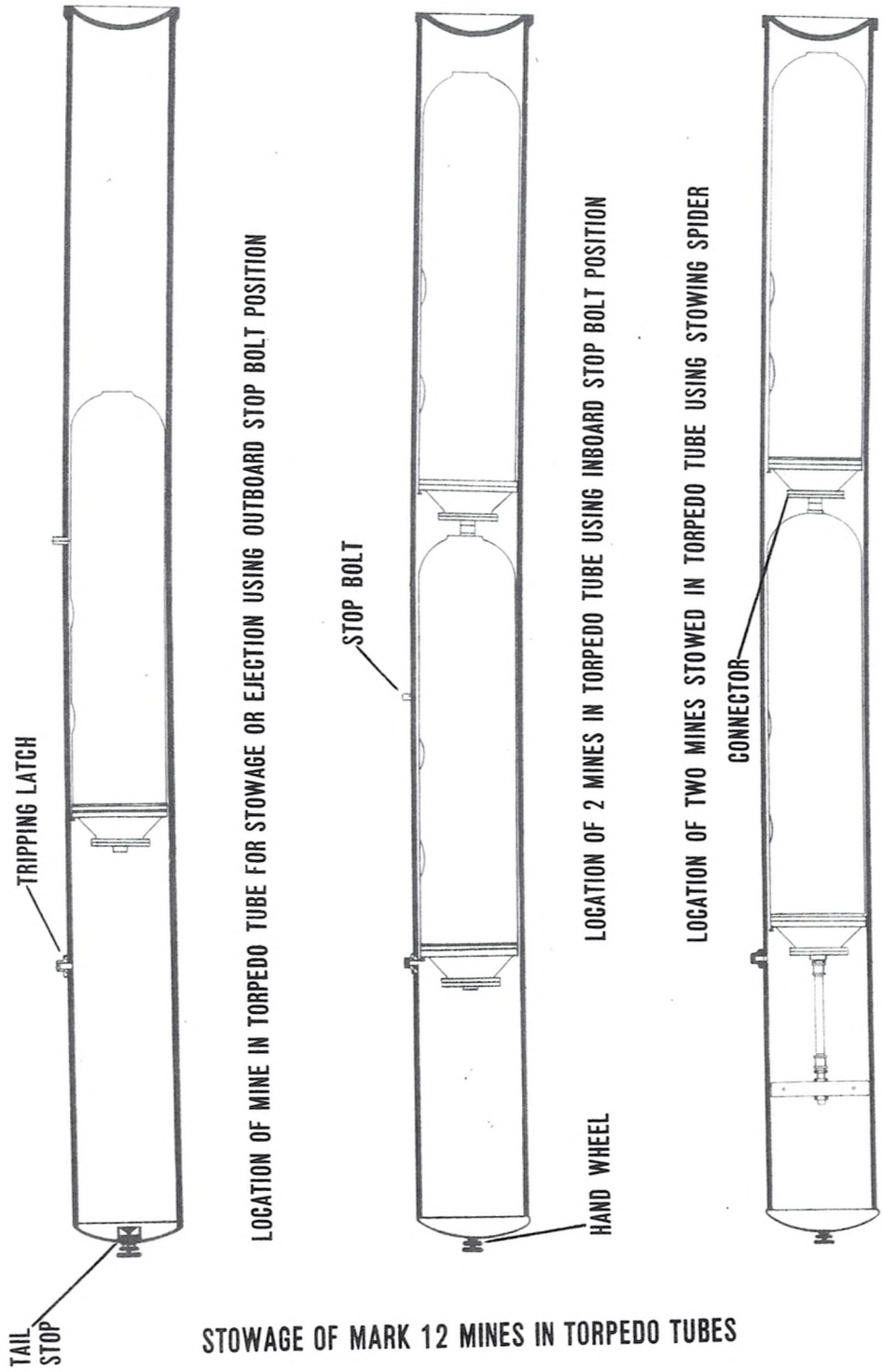
above for the first mine up to the point of allowing it to slide down the skid. First, screw one section of the Mark 12 mine connector into the tapped hole at the after end of the mine and then allow the mine to move down the skid far enough so that the second mine can be placed on the skid. Place the second mine on the skid, screw the other section of the connector into its nose, and make up the coupling between the two mines. Allow the two mines to slide down into the torpedo room until the forward end of the first mine just clears the lower end of the cradle. Secure the first mine with the belly band as above, unhook the snubbing lines, and lower the raised end of the cradle. Secure the second mine to the cradle with the belly band farthest from the torpedo tube.



3.12 The filled torpedo cradles are normally secured in position by straps which pass over the torpedo and attach to the ship's side and to the tracks. If mines are located on a cradle well toward the torpedo tube, two of these retaining straps, one over each mine, may be used. The mines may be stowed coupled or uncoupled, depending on the location of the securing bands and straps.

TORPEDO TUBE STOWAGE

3.13 MARK 12 MINES may be stowed singly or doubly in submarine torpedo tubes. There are alter-



STOWAGE OF MARK 12 MINES IN TORPEDO TUBES

nate methods for either double or single stowage, depending on whether the mines are held in place by stowing spiders or torpedo tube stop bolts. The instructions for torpedo tube stowage which follow apply to submarines beginning with number SS167.

3.14 LOADING MINES into torpedo tubes for stowage or for planting will be facilitated by a loading pole. Such a pole should be issued to all submarines engaged in handling Mark 12 mines. When a submarine is at a depth of 125 feet or more, the torpedo tubes must NOT be flooded to sea pressure, as excessive pressure may damage the extenders so that they will not operate properly.

CAUTION: When mines are placed in torpedo tubes for stowage only, safety pins must be in place in clock starters and extenders. Their lanyards must be stowed in the clock starter and extender wells so they will not jam in the torpedo tubes. Safety bars secured with safety screws must be installed on the mines.

STOWAGE WITH STOP BOLT

3.15 STOWAGE WITH STOP BOLT. One or two Mark 12 mines may be stowed in a torpedo tube by using the stop bolt to secure the mines. However, when this is done, mine cases with serial numbers below 6200 should be fitted with modified guide latch assemblies as noted in paragraph 1.6. The distance between the guide block and the guide latch in assemblies of the original design is nearly 2 inches, but the stop bolts are only slightly more than 1 inch across in all except very old submarines. This allows approximately ⅞ inch of clearance when the stop bolt is engaged and permits movement of the mine in the torpedo tube and consequent possible damage to the guide latch assembly. The

distance from the guide latch to the guide block may be reduced to 1⅛ inches by securing a piece of metal to the face of the guide block or by improvising a new guide block or latch. Mine cases after serial number 6200 incorporate a redesigned guide latch assembly with a distance of 1⅛ inches between the guide latch and guide block. Reduction of the distance to this figure reduces the clearance when the stop bolt is engaged to about 1/10 inch.

3.16 To secure a single mine in a torpedo tube by means of the stop bolt:

(a) The stop bolt may be in either the inboard or outboard position.

(b) Push the mine into the tube until the stop bolt catches in the guide latch assembly. The guide latch will slide under the stop bolt and then snap up in front of it, locking the mine in place.

(c) Close and secure the breech door.

3.17 TO STOW TWO MINES in a torpedo tube by means of the stop bolt:

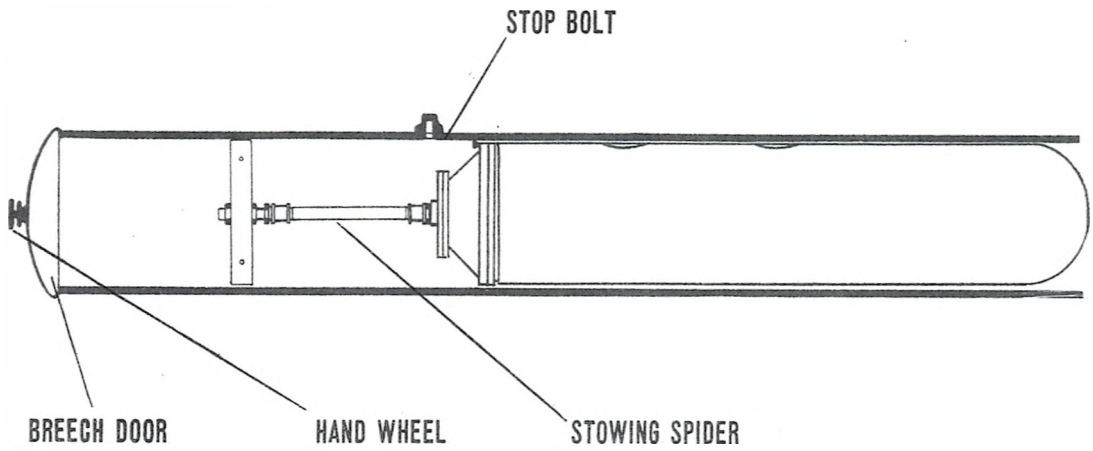
(a) Usually the stop bolt must be in the inboard position. However, in the stern tubes of some submarines, the outboard position may be used.

(b) Push the first mine into the torpedo tube until its inboard end is just outside the breech door.

(c) Slide the second mine up to the first and connect the two mines.

(d) Push the two mines into the tube, raising the stop bolt so that it will clear the outboard mine, then dropping it so that it will engage in the guide latch assembly of the inboard mine.

(e) Close and secure the breech door.



STOWING WITH STOWING SPIDER

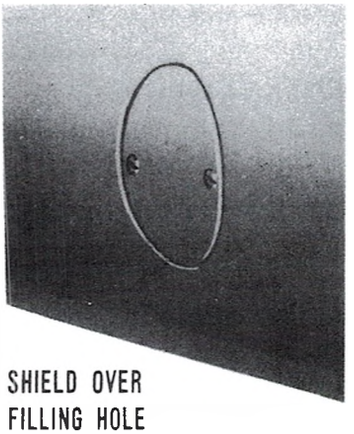
3.18 STOWAGE WITH STOWING SPIDER. For most satisfactory torpedo tube stowage, the use of a stowing spider is recommended. This device consists of a perforate disc or 'spider' which fits into a torpedo tube and is secured by four pairs of set screws. One end of a bar is fastened to the center of the disc. The other end is threaded to fit the threaded hole in the after end of a mine case.

3.19 The procedure for stowing mines (either single or double) with the spider is the same as for stop bolt stowage, except that the spider bar is screwed into the after end of the inboard mine at the time the after end of the mine just clears the breech door. The mine is then pushed into the tube until the stop bolt engages in the guide latch. The set screws of the spider are then set up to secure the mine(s) in this position.

3.20 The spider must be so oriented that the set screws will take up against the recessed surfaces of the torpedo tube, and NOT against the machined lands.

PLANTING MINES FROM TORPEDO TUBES

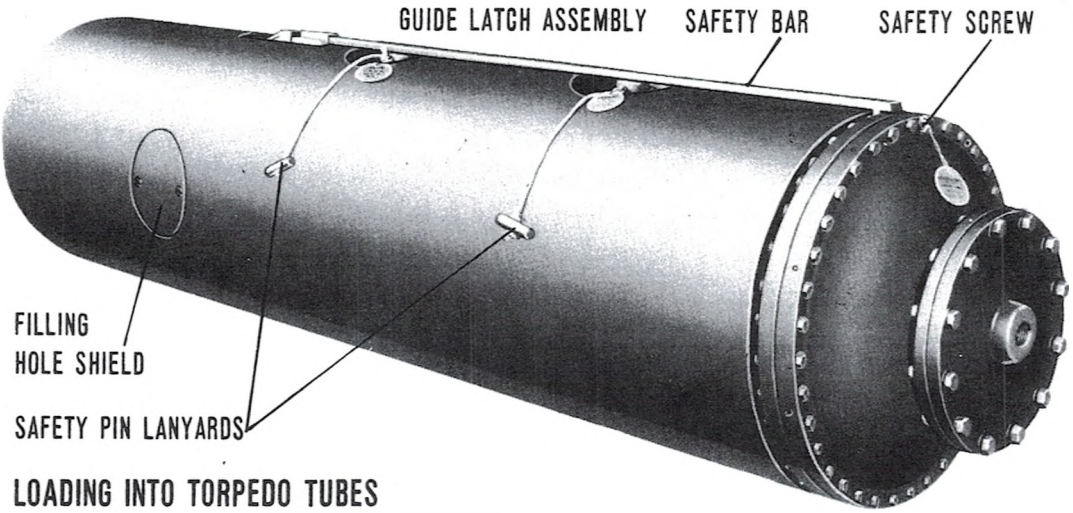
3.21 Before Mark 12 mines are loaded into torpedo tubes for planting, the tube stop bolts must be placed in the outboard positions (in tubes having poppet valve rollers 136¾ inches from their inboard ends). The torpedo poppet valve rollers (1½-inch diameter) must be replaced with the 1¾-inch rollers used with mines if the poppet valves are to be used. If the bubble eliminators are not to be used, mines may be ejected from either stop bolt position and without rgard to the size of the poppet valve rollers in the tubes. If poppet valve rollers are not 136¾ inches from the inboard ends of the tubes, the proper positions of the stop bolts will be determined by the locations of the rollers.



SHIELD OVER FILLING HOLE

NOTE: Mine cases after serial No. 6200 have shields over their side filling holes to prevent the poppet valve rollers from falling into the holes and causing premature operation of the poppet valves during planting. Extra shields have been procured and should be installed on all cases of earlier manufacture which are to be planted from torpedo tubes.

3.22 If one mine is stowed in a torpedo tube, it must be pulled out of the tube far enough to permit removal of the stowing spider (if used), the safety pins, and the safety screw when it is prepared for planting. If two mines are stowed in a tube, the inboard mine must be pulled out of the tube and disconnected from the outboard mine, and the remaining mine must then be pulled out of the tube far enough to permit removal of the safety pins and safety screw.



LOADING INTO TORPEDO TUBES

3.23 LOADING INTO TORPEDO TUBES. To load a mine into a torpedo tube in preparation for planting:

(a) See that the safety bar and the extender and clock starter safety pins are properly installed on the mine.

(b) If the poppet valve is to be used, see that the stop bolt is in its proper position and that the large poppet valve roller is installed.

(c) Slide the mine into the tube until the extender is just outside the breech of the tube. Remove the safety pin from the extender.

(d) Slide the mine into the tube until the clock starter is just outside the breech of the tube. Remove the safety pin from the clock starter.

(e) Slide the mine into the tube until its inboard end is flush with the breech of the tube. Remove the safety bar securing screw.

(f) Slide the mine into the tube until the stop bolt catches in the guide latch assembly. Be sure the bolt is properly engaged with the mine so that

the mine will not come adrift in the tube after the breech door is closed.

CAUTION: Do NOT remove safety pins or screws from the mines prematurely, or the locking balls may fall out of the clock starter and extender. The mine could then arm itself in the tube if pressure equivalent to that of 16 feet or more of water should be applied.

EJECTING MINES FROM TUBES

3.24 EJECTING MINES FROM TUBES. It is recommended that Mark 12 mines be fired from forward torpedo tubes at submarine speeds of not more than 5 knots. For speeds up to 5 knots, the recommended impulse tank pressure (p) may be calculated from the formula:

$$p = 150 + 2d \text{ (lbs. per sq. in.)}$$

in which d is the depth in feet of the keel below the surface. Tests have shown that if mines are fired from forward tubes at speeds of 5 knots or less, with the impulse pressures given by this formula, there is no danger of a ship hitting the mines. These pressures will give ejection velocities for the mines of between 25 and 50 feet per second. If mines are ejected from stern tubes, the impulse tank pressures may be reduced below those given by the formula by as much as 25 lbs. per square inch.

3.25 The spacing of mines in mine fields will be determined by the authority directing the operation.

REMOVING UNPLANTED MINES FROM TUBES

3.26 REMOVING UNPLANTED MINES FROM TUBES. If for any reason it becomes necessary to remove mines from torpedo tubes after they have been made ready for planting, install safety screws in the safety bars before the mines are started out of the tubes, and install safety pins in clock starters

and extenders when these mechanisms are just clear of the breeches of the tubes. Mines may then be stowed on cradles or in the tubes as directed above.

PLANTING FROM THE DECKS OF SURFACE CRAFT

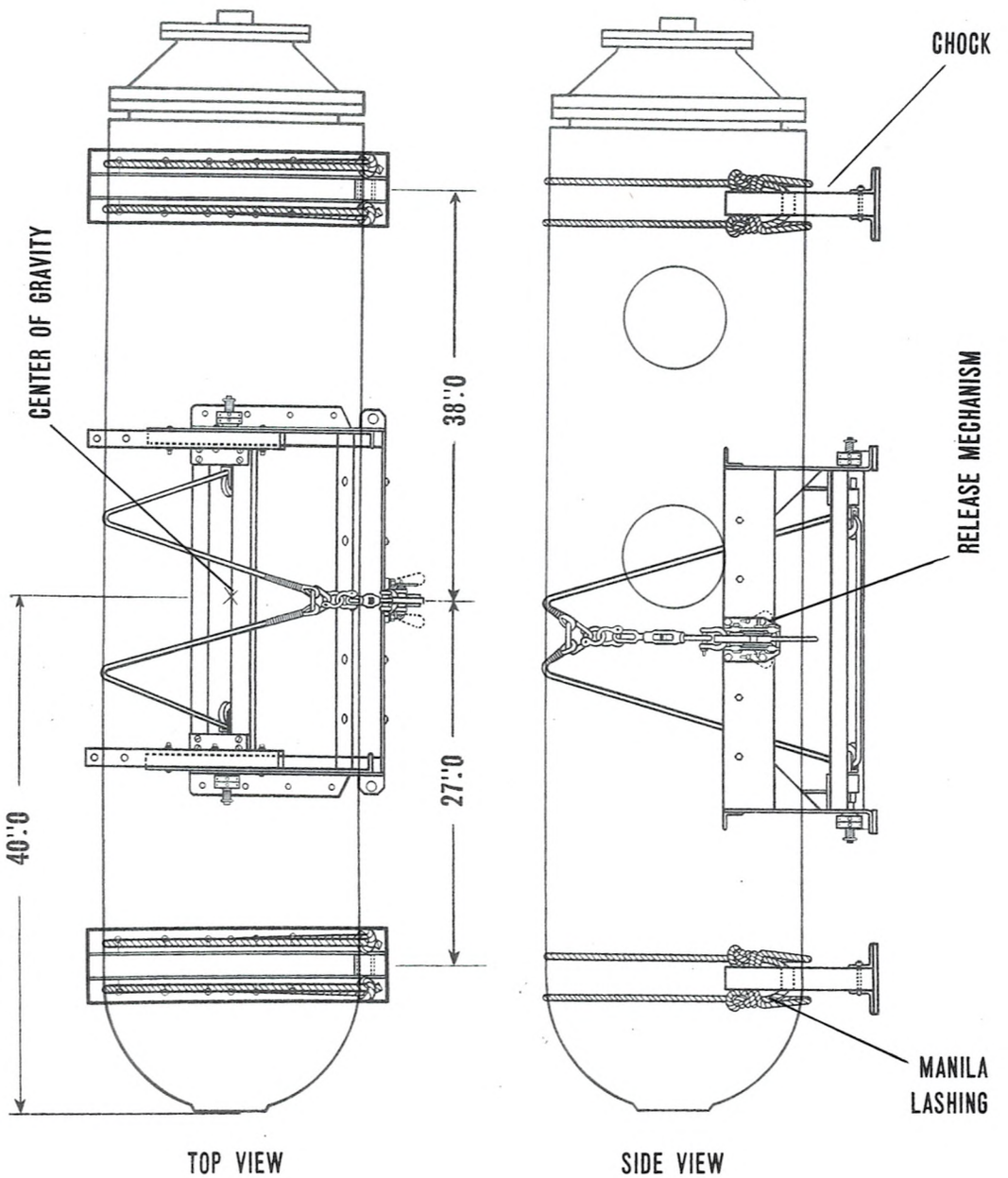
3.27 Mark 12 mines may be planted from the decks of surface craft by rolling them overboard. The recommended device for such planting is a Type C Mod. 1 depth charge release track.

3.28 The Type C depth charge release track is generally available and is easily modified for mine planting. The additions necessary for this modification are made entirely of wood and can be easily removed if it becomes necessary for depth charges to be carried on the track. These additions consist chiefly of:

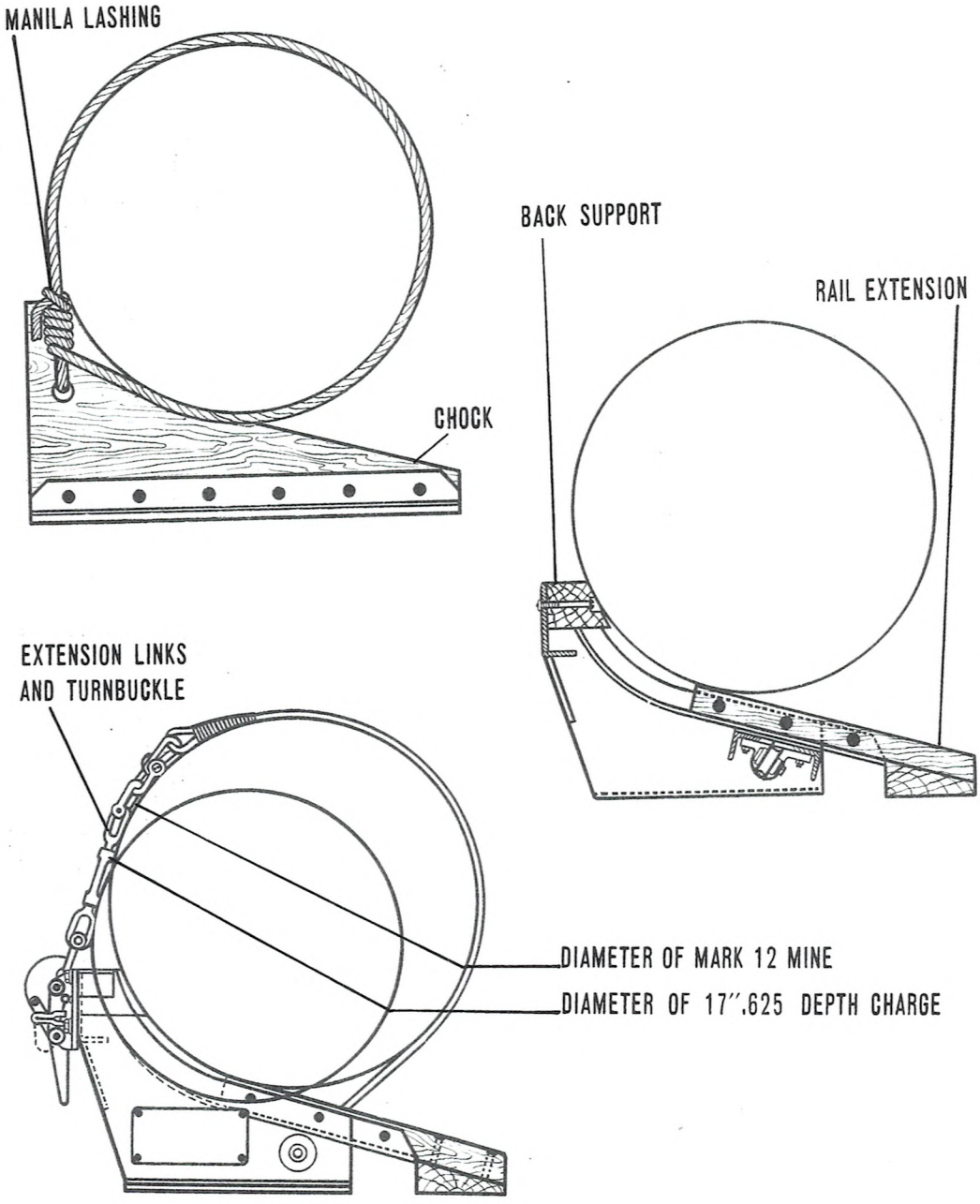
Rail extensions to carry a mine over the side of a ship,

A back support against which the mine rests, and two chocks (one on either side of the release track) to support the ends of the mine and to which the mine is secured with manila lashings.

3.29 The safety bars of Mark 12 mines must be removed before the mines are loaded on the tracks. Precaution must be taken to see that the clock starter and extender safety pins are not injured or removed. This will maintain the usual safety features of the mine. In loading a mine onto the track, orient it so that the safety pins can be reached easily. Immediately before a mine is planted, its lashings must be cast off and the safety pins must be removed from the clock starter and extender. Caution must be observed in removing the safety pins, if the retainers of the clock starter and extender are not fitted with retainer cables, as the retainers will be forced off by the springs beneath them with sufficient force to injure personnel.



MK. 12 MINE IN TYPE C MOD. 1 DEPTH CHARGE RELEASE RACK



SECTIONAL VIEWS

3.30 Mines have been planted successfully with this equipment at speeds varying from 6 to 30 knots. However, low planting speeds are preferable except in cases of emergency.

3.31 Motor torpedo boats may be adapted for planting mines by removing two after torpedo tubes and installing two, four, or six of the Type C Mod. 1 depth charge release tracks. It is important that the combined weights of the tracks and the mines loaded on them shall not exceed the combined weights of the removed torpedoes and tubes as this would affect the trim of the boat. Only four Mark 12 mines may be carried without exceeding this weight limit (approximately 9,200 pounds). The installation of six depth charge release tracks is suggested because lighter mines such as Mark 13's may also be planted in this manner, the maximum capacities being six Mark 13 mines or four Mark 12 and two Mark 13 mines.

3.32 Instructions for installing Type C Mod. 1 Depth Charge Release Tracks on PT boats are given on BuShips Dr. No. 602511.

3.33 Under special conditions mines and tracks may be substituted for all four torpedoes and tubes. When this is done, twice as many mines can be carried.

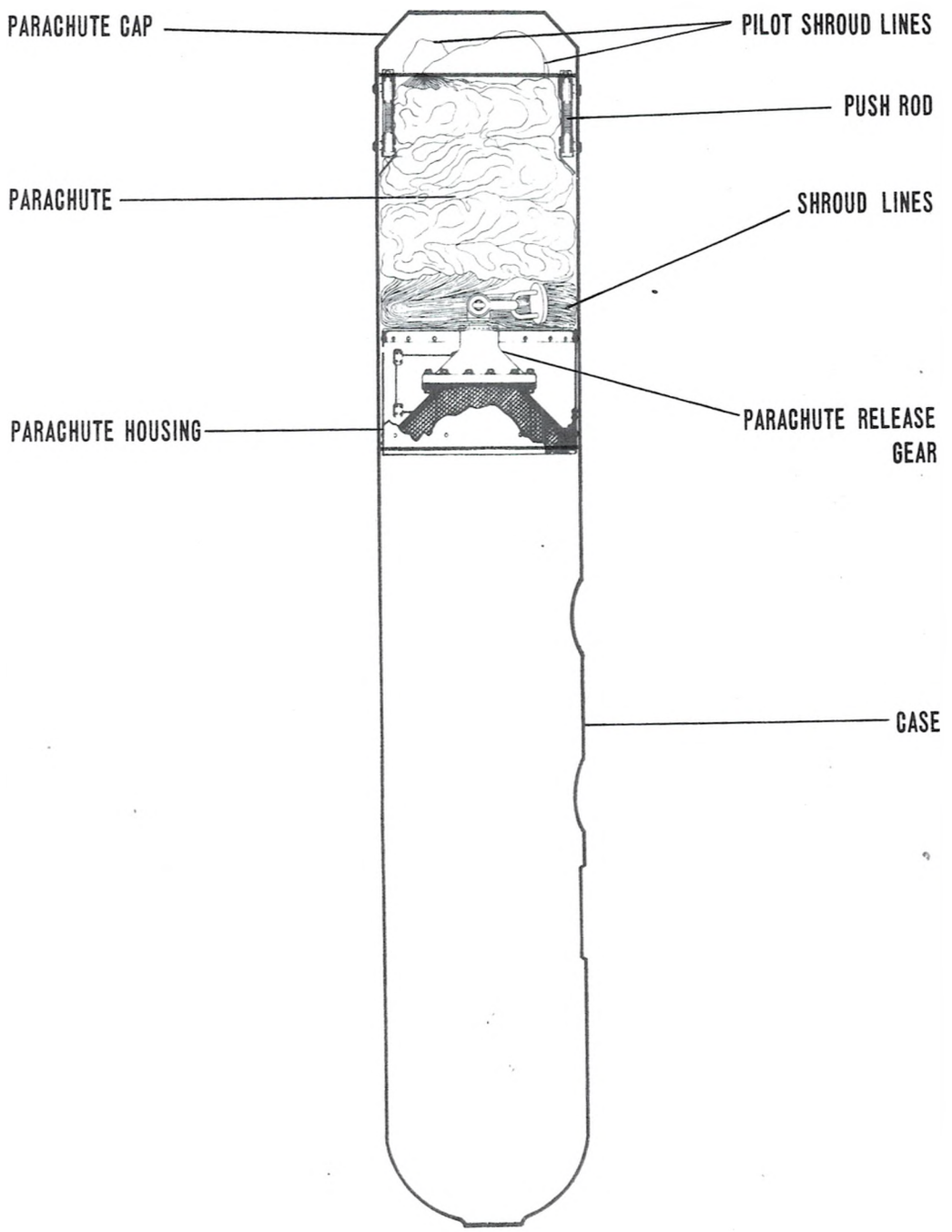
JETTISONING OF MINES

3.34 Mark 12 mines may be jettisoned either from torpedo tubes or from the decks of surface craft if safety pins are in place in the clock starters and extenders. In this condition the mines will probably remain safe indefinitely. However, if the pins should be dislodged or corroded away, the mine could arm. If the safety bars are secured in place on the mines with their safety screws, the possibility that the mines will arm is further reduced.

MARK 12 MOD. 1 MINE

O. P. NO. 901

MARK 12 MOD. 1 MINE



MARK 12 MOD. 1 SECTIONAL VIEW

4.1 The Mk. 12 Mod. 1 mine is essentially a Mark 12 mine with a parachute added to permit planting from an airplane torpedo rack. The safety bar is omitted and several modifications are made in the accessories, as noted below. The firing mechanism, explosive charge, and operation of the mine after planting are the same as for the Mark 12.

DIMENSIONS AND WEIGHTS

4.2 Approximate dimensions and weights of the Mark 12 Mod. 1 mine are as follows:

Length—130 inches.

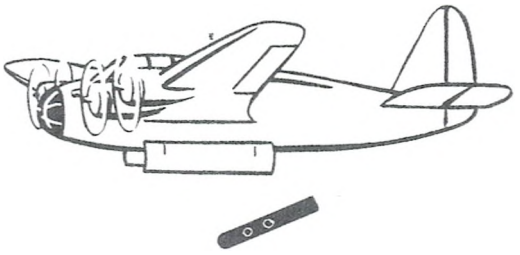
Diameter—20-13/16 inches.

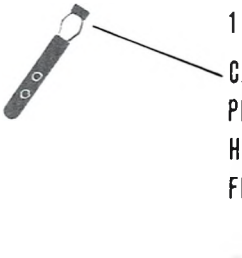
Weight of assembled mine—1595 pounds (TNT-loaded) or 1,725 pounds (Torpex-loaded).

LIST OF PARTS

4.3 Except for the changes listed below, a Mark 12 Mod. 1 mine is made up of the parts used in a Mark 12 Mine. Changes in parts necessary to modify a Mark 12 mine to a Mark 12 Mod. 1 (List of Drawings, Sk. No. 14986; General Arrangement, Dr. No. 239234; Outline, Dr. No. 239300) are as follows:

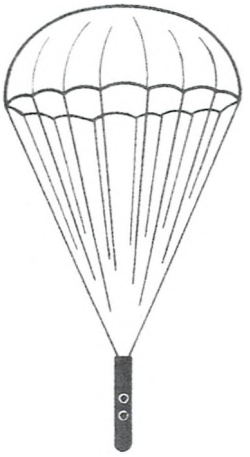
HOW IT WORKS





1

CAP FORCED OFF BY PUSH RODS. SERVES AS PILOT CHUTE PULLING PARACHUTE OUT OF HOUSING. CAP SNAPS BREAK LINE AND FALLS FREE OF MINE



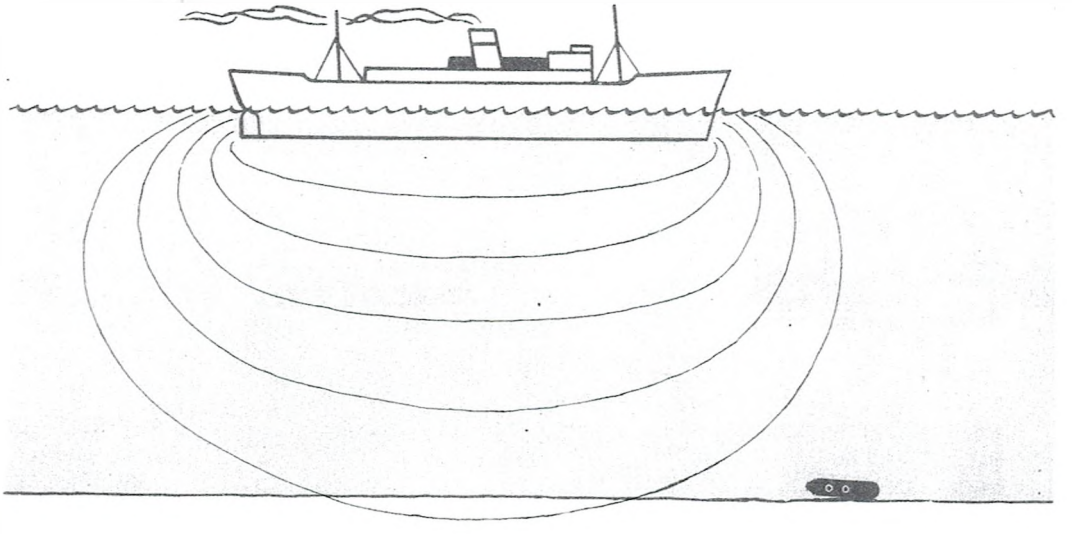
GENERAL

2

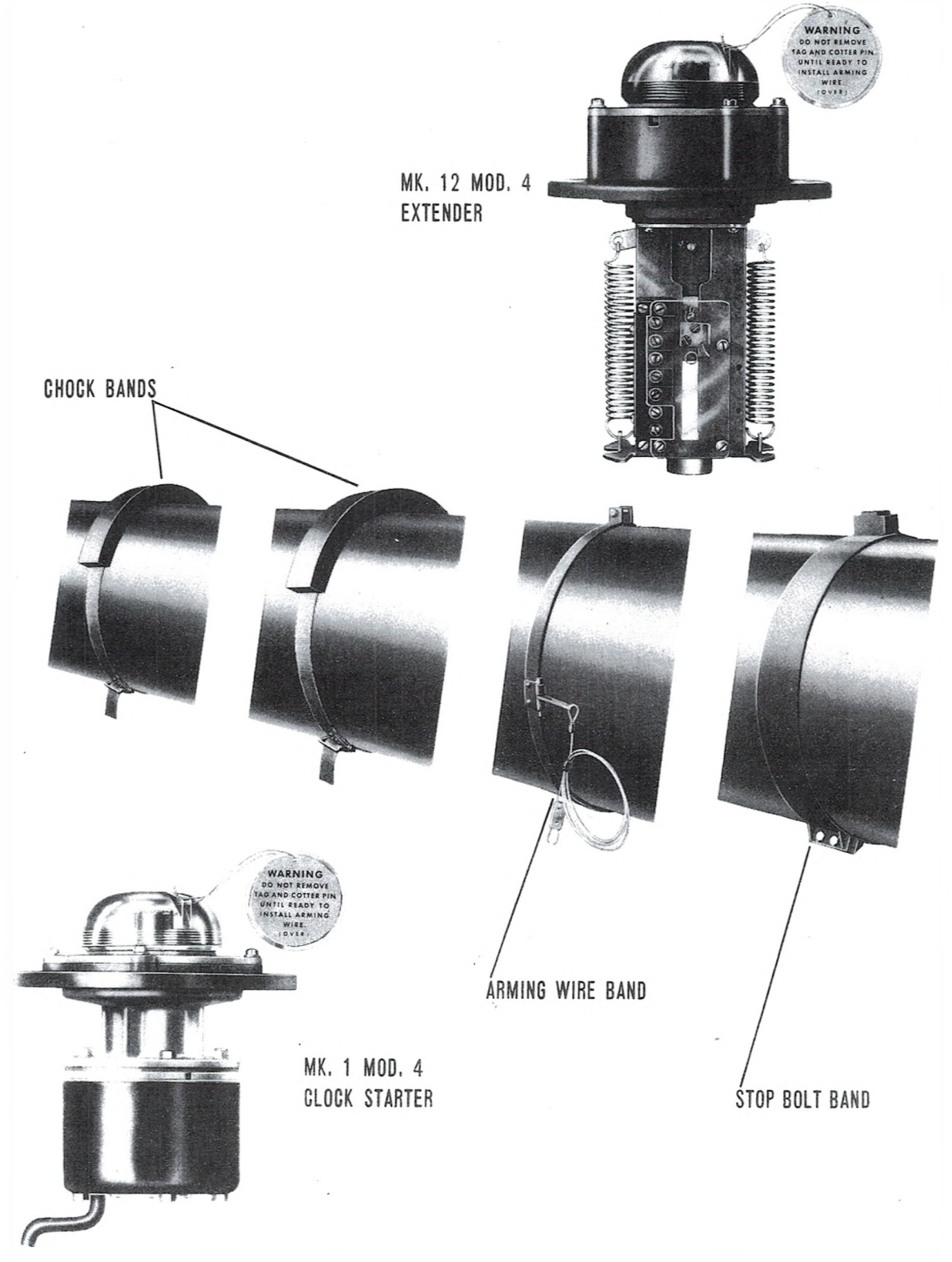
WATER PRESSURE CAUSES EXTENDER AND CLOCK MECHANISM TO OPERATE, ARMING MINE

3

CHANGES IN THE EARTH'S MAGNETIC FIELD, SUCH AS THOSE CAUSED BY PASSING SHIPS, FIRES MINE

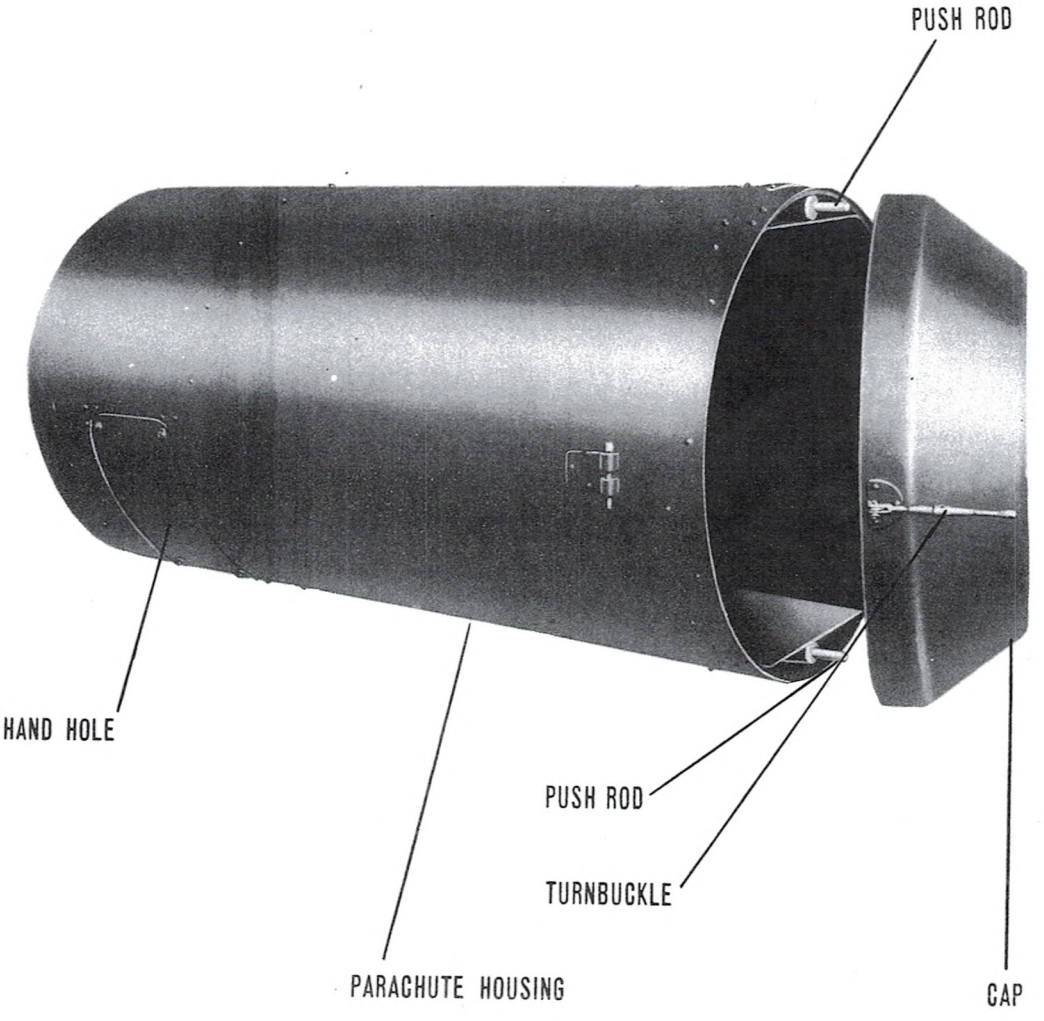


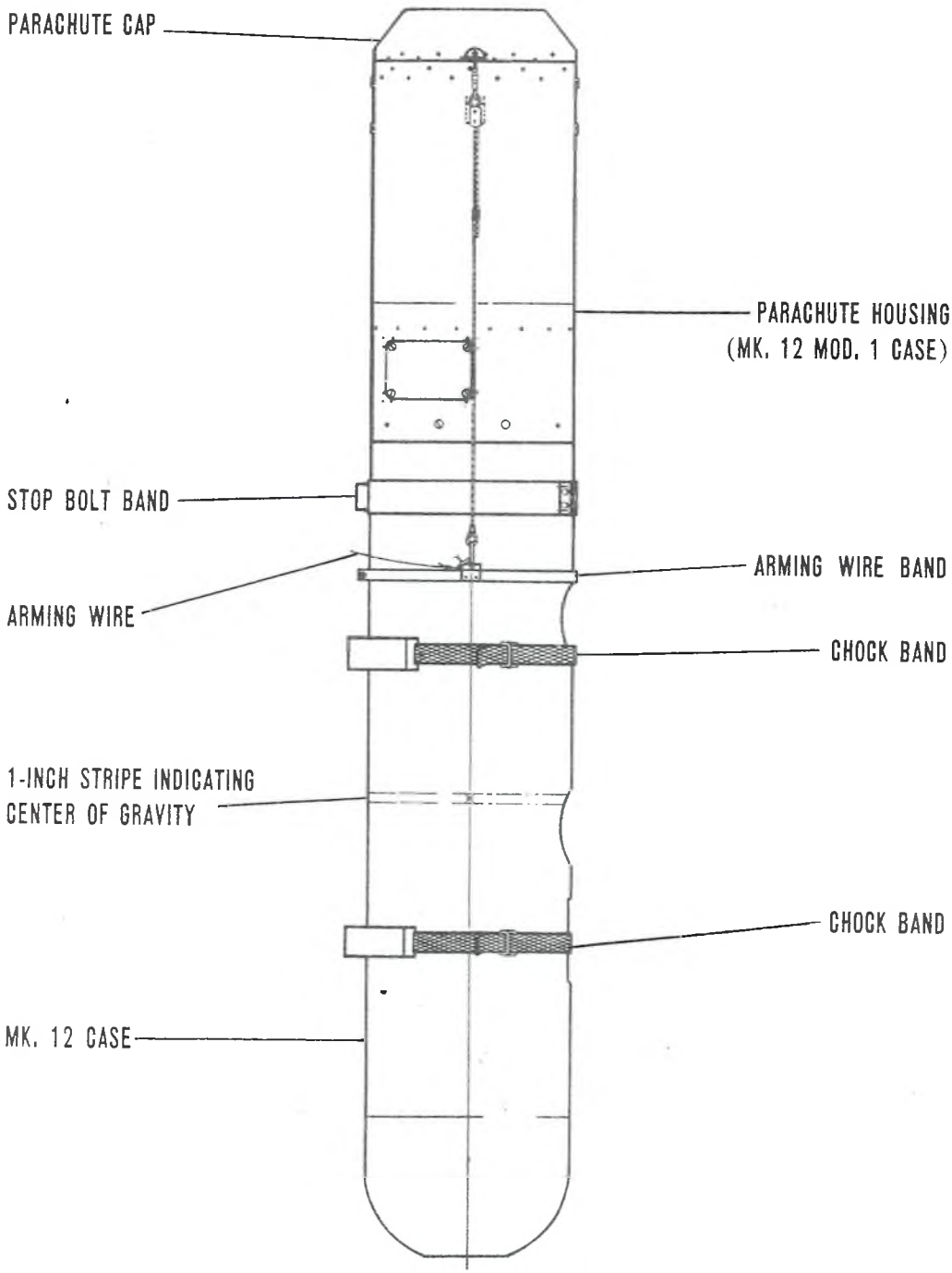
LIGHT BLUE INDICATES WATER


WARNING
DO NOT REMOVE TAG AND COTTER PIN UNTIL READY TO INSTALL ARMING WIRE.
(OVER)
MK. 12 MOD. 4
EXTENDER
CHOCK BANDS
ARMING WIRE BAND
STOP BOLT BAND
WARNING
DO NOT REMOVE TAG AND COTTER PIN UNTIL READY TO INSTALL ARMING WIRE.
(OVER)
MK. 1 MOD. 4
CLOCK STARTER

MARK 12 MOD. 1 MINE

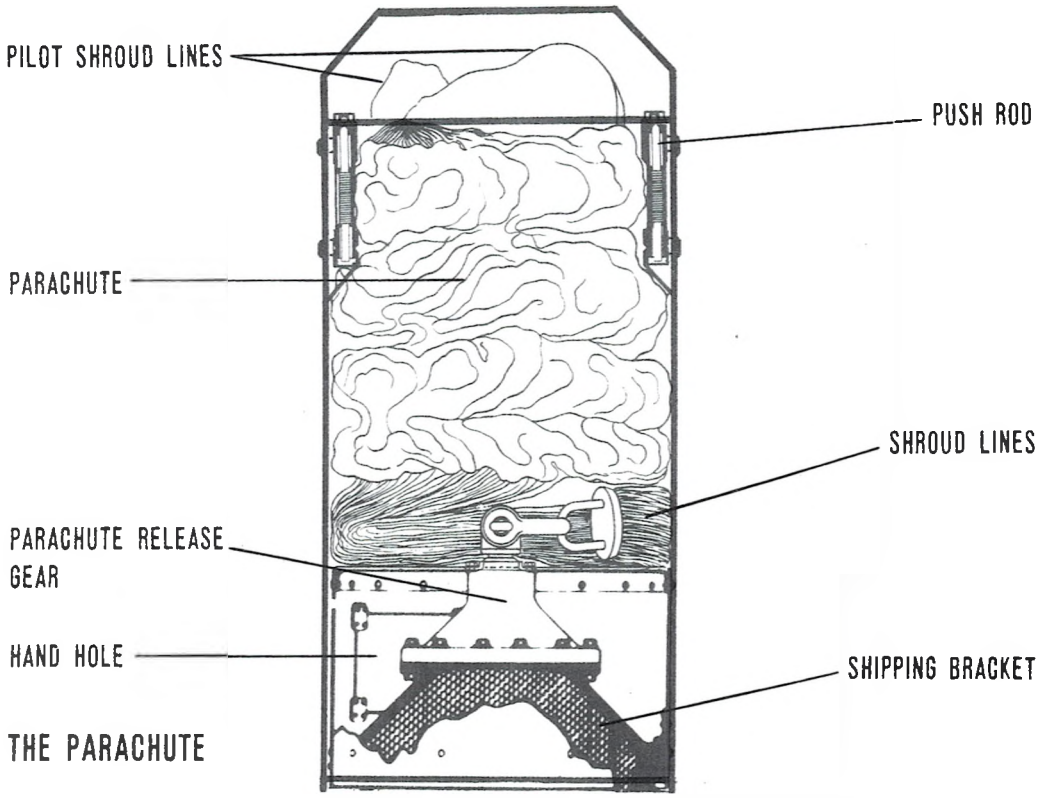
PARTS





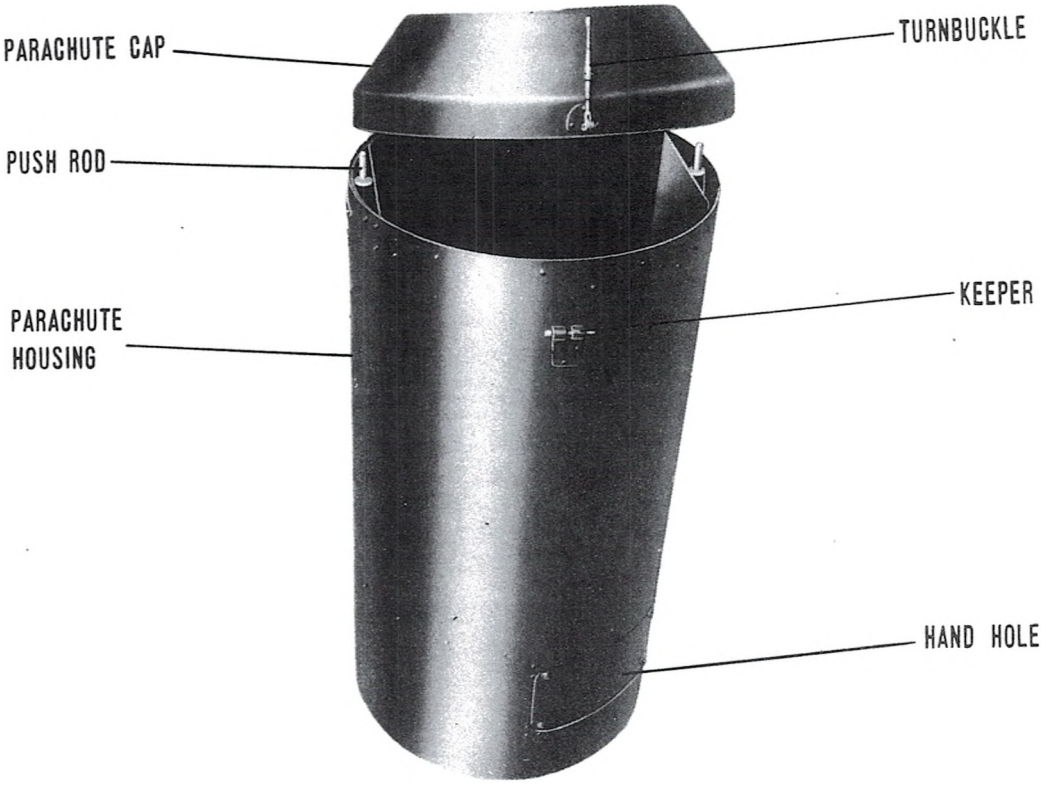
MARK 12 MOD. 1 MINE WITH CARRYING ACCESSORIES

DESIGNATION	LIST OF DRAWINGS SK. NO.	GENERAL ARRANGEMENT DR. NO.
(a) Parts added:		
(1) Parachute:		
Mark 1, or	14995	239315
Mark 1 Mod. 1	109935	383750
(2) Case (parachute housing)—Mark 12 Mod. 1	14984	239361
(3) Release Mechanism—Mark 6	14985	239218
(4) Stop Bolt Band—Mark 2	107379	239220
(5) Chock Band—Mark 4	107374	369288
(6) Arming Wire Band—Mark 1	107393	369291
(b) Parts substituted:		
(1) Clock Starter:		
Mark 1 Mod. 1, or	14978	231481
Mark 1 Mod. 4	55453	343074
(2) Extender:		
Mark 12 Mod. 1, or	14976	231455
Mark 12 Mod. 4	55452	343073
(c) Parts removed:		
(1) Connector plate and fin (the fin was included on only the first 6,200 cases).		
(2) Safety Bar		
(3) Guide Latch Assembly		



THE PARACHUTE

4.4 THE PARACHUTE. The parachute is made of rayon cloth. Twenty-eight shroud lines secure the canopy of the chute to an attachment ring and U bolt with which the assembly is fastened to a release mechanism on the mine case. A 51-inch-diameter vent hole is cut in the center of the canopy, and a pilot break line is fastened around the shrouds at the vent. Four pilot shroud lines attached to the break line connect the parachute to a cap on the parachute housing. When the mine is dropped from a plane, the cap is forced off the housing by push rods and serves as a pilot chute, pulling the parachute out of the housing. The cap then snaps the break line and falls free of the mine. When opened, the parachute is approximately 19 feet in diameter and 20 feet long. The Mark 1 Mod. 1 parachute differs from the Mark 1 only in the details of construction.



THE PARACHUTE HOUSING

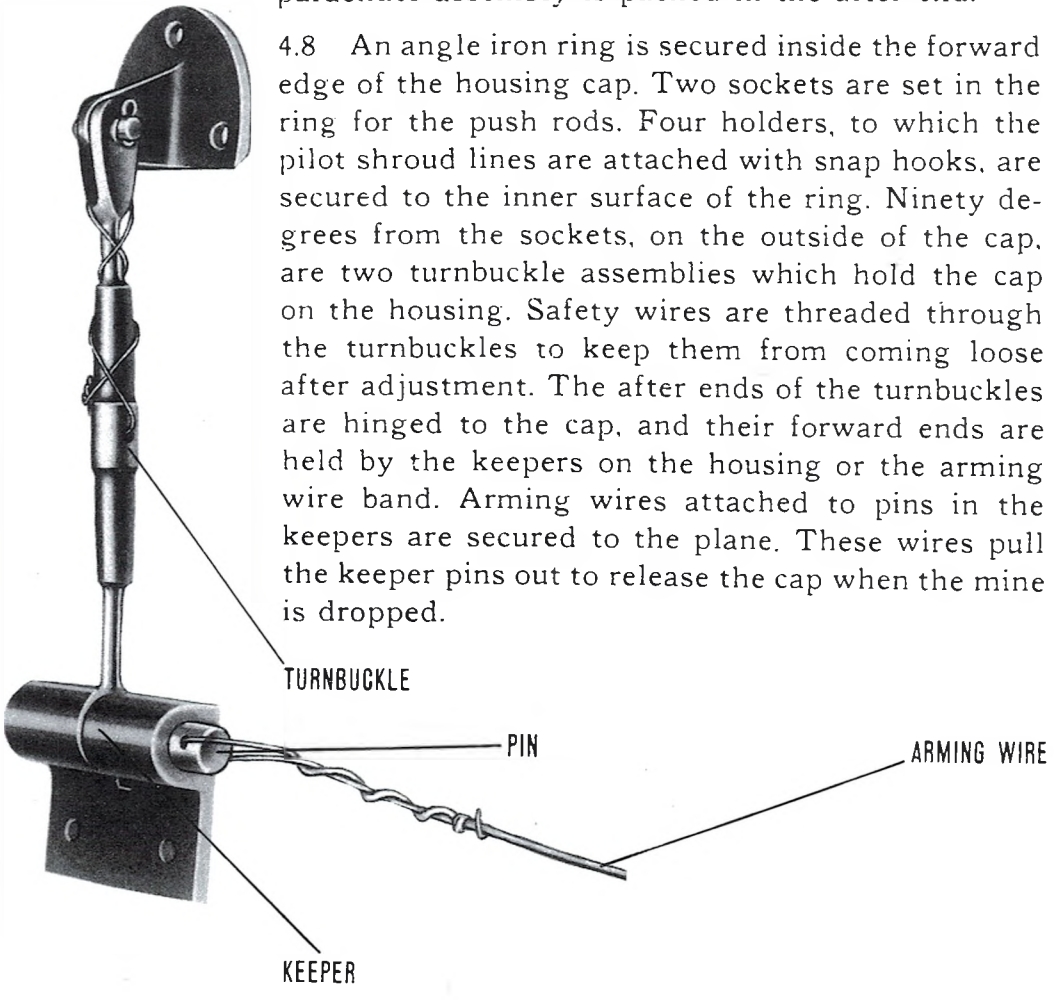
4.5 THE PARACHUTE HOUSING. The parachute housing, designated the Mark 12 Mod. 1 case, is made in two parts—a cylindrical housing, which is attached to the Mk. 12 mine case, and the cap, which closes the after end of the housing until the mine is dropped.

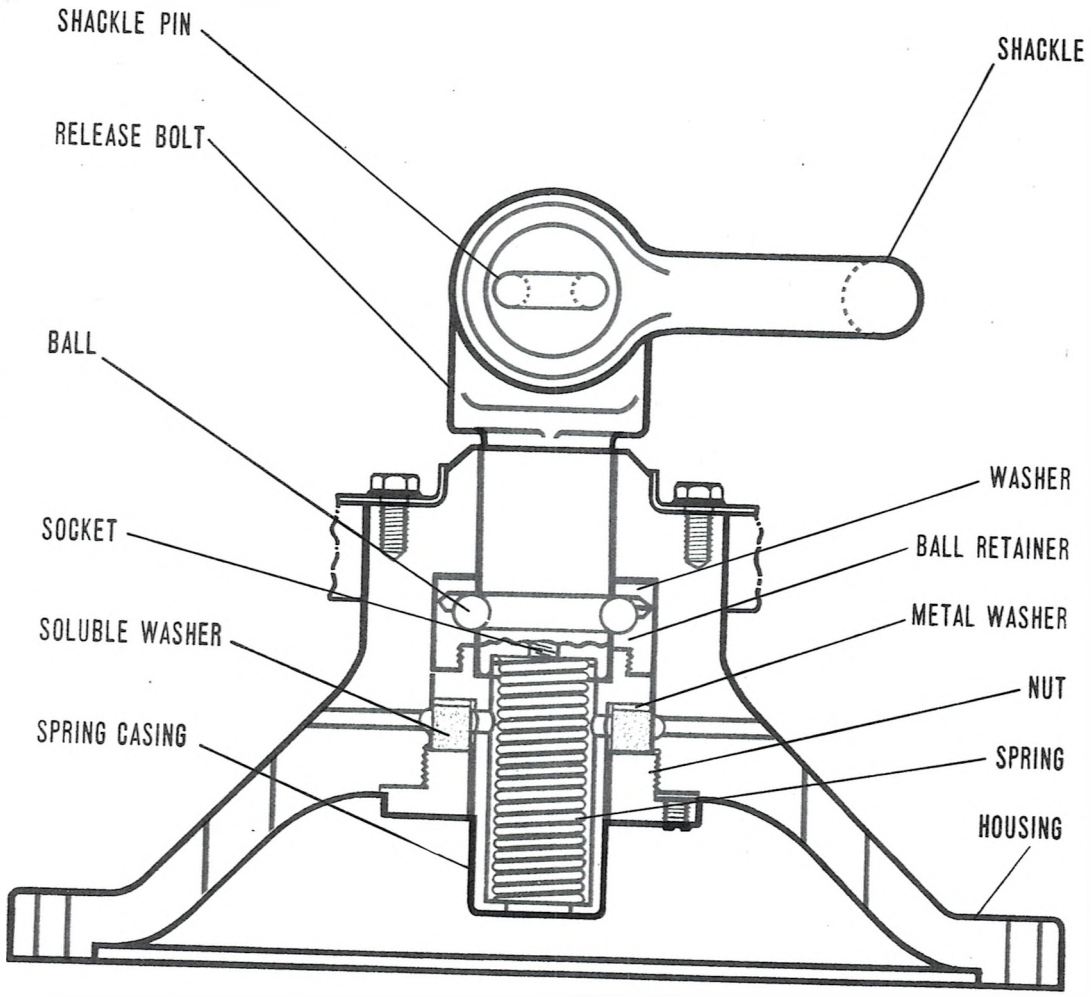
4.6 A guide pin riveted to the forward end of the housing fits in the safety bar thumb screw hole in the mine cap. Two hand holes in the forward end of the housing give access to the bolt flange of the release mechanism which secures the parachute to the mine case. Diametrically opposite each other at the after end of the housing are two push-rod assemblies which separate the cap from the housing when

the mine is dropped. Two keepers for holding the cap in place are riveted to the after end of the housing, 90 degrees from the push-rod assemblies. Keepers for the cap are also provided on the Mk. 1 arming wire band. This band may be used when necessary to provide a satisfactory lead for the parachute arming wires.

4.7 The forward section of the housing is divided into two parts by a support plate to which the release mechanism is bolted. The release mechanism is enclosed in the forward end of the housing, the parachute assembly is packed in the after end.

4.8 An angle iron ring is secured inside the forward edge of the housing cap. Two sockets are set in the ring for the push rods. Four holders, to which the pilot shroud lines are attached with snap hooks, are secured to the inner surface of the ring. Ninety degrees from the sockets, on the outside of the cap, are two turnbuckle assemblies which hold the cap on the housing. Safety wires are threaded through the turnbuckles to keep them from coming loose after adjustment. The after ends of the turnbuckles are hinged to the cap, and their forward ends are held by the keepers on the housing or the arming wire band. Arming wires attached to pins in the keepers are secured to the plane. These wires pull the keeper pins out to release the cap when the mine is dropped.





MARK 6 RELEASE MECHANISM

PARACHUTE RELEASE MECHANISM

4.9 THE PARACHUTE RELEASE MECHANISM. The Mk. 6 parachute release mechanism is a soluble-washer-controlled device which keeps the parachute attached to the mine until after the mine is submerged, and then allows the parachute to separate from the case and drift away from the mine. This is intended to prevent the mine from being dragged along the bottom if planted where there are currents and to remove the steel parts of the parachute assembly (which might affect the operation of the firing mechanism) from the vicinity of the mine.

4.10 Principal parts of the release mechanism are:

(a) A housing which is bolted to the cap of the mine case and to the support of the parachute housing.

(b) A release bolt fitted with a shackle for securing the parachute attachment ring to the mechanism.

(c) A spring and spring retainer.

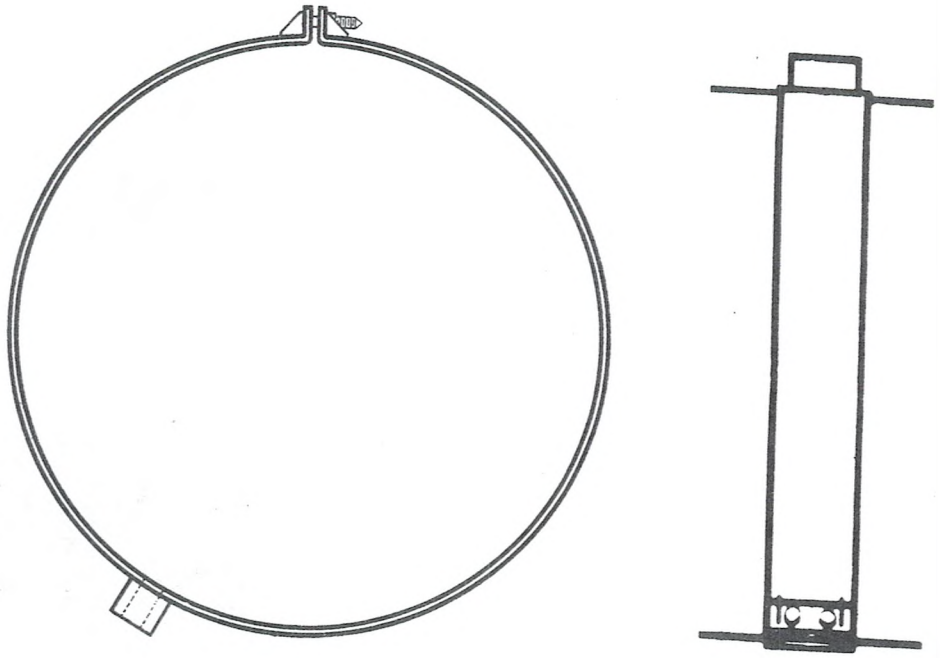
(d) A ball retainer.

(e) Eleven steel balls.

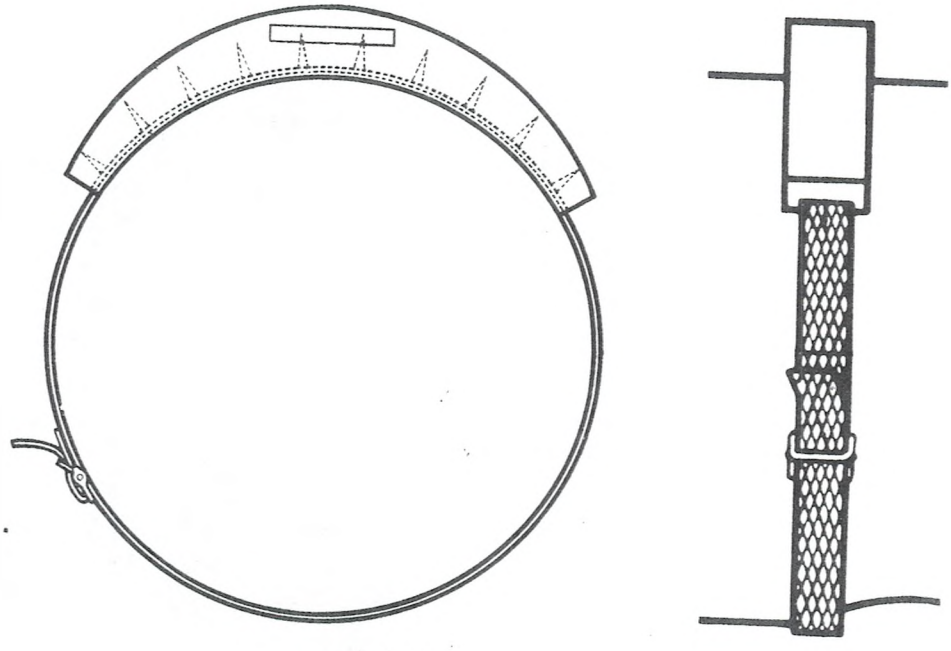
When the mechanism is assembled with a soluble washer in place, the steel balls are held partly in a groove in the release bolt and partly in the housing. Because these balls are slightly loose they serve as ball bearings and allow the release bolt to revolve, preventing the parachute shroud lines from twisting.

4.11 The soluble washer dissolves after being submerged approximately 20 minutes. The spring then moves the ball retainer clear of the balls, allowing them to slip out of the groove in the release bolt. This forces the release bolt clear of the mechanism, freeing the parachute.

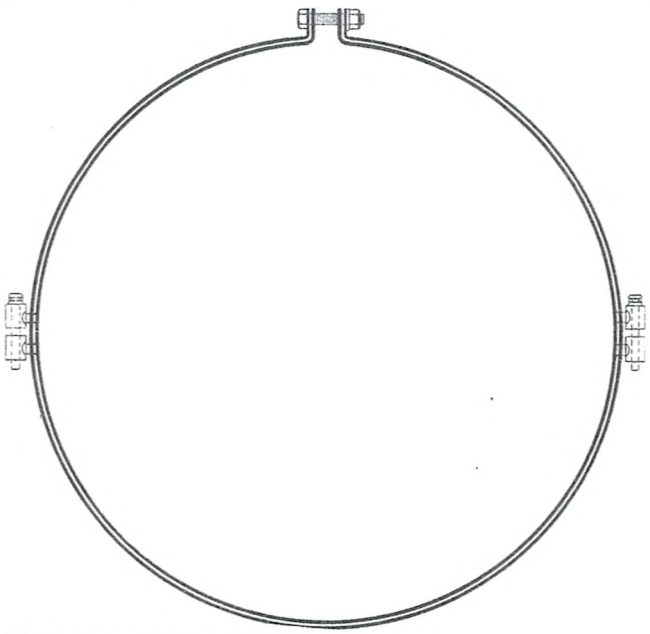
4.12 During shipment and storage the release mechanism is assembled with a wooden washer in place of the soluble washer. The wooden washer must be replaced with a soluble one before a mine is planted.

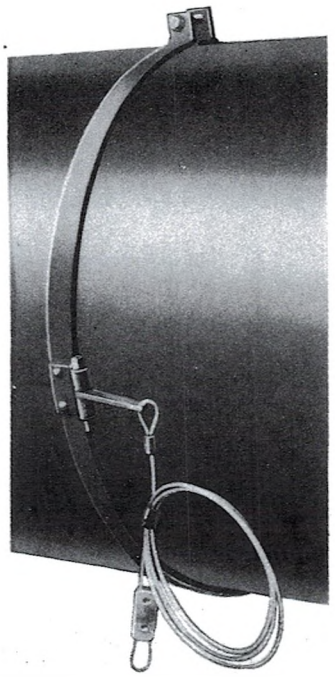


STOP BOLT BAND

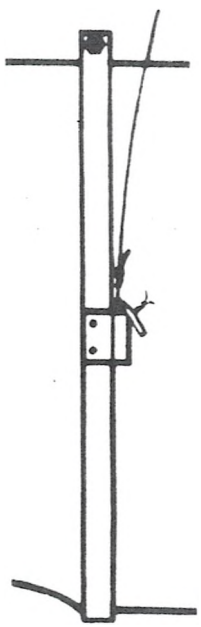


CHOCK BAND

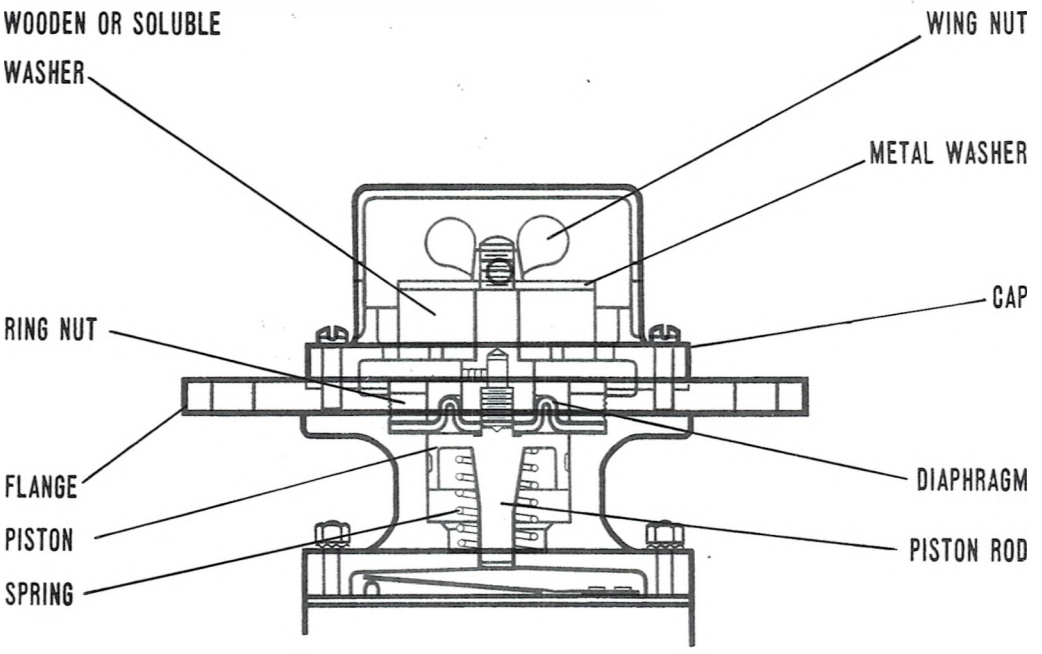




THE ARMING WIRE BAND



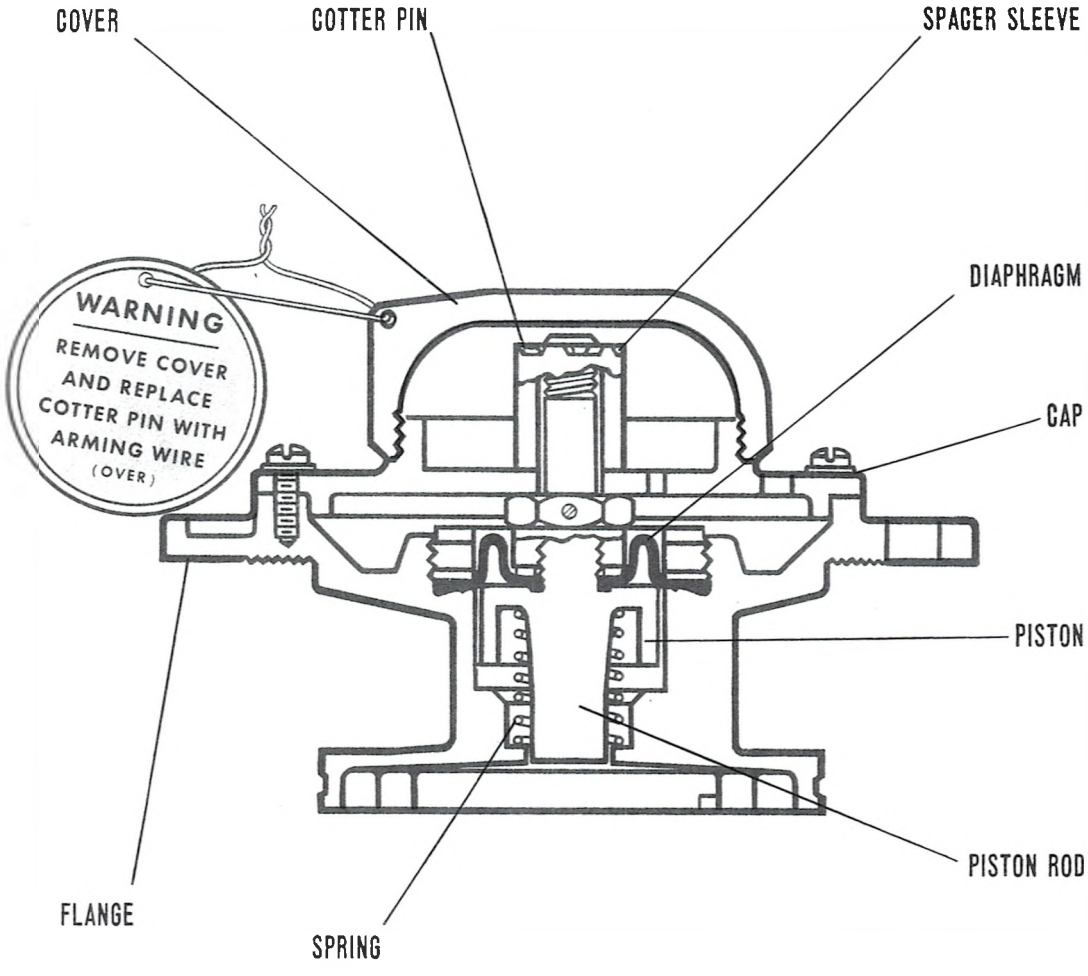
4.15 THE ARMING WIRE BAND. In some racks in which the Mk. 12 Mod. 1 mine may be carried it is not feasible to lead the arming wire of the parachute cap directly upward to secure them to the plane. In this event, a Mk. 1 arming wire band must be used to insure proper release of the parachute cap. The arming wire band assembly includes the band and two cables fitted with connectors for attaching them to the band and with clamps by which the lengths of cables can be adjusted. When this band is used, it is secured around the mine case at a point such that when the mine is loaded in the rack from which it is to be planted, the parachute cap arming wires can be secured to the plane directly above the keepers on the band. The cables are secured in the keepers on the band by pins (to which the arming wires are fastened) passing through the keepers and holes in the connectors on the ends of the cables. The cable loops are passed through the eyes in the turnbuckles on a parachute cap and the cables are taken up to the correct length by adjusting the loops and securing the clamps.



MARK 1 MOD. 1 CLOCK STARTER

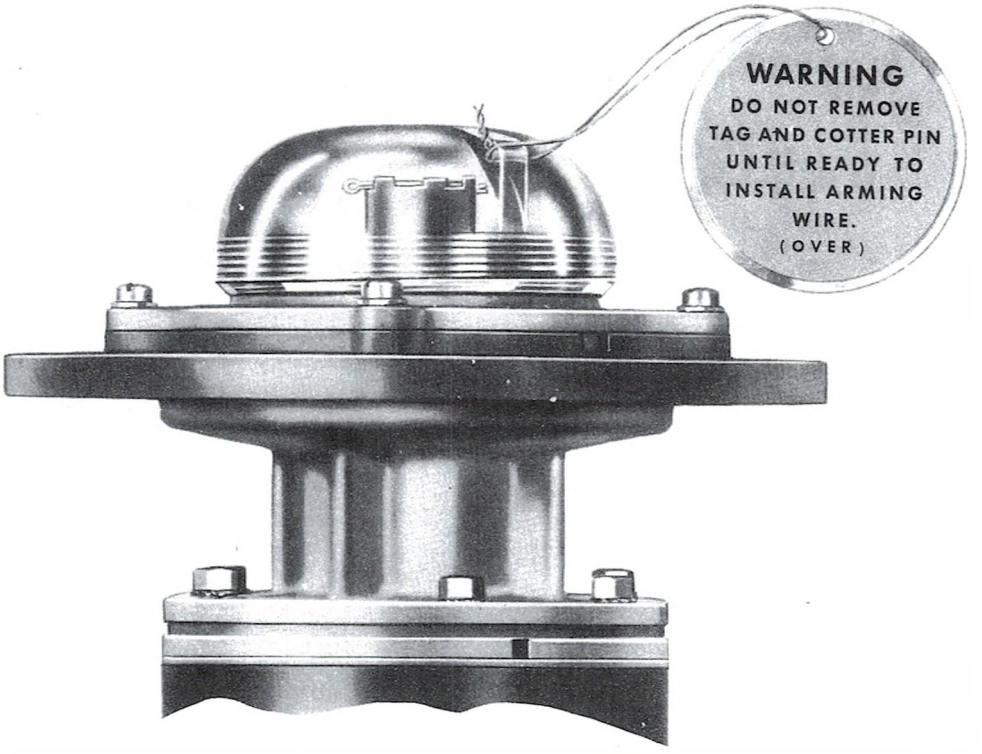
THE CLOCK STARTER

4.16 THE CLOCK STARTER. The Mk. 1 Mod. 1 clock starter is similar to the Mk. 1 except for the outer portion of the mechanism. The ball lock parts are replaced by a large metal washer which rests on a shoulder on the piston rod and is held in place by a wing nut. A wooden washer is placed in the clock starter during shipment and storage to lock it in the safe position. This washer must be replaced by a soluble washer before the mine is planted. A metal cover screws onto the outer portion of the mechanism to protect the soluble washer.



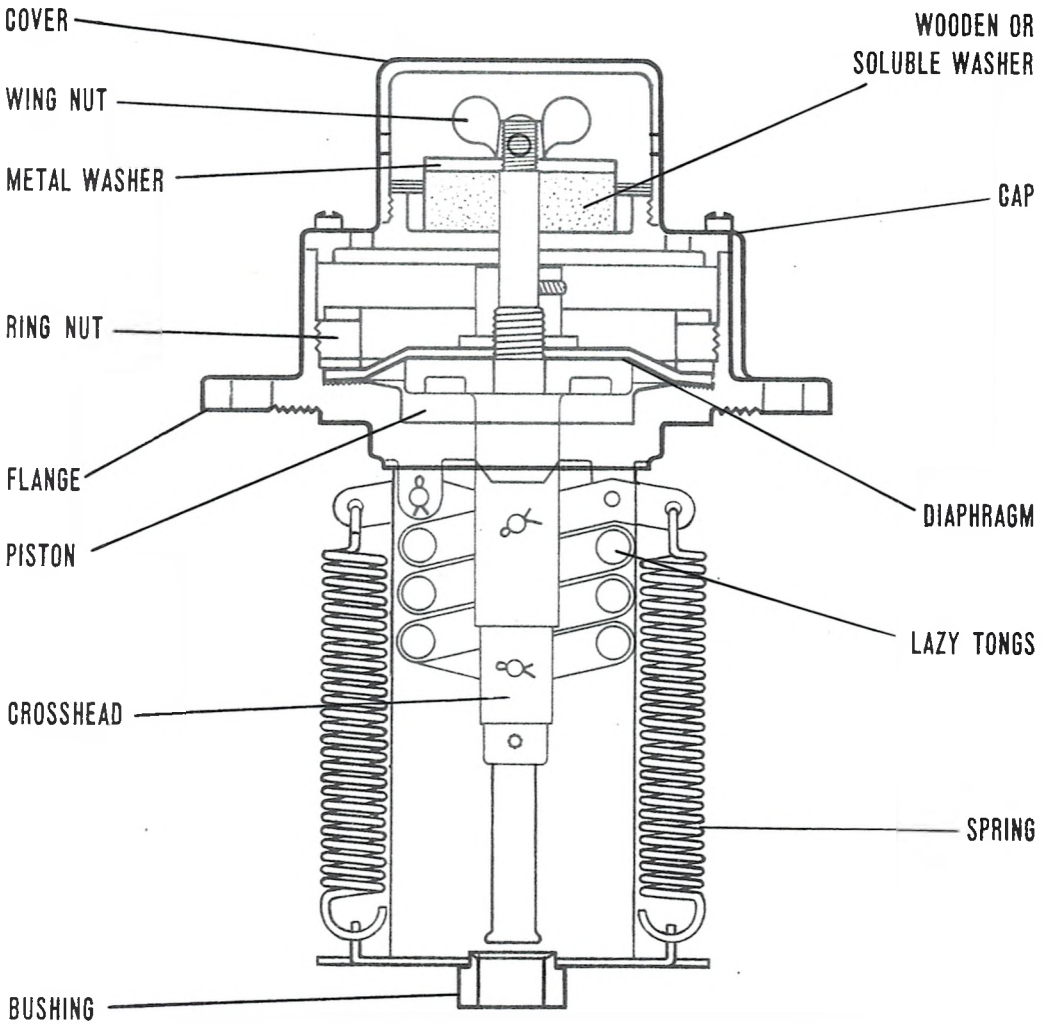
GENERAL ARRANGEMENT

CLOCK STARTER



MARK 1 MOD. 4 CLOCK STARTER

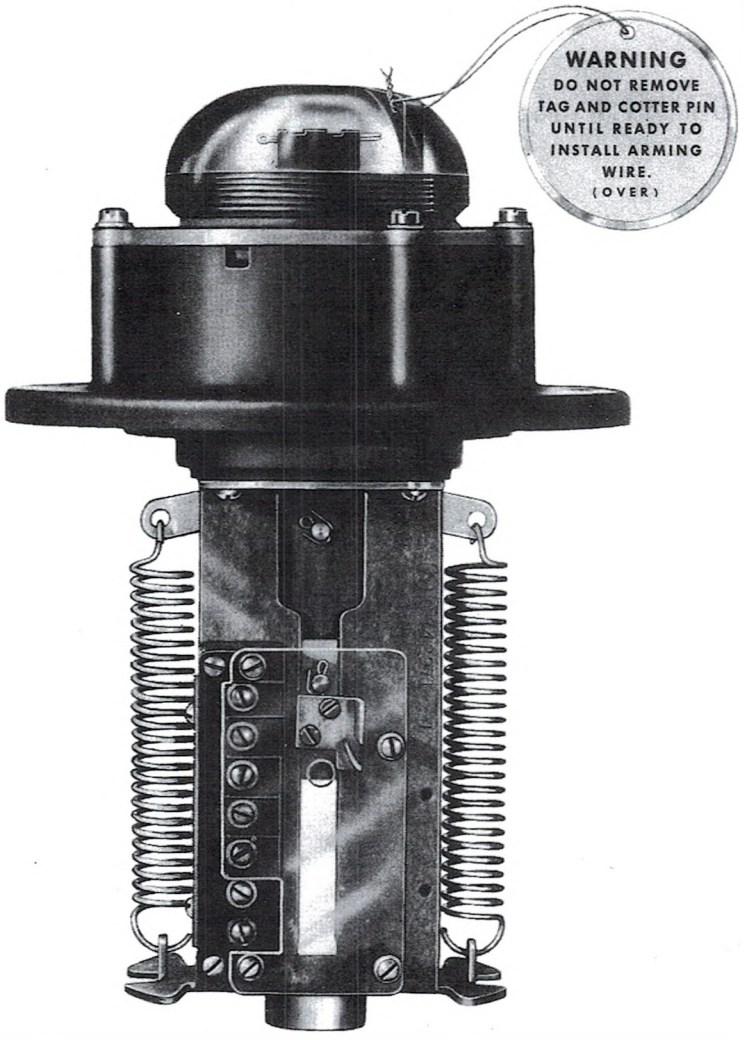
4.17 The Mk. 1 Mod. 4 clock starter is similar to the Mk. 1 except that a spacer sleeve, secured by a cotter pin before planting, takes the place of the ball lock assembly. When the mine is loaded into a torpedo rack, an arming wire replaces the cotter pin. When the mine is released, the arming wire is withdrawn and the clock starter is then free to operate. A transparent cover is supplied with this mechanism to protect its outer parts until the mine is prepared for planting.



MARK 12 MOD. 1 EXTENDER

4.18 THE EXTENDER. The Mk. 12 Mod. 1 extender differs from the Mk. 12 in the same way that the Mk. 1 Mod. 1 clock starter differs from the Mk. 1, the ball lock parts being replaced with soluble washer parts similar to those of the clock starter. The same wooden and soluble washers are used in both mechanisms.

EXTENDER



MARK 12 MOD. 4 EXTENDER

4.19 The Mk. 12 Mod. 4 extender is similar to the Mk. 12 Mod. 5 except that a spacer sleeve secured by a cotter pin or arming wire replaces the ball lock. As in the Mk. 1 Mod. 4 clock starter, arming wires release the extender for action when the mine is dropped. Mk. 12 Mod. 4 extenders may be issued with antirecovery switches. These switches are not used in the Mark 12 Mod. 1 mine, and should be removed at assembly.

INSTRUCTIONS FOR ASSEMBLING THE MARK 12 MOD. 1 MINE

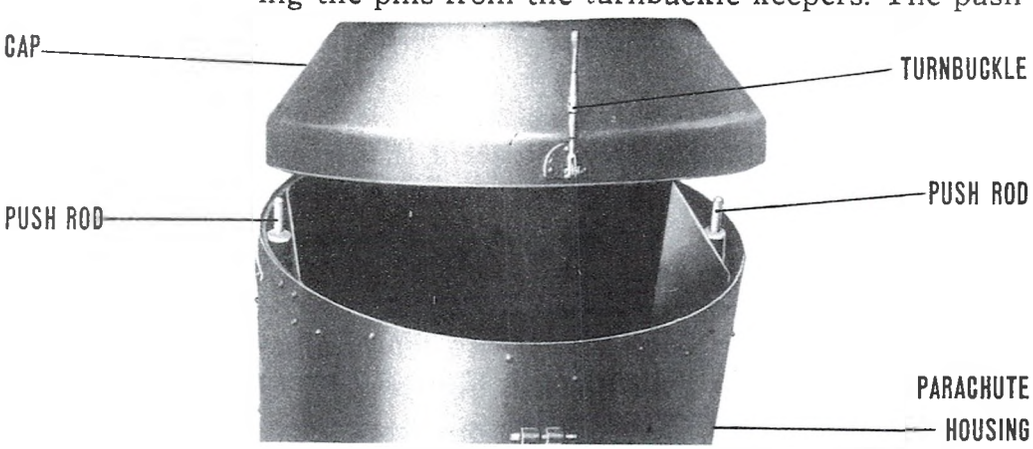
5.1 With the exceptions noted in Chapter IV, assembly of a Mk. 12 Mod. 1 mine is the same as that of a Mk. 12 up to the point of adding the Mk. 12 Mod. 1 case containing the parachute gear.

5.2 During shipment (in a plywood box) the parachute cap and the Mk. 6 release mechanism are assembled on the parachute housing. Parachutes are usually boxed separately, one to a box.

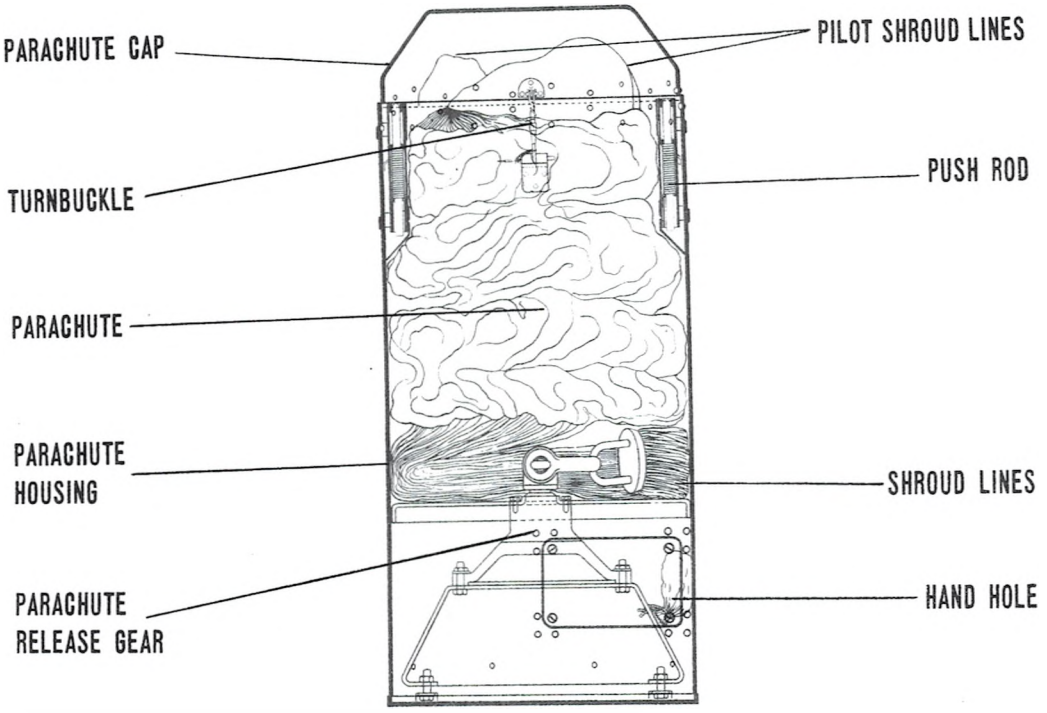
5.3 The release mechanism is bolted to the support plate and to an iron shipping brace which in turn is bolted to a wooden ring in the crate. As this ring protects the release mechanism and its housing, it should be kept secured to the housing as long as possible. A wooden washer is installed in the release mechanism to hold it together during shipment. This must be replaced by a soluble washer before the mine is planted. Tools for assembling Mk. 12 Mod. 1 mines are in the tool set for Mk. 12 mines.

ASSEMBLING THE PARACHUTE HOUSING

5.4 After removing the housing from its crate, detach the parachute cap from the housing by removing the pins from the turnbuckle keepers. The push



GENERAL



rods will then force the cap away from the housing. Disconnect the shackle from the release bolt by withdrawing the cotter pin from the end of the shackle pin and unscrewing the pin.

5.5 Remove the three ropes tied around the shroud lines of the parachute and suspend it by the vent shrouds. If sufficient space is not available to suspend it above the deck, stretch the parachute out along the deck, taking care to avoid catching it on projections or sharp edges.

5.6 Stand the housing, forward end down, close to the shroud attachment ring. Hook the shackle through the U-bolt of the ring. Place the shackle pin through the shackle and the release bolt and insert a cotter pin in the shackle pin, opening the ends of the cotter pin to hold it in place.

5.7 While lowering the parachute slowly (or carrying it toward the housing if it is laid out on the deck), hold the shroud lines in both hands and lay the lines in the housing in parallel folds. Pack the full length of the lines in two layers in this manner, taking care to arrange them so that they will not tangle when paying out. It is important that the shroud lines be laid evenly without twists, spirals, or figure eights. Place the canopy in the housing, distributing the cloth evenly over the entire area.

5.8 Draw the slip noose of the pilot break line tightly around the shroud lines where they cross in the vent hole of the parachute. Secure the parachute in place with string tied between the holes in the housing diametrically opposite each other. This string should have a breaking strength of not more than 10 pounds. Knot the string at each hole.

5.9 Attach the pilot shroud trigger hooks to the holders on the inside of the parachute cap.

5.10 Attach the cap to the parachute housing as follows:

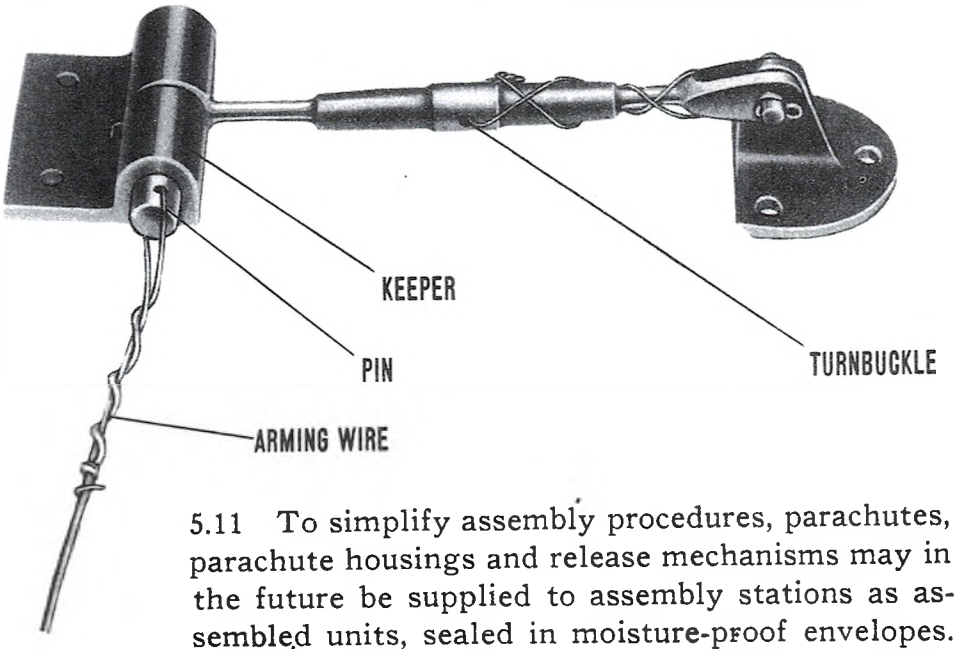
(a) Test the push rods on the housing by depressing the rods and then allowing them to be pushed out by their springs.

(b) Fit the push rods into the sockets in the cap ring and push the cap into place.

(c) Secure the turnbuckle eyes in the keepers on the housing.

(d) Adjust the turnbuckles until there is about ⅛-inch clearance between the cap and the ring in the housing on which it seats.

(e) Thread wire through turnbuckles and secure them.



5.11 To simplify assembly procedures, parachutes, parachute housings and release mechanisms may in the future be supplied to assembly stations as assembled units, sealed in moisture-proof envelopes. These envelopes should never be broken or opened until the parachute assemblies are assembled on mine cases.

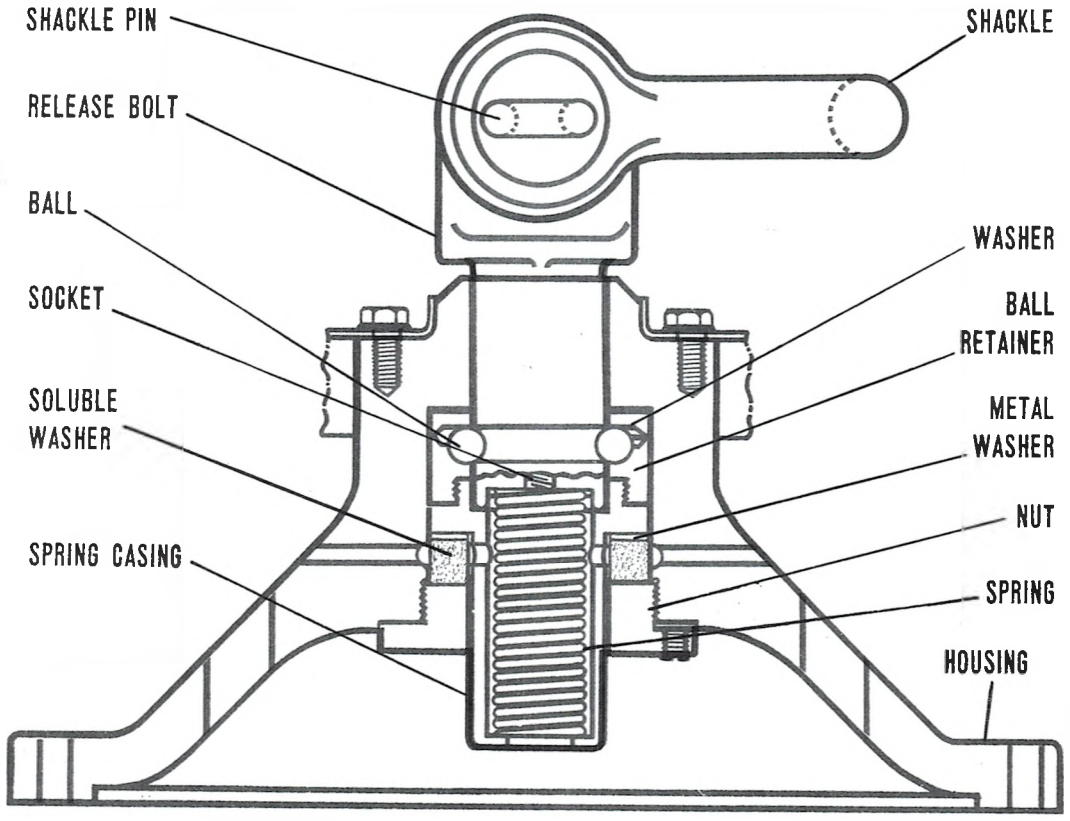
ATTACHING THE PARACHUTE HOUSING TO THE MINE CASE

5.12 Remove the hand hole covers from the parachute housing and detach the wooden ring and steel brace.

5.13 Replace the wooden washer in the release mechanism with a soluble washer as follows:

(a) Screw the threaded end of the special tool supplied for this assembly into the socket in the forward end of the release bolt. Tighten the nut on the tool against the spring retainer.

PARACHUTE RELEASE MECHANISM ASSEMBLY TOOL



MARK 6 RELEASE MECHANISM

(b) Unscrew the locking nut with the spanner provided for this purpose.

(c) Loosen the nut on the assembly tool about ⅜ inch, no more, and exert sufficient pressure on the tool to loosen the wooden and brass washers. Remove the washers.

(d) Slowly screw the nut on the tool up again. Before tightening it fully, jiggle the tool to make sure that the ball bearings seat properly; then tighten the nut.

(e) Place the brass washer and then a soluble washer around the spring retainer. Replace and tighten the locking nut, which should seat to within ⅛-inch of the recess in the release mech-

anism frame. If the locking nut does not seat within this limit, the ball bearings are probably not in place, and it will be necessary to loosen the nut on the assembly tool and tighten it again, as in (d).

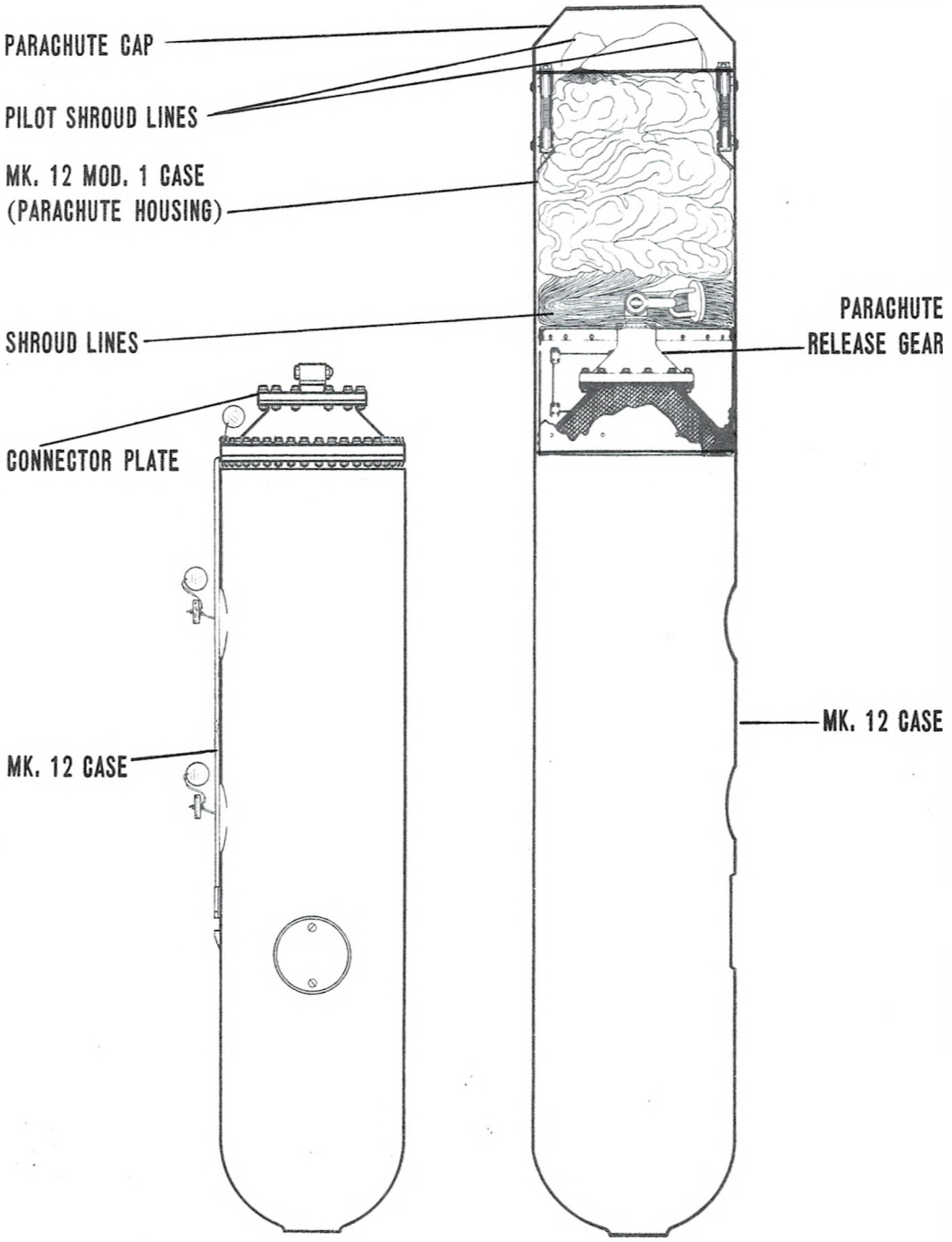
(f) Tighten the locking nut set screw.

5.14 Place the parachute housing over the mine cap with its guide pin in the safety bar screw hole. Bolt the release mechanism housing to the cap of the mine case. Use the special long wrench to hold the nuts and a short wrench to draw up the bolts. If it is difficult to fit the parachute housing on the mine cap, inspect the rubber gasket between the mine case and the cap. If the gasket protrudes, it may be necessary to cut off the protrusions with a sharp knife before the parachute housing will seat properly. Insert screws through the holes around the forward edge of the housing into the holes in the mine cap and set them up. If the screw holes do not line up, it may be necessary to enlarge the holes in the parachute housing.

5.15 Cut the knots off the strings which were tied across the after end of the parachute housing to keep the parachute compressed.

5.16 Determine the center of gravity of the assembled mine and paint a one-inch wide stripe around the mine case at this point.

5.17 Complete assembly of the Mk. 12 Mod. 1 mine should not be made more than two weeks before the mine is to be planted, as the soluble washer in the release mechanism will deteriorate under unfavorable conditions. If for any reason complete assembly is made long in advance of planting and the wooden washer left in the release mechanism, the mine must be disassembled and a soluble washer installed before planting.



MARK 12 MINE MARK 12 MOD. 1 MINE

CONVERSION OF ASSEMBLED MK. 12 MINE TO MARK 12 MOD. 1

5.18 To convert an assembled Mk. 12 mine for use as a Mk. 12 Mod. 1, remove the safety bar, the guide latch assembly, and the connector plate.

5.19 Substitute a Mk. 1 Mod. 1 or a Mk. 1 Mod. 4 clock starter for the Mk. 1 or Mk. 1 Mod. 5 as follows:

(a) Remove and disassemble the clock assembly.

(b) Assemble and test the clock starter and clock delay mechanism to be used as directed in paragraphs 2.5-2.6.

(c) Install the clock assembly.

5.20 Substitute a Mk. 12 Mod. 1 or a Mk. 12 Mod. 4 extender for the Mk. 12 or Mk. 12 Mod. 5 as follows:

(a) Remove the extender to be replaced.

(b) Test the extender to be used as directed in paragraph 2.7-2.8.

(c) Install the extender.

NOTE: Detonators are not installed until immediately before mines are issued for planting. See paragraph 3.7 for instructions for detonator installation.

5.21 Install the parachute gear as directed in paragraphs 5.4 through 5.17.

GENERAL INSTRUCTIONS

6.1 Mk. 12 Mod. 1 mines are designed for planting from airplane torpedo racks, and will be issued for service completely assembled except for detonators, soluble washers, and/or arming wires.

6.2 The same precautions should be observed when handling and stowing Mk. 12 Mod. 1 mines as are observed when handling and stowing Mk. 12 mines (par. 3.2).

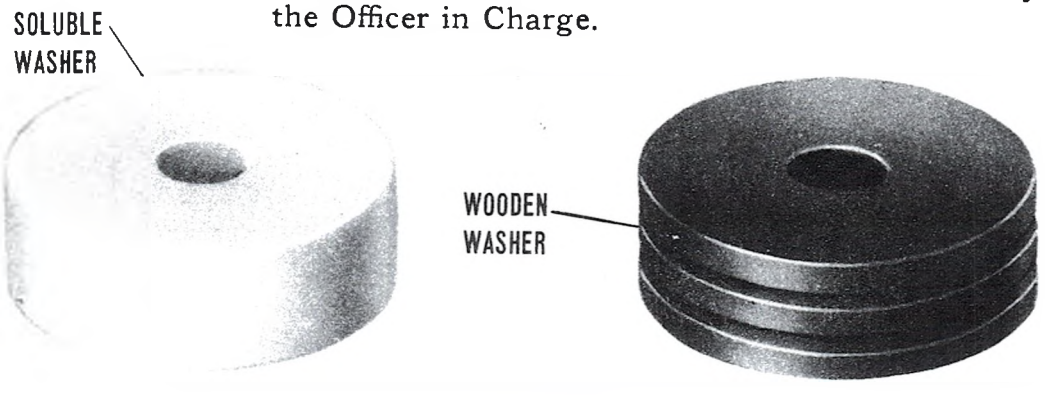
PREPARING MINES FOR PLANTING

6.3 ADVANCE BASE INSPECTION. Each mine should be given a field operational test and/or inspection before the detonator is installed. In addition to the items noted for inspection in paragraph 3.6, the parachute gear should also be inspected.

6.4 DETONATOR INSTALLATION. Detonators are installed in Mk. 12 Mod. 1 mines as directed in paragraph 3.7 before the mines are issued to the aircraft by which they will be planted.

USE OF SOLUBLE WASHERS AND ARMING WIRES

6.5 GENERAL. The choice of the proper combination of soluble washers and arming wires depends upon planting conditions, and will be directed by the Officer in Charge.



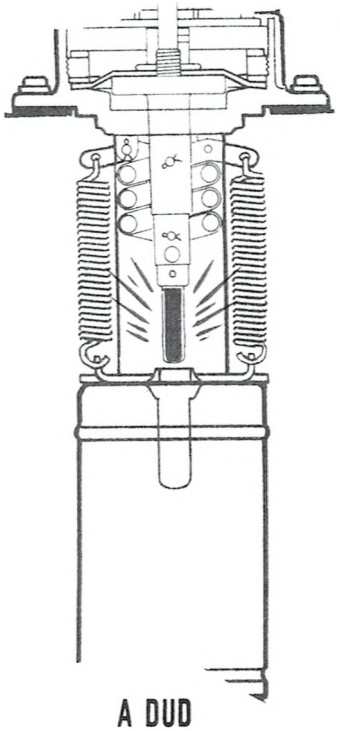
6.6 Mines planted on soft bottoms settle quickly and so do not require long delays between planting and arming, while mines planted on hard bottoms where there are strong currents may not become stabilized quickly, and so require long delays.

6.7 The time in which a soluble washer is designed to dissolve is based on average conditions, and planting conditions may cause considerable variation from the designed period. Washers dissolve faster in warm water than in cold. A strong current which causes water to circulate around a washer will decrease its dissolving time, while a washer imbedded in mud or silt may take from 2 to 10 times its designed period to dissolve.

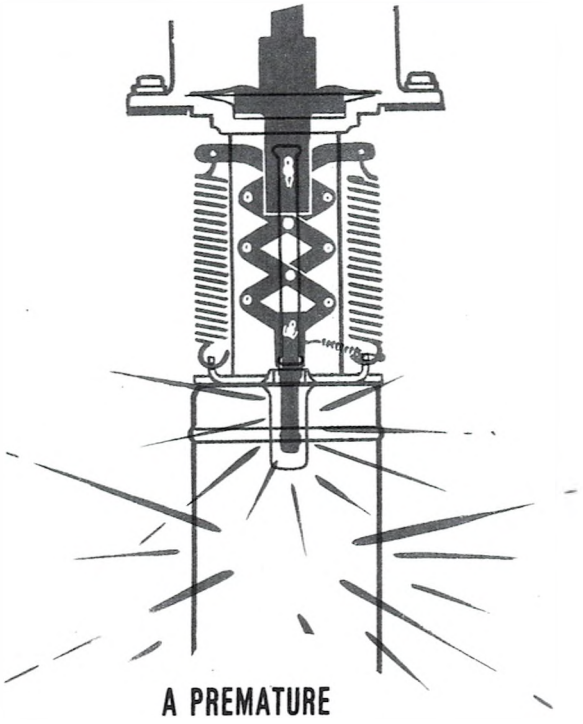
6.8 Where a dud is preferable to a premature, the extender may be fitted with a soluble washer which will hold it in the retracted position until after the firing mechanism has armed. Then, if the firing circuit closes prematurely, the detonator will explode in the retracted position and the mine will be a dud. This procedure is unnecessary for mines provided with antipremature assemblies, as these assemblies will prevent premature detonation of the mines at the end of the arming delays.

6.9 Where a premature is preferable to a dud, the antipremature assembly should not be used, and the extender should be fitted with a soluble washer or arming wire which will allow it to operate before the clock delay arms the mine, so that premature closing of the fire circuit will fire the detonator in the booster and explode the mine.

6.10 Wooden washers or safety cotter pins must be kept in place in clock starters and extenders in assembled mines until the mines are prepared for planting. If they are not, and a mine is dropped acci-



A DUD



A PREMATURE

dentally in friendly waters, or stored in a magazine which has to be flooded, the mechanisms may operate and arm the mine. The wooden washers and safety cotter pins are to be removed and replacd with soluble washers or arming wires when the mines are placed in planes from which they are to be planted. If they are not removed at this time, the mines will be duds, because the washers or cotter pins will prevent the clock starters and extenders from operating.

6.11 It may be considered desirable to equip extenders and clock starters with arming wires whenever possible. If this is done and it becomes necessary to jettison a mine, the wires may be released and allowed to fall with the mine. This is intended to lock the clock starter and extender safe and prevent arming of the mine. THIS PROCEDURE,

HOWEVER, IS NOT RELIABLE, AS THERE IS A POSSIBILITY THAT THE ARMING WIRES WILL BE WIPED OFF THE MINE WHEN IT STRIKES THE WATER, THAT HYDROSTATIC PRESSURE OR COUNTER-MINING SHOCK WILL SHEAR THE WIRES, OR THAT THE WIRES WILL CORRODE AND BREAK AFTER PLANTING. IF ANY ONE OF THESE OCCURS, THE MINE WILL BE FREE TO ARM. NO MINE CAN BE JETTISONED IN WATER LESS THAN 800 FEET DEEP WITH POSITIVE ASSURANCE THAT IT WILL NOT CONSTITUTE A HAZARD. THE CASE OF A MINE DROPPED IN MORE THAN 800 FEET OF WATER WILL PROBABLY BE CRUSHED AND OR FLOODED, RENDERING THE MINE INOPERATIVE. THE POSITION OF A JETTISONED MINE SHOULD BE REPORTED TO THE PROPER AUTHORITIES SO THAT THE AREA CAN BE AVOIDED UNTIL THE MINE HAS BEEN SWEPT OR UNTIL IT IS ESTABLISHED THAT THE MINE DOES NOT CONSTITUTE A HAZARD TO NAVIGATION.

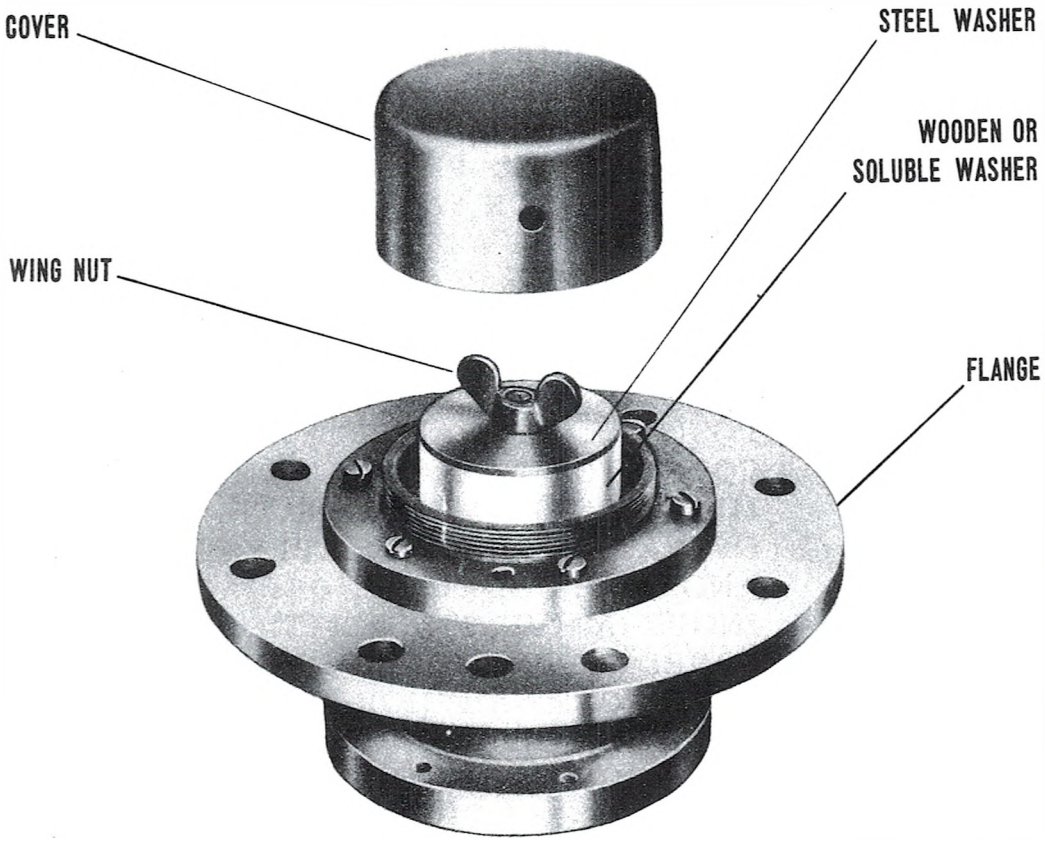
6.12 Soluble washers are installed, when used, immediately before mines are installed in aircraft. Arming wires may be assembled either before or after the mines are installed in aircraft, depending upon the types of torpedo racks and accessories.

6.13 To install soluble washers in a Mk. 1 Mod. 1 clock starter or a Mk. 12 Mod. 1 extender:

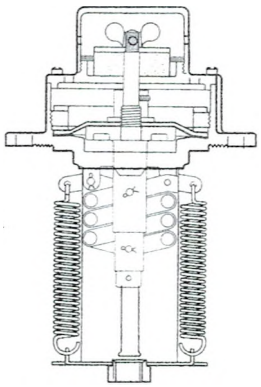
(a) Unscrew the mechanism cover and remove the wing nut, metal washer and wooden washer from the mechanism piston rod.

(b) See that the mechanism is thoroughly dry, and that the soluble washer to be used is not cracked and is firm and hard.

(c) Place the soluble washer over the piston rod and seat it on the mechanism cap.



MARK 1 MOD. 1 CLOCK STARTER

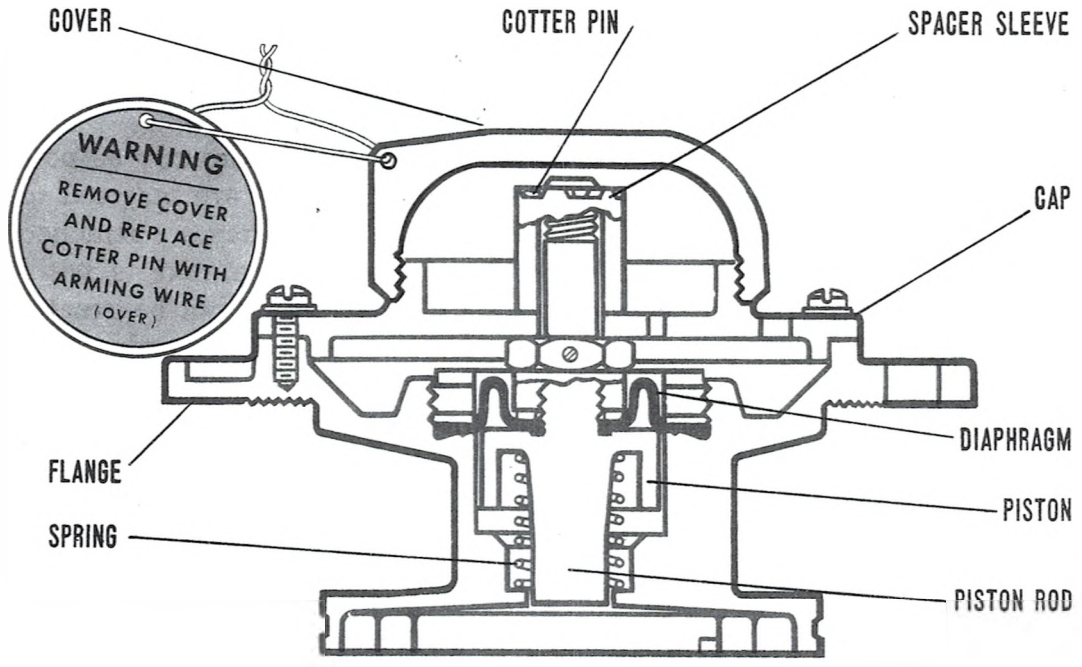


MARK 12 MOD. 1
EXTENDER

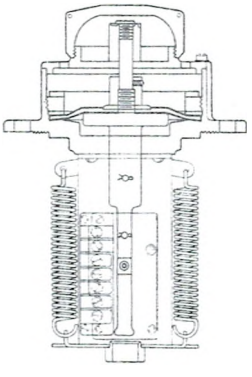
(d) Place the metal washer on top of the soluble washer and secure it by screwing the wing nut down on the piston rod until it takes up against the metal washer. The metal washer should be seated firmly on the piston rod shoulder or on the soluble washer.

(e) Replace the mechanism cover, screwing it firmly in place.

NOTE: Use hand pressure only in tightening wing nuts, and do not exert sufficient torque on a clock starter wing nut to twist the piston rod and thus possibly damage the diaphragm.



MARK 1 MOD. 4 CLOCK STARTER

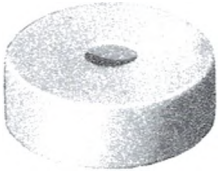


MARK 12 MOD 4 EXTENDER

6.14 If the mine is fitted with a Mk. 1 Mod. 4 clock starter and a Mk. 12 Mod. 4 extender, remove the covers of these mechanisms and substitute arming wires for the safety cotter pins used during storage and shipment. Be sure the spacer sleeves are properly placed on the piston rods so that the arming wires will prevent motion of the piston rods of the mechanisms. Secure the arming wires in place with two Fahnstock clips on each wire. Secure the free ends of the arming wires to an arming plate or swivel loop, and secure the arming plate or swivel loop in the arming wire release mechanism in the plane. Cut off the free ends of the arming wires 13 inches or more from the mechanism stems through which they are inserted. See that the cut ends are rounded and smooth so that the clips will not catch on them when the wires are withdrawn. Arming wires cut off shorter than 13 inches are much more

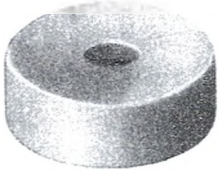
likely to be wiped off a mine, if an attempt is made to jettison the mine safe, than wires cut to this length or longer.

6.15 Arming wires should lead as directly as possible from the holes in which they are inserted to the arming plate or point at which they are attached to the plane. The angle at which a wire is withdrawn from a hole should preferably not be greater than 10° from the axis of the hole. An arming wire withdrawn at an excessive angle from the axis of a hole may be broken off in the mechanism and prevent its arming. In general, the same conditions apply to arming wires attached to arming pins, as they may be torn off the pins without withdrawing them.



PINK WASHER
1 DAY

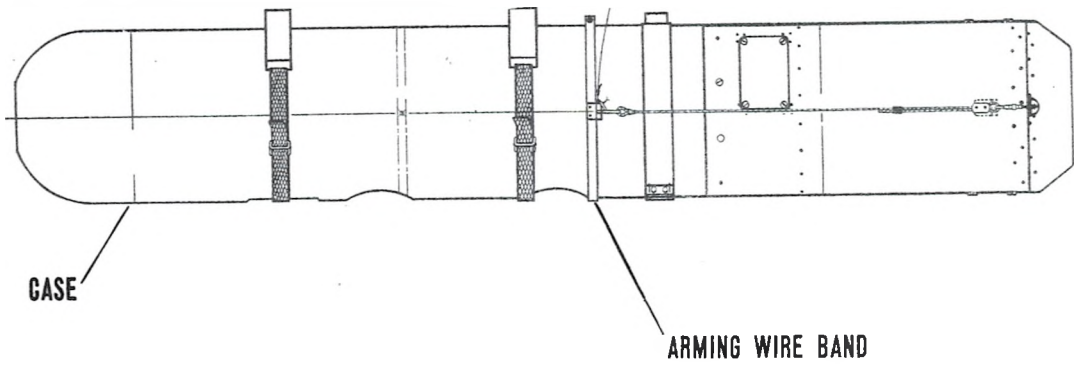
YELLOW WASHER
2 DAYS



BLUE WASHER
3 DAYS

6.16 A Mk. 1 Mod. 4 clock starter or a Mk. 12 Mod. 4 extender may be modified for use as a soluble-washer-controlled device with the delay arming accessories shown on Dr. No. 369146. These accessories consist of three soluble washers, a knurled nut, and a cotter pin. The pink washer dissolves in 1 day; the yellow in 2 days; and the blue in 3 days. When a soluble washer is to be used instead of an arming wire, (1) the spacer sleeve is removed from the piston rod, (2) the soluble washer is slipped over the piston rod, and (3) the nut is screwed on the outer end of the piston rod and locked by the cotter pin. Although Mk. 1 Mod. 1 clock starters and Mk. 12 Mod. 1 extenders were not designed to be used with arming wires, they may be modified for such use by the substitution of soluble washer covers and wing nuts of the type supplied for Mk. 1 Mod. 2 clock starters and Mk. 12 Mod. 2 extenders for the original parts. Soluble washers with delay periods in excess of 45 minutes must not be used in the clock starters of mines in which SD mechanisms are used.

CARRYING ACCESSORIES



ARMING WIRE BAND

6.17 ARMING WIRE BAND. When using racks which do not provide a place for securing the parachute cap arming wires in a manner which meets the conditions outlined in paragraph 6.15, it is necessary to use a Mk. 1 arming wire band. To install this band, secure it around the mine case at such a point that the arming wires can be secured to the plane directly above the keepers on the band, when the mine is loaded into the rack from which it is to be planted. Secure the cables in the keepers on the band by pins (to which the arming wires are fastened) passing through the keepers and through the holes in the connectors on the ends of the cables. Remove the keepers on the parachute housing by knocking out their rivets. Pass the loops of the cables through the parachute cap turnbuckle eyes. Take up the cables to the correct length by adjusting the size of the loops, and secure them with the clamps provided on the cables. Set up the turnbuckles until there is about ⅛-inch clearance between the cap and the ring in the housing on which it seats, and then secure the turnbuckles with seizing wire. Tie the arming pins to the connectors with light twine so that the pins will not be worked out of the keepers by vibration. The cord will be broken when the pins are withdrawn by the arming wires.

CHOCK BANDS

6.18 CHOCK BANDS. Airplane torpedo racks are designed to accommodate 22½-inch torpedoes. Therefore, it may be necessary to place spacers between a mine and the chocks or sway braces of a rack to take up the excess clearance between the braces and the mine case. The Mk. 4 chock band, consisting of a shaped wooden spacer and a webbed strap for securing it in place has been provided for this purpose. Two Mk. 4 chock bands are used with each mine, one on either side of the center of gravity. The chock bands were designed to be attached to the mine cases. However, if the chock bands are attached to a mine, they may be wiped off the mine on impact with the water and float on the surface, revealing the location of the plant to the enemy. To prevent this, the spacers on the chock bands can be secured to the torpedo rack and the straps cut off. If, however, the chock bands are to be secured to a mine, place the chock bands on the mine case in a position such that the spacers will bear directly against the chocks or sway braces when the mine is loaded into the rack from which it is to be planted. Secure the bands in place by drawing the straps up tight and locking them with their buckles.

STOP BOLT BAND

6.19 STOP BOLT BAND. If a stop bolt band is to be used, locate it on the mine case in a position such that the stop bolt will engage in the hole in the key when the mine is loaded into a torpedo rack. (This position will usually by 30 to 35 inches aft of the center of gravity of the mine.) Orient the band with the key diametrically opposite the clock starter and extender openings in the mine case and secure it by tightening the securing bolts. (Because, when chock bands are used, these mines do not fit as far up into the racks as torpedoes, the keys on stop bolt bands of early manufacture (designated key bands) have to be built up before they will engage the stop bolts satisfactorily. The key band must be used,

PLANTING

however, if a mine is to be planted from a rack having a socket for the key instead of a stop bolt.) In some mines, sockets for stop bolts will be found set in the cases. These were intended to fit the stop bolts of torpedo racks, but generally will not engage them and so are not usually used.

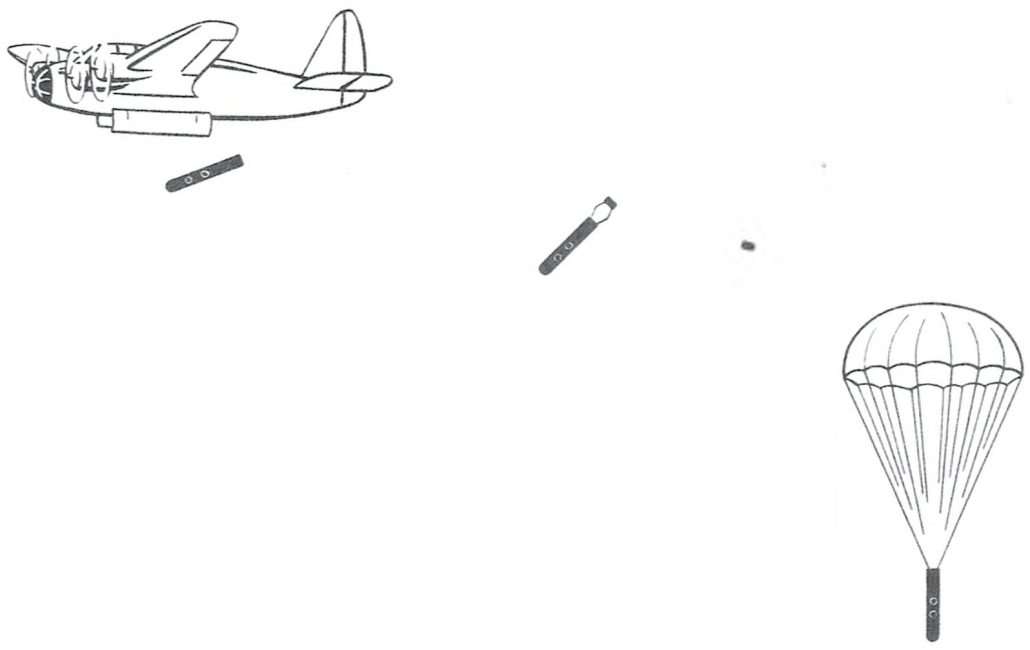
INSTALLATION IN AIRCRAFT

6.20 INSTALLATION IN AIRCRAFT. A Mk. 12 Mod. 1 mine may be installed in an airplane torpedo rack designed to carry a Mk. 13 type torpedo, using the procedure for loading the Mk. 13 Mod. 1 or Mod. 2 torpedo. The Mk. 8 hoisting band may be used for installing the mine. The band should be oriented so that the section of the band passing under the mine is shorter than the section of the band passing over it, to provide a fair lead for the hoisting cables. Standard torpedo slings and hoisting gear may require modification for mine handling. The use of the torpedo starting cable as an anchoring point for arming wires is not recommended.

6.21 Reliable information as to the installation of Mk. 12 Mod. 1 mines in all types of aircraft is not yet available. The following table gives the capacities of certain Army and Navy aircraft for Mk. 12 Mod. 1 mines. These aircraft can carry Mk. 12 Mod. 1 mines only if they are equipped to carry torpedoes and if the carrying accessories noted in paragraphs 6.17-6.19 are provided where necessary.

DESIGNATION	CAPACITY
A-20A and B	1
B-25 Series	1
B-26 Series	1
BD-1 and -2	1
PBJ-1	1
PBM-3	2
PBY-5	2
PB2Y-3	2
PV-1	1
TBF-1	1

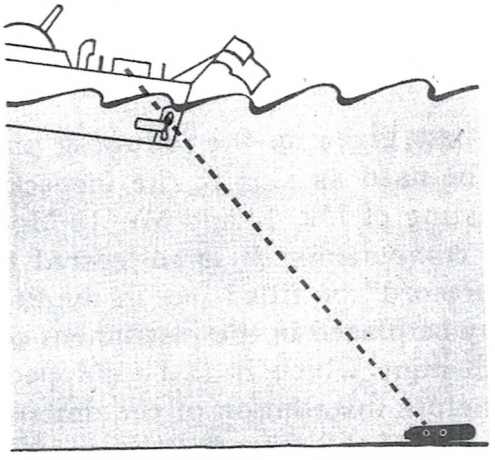
PLANTING FROM AIRCRAFT



6.22 PLANTING FROM AIRCRAFT. The minimum planting altitude necessary for satisfactory operation of the parachute is 650 feet. The maximum altitude is limited only by the required accuracy of planting. The minimum planting air speed is 110 knots. The maximum planting air speed at which the parachute has been tested is 165 knots. It is believed that at least 75 per cent of the parachutes will function satisfactorily at air speeds up to 200 knots.

6.23 The spacing of mines in mine fields will be determined by the authority directing the operation.

6.24 The fall of a Mk. 12 Mod. 1 mine entering the water is not checked appreciably until the parachute enters the water. Consequently, some Mk. 12 Mod. 1 mines may be damaged by impact with the bottom if they are planted on hard or rocky bottoms in less than 35 feet of water.



PLANTING FROM THE DECKS OF SURFACE CRAFT

6.25 PLANTING FROM THE DECKS OF SURFACE CRAFT. Mk. 12 Mod. 1 mines may be planted from the decks of surface craft in the same manner as Mk. 12 mines (pars. 3.27-3.33). The only change necessary in the mine assembly is the removal of the parachute, the parachute housing, and the stop bolt, arming wire and chock bands before securing the mine aboard ship.

6.26 Mk. 12 Mod. 1 mines assembled with Mk. 1 Mod. 1 clock starters and Mk. 12 Mod. 1 extenders must have soluble washers installed in these mechanisms in the same manner as when preparing the mines for planting from planes (par. 6.13). These soluble washers must be protected from excessive moisture until the mines are planted, or they may dissolve and allow the mines to arm prematurely.

6.27 When Mk. 12 Mod. 1 mines assembled with Mk. 1 Mod. 4 clock starters and Mk. 12 Mod. 4 extenders are placed on the release tracks, the cotter pins holding the spacer sleeves on these mechanisms should be replaced with arming wires. These wires should be secured to the tracks in such a way that they will be pulled out of the clock starter and extender when the mine is launched.

LIGHT BLUE INDICATES WATER

SUGGESTED USE OF CHECK LISTS

A.1 The check lists given on the following pages are intended to be used as aids in the inspection, assembly, and testing of Mk. 12 and Mk. 12 Mod. 1 mines and their components. It is suggested that the "Assembly Record" be filled out in duplicate, and that one copy be placed in the instrument compartment of each mine which is to be shipped to another station before installation of the detonator and final preparation of the mine for planting. This record will then show a crew preparing the mine for planting the type and condition of the components in the mine assembly. The record should be removed from the instrument compartment when the mine is prepared for planting.

A.2 Check lists of mine components should be filled out to insure proper testing and inspection of these units and to provide records of their condition at the time of their use in a mine assembly. The assembly check lists assume that all mine components have been tested prior to installation.

CHECK LISTS FOR COMPONENTS OF MK. 12 AND MK. 12 MOD. 1 MINES

CD AND CS MECHANISMS	CHECKED BY
1. CD- Mod.	_____
2. CD serial no.	_____
3. CS Mk. Mod.	_____
4. CS serial no.	_____
5. CD starts and stops properly	_____
6. Ohmmeter tests of CD leads	_____
7. CS starts CD above 4 and below 7 pounds per sq. in.	_____
8. CS stops CD above 1½ pounds per sq. in.	_____
9. No. high pressure leak	_____
10. CD run down	_____

APPROVED BY_____DATE _____
Inspector

EXTENDER MECHANISM	CHECKED BY
1. EX Mk. Mod.	_____
2. Serial no.	_____
3. Extends fully between 4 and 7 lbs. per sq. in.	_____
4. Retracts completely above 1½ lbs. per sq. in.	_____
5. No high pressure leak	_____
6. Crosshead clean	_____
7. Locking device reinstalled and warning tag in place.	_____
8. Proper target strip.	_____

APPROVED BY _____ DATE _____
Inspector

SD-5 MECHANISM	CHECKED BY
1. Serial no.	
2. All parts intact	
3. No leakage of electrolyte	
4. No corrosion of any part	
5. All securing nuts tight	
6. Insulating disc inside lid	
7. Resistor bracket tight	
8. Banana plug tight	
9. Resistor leads undamaged	
10. Proper resistor installed	
11. Contact clearances between 0.035 and 0.075 inch	
12. Contact springs not touching	
13. Edge of anode support flush with bottom of slot	
14. Slot lines up with lever	
15. Clearance between lever and bottom of slot at least 9/32-inch	
16. Spring tension correct	
17. Jumpers installed	
18. CA-256 installed	
19. Terminal block cover replaced	
20. Open circuit between green and white leads	

APPROVED BY _____ DATE _____
Inspector

TD-1 MECHANISM CHECKED BY

1. Serial no. _____
2. Ohmmeter tests satisfactory _____

APPROVED BY _____ DATE _____
Inspector

SE-1 MECHANISM

1. Serial no. _____
2. Ohmmeter tests satisfactory _____

APPROVED BY _____ DATE _____
Inspector

BATTERY

1. Type (B-3 or B-3 Mod. 1) _____
2. Temperature _____
3. Short-circuit current _____

APPROVED BY _____ DATE _____
Inspector

FIRING MECHANISM

1. M-3 Mod. _____
2. Serial no. and manufacturer _____
3. Mechanism previously tested _____
4. Ohmmeter tests satisfactory _____

APPROVED BY _____ DATE _____
Inspector

ASSEMBLY RECORD, MARK 12 AND MARK 12 MOD. 1 MINES

1. INSTRUCTIONS:

Items 2 and 3 of this record should be filled out in duplicate at the time of assembly. One copy should be retained by the station. The other should be placed in the instrument compartment, to be removed when the mine is issued for planting.

2. ASSEMBLY DATA:	CHANGES	DATE
(a) Date	_____	_____
(b) Assembly station	_____	_____
(c) SD-5 resistors, letter and color	_____	_____
(d) SE-1 setting	_____	_____
(e) Date of manufacture of battery	_____	_____
(f) Firing mechanism:	_____	_____
(1) M-3 Mod.	_____	_____
(2) Type (RED or BLUE)	_____	_____
(3) Zone (N, T, or S)	_____	_____
(4) Sensitivity (F, M, or C)	_____	_____
(5) Manufacturer	_____	_____

3. SERIAL NUMBERS:

(a) Mk. 12 case	_____	_____
(b) Mk. 12 Mod. 1 case	_____	_____
(c) M-3 Mod.	_____	_____
(d) SD-5's	_____	_____
(e) CD	_____	_____
(f) CS Mk. Mod.	_____	_____
(g) EX Mk. Mod.	_____	_____
(h) SE-1	_____	_____
(i) Parachute	_____	_____

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Inspector

ASSEMBLY CHECK LIST, MARK 12 MINE

		CHECKED BY
1.	Case interior clean.	
2.	Correct target strip on terminal block.	
3.	Terminal block orientation correct.	
4.	TD-1 leads correctly connected.	
5.	Clock leads correctly connected.	
6.	TD-1 and clock cable strain relief clamped under TD-1 mounting ring.	
7.	Antipremature fuse in place and leads correctly connected.	
8.	SE-1 leads correctly connected.	
9.	Spacer and booster installed.	
10.	Extender cable installed.	
11.	Electrical subassembly test satisfactory.	
12.	SE-1 reset.	
13.	Battery disconnected.	
14.	Clock fully wound to START.	
15.	CD safety device secure and warning tag in place.	
16.	SE-1 installed with correct orientation and setting.	
17.	Battery box cover and cushion modified.	
18.	SD-5's mounted and leads correctly connected.	
19.	Firing mechanism correctly oriented and leads correctly connected.	
20.	Open circuit between POS. and NEG. on terminal block.	
21.	Battery correctly connected.	
22.	Open circuit between extender cable leads.	

		CHECKED BY
23.	Installed SD-5's tested.	_____
24.	All terminal block connections tight and cover in place.	_____
25.	Battery and battery plate in place and clamping screws tight.	_____
26.	Battery cover secured in place.	_____
27.	Mine cap bolts set up.	_____
28.	Extender and clock starter nuts set up.	_____
29.	Safety bar in place and warning tag on safety screw.	_____
30.	Required information stenciled on mine case.	_____

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ASSEMBLY CHECK LIST, MARK 12 MOD. 1 MINE

NOTE: Check lists for Mk. 12 mines are also applicable to the assembly of Mk. 12 Mod. 1 mines, except that no safety bars and safety screws are used on the latter. This list should be used as a supplement to the lists for Mk. 12 mines.

		CHECKED BY
1.	Parachute packed.	_____
2.	Parachute cap secured.	_____
3.	Soluble washer installed in release mechanism.	_____
4.	Parachute housing secured to mine cap.	_____

APPROVED BY _____ DATE _____
Inspector

ADVANCE BASE CHECK LIST, MARK 12 MINE

		CHECKED BY
1.	Firing mechanism fuse intact.	_____
2.	SE-1 fuse intact and setting correct.	_____
3.	Correct resistors installed in SD-5's.	_____
4.	Battery type	_____
5.	Battery temperature	_____
6.	Battery short circuit current	_____
7.	Clock assembly and extender operate manually.	_____
8.	Safety devices secure and warning tags in place.	_____
9.	Clock fully wound.	_____
10.	Open circuit between detonator cable leads.	_____
11.	Detonator installed.	_____
12.	Mine cap, extender, and clock starter nuts set up.	_____
13.	Required information stenciled on mine case.	_____

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Inspector

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