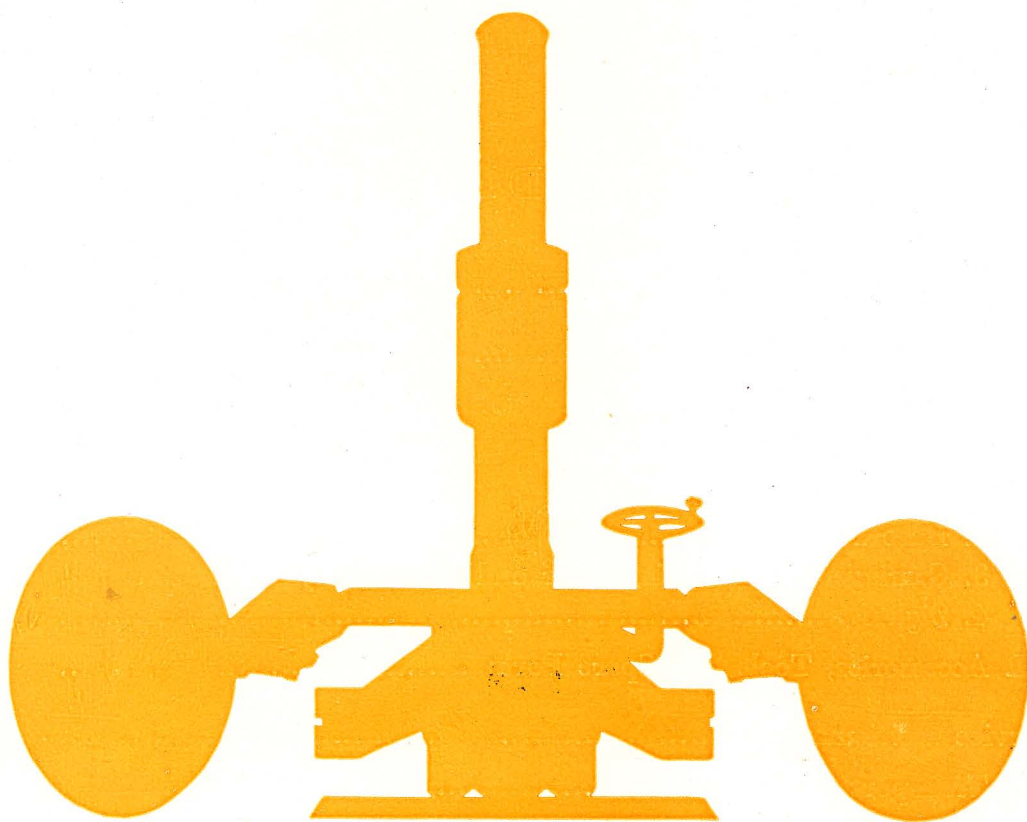


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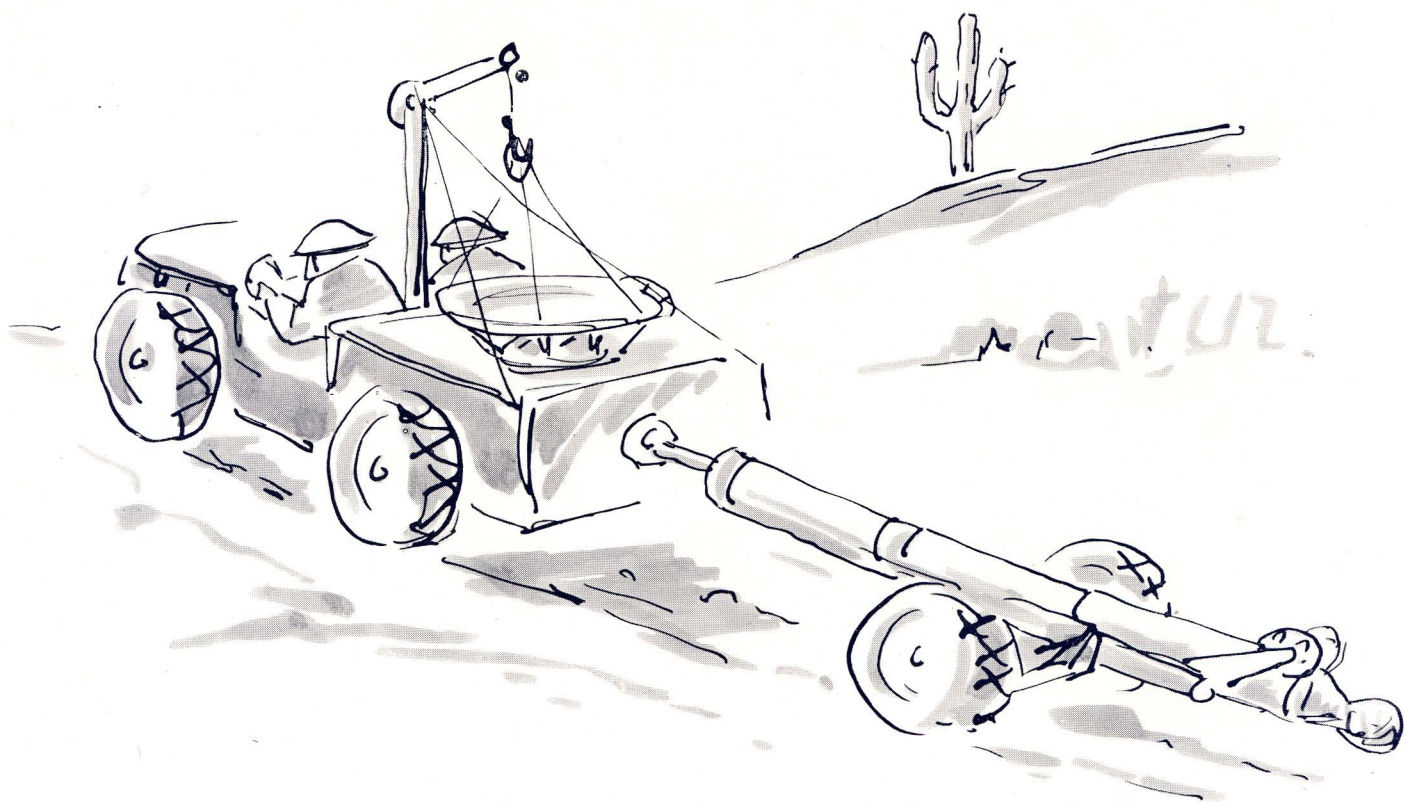


**160 mm MORTAR**

**MODEL/53**

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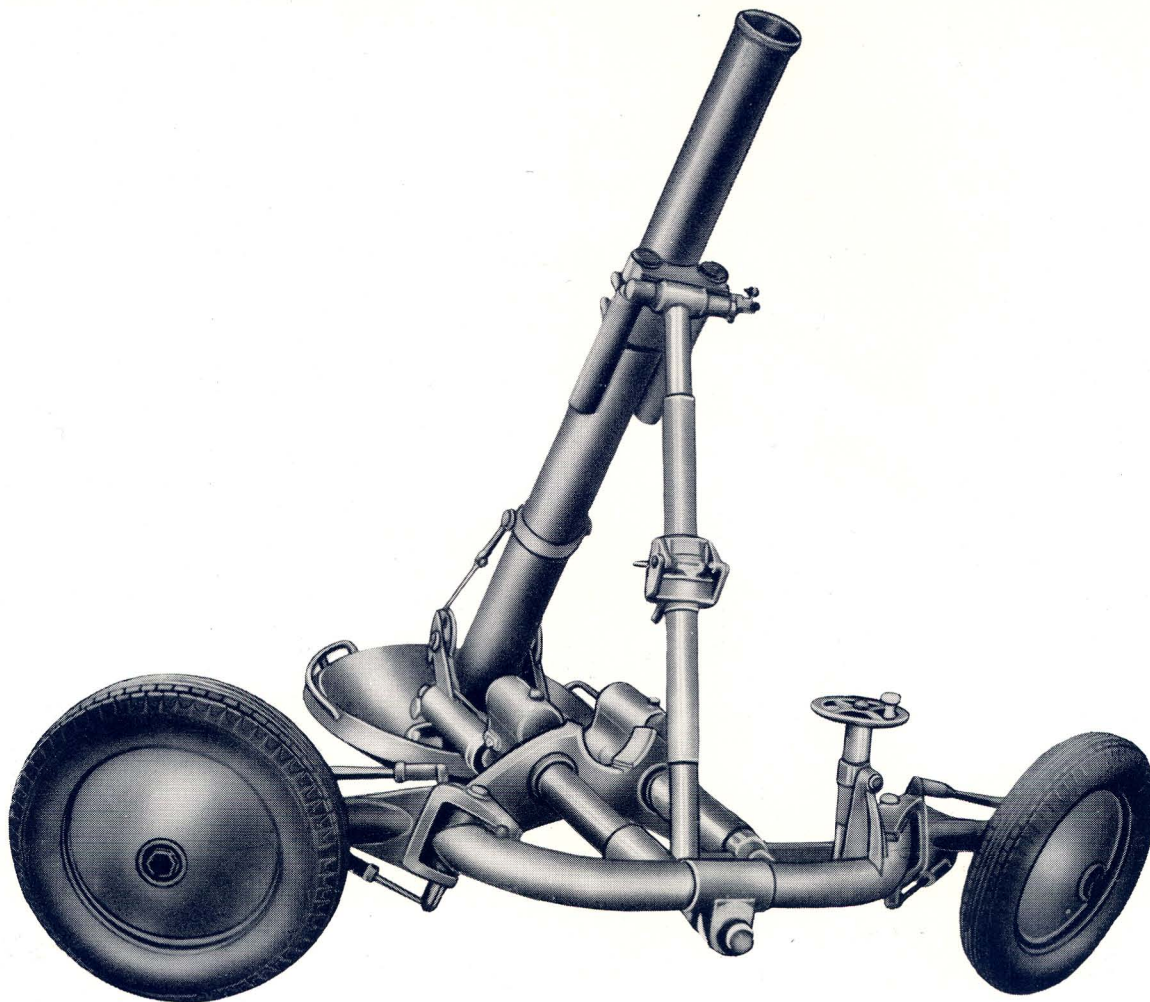
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## A. GENERAL DESCRIPTION

The principles on which the 160-mm Mortar m/53 are based are the same as in other similar weapons: smooth-bored barrel, streamlined shells, stabilized by wings and multiple charges. The range is 500—10.000 metres, with a safe margin in either way. The ammunition consists of high explosive shells, smoke munition and hollow charge rounds. The mortar is normally towed behind a motor vehicle. Putting the Mortar in firing position is easy and it is ready for firing in minutes.

The weapon can be used by infantry or by artillery. Owing to its exceptional firing power it can play an important part in the heavy armament of infantry. Compared with artillery weapons of similar calibre, the 160-mm Mortar is outstanding because of its lightness and mobility in the most difficult conditions. Total weight of the gun with carriage is approx. 750 kg.



## **B. MORTAR**

### **I. Main Parts**

The 160-mm Mortar m/53 consists of the following main parts:

- 1) Barrel with Breech Block,
- 2) Base Plate,
- 3) Carriage with Training Gear, Recoil Disjuncter and Transport Equipment.

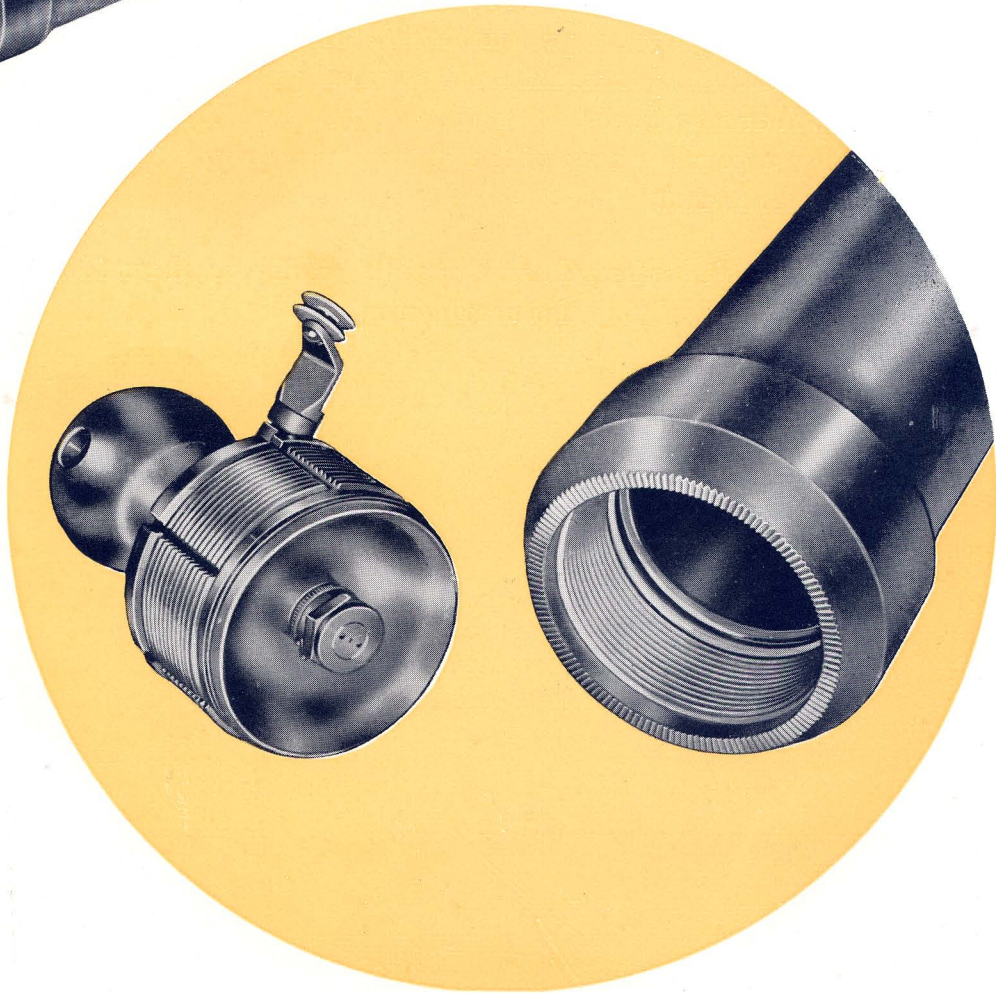
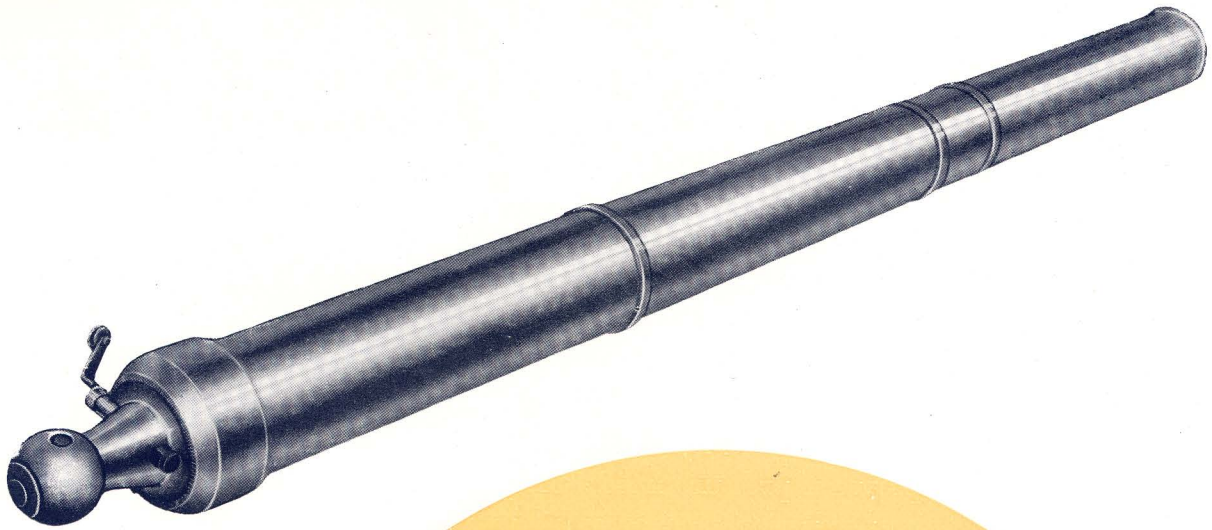
In addition there is a Tool and Spare Part Box for Accessories and Spares.

### **II. Detailed Description**

#### **1. BARREL WITH BREECH BLOCK**

The barrel is smooth bored, has a diameter of 160,25—160,40 mm and a length of 2850 mm. In the conical part at the upper end there are two integral rings for securing the position of the cradle, in the lower end is a ring for clamping the equilibrating mechanism. At the breech reinforcement on the tube are two pins, by means of which the barrel is secured to the carriage.

The inside of the rear part of the barrel is so shaped that the breech block can easily be screwed into it. To secure the breech block in place the rear part of the barrel is rifled in radial direction. The rear part of the barrel is engraved with »160-mm Mortar m/53», number, year and the name of the makers. The outside of the barrel and the breech block are treated with phosphate to prevent rust.



**Breech Block.** The outside of the breech block consists of a conical gaslock, a threaded part, the neck and also the butt ball. The butt ball fits a spherical depression in the base plate. There are dirt grooves in the threaded part of the breech block and also at the rear of the butt ball. A hole in the neck of the breech is for the mechanism tension tap. Inside the breech block carries the breech anvil and has a boring for the percussion mechanism. The percussion mechanism consists of the following parts: breech anvil lining, percussion pin, percussion bolt and percussion springs, socket screw, stop screw for the percussion bolt and firing arm with firing line. The breech anvil is threaded on the outside so that it can be screwed into the breech block; it is bored axially for the percussion pin. The breech anvil is secured in the breech block by a stop spring.

**Functioning of the Percussion.** When not in use, the tension spring turns the cocking arm until the tension axle comes in contact with its stop screw. When firing, the tension axle is rotated in opposite direction and the edge of the axle catches the bolt link and presses the percussion bolt backwards, effecting compression of the percussion spring. On further cocking of the handle the tension link is set free and the bolt is thrown forward by the spring pressure. The percussion pin comes out through the hole in the breech anvil and indents the primer of the initial cartridge. A stop screw limits rotation of the cocking arm backward. The tension in the percussion spring returns the percussion bolt to starting position and avoids permanent protrusion of the pin. Cocking arm and tension axle are returned by the tension tap spring back to their initial position. A gas outlet prevents pressure inside the percussion mechanism, while leakage from the barrel to the percussion mechanism is prevented by a simple and effective construction. A damaged mechanism can easily be replaced. The breech block is secured in position by a gear segment with radial teeth corresponding to the grooves on the rear part of the barrel.

On the breech block are barrel number and markings used for identification when assembling and disassembling the mechanism.







## 2. THE BASE PLATE

The base plate is round and welded electrically from high tensile steel plates. At the bottom several conical ribs give stability in loose ground. In the middle of the base plate a spherical depression takes the butt ball. The spherical depression is surrounded by a 4-part fastening sector to which a locking device of the butt ball to the base plate is secured. The locking device allows a firing sector of  $360^\circ$  without moving the base plate. Four leather covered handles are used, when the base plate is lifted or carried by hand. The base plate is painted with exception of the inner surface of the depression. This is greased with special grease to prevent rust.



### 3. CARRIAGE WITH TRAINING GEAR AND RECOIL DISJUNCTOR

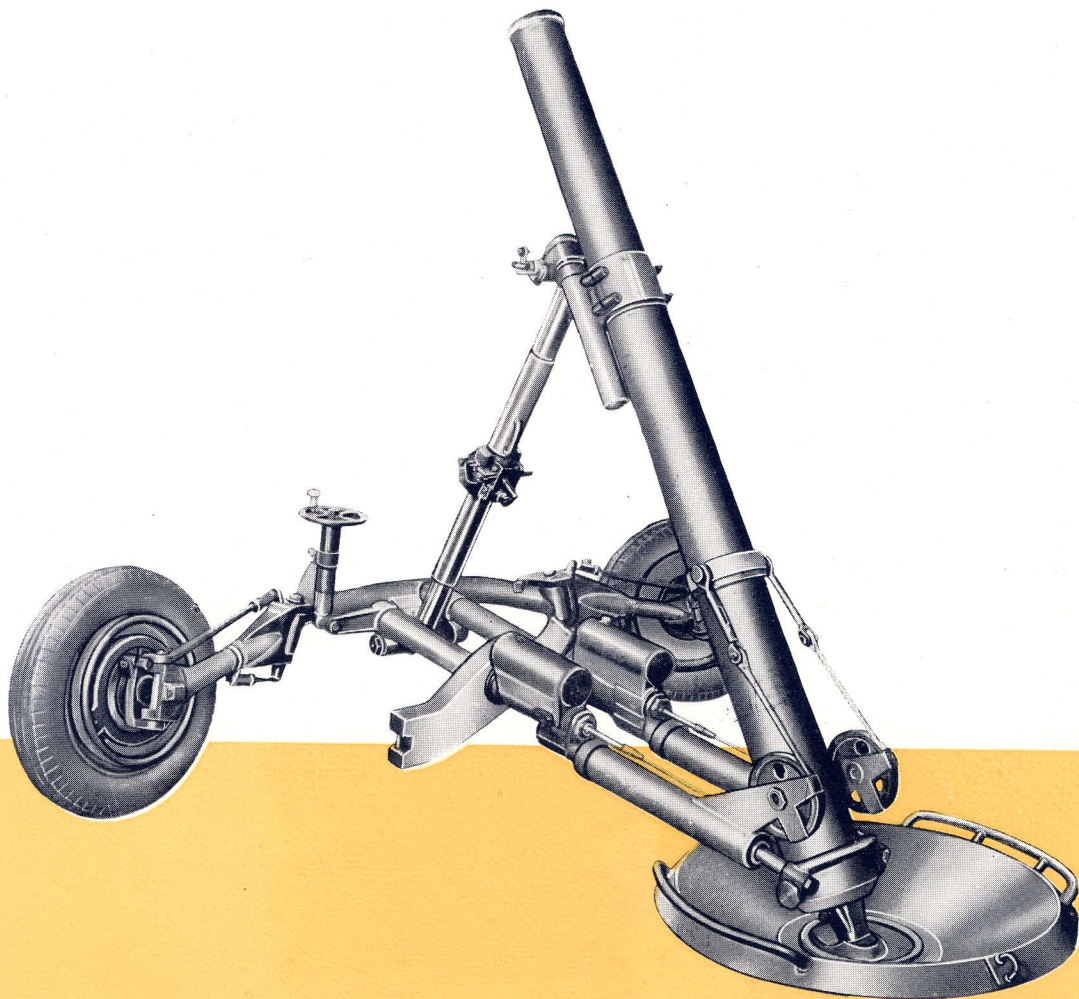
The main parts of the carriage are:

- a) Carriage Body with Barrel Weight Equilibrator,
- b) Cradle and Recoil Disjuncter,
- c) Elevating Gear,
- d) Divergence Correction Mechanism,
- e) Traversing Gear,
- f) Transport Equipment.

#### a) The Carriage Body

is triangular and made of high tensile steel tubes by welding. In the rear part of the carriage body an elastic connection to the breech block prevents undue stresses during fire.

The **Barrel Weight Equilibrator** consists of two cylinders welded to the carriage body and of pistons connected to the barrel by means of pulley guided cables. It allows easy rising and lowering of the barrel by hand.



## b) Cradle and Recoil Disjunctor

The cradle is of welded construction. It is fixed to the barrel and carries on each side an integral recoil cylinder. The barrel is kept in the cradle by the cradle belt and belt locking screws. Recoil cylinders glide in the cradle borings. The front parts of the recoil cylinders are hinged to the T-piece at the upper end of the elevation system. Inside each of the recoil cylinders are a recoil spring and a link rod. At the end of the rod a thrust bushing, two thrust rings and a stop nut are fitted. The cylinder lid has a lubrication nipple, from which oil is directed to the recoil springs and along the grease grooves in the recoil cylinders to the bearing surfaces in the cradle.

**Function of the Recoil Disjunctor.** The recoil disjunctor prevents undue stresses during fire. The sudden release of power which takes place, when a round is fired, causes, apart from discharging of a projectile, a recoil thrust in opposite direction. The effect is a sudden impulse on the barrel, and the base plate directed axially and toward the ground. The springs of the recoil mechanism absorb the resulting motion without affecting the carriage. As the barrel recoils, the link rod thrust bushings press the recoil springs together against the lids of the recoil cylinders. When the recoil forces have ceased, the barrel may come back with speed and the vibration is picked up by the springs, as the same spring is mounted to absorb thrust from both sides.

## c) Elevation Gear

The elevation pillar system is hinged at the top to the recoil disjunctor by means of a T-piece and at the lower end it is connected to the carriage by means of another T. The elevation pillar system consists of a two-part interhinged telescopic tubing: outer tubing containing the right and left hand elevation screws and corresponding internal tubes. The screws are interconnected by means of a coupling dog, and are operated by a hand lever. They are driven by means of a conical gear. The elevation screws are carried on slide bearings in the body of the pillar. The elevation gear mechanism is fitted with lubrication nipples and corresponding grease grooves.

## d) Divergence Correction Mechanism

acts also for fine adjustment of the traverse and consists of a screw-operated telescopic tubing in which one tube is hinged to the carriage and the other to the cross bar of the transport carriage. The main parts are: protection tube, training screw, divergence nut, extension tube, divergence crank and clamping mechanism. The training screw and the extension tube slide in a protection tube. The inside of the training screw is hollow, fitted with radial grease holes and lubrication nipple at the end.

**Function of the Divergence Correction Mechanism** when turning the handle of the divergence wheel, the carriage body and the transversal inclination of the cradle in relation to the wheel-axle is regulated. By means of a special adjustment in the sights training in traverse can be achieved simultaneously.

## e) The Traverse Mechanism

consists of a gear transmission comprising two parallel concentric gears of which one is fixed to the wheel of the transport equipment and the other to the carriage by means of a geared dog clutch. In the former there is one cog more than in the latter. Both

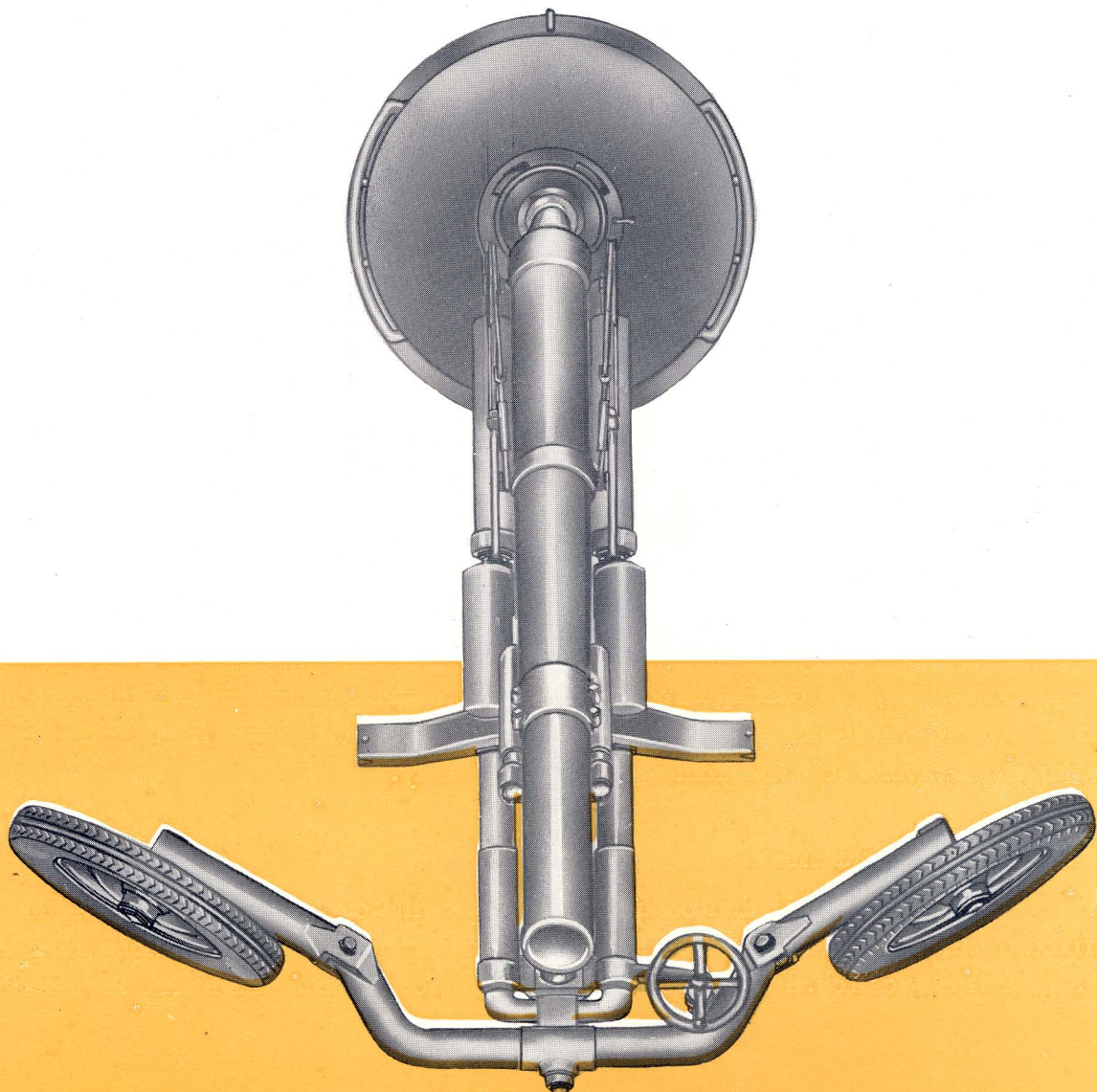
are in mesh with a planetary, the axle of which rotates with the outer casing of the mechanism. The mechanism is fitted with lubrication nipples and corresponding grease grooves.

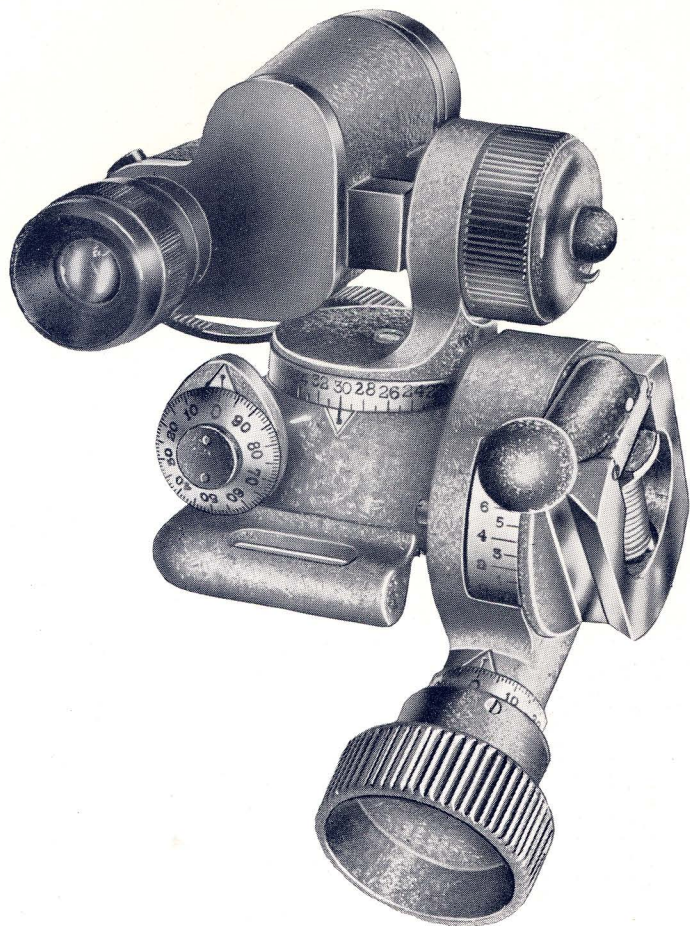
**Function of the Traverse Mechanism.** By turning the handwheel fastened to the casing the smaller gear rotates. After one rotation of the handwheel it has compelled the gun gear on the wheel one cog ahead, and a slow traversing motion is obtained.

#### f) Transport Equipment

When firing, the transport axle acts as a front support of the mortar. It consists of a wheel axle with swinging arms carrying the wheels.

The wheel axle is carried by journals in the middle of the under carriage. In both ends are hinges for the swinging arms and their locking devices. The wheels are carried on hinges by the swinging arms so that the wheels may swing  $80^\circ$  and back for easy change over from transport to firing position and vice versa. The mortar can with very little effort be put in firing position in a short time.





#### 4. SIGHTS

Sight instrument m/53 and reverse sight instruments are used as sights.

The main parts of the sight instrument m/53 are: traversing crew, elevation screw, optical part and three water levels.

The elevation comprises the elevation range  $40^{\circ}$ — $90^{\circ}$ .

The angles are set by the elevation screw. The traverse is graduated at the wish of the user. During training the divergence has to be controlled simultaneously with the traverse.

### III. Accessories, Tools and Spare Parts

The mortar accessories, tools and spare parts are placed in the tool and spare part boxes which are divided into compartments. The boxes are painted on the outside and there is a name plaque of the same kind as found on the different parts of the mortar. The lid is kept tight by a rubber packing.

#### C. SERVICE PARTICULARS

##### I. TRANSPORT OF THE MORTAR

The mortar is normally towed behind a motor vehicle.

When the mortar is made ready for transport:

The barrel is lowered and clamped by the transport belt.

The traverse mechanism is disconnected from wheel.

The swinging arms are folded and clamped to the carriage body.

The wheels are locked in transport position.

The sights are removed and put in their special box.

The base plate is taken up on the vehicle.

All tarpaulins and covers are put on, and the mortar is ready for transport.

## II. MAKING THE MORTAR READY FOR FIRE

When the mortar has been moved to firing position, it is made ready for fire in the following manner:

A suitable hole is made for the base plate.

The mortar is then placed near the hole.

Tarpaulins and covers are removed.

The base plate is put in position in the ground.

The breech ball is locked in the spherical depression in the plate.

The wheels are brought into firing position and locked as follows:

- 1) Both wheels to be turned in orthogonal position.
- 2) a — One arm in firing position by rolling  
b — The wheel to be turned in firing position.
- 2) a<sub>1</sub> — Other arm in firing position by rolling.  
b<sub>1</sub> — The corresponding wheel to be turned in firing position.

The traverse mechanism is connected to the wheel.

The muzzle cover and the protection covers are removed.

The towing belt of the barrel is opened.

The barrel is raised and the coupling of the elevation pillar is locked.

The sights are taken out of their box and placed in position.

Firing line is taken out and fixed in place.

## III. FIRING

When the mortar has been assembled according to V, training can take place.

When target and elevation are given, approximative azimuthing is performed by turning the wheel of the transport axle.

Approximative elevation is obtained by placing the sights on the recommended angle. Then the barrel is lowered or raised by means of the elevation crank until elevation has been obtained and controlled by water levels.

Final traverse adjustment is made by use of the divergency mechanism and the sights are controlled with the water levels. When the right training is obtained, the mortar is ready for fire.

The barrel is then lowered for inserting the round and raised again and the training is again controlled.

On the projectile tail the right number of additional charges have been affixed.

When the first round is fired, a certain setting of the base plate occurs. Usually this is called setting round, and direction and elevation are not as accurate and reliable as for the following fired in the same series.

## IV. CARE OF THE MORTAR

With some care and using the tools provided with the mortar it is possible to dismantle and reassemble the mechanism in field. This may be necessary for cleaning and adjustment as well as for replacing a part by a spare.

Lubrication of all training screws, bearing surfaces and other parts is assured by lubricating grooves and holes and the lubrication nipples in an efficient way.

The composition of the lubricating grease has to be selected according to the time of the year.

## D. TECHNICAL DATA

Weight of the Mortar, complete .....	750 kg.
Weight of the Barrel with Breech Block .....	185 kg.
Weight of the Base Plate .....	185 kg.
Weight of the Carriage .....	350 kg.
Weight of the Tool and Spare Part Box, filled .....	20 kg.
Length of the Barrel (from the Breech Bottom to the Muzzle) .....	2850 mm.
Calibre of the Barrel .....	160.40 mm.
The Mortar in motor vehicle towed position:	
Total length .....	3640 mm.
Max. width .....	1650 mm.
Height .....	1050 mm.
Ground clearance .....	400 mm.
Track .....	1460 mm.
Ballistic Data:	
Max. range .....	10.500 m.
Min. range .....	500 m.
Elevation limits .....	45°—75°.
Traverse .....	360°.
Weight of Round with Fuse .....	43.5 kg.
Propellant of Central Cartridge .....	40.0 gr.
Max. initial velocity .....	370 m/s.
Min. initial velocity .....	80 m/s.
Max. pressure in the Barrel .....	1.500 A.

