

**INFORMATION REPORT INFORMATION REPORT**

CENTRAL INTELLIGENCE AGENCY

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Att. No. 1: Chapters 3, 9, and 11 of the handbook on the T-54 tank described in referenced reports. The titles of these chapters are as follows:

Chapter 3: "Tank Armament", with 28 diagrams numbered from 25 to 53, with number 45 not included.

Chapter 9: "Fire Fighting and Smoke Generating Equipment", with eight diagrams.

Chapter 11: "Instructions for Driving the Tank", with one diagram.

Att. No. 2: A collection of diagrams entitled "Document 'A-1' (Miscellaneous Documents), Book of Diagrams". The diagrams pertain to various parts of the tank, including sights, trigger mechanism, recoil mechanism, elevating mechanism, pumps, shells, and fuses. The diagrams are numbered consecutively from 1 to 100, except that numbers 18 through 24 are not included.

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TANK ARMAMENT

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## General Description

A 100mm. gun (1944 model type D-10 T) is mounted in the turret, and co-axially with it a 7.62mm. machine gun (1943/46 model) (SGMT). On the turret is mounted a 12.7mm. anti-aircraft M.G. (1938/46 model) (DSHK). Inside the tank to the right of the driver is mounted a front hull 7.62mm M.G. (SGMT).

The sighting system for the gun and co-axially mounted M.G. is provided by a telescopic sight type TSh 2-22, a sight-clinometer and an azimuth indicator, marked on the race ring of the turret.

On the hull rear plate are fitted two smoke canisters (BSH-5) to provide a smoke screen.

Inside the tank there is a rest for one 7.62mm automatic carbine (AK) which is the personal weapon of the tank crew, and a signal pistol.

## Sec. 1. Role and Characteristics of the Gun.

The 100mm tank gun is designed: -

- for engaging enemy tanks and self-propelled guns;
- for the destruction of embrasures of pill-boxes and wood and earth fire positions and of different sorts of field works;
- to neutralize and destroy enemy artillery;
- to destroy enemy infantry weapons and personnel.

The effective rate of fire of the gun is up to 7 rounds a minute.

The gun and its sighting equipment allow: -

- direct fire with the aid of the TSh 2-22 sight at ranges up to 6900m;
- indirect fire with the aid of the cross-level and azimuth indicator at ranges up to 15,600 m.

The direct fire range with armour piercing shell is 1000 m and with the H.E. fragmentation shell 1100 m (assuming the target to be 2 m high).

Laying the gun in the horizontal plane is accomplished by traversing the turret, thus allowing a 360° field of fire. The vertical field of fire is from -4° to +17°.

## Sec. 2. Short description of the Operation of the Gun.

The 100mm tank gun (see figs 25, 26) consists of the following main parts: -

the barrel (1), a semi-automatic breech, cradle (17), recoil mechanism (5), elevating mechanism (16), recoil guard with trigger mechanism, trunnions (30) with acicular bearings and a compensator (28).

The barrel consists of a monoblock tube, sleeve, breech ring and a guide rod.

The semi-automatic block type breech moves horizontally.

The cradle (17) is cast and of a tubular type. Above it in the lugs of the cradle are housed the buffer and the recuperator cylinders (the buffer to the left, the recuperator to the right looking in the direction of firing). Inside the cradle is the barrel, which on recoil moves on bronze liners attached to the cradle.

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The cradle is attached to brackets on the tank turret by two trunnions. (30)

The recoil system (5) consists of a hydraulic buffer and hydropneumatic recuperator. The buffer is filled with 6.4 litres of "Steel M" (glycerine/ethyl alcohol mixture): the recuperator is also filled with "Steel M" and nitrogen. The amount of liquid in the recuperator is 4.4 - 4.6 litres: the initial pressure of the ~~nitrogen~~ 53-57 atmospheres.

The buffer and recuperator rods are attached to the breech ring and on firing move with the barrel.

Normal length of recoil is 490-550 mm, maximum length 570 mm. (marked STOP).

The elevating mechanism (16) is of the arc type with an actuating link on the left side of the gun.

The firing mechanism consists of an electrical and mechanical (hand) firing lever.

The electrical firing device is housed on the handle of the elevating mechanism nut. The mechanical (hand) firing lever (14) is outside behind the left shield of the recoil guard.

The recoil guard consists of a fixed part, attached to the cradle, a collapsible part (12) and the tank commander's removable guard (11). During firing the guard protects the crew from blows from the breech.

### Sec. 3. Short Description of the Gun Mounting.

The 100mm tank gun is mounted in the turret on trunnions.

The cradle trunnions are removable: one end is fastened by bolts to the turret brackets, and the other passes through apertures in the cradle.

To reduce friction on the moving parts of the trunnions acicular bearings are fitted. The bearings have a packing, which protects them from dust.

The turret embrasure in front is covered by a movable armoured plate, which is placed on the gun barrel and fastened by bolts to the front cradle collar. To protect the fighting compartment from dust, the embrasures of the gun, M.G. and TSh 2-22 sight are covered by covers. The covers are removed from the M.G. and sight in action.

On the left turret bracket is fitted the elevating and compensating mechanism of the tank gun. The elevating mechanism allows vertical angles to be applied to the gun. The compensating mechanism ensures an equal effort on the elevating hand wheel through the whole vertical range.

The gun is laid in the horizontal plane by traversing the turret up to 360° by means of the turret traverse mechanism.

To clamp the gun in the travelling position a clamping device is fitted in the turret, giving a choice of three positions.

### Sec. 4. Sighting and Observation Instruments.

#### (a) The TSh 2-22 Pivot Sight.

The TSh 2-22 sight is used for direct fire by both the gun and the co-axial 7.62 mm M.G. The sight (fig. 27) is a telescopic optical tube with a sight head, which moves in the vertical plane at a given angle in relation to the eye-piece.

When the sight is mounted in the tank, the sight head is rigidly linked to the gun by a bracket attached to the cradle. The eye-piece section is attached to the turret roof by a hinged clamp.

#### Optical Characteristics of the Sight.

Magnification (variable)	3.5 x and 7 x.
Field of Vision, degrees	18 and 9.
Diameter of the Exit pupil mm.	5.4 and 2.7.
Distance of Exit Pupil mm	25.

The TSh 2-22 sight consists of a sight head with a sighting mechanism, a pivot with a straightening system, a variable magnification box, an eye-piece with a light filter, sighting gear, and protective glass heater and wiper.

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The sight head consists of the main case (21) with a cap containing the protective glass and heater. In the lower part are two cylindrical trunnions (20), and in the upper part - a tooth and cam mechanism with a screw (4) to fasten the sight to the bracket.

In the sight head is the sighting gear mechanism and the direction (3) and height (5) adjusting screw mechanisms. In the upper part of the sight head beneath the screws (3) and (5) is screwed a lamp socket to illuminate the graticules.

The pivot mechanism (19) consists of the front and rear sections of the pivot and the side mirror frame.

The front part of the pivot is firmly attached to the top of the sight head and the rear to the variable magnification box. The front and rear sections are joined together by two junction plates, to the left of which is attached the side mirror frame. The mirrors are attached by toothed plates.

The variable magnification box (18) is designed to house the mechanism which alters sight magnification. The mechanism consists of two movable lenses in holders. The holders are hung on free-turning axles from the top of the box. Depending on which of the lens systems is in use, the sight gives 7 x or 3.5 x magnification. Outside the box is a handle which brings the lenses into play. When the handle is pushed away, 7 x magnification is brought into play: when pulled towards one, 3.5 x magnification is being used.

The eye-piece (9) is a tube with a rotating eye-piece and an excluding light filter, which enables the sight to be used locking into the sun. The switch (14) for inserting and withdrawing the filter is on the left hand side of the sight. Outside on the tube is fitted a holed flange (10) for the pivot clamp and a bracket (13) for attaching the padded eye-piece (11).

The eye-piece section may be adjusted to obtain a sharply defined picture by turning the sleeve (12).

The sighting gear mechanism consists of a knurled nut (15), a ~~cardan~~ shaft (17) and two pairs of bevel gears. The turning movement from the knurled nut (15) to the ~~cardan~~ shaft is transferred through the first pair of bevel gears, and the movement is continued from the ~~cardan~~ shaft to the frame in which the graticules are set through the second pair.

If the horizontal cross-wire can not be fitted into the zero position of the graticule scale by turning the knurled nut (15), the four screws on the end face of the knurled nut (15) should be unscrewed 1 - 1½ turns. Then, turning the knurled nut and looking through the sight, bring the zero position of the scale and the horizontal cross-wire together. Tighten up the screws after adjusting.

The protective glass heater prevents icing-up and misting-over of the protective glass. The heater is in the form of a spiral, pressed into the rim of the protective glass holder. Outside on the holder is attached a laminated contact adaptor, to which is joined one end of the spiral: the other end is joined to earth on the sight. A wire from the plug (2) is joined up to the contact adaptor. The plug is on the left hand side of the sight head. The heater must be switched on when the sight is being used in rain or snow.

The wiper mechanism cleans the protective glass of dust, mud, snow and frost. It is fitted on the right-hand side of the sight on the variable magnification box and the sight head.

The optical system of the sight (fig. 28) consists of the following parts:

protective glass (1), object glass (2) graticules (3) condenser (4), four mirrors (5), an erector system (6-fixed lens, 7,8, moving lenses) light filter (9) and eye piece assembly (11).

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When using the 3.5 x magnification the movable lens (8) with a focal length of 275 mm is switched in. When using the 7 x magnification the lens (8) is withdrawn and lens (7) with a focal length of 550 mm is switched in.

The graticules are a glass plate with a scale on it (fig. 29). It is in the focal plane of the object glass. On the graticules are the following scales:-

- scale inscribed  $\frac{OF}{PCLN}^{(1)}$  for use when firing HE fragmentation at full charge.
- scale inscribed  $\frac{BR}{412B}^{(2)}$  for use when firing AP tracer with full charge.
- scale inscribed  $\frac{OF}{UM}^{(3)}$  for use when firing HE fragmentation with reduced charge.
- scale inscribed  $\frac{GT}{T}^{(4)}$  - for use when firing heavy bullets from the MG.

The divisions of the scales are marked 2,4,6, and so on corresponding to the ranges in 100's of metres. 2 = 200 m, 4 = 400 m, 6 = 600 m etc.

Beneath the range scales are sighting marks - the lateral correction scale. The central large inverted V is for aiming without lateral corrections, the remaining inverted V's and marks are to apply lateral corrections. The value of a division is .004 (4 mils), and between inverted V's is .008 (8 mils).

The divisions 10, 18 and 20 on the vertical line serve to ascertain whether it is possible to fire over the heads of our own troops.

The clearance between the upper end of the vertical line and the angle of the inverted V is equivalent to .002 (2 mils) and serves to define distances to targets.

In addition to the range scales and lateral correction scales, an immovable horizontal line appears in the field of vision of the sight.

Turning the knurled nut on the sighting gear, move the graticules in a vertical direction so that the division corresponding to the range coincides with the indicator line.

The sight bracket fastens the sight-head firmly to the moving part of the gun. It is fitted on the left-hand side of the gun to a recess in the cradle ring and is fastened by 4 bolts with spring-washers and a locking pin.

The pivot clamp of the sight (fig. 30) fastens the eye-piece section of the sight in a position comfortable for the layer.

## NOTES.

- |     |                    |   |  |
|-----|--------------------|---|--|
| (1) | $\frac{OF}{Full}$  | = | $\frac{H.E. shell}{Complete}$                            |
| (2) | $\frac{BR}{412 B}$ | = | $\frac{Armour piercing tracer}{412 B}$ (index explosion) |
| (3) | $\frac{OF}{UM}$    | = | $\frac{H.E. shell}{Reduced}$                             |
| (4) | $\frac{GT}{T}$     | = | Heavy  |

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The upper hinged part of the clamp is fastened to a bracket (1), welded to the inner side of the turret roof, by a bolt (3) and washer (2). 50X1-HUM

In the bracket are three threaded apertures to adjust the height of the eye-piece according to the height of the layer. To adjust the eye-piece laterally, the lateral aperture under the bolt (3) in the upper part of the clamp is used.

The drill for mounting and fastening the sight in the tank is as follows:-

1. Loosen the sleeve (7) (Fig. 27) of the clamp on the eye-piece tube, first unscrewing one or two turns the fastening nut of the sleeve.
2. Unscrew the screw (4), fastening the sight to the bracket; the catch of the fixing spring should NOT slip from the head of the adjusting screw.
3. Put the sight nose first into the sight bracket aperture, and mount it on the bracket so that the tooth of the sight head fits into the recess of the bracket, and the trunnions (20) lie straight in the radius recesses on the bracket.
4. With a special box spanner, (6) screw in the adjusting screw: the lug should clamp the sight head firmly into the bracket.
5. Join the sleeve of the pivot clamp on the sight to the connecting plate of the clamp by the bolt, and make fast the bolt ends with split-pins.
6. Clamp the sleeve to the sight with the screw and adjust the height of the eye-piece to suit the layer, using the openings in the bracket.
7. Fasten the padded eye-piece with a screw on to the bracket (13) in a comfortable position for the right or left eye.
8. Join up the electric lead for the illumination of the graticules and the heating of the object glass protective glass.

(b) The Sight Clinometer and Turret Azimuth Indicator.

The Sight-Clinometer (fig. 31) is designed to provide the necessary angles of quadrant elevation for the gun when firing from concealed positions.

The sight clinometer consists of a sight clino drum (4), a cradle (2), a spirit bubble (1) and a worm spindle with a milled knob (6) which is attached by a nut (3).

On the top of the clino drum is a divided scale, numbered from - 1 to + 5.

On the worm spindle is fixed a ring (5) with 100 divisions. The ring is fastened by a screw (7).

Every division of the scale on the drum equals 100 mils and each division of the worm spindle ring equals one mils. Thus using the sight clinometer the gun may be laid in the vertical plane from - 100 mil to + 500 mils with an accuracy of one mil.

A folding lamp which may be switched on when necessary is fitted over the sight clino.

The turret azimuth indicator is designed to show the angle of traverse of the turret in relation to the hull of the tank. The divisions of the indicator are marked on the lower ball race of the turret. The ball race is divided into 600 small divisions, the small ones being worth 10 mils and the large one 100 mils.

The indicator bar is situated on the layer's left on the upper ball race. The indicator bar and the azimuth indicator divisions are illuminated by a small lamp. When the gun is turned into the direction the tank is moving, and the longitudinal axis of the gun coincides with the longitudinal axis of the tank, the indicator reads 30 mils: with the gun turned to the rear, 60 mils: 50X1-HUM

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to the right, 45 mils and to the left 15 mils.

The turret azimuth indicator may be used for night firing and also for target indication.

(c) The K 10-T Lensatic Sight.

The K 10-T lensatic sight is used with the DKSh MG to engage aerial targets.

Basic Optical Data

Focal length object glass mm	60.9.
Light diameter of object glass mm	40
Value of small division of rangefinder mils	10
Value of large division of rangefinder mils	20
Angle subtended by radius of small graticule ring, degrees	4.5
Angle subtended by radius of large graticule ring, degrees	7.
Distance of eye pupil -	
from small ring mm	250
from large ring mm	165.

The K10-T (fig. 32) consists of a sight head (8), optical system and a light filter (3). The sight is mounted in a recess in the sight casing and is attached by two collars (1) and (7). When travelling the sight is covered by the sight casing lid (2).

The sight may be adjusted vertically and horizontally by regulating bolts (9) and (10).

To adjust the sight in the horizontal plane the binder bolt (12) must be slackened and, by turning the regulating bolt (10), adjust the optical axis of the sight horizontally to the point of aim.

To adjust the sight in the vertical plane the binder bolt (11) must be slackened, and by turning the regulating bolt, adjust the optical axis of the sight vertically to the point of aim.

When the adjustment has been completed, tighten the binder bolts (11) and (12) and fasten the regulating bolts (9) and (10) with nuts.

The optical system (fig. 33), mounted in the body of the sight, consists of a silvered and lacquered glass (5) on which are marked the graticules (the glass is in the focal plane of the object glass): a mirror (4), which ensures the refraction of the optical axis at 90°: an object glass assembly (3): a reflector (2) with a semi-transparent silvered surface on a reflecting glass.

When firing at a target on a bright background a removable light filter is used.

Light rays from the target fall on the graticule glass. The image of the graticules is reflected by the mirror (4) into the object glass (3) and strikes the reflector (2). As a result of the corresponding selection of reflection coefficients, it is possible to see simultaneously on the reflector (2) both the graticules and the target in day time without electrical illumination. Thus both target and graticules appear on the reflector simultaneously.

(d) The Tank Commander's Observation Instruments.

In the front part of the commander's cupola is mounted an observation periscope TPK-1, and around the hatch are four prismatic devices. By means of this arrangement the tank commander has all-round vision without traversing the turret.

The TPK-1 periscope is designed for observing ground, identifying targets, gauging ranges to targets, target indication and correction of artillery fire.

The TPK-1 (fig. 34) combines an observation instrument with binoculars. Magnification is variable (1 x or 3 x).

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Magnification	5 x.	50X1-HUM
Field of view, degrees	7.5.	
Diameter of exit pupil mm	5.6.	
Distance of exit pupil mm.	20.	

## Observation through the mirror

Magnification	1 x
Field of view, degrees	
horizontal	17.5.
vertical	7
Arc of vision, forward, degrees	
horizontal	36
vertical	10

The instrument is fastened by a frame (13), the axes of which go through holes in the side walls of the instrument and hold it firm. The instrument may be tilted in the vertical plane. A binder bolt (2) fixes the instrument in the tilted position. The periscope is turned in the horizontal plane by rotating the commander's cupola.

The periscope is in three main parts: the periscope head, the main body and the eye-pieces.

The periscope head contains the upper prism.

The body contains the mirror (18), protective window (16), handles (7) and eye-pieces (5). On the left handle there is the commander's control button (9). The body and head-piece are joined by a pivot mechanism (15) and a lock (20).

The eye-pieces (5) consist of object glasses and eye-piece assemblies. The left eye-piece is fixed immovably to the body, but the right can move in a slide when the knurled nut (6) is turned. In the field of view of the right eye-piece are gratitudes for measuring angles in the vertical and horizontal planes, and a range-finder scale for measuring ranges to targets with a height of 2.7 metres. To define ranges the target image must be set between the tick and dotted lines so that it touches them. The figure under which the image is gives the range to it in 100s of metres.

The eye-pieces must be adjusted for clearness of image and to fit the eyes of the observer. To adjust for clearness.

1. Set the mirror (18) with the knob (3) in a vertical position parallel with the front wall of the periscope.

2. Turning the collars (17) adjust the right eyepiece for sharpness of image and then the left. To set a distance between the eyepieces, equal to that between the eyes of the observer, turn the knurled nut (6) and adjust the right eyepiece in relation to the left until a comfortable position is reached and the image is seen in one circle and not two.

3. Then remember the number which appears on the scale (8) against the indicator. This number (e.g. 65) is the distance in millimetres between the eye-pieces and between the eyes of the observer. In future when preparing the periscope for operation the eyepieces may be set directly by using this number.

Before using the mirror for observation, tilt it, pull out the knob (3) with the fixing device to the right and turn it back to stop into the head of the arresting screw. Then release the knob so that the fixing device fits into the recess in the regulating plate.

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If it becomes necessary to clean dust from the mirror and object glasses (use clean, dry flanneling), unscrew the screws (10) and lift the frame with the protective window.

In the event of damage to the upper prism (11), it may be replaced by a spare one, as follows:-

1. Unfasten the lock (20), raising the catch.
2. Turn the body of the periscope 90° to the head-piece. In this position it will be held by the pivot mechanism lock plate.
3. Remove the prism, pulling it down by the rim.
4. Insert the spare prism.
5. With a finger of the left hand press down on the pressure plate (1) of the lock of the pivot mechanism, and with the right hand turn the periscope back to its working position and close the lock.

The prismatic observation devices (episcopes) (fig. 35) mounted in the commander's cupola, are identical in design. Each episcopes consists of a prism in a metal frame 4. In front of the eye-piece is a protective window (1). On the lower part of the episcopes is a rubber pad protecting the observer from hard knocks on the episcopes.

(e) The Layer's and Loader's Observation Devices

MK-4 periscopes are fitted in the sighting compartment for the layer and loader. The main parts are as follows:-

Prisms (10 and 15), main body (6), movable prism (13), brow pads (14) and handle (16). The main body consists of two parts joined by a pivot mechanism and a lock (7). This device enables the upper prism to be changed without removing the periscope.

The periscope is fastened by two flanges (12) and bushes (8). On the side walls of the upper part of the body are trunnions which lie in recesses in the lower flange and support the periscope. The binder bolt (5) holds the device in the slant position.

The movable prism (13), fastened in the periscope, enables the observer to see backwards. If the prism is moved right upwards, then observation is restricted to the front if, however, it is moved right down and the periscope turned through 180°, then observation is extended to the rear.

In these positions the prism is held by holding balls (1). To change the upper prism in the event of damage, open the lock (7), turn the lower part of the periscope through 90°, remove the prism, insert the new one and rejoin both halves with the lock.

To ascertain the direction of march the periscopes are equipped with a graduated scale and indicator. The scale (3) is fixed immovably to the top of the turret, and the indicator (2) moves with the periscope. The graduated scale has 30 equal divisions worth 6° (100 mils) arranged in a semi-circle.

(f) The Driver Mechanic's Observation Instruments.

For observation with hatches closed two instruments are housed in the junction between the hull top-plate and the hull front-plate (fig. 57).

The instrument consists of two prisms (4 and 11), set in a metal casing (12). On the casing is a rubber packing (13), which prevents dust from getting into the tank.

The left-hand episcopes allows observation to the front and partially left, and the right-hand one, set at an angle of 15° to the left-hand one, allows observation forward and right. Both episcopes are mounted on a base (10) and may be fixed in a raised or lowered position by an adjuster bolt (3).

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In front of the internal windows of the left and right episcopes are protective windows of toughened glass. The protective windows (9) are set in the brow pad (7).

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Outside the tank in front of each window is a rubber wiper (14) attached by 3 screws. To clean the glass of snow and mud move the episcopes up and down. The internal windows should be cleaned when the episcopes are in the lowered position. To wipe the inner side of the protective window, the episcopes must be removed. To clear snow and dust from the windows, clean, dry flannel must always be used.

In the event that an episcopes is damaged or destroyed during operations, the unserviceable episcopes is removed, and a spare one fitted.

(g) Maintenance of sighting and optical equipment.

During technical servicing and march halts the condition and fastenings of the instruments must be checked. During technical servicing No. 3 in addition the zero aiming position of the ~~TS~~ 2-22 sight is checked.

Dirt should be wiped off with a clean rag, and the instrument should be lightly oiled with industrial vaseline. The glass surfaces must not be oiled or touched with the hands: it is permitted only to wipe them with clean dry flannel.

Excessive force must not be applied when turning knurled nuts and tightening binder bolts.

Care must be taken when fitting and removing the instruments not to damage the optical parts.

## Sec. 5. Ammunition

Ammunition carried by the T-54 is as follows:-

- 34 rounds for the 100mm D-10T, of which 20 are HE fragmentation and 14 AP tracer.
- 500 rounds for the 12.7mm MG DSLh, of which 400 are AP incendiary B.32 and 100 AP incendiary tracer EZT.
- 3000 rifle rounds for the 7.62mm MG SGMF, of which 1800 have a heavy bullet, 300 on AP-incendiary bullet and 900 a tracer bullet.
- 300 rounds 1943 type for the 7.62mm Kalashnikov automatic carbine, of which 282 are ball amm. and 18 tracer.
- 20 hand grenades F-1.
- 2 sets of signal cartridges for the signal pistol.
- 2 smoke canisters.

### (a) Ammunition Stowage

The stowage of the 100mm. rounds is shown on fig. 38. 34 of these fixed amm. rounds are stowed in special racks in the hull and turret of the tank. The main shelved rack (fig. 39) for 20 rounds is in the front of the hull. It consists of a front (2) and rear (1) plate, trays (3) and safety brackets (4). A shelved rack for 5 rounds is housed in a recess in the turret.

Amm. clips for 9 rounds are situated:-

- on the left side of the hull - 2 rounds.
- on the right side of the hull - 4 rounds.
- in the bilge of the tank by the fighting compartment bulkhead - 1 round.

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- on the right side of the turret - 2 rounds.

The amm. clip (fig. 40) consists of a small bracket (1), a spring (2), a large bracket (3), wire catches (4), clips (5), and drop-hinged holders (6).

Stowage of 12.7mm rounds for the DShK MG. 200 rounds for the DShK MG are fitted in belts of 50 each and stored in magazine boxes. There are 4 of these boxes, situated:-

- in the fighting compartment of the tank on the left-hand side of the hull - 1
- on a bracket on the layer's seat (under the gun - 2).
- on a bracket on the MG cradle - 1.

The remaining 12.7mm rounds (300) are stored in their issued packing in spare places.

Stowage of 7.62mm rounds for the SGMT MG. Rounds for the co-axial and front hull MGs SGMT are fitted in belts of 250 rounds. The belts are kept in 14 magazine-boxes, of which 11 are for the co-axial MG (the scale for the SGMT) and 3 for the hull MG (additional). The belts for each are identical.

The magazine-boxes for the co-axial MG are situated:-

- on the right side of the hull behind the racks - 4.
- on a bracket on the layer's seat (under the gun) - 4.
- on a bracket on the co-axial MG - 1.
- in the front of the hull - 1.

Of the 11 magazine-boxes, two are reserve.

Magazine-boxes for the hull MG are situated:-

- to the right front of the driver - 2.
- to the right of the driver's seat under the MG - 1.

Stowage of rounds for the AK automatic carbine. The AK automatic carbine is kept in a tarpaulin cover in the turret on the right-hand side. 180 rounds (in six curved magazines) are kept in a tarpaulin bag, which is fastened to the right side of the turret under the carbine. The remaining 120 rounds are kept in any available space at the crew's discretion.

Stowage of the F-1 hand grenades. 12 F-1 hand grenades are kept in 5 tarpaulin bags and are fastened by straps to special shelves on the sides of hull in the fighting compartment. The grenade primers are kept in a separate bag marked "PRIMER". The remaining 8 grenades are stored at the crew's discretion.

Stowage of the 26mm. signal cartridges. The signal pistol and 2 sets of cartridges are kept in a leather holster and special bag, attached to the turret behind the commander's seat.

#### (b) Ammunition Markings.

Markings are defined as the standard signs and inscriptions painted on the shell, cartridge case and packings of ammunition (see fig. 41).

Their function is to distinguish rounds and enable to be used only those which are designed for a given gun and correspond to the execution of a given fire task.

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The following fixed amm. is used with the 100mm tank gun:-

Designation of Round	Round Code	Shell Code	Charge	Fuze
Fixed cartridge with AP-tracer shell	UER-412D	ER-412D	Full	MD-8 or DBR-2.
Fixed cartridge with AP-tracer shell and ballistic cap(1)	UER-412B	ER-412B	Full	MD-8
Fixed cartridge with AP-tracer sharp pointed shell(2)	UER-412	ER-412	Full	MD-8
Fixed cartridge with HE - fragmentation shell (full charge)	UOF-412	OF-412	Full	RGM-6, RGM.
Fixed cartridge with HE - fragmentation (reduced charge)	UOF-412U	OF-412	Reduced	RGM-6, RGM.
Fixed cartridge with tracer practice shot (2)	UPER-412	PRB-412	Full	-
Notes (1) AP-Tracer Shells ER-412B and EP-412 are fitted with No.7 tracer. (2) Such shells must only be used for practice. The head and cylindrical part of the shell are painted black.				

(c) Handling and Preparing of Ammunition.

Inspection of amm. before stowage in the tank. The crew receive the gun rounds in 17 standard amm. packings. Before stowing in the tank, the condition of the racks must be checked and then the rounds checked, grease, sand and dirt removed, sorted according to markings and weight, and stow them in the tank through the **Loader's** hatch.

When stowing.

1. Rounds in which the RGM fuze striker cover is seen to be torn or punctured when the fuze cap is removed, must be replaced.
2. Check that the fuze of the RGM is set to "0". Rounds which have the setting "Z" should be changed.
3. Check that the fuze has been screwed right home. If necessary, it is permitted to screw it home (at a distance of 20-30 m. from the tank) under the supervision of an artillery technician.

In tanks it is forbidden to carry out any work on ammunition whatsoever, with the exception of removal of safety caps, fuze setting, and ~~cleaning~~ the shell and cartridge with a rag.

4. Rust on the centering band and driving band of the shell must be removed with a brass scraper and a rag dipped in parafin. Change any shells with dents.
5. Check that the shell and cartridge are firmly joined. If a shell is just holding to the cartridge, but cannot be pulled out by hand, it may be stowed in the lowest tray of the main rack and used at the first opportunity.
6. Cartridges with cracks on the base or around the flange, or with big dents should be replaced.

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7. The primer which protrudes from the base of the cartridge is screwed in with a special key from the standard spare parts kit. However, if it is sunk more than .5mm unscrew it, and set it flush with the base of the cartridge.

Preparation of ammunition for firing and handling during firing.

1. Before loading the cartridge, wipe it with a rag so that the barrel does not become dirty.
2. When firing fragmentation or HE. fragmentation shell set with the special key the RGM Fuze corresponding to the given command. The fuze should be set on only the next two or three shells prepared for firing.
3. Treat the shells carefully - do not drop them. To fire a shell which has fallen from a height of more than 1 metre, is forbidden.
4. When loading do not knock the RGM Fuze against the breech block, or the fuse cap may be damaged. If the cartridge does not go completely home into the chamber, it is categorically forbidden to strike the base of the cartridge to ram the cartridge into the gun. In such an event the wedged cartridge must be removed from the barrel with the hand extractor and placed in an ammunition box: the chamber must be inspected and cleaned and then the gun may be loaded with the next serviceable clean cartridge.
5. If there is misfire in the primer, switch off the electrical firing gear BS-11, wait one minute and switch on again. Re-cock and fire. If once again there is a misfire, do not release the striker again but, having waited one minute, open the breech and remove the cartridge. Load the gun with another cartridge and fire.
6. If, after the removal of the cartridge the shell remains in the barrel, the gun may only be unloaded by firing with a reduced charge. For this a shortened cartridge (30mm. smaller) is used with a reduced charge: insert into the breech and fire.
7. The shortened cartridge (one per tank), in weight  $\frac{3}{4}$  of the standard one, is made at unit level from standard cartridges and normal charges, is kept in the racks and carried in the tank as laid down by the Main Tank Directorate (GBIT).

Handling of shells not used during firing. Screw safety caps back on all fused shells. Check that rounds with the PGM Fuze are set to "0". Such rounds must be fired first at the next shoot.

Rounds checked as above are laid neatly back in the racks.

Do not allow cartridges to come into contact with battery terminals. Disregard of this rule will lead to the explosion of the charges.

Sec. 6.

#### Gun Drill

- (a) Preparation of the gun for firing and movement.

Inspection of the gun before firing. Before moving off on a battle tank or firing practice, the gun must be inspected. The bore, chamber, breech guides in the breech ring and breech must first be wiped free of grease with a rag.

Inspect the barrel from the inside and the outside. If cracks or bulges are discovered the gun must not be fired.

Take out the breech block. Strip the striker mechanism. Wipe the parts free of grease, dirt and dust and inspect them. Check with a gauge striker protrusion. It should be between 2 and 2.38mm. If the firing pin protrudes less than 2mm from the breech surface, the striker bore should be cleaned carefully with a wooden rod and rag. If after this protrusion has not increased, fit the spare striker mechanism.

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Place the block in the guides, and, by opening and shutting the breech two or three times, check the operation of the breech and striker mechanisms. In the case of an unloaded gun the striker must be released without weakening the main spring.

If the breech closes sluggishly, carefully clear out the guides: if this does not help, adjust the spring of the closing mechanism by screwing the adjuster nut into the socket of the semi-automatic closing device.

Inspect the firing mechanisms, cock the striker and by pressing the hand firing lever, test the firing mechanism.

Check the electrical and hand firing levers by the 3-way switch. The mechanism should work in three different positions of the elevating handwheel. In all three positions the electric firing switch should work reliably.

Check the movement along the recoil strip of the recoil indicator slider which should move along freely.

Check the elevating gear. Release the gun from the travelling clamp. Turning the elevating handwheel, apply maximum angles of depression and elevation. If the handle moves stiffly, remove the dirt from the cylindrical cogs and toothed arc.

Check the traversing gear. Release the turret clamp and check the operation of the traversing mechanism by turning the turret through 360° right and left using both electrical and manual mechanisms.

Check the TSh 2-22 sight. Check the fastenings of the pivot clamp to the turret roof and the fastenings of the sight itself. The sight clamp should turn freely on the pivot without rocking or sideways movement. Fasten the brow pad in the holder in the required position. Check cleanliness of protective glasses, and remove dirt and dust with flannelette. Looking through the sight, make sure that the image of viewed objects, the graticules, sighting "inverted V's" and lines are clear. Turning the knurled nut, check the movement of the sight carriage: the end divisions of the sighting scale should reach the indicator line. Check the serviceability of the night graticule illumination system, firstly switching on the tumbler switch, "Optical Illumination".

Checking of recoil mechanism. Check the piston rod fastenings. Ensure that there is no liquid seeping from the packings or from the shut-off valve of the recuperator. Before firing the recoil system must be checked.

Check the quantity of liquid in the recuperator and buffer, and also the pressure in the recuperator. If necessary the amount of liquid and pressure of nitrogen should be brought up to the required level: the amount of liquid in the buffer up to 6.4 litres in the recuperator to 4.4 - 4.6 litres, and the initial pressure in the recuperator to 53-57 atmospheres.

To check the amount of liquid in the buffer, fit the night olino, attaching it to the guard shield, set at + 100 mils. Turning the elevating handwheel, bring the bubble to the centre, thus applying to the gun an angle of elevation of 6°. Unscrew the stopper from the buffer cylinder with key (42-52). If liquid appears in the aperture, then there is sufficient in the buffer. If it does not appear, add it in the following manner:

Collect the liquid in a grease gun, insert the end in the aperture and add the liquid until it runs out of the aperture. Screw up the stopper of the buffer cylinder.

The drill for checking the liquid in the recuperator is as follows:-

1. Bring the barrel to a horizontal position.
2. Unscrew the valve top with key 42-52.
3. In the T-pipe recess screw in a T-pipe with a manometer so that the scale is visible.

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4. Carefully unscrew the valve one turn with key (42-15) and check the pressure on the manometer. Close the valve.
5. Remove the split-pin on the end of the recuperator piston nut, fit key A52840-28 to it and, turning the key screw the nut onto the piston until the graduation line on the piston coincides with the face of the nut.
6. Screw on to the end of the recuperator piston the screw of the liquid determining device (42-411), place the pipe on the screw, and tighten the nut of the device.
7. Place a tap wrench on the nut of the device and, turning it, release the recuperator piston 110mm. so that the graduating line on the screw of the device coincides with the face of the nut.
8. Unscrew the valve and check pressure on the manometer. Tighten the valve.
9. By the readings on the manometer (initial pressure and pressure when piston is released 110mm) work out on the graph attached to the guard shield the amount of liquid in the recuperator: find on the graph (fig. 42) the intersection point of the horizontal and vertical lines: the horizontal lines being the initial pressure and the vertical lines the pressure with the pressure released 110mm.

If the point of intersection lies on the middle line or between the middle line and one of the adjoining parallel lines, then the amount of liquid is inside the limits. (~~4.4-4.6~~ litres).

If, however, the intersection point lies higher than the top diagonal line, the liquid in the recuperator is above the limits and must be decreased: if it lies below the line, liquid must be added to that in the recuperator.

To reduce the amount of liquid in the recuperator:-

1. Apply an angle of elevation of 5°-10° to the gun.
2. Without removing the T-piece, unscrew the cap on a branch of the T-piece a couple of turns.
3. Place a litre jar under the branch of the T-piece. Carefully unscrew the valve half a turn and release the surplus liquid into the jar. Screw up the valve and test again as shown above.

To add liquid to the recuperator using the dual-action pump:-

1. Join the screw of the device to the recuperator piston.
2. Return the recuperator piston to the run-out position, joining with key A52840-28 the nut with the piston so that the apertures in the nut and the piston coincide: then join them with a split-pin.
3. Apply maximum angle of depression to the gun.
4. Join the cap with the branch of the T-piece.
5. Unscrew the valve a half-turn and release part of the nitrogen, bringing the pressure in the recuperator to 30-40 atmospheres. Close the valve.
6. Screw out the manometer from the T-piece and screw in a stopper. Disconnect the cap from the other branch of the T-piece and connect to it the tube of the pump.
7. Pour into the pump reservoir the measured amount of liquid (as per the graph). Set the tap of the pump to "Liquid" and prime the pump so that liquid enters and fills the tube.
8. Unscrew the valve one or two turns and pump the liquid from the pump into the recuperator. Close the valve.
9. Unscrew the stopper from the T-piece branch and insert a manometer.

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a nitrogen cylinder. Carefully open the cylinder tap.

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11. Unscrew the valve one or two turns and, watching the manometer indicator, bring the pressure in the recuperator up to standard (53-57 atmospheres). Close the valve and cylinder tap.

12. Remove the cylinder tube from the T-piece and screw back the cap.

13. Re-check the liquid in the recuperator by the graph, and if it is within limits, disconnect the manometer and T-piece. In order to provide a hydraulic nitrogen resistance in the recuperator, set the gun at angle of 10°-15° elevation, unscrew the valve half a turn and when liquid appears in the T-piece recess, quickly close the valve.

14. Screw on the caps.

To add liquid to the recuperator using the NVG pump (52-I-035) (fig.43):-

1. Join the screw of the device to the recuperator piston rod.
2. Return the recuperator piston rod to the run-out position, screwing up the nut on to the piston with key (A52840-28) until the aperture in the nut coincides with that in the piston rod. Then split-pin the nut.
3. Mount the pump on top of the cap of the front (internal) fuel tank, thus:-
  - unscrew two bolts of the cap fastener and remove the front (internal) fuel tank cap.
  - fasten with bolts the bracket of the pump in its place.
  - fit the pump into the guide bracket.
4. Unscrew the manometer from the T-piece and replace it with a plug. Disconnect the cap from the other branch of the T-piece and joint up the pump tube.
5. Pour into the reservoir the measured quantity of liquid and lower the inlet tube of the pump into it; set the pump tap to "Liquid" and prime the pump so that the liquid fills the outlet tube.
6. Unscrew the valve one or two turns and pump the liquid into the recuperator. Close the valve.
7. Remove the tube and plug from the T-piece and screw on the cap and manometer.
8. Check the amount of liquid against the graph. If the amount is within the limits, unscrew the T-piece with the manometer and make a hydraulic resistance in the recuperator as shown above.
9. Screw on the valve cap.
10. Remove the pump and replace the front fuel tank cap.

To check the pressure in the recuperator:-

1. Lay the gun in the horizontal position.
2. With key 42-52 remove the cap from the cylinder bottom.
3. Screw the manometer into one branch of the T-piece, and then screw the T-piece into the recuperator cylinder recess.
4. With key sb 42-15 carefully unscrew the valve a half-turn and check the pressure on the manometer scale. Close the valve. Normal pressure in the recuperator should be 53-57 atmospheres. If the pressure (with a normal amount of liquid) is less than that, nitrogen must be added.

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To add nitrogen to the recuperator from the cylinder:-

1. Remove the cap from one branch of the T-piece and join up the tube from the nitrogen cylinder. The end of the tube is connected to the charging point 41-260 of the cylinder.
2. Unscrew the shut-off valve one or two turns and carefully turning the knurled nut, open the cylinder tap. Watch the manometer indicator and bring the pressure in the recuperator to standard (53-57 atmospheres).
3. Close the valve and cylinder tap and disconnect the tube from the T-piece: replace the T-piece cap.
4. Screw out the T-piece with the manometer and screw in the caps.

To add nitrogen to the recuperator using the pump NVG (52-I-035):-

1. Remove a cap from the T-piece and connect the tube from the pump (first having set up the pump as described above).
2. Set the pump tap to "Air", unscrew the valve one or two turns, and pump in air to the required standard (observing the manometer indicator).
3. Close the valve, disconnect the tube of the pump and replace the cap. Screw out the T-piece with the manometer. Remove the pump and replace the petrol tank cover cap.

If pressure in the recuperator is more than the required standard (with the normal amount of liquid), then the surplus must be released.

To release surplus nitrogen (air) from the recuperator:-

1. Apply maximum elevation to the barrel.
2. Without taking off the T-piece with the manometer, release a cap on the T-piece a few turns.
3. Open the valve a half-turn and release the surplus nitrogen observing the fall of pressure on the manometer scale. (If nitrogen comes out mixed with liquid, the tank must be moved so that the front is lower than the rear.
4. Having released the surplus nitrogen close the valve, unscrew the T-piece with the manometer and screw in the caps.

Each time nitrogen is added or released from the recuperator a hydraulic resistance must be formed (as shown previously above).

Until this hydraulic resistance has been formed, it is forbidden to work the elevating mechanism and especially to set angles of depression on the gun, to avoid losses of nitrogen from the recuperator.

NOTES

When checking liquid in the recuperator it is permissible to use instead of tool sb 42-411 the tool for pulling back the barrel sb 42-102, with which the latest issue of guns is equipped. For this, having checked recuperator pressure (run-out pressure) screw in one end of the sb 42-102 in an aperture in the breech ring, having unscrewed the plug, and fasten the other end to the turret.

Turning the tap wrench of the tool, pull back the barrel 110mm. On the latest issue guns there is a graduated line marked "110".

Pull back the barrel until the rear face of the breeching coincides with the graduated line.

In this position check pressure in the recuperator, and using the graph as above, check the liquid also.

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### Testing of Sight TSh 2-22.

To engage with aimed fire it is essential that the zero sighting line is parallel to the axis of the bore. This is achieved by testing the sight for height and direction. The sight is tested on a distant object or testing board.

Distant object method:-

1. Arrange the tank on a level platform without longitudinal or lateral slant.
2. Select a point of aim, 1000m away.
3. Stick a cross-wire of 2 threads over the muzzle face on the marked lines.
4. Remove the striker mechanism from the breech.
5. Turning the sighting knob, bring together the zero division of the range scale and the horizontal indicator line.
6. Looking through the striker aperture in the breech, bring the cross-wires on the muzzle face on to the selected point of aim, using the elevation and traverse mechanisms.

If the sight is correctly fitted, the top of the central (large) inverted 'V' will coincide with the point of aim.

If the inverted 'V' is displaced left or right in relation to the point of aim, then adjust it for direction by turning screw (3) (fig. 27) with the key (6). If it is displaced up or down in relation to the point of aim, then by turning the nut (15) of the sighting gear, bring the top of the central inverted 'V' to bear on the point of aim and then by turning screw (5) with key (6), set the horizontal wire on the zero divisions.

When visibility is bad or at night the TSh 2-22 sight is checked with a sights testing target (fig. 49), which is set up after testing the sight by the distant object method and zero-ing the M.G.

When testing the sight by the sights testing target, set it up 20 m from the muzzle face of the barrel so that the horizontal line coincides with the cross thread in the field of view of the sight or is parallel with it. The cross-wire on the muzzle-face should line itself up on the mark for the gun, and the top of the central inverted 'V' of the sight must coincide with the sight mark, as when testing the sight by the distant object method.

(c) Transferring the gun from the travelling position to the fighting position, and gun handling when firing.

The gun is moved from the travelling to the fighting position on the comd's order: "Action".

The drill is as follows:-

1. Take off the covers from the muzzle and breech of the gun, from the sight TSh 2-22, co-axial MG and hull MG and remove the plug from the aperture in the hull front plate.
2. Free the moving parts of the gun and turret (unclamp).
3. Close and lock all hatches.

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4. Switch on the turret lighting and sighting gear and electrical firing switch.
5. Push the recoil indicator slide as far forward as possible.
6. Set sights to zero.
7. Raise the collapsible recoil guard from the vertical to the horizontal and fit the folding commander's recoil guard.
8. Open the breech by hand.
9. Load M.Gs.
10. Give the 'ready' signal.
11. Watch for the senior comd's signals.

To load:-

1. Lift and turn the breech lever towards you and to the left, and then turn it in the other direction and press on the breech retainer catch - the breech will open.
2. Insert the round into the chamber, and ram it home sharply: the breech will close automatically.
3. Press on the loader's safety switch and report ready.

Laying the gun is achieved in direct laying by using the TSh 2-22 sight and in indirect laying by using the turret traverse azimuth indicator and the sight clino.

During direct laying the tank comd, having given the order to fire, indicates to the layer the shell to be used, the target direction, nature of tgt. range and method of fire.

Horizontal laying is achieved by traversing the turret. The turret may be traversed by the layer with the hand or electrical traverse system, and also by the comd using the comd's traverse system (see chap. "Electrical Eqpt. of the Tank" for details).

Vertical laying is achieved by using the elevating mechanism of the gun.

Laying is carried out in the following sequence:-

1. The tank comd, traversing the cupola, directs the TPK-1 device on to the tgt so that the central (vertical) graduations of the mirror and head prism or cross-wires of the eye-piece coincide with the centre of the tgt, switches on the button on the handle of the periscope and simultaneously gives the order to fire.
2. While the turret is turning, which it started to do when the button was switched on, the tank comd holds the periscope on the tgt until the turret ceases traversing. He then releases the button.
3. The layer, turning the knurled knob of the sighting mechanism, moves the sight graticules and brings together the division corresponding to the range to the tgt and the horizontal indicator line. The angle is set on the 'ER' or 'OF' scale according to the chosen charge (full or reduced).
4. Turning the handle of the traverse gear (or turning the traverse switch) and the elevating hand wheel bring the top of the central inverted 'V' on to the point of aim, if the laying is to be direct and without applied lateral corrections. If lateral corrections are to be applied, the layer brings together the point of aim and the top of one of the inverted 'V's or one of the short lines to the right or left of the central inverted 'V', depending on the size and direction of the correction.

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Indirect fire is used when firing from concealed positions and when the tgt is not visible through the TSh 2-22 sight. Having noted the data on the turret azimuth indicator and the sight clino e.g. 32-40 and 1-15, the target may be engaged using the data of the azimuth indicator, the sight clino and range tables.

### Firing

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Firing drill is as follows:-

1. Switch on fans.
2. Check the point of aim.
3. Press the electrical firing switch or firing lever, having reported "shot".

If a round is not fired when the striker is released, the loader must:

1. Wait not less than one minute and break the circuit with the BS-11 switch.
2. Having received permission from the layer, re-cock.
3. Report "Ready".

If there is still no round fired when the striker is released again, wait one minute, open the breech and change the round.

Note: When engaging enemy tanks in the event of a misfire the round is changed after the first release of the striker. Safety precautions are observed.

### Unloading.

When the tank cmd orders Cease Firing a loaded gun must be unloaded.

It is forbidden to move with a loaded gun.

To unload:-

1. Open the breech sharply.
2. Remove the round and place it in the rack.
3. Close the breech.

Note: If when unloading the cartridge and charge come out, leaving the projectile in the chamber, the gun may be unloaded by firing the round with a reduced charge in a specially shortened cartridge (see section "Handling of Amn. and Preparation for Firing").

### Firing Safety Precautions

1. Do not move behind the recoil guard, to avoid blows from the recoil system.
2. It is obligatory to wait one minute in the event of a misfire and then to re-load. (This is to avoid an accident caused by a hang-fire).
3. If recoil exceeds 570 mm. cease firing, check the system, ascertain the cause and remedy the fault.
4. Cease firing if knocking is heard from within the recoil cylinders during recoil of the moving parts.
5. In winter when the air-temperature is low, the first 2 or 3 rounds (warmers) should be fired with reduced charge.

(d) Maintenance of the Gun.

In battle and after range practice, maintenance consists of cleaning, inspection of the parts and mechanisms, and oiling.

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On a normal inspection check:-

- operation of the elevating mechanism, traversing mechanism, and turret clamps.
- electrical firing switch.
- covers and cover fastenings
- amm. racks and round fastenings.

On technical servicing No. 1 check:-

- serviceability of racks and round fastenings
- serviceability of electrical firing switch:

ensure the gun is unloaded, and setting the striker on to the ~~sear~~, release it by pressing the button or lever.

- ease of movement of the hand wheels on the horizontal and vertical laying mechanisms. If the turret traverse handwheel is tight, clean the cogs of the driving gear and the cogs of the lower race ring, oil with ~~TSIATM~~-201. In hot dusty conditions lightly oil with gun oil and if required wash out the race ring.

- condition of the chamber ~~and bores~~: if necessary clean and oil.

On Technical Servicing No. 2 carry out all No. 1 tasks as above and in addition check serviceability of turret clamps.

On Technical servicing No. 3, carry out all No. 1 and 2 tasks and in addition oil the cogs of the traversing gear of the turret (the electrical mechanism).

Moving to the Travelling Position. The gun is moved into the travelling position on the order of the tank comd "Cease Firing". The drill is as follows:-

1. Unload.
2. Clamp the turret and moving parts of the gun.
3. Unclamp and lower the recoil guard.
4. Set the TSh 4-22 sight scale to zero.
5. Set the recoil indicator slide to the forward position.
6. Carry out an external inspection of the tank.
7. Switch off the tumbler switches on the sight, electric firing switch and turret illumination.
8. Covers on.
9. Report on the gun condition (length of recoil and amm. expenditure).

#### Cleaning the Gun

In battle gun cleaning is done on the orders of the comd depending on the battle situation. In addition, the gun is cleaned after firing, a march, exercises involving its use and for inspection.

To clean the gun after firing.

1. Oil the bore with gun oil while the gun is still warm (the oil softens the carbon deposits and facilitates its removal). Wind a thin rag round the sponge brush and liberally cover with gun oil. Introduce the brush into the barrel and

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2. Clean the outer surface of the barrel with rags and if they are excessively dirty, wash down with water (breech with parafin or diesel fuel) and then wipe carefully.

3. 2-3 hours later (when the carbon has softened) remove the oil from the barrel. Open the breech, twist a rag into a wad, soaked in parafin or diesel fuel, and push the wad along the barrel with a pole from the muzzle end.

4. Wash out the barrel. Push a wooden plug wrapped in rags into the chamber and apply a small angle of elevation. Pour soapy water or parafin into the barrel and clean unit with the sponge brush for 10 minutes. Use 1-1.5 litres parafin or 5-6 litres of water with 50 grams of soap.

Wash the barrel twice with parafin or three times with soapy water. If parafin or soap are not available, clean hot water may be used, but must be changed 5 or 6 times. When changing the liquids, depress the gun, pour off the liquid and then wash out the barrel again as indicated.

5. Pour off the liquid, remove the remnants of it from the barrel, depressing the gun and removing the plug and wiping out the barrel.

6. "Pull Through" the barrel. Pass a wad tightly bound with clean dry linen cloth 5 or 6 times through the barrel.

Wind the cloth strip around the middle of the wad two or three times. Wind the upper layer lightly into a cone and fasten it with a thread. The linen wad must be of such a thickness that it takes not less than 6 or 7 men to force it through the barrel. To pull through the barrel quickly and cleanly, ensure that the strip is not wound along the whole wad (the strip must be shorter than the wad). If the winding slips or jams, re-wind. If a hydro sponge is available, the oil may be removed and the barrel pulled through with it after washing (sponging through). This does not change the sequence of cleaning.

7. Ensure that the barrel is clean. Pass along it a test wad with a tightly wound clean, dry, white cloth. If traces of carbon remain on the cloth, continue dry cleaning: if it is badly marked, re-start washing.

Remember that the washing of the barrel is the basic method of cleaning it.

8. Carefully clean the chamber, breech guides, test clinometer surface, and all grooves angles and hollows where dirt may gather. Use for this a rag, parafin and wooden rods of various shapes with sharpened points.

To clean the breech it must be taken to pieces and each part wiped clean with a dry rag. To remove carbon from striker mechanism parts and the front surface of the breech piece, wipe initially with parafin rags and then wipe off with a dry rag.

To clean the moving parts, clean the cradle, breech ring, recoil system, gears and arc of the elevating mechanism.

To clean the ~~Mk~~ 2-22 it must be wiped with a dry, clean rag, seeing that the lenses are not scratched or damaged. Remove dust and grit from the lenses and then wipe them with flannellette.

#### Inspection after cleaning

After cleaning the gun is inspected with the aim of finding and remedying faults. The sequence is as follows:-

1. Establish by internal and external inspection that there are no dents, cracks, bulges, burrs on the lands of the rifling: is the barrel firm, and what is the condition of the breech ring and chamber?

2. According to the recoil indicator slide (during firing) and by external inspection of the recoil system, ascertain whether the buffer and recuperator

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must be checked, whether liquid is escaping, and whether the recoil system fastenings are broken.

3. Having inspected the breech mechanism parts, ascertain whether they are distorted, worn, or cracked: whether springs have broken, and whether the fastenings are in order.

4. Ensure that the sight fastenings on the pivot mechanism clamp and bracket are firm.

#### Greasing

The gun is always greased after cleaning.

To preserve the gun and protect its mechanisms the following lubricants are used: gun oil, oil AF-70, and spindle oil AU.

Gun oil is used for long term preservation of all the metallic parts from rust. Oil AF-70 is used for short term preservation of all metal parts from rust for about a year. Spindle oil is used to lubricate the gun mechanisms mixed 50%/50% with gun oil.

Barrel greasing is carried out in the following sequence.

- grease the barrel: use a clean dry sponge brush wound with a well greased clean fine rag and pass it 4 or 5 times through the barrel. See that the grease is spread evenly over the length of the barrel.
- grease the chamber using the same grease rag and one section of the sponge.
- wipe the breech guides of the breech ring lightly with a clean rag soaked in oil.

The breech is oiled with a clean rag soaked in oil. Dismantle the breech and oil all the parts: re-assemble and check the operation of the mechanisms. It is essential to remember that thick oil clogs the mechanisms.

The cradle is lubricated with the oil can of spindle oil AU. The cradle guides and the machined sliding surface of the barrel are oiled. When dismantling in summer the cradle is oiled with gun oil, and in winter with a 50/50 mixture of gun oil and spindle oil.

The arc and cylindrical gear of the elevating mechanism are lubricated with a rag soaked in oil. In addition all paint-free surfaces of the gun and places where the paint has worn away should be oiled. Painted surfaces will not be oiled.

#### Gun History Sheets

A gun history sheet is a document giving the life history of the gun. First drawn up in the factory, it is an indispensable part of the gun and must accompany it in all circumstances, whether in peace or war.

The sheets are kept in the form of notes translated into graphs giving data concerning

- use of the gun in units.
- nature of repairs.
- noted production and construction faults.

After firing and inspection the following facts are entered: time of firing, number of rounds fired, and charges used.

Details of repairs and damage, and what action was taken to remedy it, must be explained in notes. All entries will be in ink and will be clear, tidy and made at the relevant time.

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Nature of Fault or Stoppage	Cause	50X1-HUM
On loading the breech does not close or closes sluggishly	<p style="text-align: center;"><b>THE BREECH</b></p> <ol style="list-style-type: none"> <li>1. Cartridge not chamber gauged or dented, bulges on the cartridge lip, shell set aslant in the cartridge, primer protruding, bulges on the driving band.</li> <li>2. Chamber dirty and cartridge only partially enters.</li> <li>3. Weak ramming</li> <li>4. Thick grease on the guide grooves and ribs of the breech ring; dents or bulges on the working surfaces of the breech piece or breech guides.</li> <li>5. Closing mechanism spring weakened or broken</li> <li>6. Extractors bent.</li> <li>7. The plunger of the opening mechanism has not returned to its extended position because of: <ul style="list-style-type: none"> <li>- dirt or scratches in the bearings.</li> <li>- heavy friction between plunger and guides.</li> <li>- weakening or breakage of the plunger spring.</li> </ul> </li> </ol>	<p>Change the round.</p> <p>Remove carbon deposits and oil remnants, wipe with rag. Ram energetically. Remove the breech piece. Remove surplus grease and dirt, clean out dents with file and glass paper.</p> <p>Compress spring with adjusting nut: if this does not help, replace spring. Replace.</p> <p>In all cases return the plunger by hand: do not cease firing. After firing, if there is dirt on the bearings, remove it: if scratches, clean and oil the bearings and plunger: change the weakened or broken spring.</p>
Breech does not open after firing	<ol style="list-style-type: none"> <li>1. Broken firing pin jammed or cartridge base buckled</li> <li>2. Scratches or dents on the breech working surfaces.</li> <li>3. Retaining catch jams, and plunger passes under it on run-out, not striking it.</li> </ol> <p>Sluggish run-out.</p>	<p>Remove striker mechanism: allow cartridge case to cool and try to open breech. If not, apply a wooden rod to the breech piece and strike it with a hammer, simultaneously endeavouring to open the breech with the LBM. Open breech as above. Clean out scratches with smooth file. Inspect catch, remove dirt, and oil.</p>
Cartridge ejects sluggishly.	Sluggish run-out.	Check recoil system and remedy faults.
Cartridge does not eject.	<ol style="list-style-type: none"> <li>1. Expanded cartridge.</li> <li>2. Carbon deposits or residue in the chamber.</li> <li>3. Worn extractor catches.</li> </ol>	<p>Remove cartridge with screw extractor, screwing the end into the primer recess. Remove cartridge as above. Clean chamber. Replace extractors.</p>
Breech will not stay in the left (open) position.	<ol style="list-style-type: none"> <li>1. Worn extractor catches.</li> <li>2. Sagging or breaking of extractor detent catch springs.</li> </ol>	<p>Replace extractors.</p> <p>Replace springs.</p> <p style="text-align: center;">50X1-HUM</p>

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Nature of Fault or Stoppage	Cause	Remedy
Misfire.	<ol style="list-style-type: none"> <li>1. If firing pin has left a deep mark, primer faulty.</li> <li>2. If mark faint, then striker mechanism dirty or faulty (firing pin burred, main spring weak).</li> </ol>	<p>Change the cartridge.</p> <p>Remove striker mechanism. Remove surplus grease. If this does not help, replace faulty parts.</p>
Electric Firing switch does not work.	<p>Firing Mechanism Faults</p> <ol style="list-style-type: none"> <li>1. Wire disconnected or relay faulty.</li> <li>2. Fuze blown.</li> <li>3. Firing mechanism requires adjustment.</li> <li>4. Carbon deposits on the contact ring.</li> </ol>	<p>Fire by hand lever.</p> <p>After firing, replace fuze. After firing, adjust.</p> <p>Clean ring.</p>
<p>Collapsible part of guard will not stay in fighting position.</p> <p>Elevating gear works stiffly</p> <p>Elevating mechanism 'gives' when rounds are fired.</p>	<p>Recoil Guard Faults</p> <p>Guard clamp spring broken.</p> <p>Elevating Mechanism Faults</p> <ol style="list-style-type: none"> <li>1. Teeth of the elevating arc or cylindrical gear dirty.</li> <li>2. Burrs on the teeth of the arc or cylindrical gear.</li> </ol> <p>Disc springs broken or weakened.</p>	<p>Continue firing with guard dropped. Replace spring after firing.</p> <p>Clean arc and gear.</p> <p>Remove the projecting parts with a smooth file.</p> <p>With small 'give' not affecting accuracy of fire, continue firing. After firing compress the disc springs, turning the nut not more than 1/4 of a turn from the position in which the graduating line on the nut coincides with the centre of the line on the bush.</p> <p>If mechanism still gives, change the disc springs, turning the nut as shown in the section "Disassembling and assembling of the elevating mechanism" (Gun drill procedures).</p>
<p>Liquid seeps through packings of buffer and recuperator piston rods.</p> <p>Liquid seeps through plug of buffer piston rod or recuperator valve.</p> <p>Long recoil (more than 560mm) normal in-out.</p>	<p>Recoil System Faults</p> <ol style="list-style-type: none"> <li>1. Packings insufficiently compressed.</li> <li>2. Packings worn.</li> </ol> <p>Valve or plug insufficiently screwed in.</p> <ol style="list-style-type: none"> <li>1. Broken or weakened slide spring.</li> <li>2. Insufficient liquid in buffer and recuperator.</li> </ol>	<p>Compress.</p> <p>If after compressing, seepage continues, but does not effect recoil, continue firing. If recoil system works abnormally, the packings must be changed in workshops.</p> <p>Screw in.</p> <p>Check serviceability of slide and replace if necessary. If length of recoil does not increase, firing may continue, keeping close watch on the recoil length. If recoil reaches 570mm, cease firing and top-up liquid in the buffer and recuperator.</p>

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Nature of Fault or Stoppage	Cause	Remedy
Short recoil (less than 490mm) normal run-out.	Excess of liquid in the recuperator.	Check quantity of liquid in the recuperator on the graph and if necessary, top-up.
Incomplete run-out, but gun able to be run-out by crew's efforts: normal recoil.	1. Strong friction as a result of insufficient lubrication of cradle slides. 2. Insufficient pressure in the recuperator.	Oil the slides with spindle oil with a grease gun through the apertures in the cradle or with gun oil with a pressure greaser. Re-charge to normal.
Incomplete run-out, not able to be completed by crew's efforts.	Overheating of liquid in the buffer.	Lay the gun horizontally. Carefully unscrew the plug one or two turns from the aperture on the upper surface of the buffer cylinder, and release the compressed air: keep face well away from aperture to avoid hot steam burns.
Violent run-out, short recoil.	Too much liquid in the recuperator.	Release surplus.
Violent run-out with knocking normal recoil	Worn buffer piston rod or faulty retarding valve.	Recoil system to workshops for dismantling and remedying.
Piston head loosens on recuperator piston rod.	Piston head unscrews itself.	Screw on the piston head to the piston and fasten a locking pin, as shown in Instructions for 100mm tank gun repairs.
Loosening of the shaft in the front cap of the buffer.	Shaft unscrews itself.	Screw in the shaft into the front cap, and solder up.

Sec. 7. Short Description of M.G. Mountings.  
(Co-axial, Hull and Anti-Aircraft MGs).

The SGM Tank MG.

The principles and operation of the 7.62mm tank MG 1943 model (SGMT) are the same as the 7.62 MMG 1943 model (SGM). There are, however, the following differences:-

1. There is no mount. The MG is attached to a mounting fitted to the gun cradle.
2. There is a special recess in the back plate for an electric firing switch relay.
3. There is no tangent sight.
4. There is no ejection opening cover.
5. On the hull MG there is no flash eliminator: in its place is a barrel extension piece.
6. On the co-axial MG is a shield to protect the gunner from bullet (lead) fragments.
7. The magazines of the co-axial is standard, but the hull M.G. has special magazines with belt feeder arms.
8. Both M.Gs (co-axial and hull) have a spent cartridge case holder consisting of a metal frame and tarpaulin bag (sleeve).

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(a) The Co-axial SGM<sup>T</sup> Mounting.

Inside the tank parallel to the gun on a mounting coaxial with it is mounted a 7.62mm MG SGM<sup>T</sup> fastened to the cradle.

The co-axial MG is designed to engage ground targets, mainly personnel and enemy fire positions.

The machine gun is aimed by the telescopic sight ~~ES~~ 2-22 on the scale marked GT using the elevating gear of the gun and the turret traverse mechanism (during this procedure the same angles are applied to the gun.)

To fire the M.G. the electric firing switch on the traverse mechanism hand-wheel must be pressed, or the switch on the master control.

The layer fires the M.G. It is cocked and reloaded by the loader by the loader.

The M.G. mounting (fig. 46) consists of the following main parts: the bracket (7) and rear bracket plate, the spent cartridge case holder frame (6), the horizontal screw of the adjusting mechanism (13), the front and rear stand brackets (8 and 14) the front and rear slides (5 and 16) the shock absorber and two shields (1 and 2) protecting the crew from lead fragments.

The SGM<sup>T</sup> bracket is in the form of a bar, fastened at both ends to the gun cradle. This bracket ensures that the axis of the M.G. is parallel to the axis of the bore of the gun.

The front part of the bracket (20) (fig. 26) is fastened to a flange on the gun cradle by two diagonally pressed inserts and 4 bolts, two of which pass through the two pressed inserts. The bolts are fastened with wire split pins.

Between the top surface of the bracket and the cradle flange is a gasket to mount the bracket in the horizontal plane so that the M.G. barrel is strictly in the centre of the turret opening.

In the rear part of the bracket is an eye, through which is fitted the horizontal screw (13) of the adjusting mechanism. On the ends of the horizontal screw are fitted two collars each of which is divided into 10 divisions. One division is equal to a change of position of the axis of the barrel by 1 mil/ thousandth.

In the rear lower part of the bracket near the eye for the horizontal screw is a groove with a threaded aperture for the attachment of the bracket to the rear plate.

The rear plate of the bracket is attached to the right recoil guard of the gun by 2 bolts and a pressed cylindrical pin.

The frame (6) together with the stand brackets (8 and 14) and the horizontal screw (13), ~~or the adjusting mechanism~~. On the frame are the front and rear slides (5 and 16) and the shock absorber. The frame and slides are mounted on the bracket by means of the stand brackets.

The front stand bracket of the frame is mounted in a cylindrical vertical aperture in the bracket and fastened in the aperture by a stem and two nuts.

The rear stand bracket is mounted in an aperture in the horizontal screw of the adjusting mechanism. Before fitting a collar is fitted to the stem of the stand bracket. Underneath the stem is fastened by another collar (12). Around this collar are ten divisions to adjust the M.G. vertically. Each is worth one thousandth.

In this way the frame is rigidly fixed to the bracket of the SGM<sup>T</sup> MG.

On the upper surface of the frame is a base plate in the form of a dove-tail joint for the front and rear slides.

The slides are attached to the SGMT by an eye and pin (15) with a ring. On the rear slide is a screw to limit the horizontal displacement of the M.G. and on the front slide is a shock absorber consisting of rear (19) and front (4) springs, a bolt (3), washer, nut and check nut.

The shock absorber softens the recoil when firing and improves accuracy. When adjusting the shock absorber springs attention should be paid to the clearance between the rest (18) and the rear wall of the slide (5). It should be 14-18mm.

The spent cartridge case holder is fastened to the MG bracket on the left side by 4 bolts (9), and to the recoil guard of the gun by one bolt. It consists of a metal jacket (11) and a tarpaulin bag (10). Under the four bolts attaching it to the M.G. bracket are washers, and under the bolt fastening it to the recoil guard is a locking baffle.

On the right of the M.G. bracket is the magazine frame with guiding casing for fitting the magazine (21) (fig. 26) with a loaded belt of 250 rounds.

On the front of the barrel on the gas block is fitted the protective shield (2) (fig. 46), which protects the crew from lead fragments. In front of the protective shield (2) is a second protective shield (1) attached by 2 bolts.

(b) The Hull M.G. Mounting.

Inside the tank to the right of the driver mechanic is mounted a hull M.G. SGMT (fig. 47).

The M.G. is aimed along the course of the tank and has no independent arc of fire: it is therefore aimed by turning the tank towards the target.

The driver mechanic fires the hull MG by pressing with the thumb of his right hand a button set on the upper part of the right steering lever.

Firing the gun is achieved by an electrical firing switch set on the butt plate, and cocking is carried out by the driver-mechanic with a special lever.

The SGMT hull MG mounting consists of the following main parts:-

a bracket (18) with front (16) and rear (7) slides, a magazine opening cover (3) magazine (12) protective shield (2) and a special device for cocking the gun consisting of a handle (19) bracket (5) with rollers, a pull rod, spring (20) and cable (4).

The bracket (18) is attached by three bolts and two pressed pins to the rear and front plates. The plates are welded to the battery bulkhead. The bolts are split-pinned and the pins centre-punched.

The rear and front guides (15) for the front and rear (16 and 7) slides are fastened to the front and rear parts of the bracket by two bolts and two pins. On the front slide is a shock absorber (17) as on the co-axial MG. The slides are fixed to the MG by an eye and a pin with a ring.

On the SGMT hull MG bracket on the left side, the feed block casing (3) and the tarpaulin sleeve (5) are fastened by 5 bolts (14). The end of the sleeve is inserted into a bucket (11) (replacing the spent cartridge case holder), which is attached to the floor of the tank by a strap (10) and 2 welded brackets. The magazine (12) is fitted next to the bucket (11).

The hull MG bracket is fitted horizontally and vertically so that the muzzle is in the centre of the aperture drilled through the hull front plate.

The bracket is adjusted horizontally by the gaskets and washer, which are fitted between the flat surface of the bracket and the socketed plates welded to the battery bulkhead, and vertically by the elliptical holes in it, drilled for the bolts.

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The bracket (5) with rollers for guiding the cocking cable is mounted on the rear of the battery bulkhead.

The cable (4) is joined at one end through an eye to the cocking handle, and at the other end to the actuating lever of the segmented arc of the cocking lever by a nut and lock-nut.

The cocking handle and segmented arc is attached to a bracket welded to the battery bulkhead.

The spring (20) is designed to return the cocking handle to the extreme front position. One end of it is attached to a bracket on the battery bulkhead and the other to a pull-rod which is joined to the M.G. cocking handle.

The protective shield (2), protecting the driver mechanic from burns from the propellant gases expelled from the gas block, is attached by bolts to sockets welded to the battery bulkhead.

To decrease the inflow of propellant gases into the driver's compartment, there is a barrel extension piece on the muzzle of the M.G.T. To ventilate the driver's compartment during firing there is a louvre in the driver's hatch, closed by a cover.

A rubber cork (1) is fitted into the hull front plate aperture to prevent snow and dust penetrating.

## (c) SGM T M.G. Drill

Preparing the M.G. for firing and travelling.

To prepare for firing:-

- remove the cover from the M.G. and the co-axial M.G. embrasure.
- remove the M.G. from its mounting.
- dismantle the M.G. and clean the parts, paying special attention to the barrel.
- inspect the M.G. dismantled.
- oil the moving parts of the M.G. and the chamber with rifle oil (winter - oil No. 21) and assemble the M.G.
- check the gas regulator setting (normally part 2).
- inspect the M.G. assembled.
- mount the M.G.
- inspect the belts: belts with bulges or broken clips or distorted joining links should not be used: lightly stretch the loaded belts: the rounds should not fall out.
- check the M.G. fastenings on the mounting and the condition of the belt boxes and spent cartridge case holder.
- check the serviceability of the spare parts kit.
- check the action of the moving parts and trigger mechanism.

Using an aiming tube check the line of sight of the co-axial M.G. with the TS 2-22 telescopic sight, and check the action of the M.G. (The hull M.G. does not adjust).

To prepare the M.G. for travelling:-

- see that it is not loaded.
- oil the barrel if it is not oiled.

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- insert the cork into hull front plate aperture. <sup>Attachment</sup> CSDB 3, 645, 595
- pack away belts into the magazine boxes.
- fasten the magazine boxes in place.

#### Loading the M.G.

To load the M.G.:-

- open the feed block cover.
- insert the belt into the magazine opening, placing the cartridge of the first round between the claws.
- pull the belt hard back.
- close the feed block cover and with the re-loading handle (in the case of the hull M.G., the cocking handle) pull back the moving parts and push the re-loading lever right forward.

The M.G. is loaded.

The gas regulator mounting. On the new M.Gs now becoming operational the regulator is fitted on the central gas channel i.e. the figure 2 of the regulator is against the mounting line on the gas block.

After 3000 rounds have been fired set the regulator to the smallest gas part "1". The largest gas part is marked "3". This is used when the moving parts are dirty or the barrel worn, or when the air temperature is low. When firing in these conditions the moving parts do not go fully back.

To change the gas regulator from one part to another, insert a key in the regulator groove and turn it so that the necessary figure coincides with the index mark on the gas block. During this the retaining pin should be in the groove of the regulator head.

Adjusting the barrel lock. If during firing diagonal tears are observed on the cartridge case, without dismantling the M.G. or removing the barrel lock, turn the barrel lock screw with a key so that the base of the lock displaces 1-1.5 divisions to the right. As a result of the inclined grooves in the lock base, the barrel moves back, thus decreasing the distance between the breech face of the barrel and the breech block face recess. It must be borne in mind that excessive reduction of this distance may lead to misfire.

This type of misfire should be stopped by displacing the lock as above but in the opposite direction i.e. to the left.

#### Aiming

The co-axial M.G. is aimed at the target using the TSB 3-22 sight on the GT scale.

On the order of the tank commander the layer, pressing his forehead against the brow pad so that it will not be shaken off when the tank is in motion, and turning the sight-setting knob, brings the division of the GT scale corresponding to the range against the horizontal indicator line. Then turning the traverse hand-wheel and the elevating hand-wheel, he brings the top of the inverted 'V' on to the point of aim.

The gun is fired by pressing the firing button, which is on the traversing lever or on the master control.

Changing a hot barrel. A hot barrel must be changed every 500 rounds when the gun is being fired constantly or firing frequent bursts.

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Remedying a stoppage when the barrel is hot must be carried out quickly (this applies to a misfire or incomplete run-out). If this is not done there may be a self-ignition of the round in the half-open breech.

To remove a hot barrel from the body the protective shields must be removed, the piston group cocked, the magazine opening cover moved forward and removed together with the feed block body. Release the catch and turn the barrel lock hard left: then remove the barrel by the handle. If the barrel is tight in the body recess, use a key and insert in a groove on the front end of the body and move the barrel forward 5 or 6 mm.

## Firing the M.G.

To fire the M.G. press the button of the firing switch on the master control handle or on the traversing handwheel. The gun will continue firing while the button is pressed and there are bullets in the belt. To stop firing release the button.

Rifle rounds with a heavy or light bullet are used. The intensity of fire in any given case depends on the battle circumstances and the nature and the size of the target.

Short bursts (2-7 rounds) at a range of up to 600 m at battle speeds are the basic type of fire for the M.G.T. Long bursts (10-15 rounds) are permissible in exceptional circumstances. Firing at ranges of 600-1000 m is used only when the targets are large and unarmoured e.g. infantry and cavalry groups, vehicle columns etc.

## Unloading

To unload: -

- open the magazine opening cover.
- remove the belt.
- lift the feed block body and remove the round from the longitudinal slot of the body.
- uncock the moving parts.
- move the slide right forward.
- replace the feed block body and close the magazine open cover. (gun unloaded).
- unfasten the spent cartridge holder and empty the spent cartridges into a bucket.
- covers on.

Loading the belt with rounds. The M.G.T. is equipped with metal belts, composed of links joined by spirals of spring wire. A belt of 250 rounds consists of separate strips of 50 links (there are also one-piece belts of 250 rounds).

The rounds must be fitted evenly in the links, so that the neck of the cartridge case coincides with the front edge of the belt. The belt is coiled into the magazine box, with the bullets to the front.

(d) Zeroing the co-axial M.G.

(Note: The hull M.G. cannot be zeroed, as it has no sight or aiming mechanism. Aiming is achieved by turning the tank).

Zeroing is one of the prime factors for achieving accurate fire.

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NOT ONLY / All zeroing work must be carried out with "special" care and accuracy as shown in this chapter.

Check zeroing is carried out:-

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- when a new MG has been mounted in the tank.
- when the M.G. has been repaired or parts changed which affect zeroing, i.e. the barrel or the co-axial mounting dismantled.
- when excessive dispersion of bullets has been noticed during firing.

Before zeroing the M.G. must be carefully prepared for firing. Check:-

- adjustment of the TSh 2-22 sight with the gun.
- condition of the M.G. barrel.
- assembling and mounting of the M.G.

For this the tank must be on level ground.

To check zeroing use rounds with heavy or light bullets 1930 pattern (when using light bullets the impact check point will be 1 cm lower) in air-tight packings. All rounds must be from the same factory, of the same year and lot.

Check zeroing and zeroing must be carried out on a clear still day. Initial checking of the M.G. When the zero sighting line of the TSh 2-22 has been checked, the initial checking may be carried out using a special testing board (fig. 45) set up at a distance of 20 m from the muzzle of the D-10 T gun at gun trunnion height perpendicular to the line along the axis of the bore, or by using a distant object 400 m away. Set the TSh 2-22 sight to "0" range and using the elevating and traversing mechanisms bring into coincidence the top of the central inverted 'V' with the corresponding mark on the board or with the distant object.

By unscrewing or screwing the adjusting bushes of the adjusting mechanism, bring the barrel of the M.G. into coincidence with the corresponding cross on the board or the distant object, using the aiming tube or looking along the barrel. In the latter case remove the plug joint, the butt plate with the breech and take out the moving parts. Place a cartridge case with a small opening into the chamber.

To zero the co-axial M.G. check the zeroing first with single shots and finally at automatic fire.

To do this:

1. At a distance of 100m from the muzzle of the M.G. erect a zeroing target at the height of the line of fire and perpendicular to the axis of the bore, (fig.45) so that the horizontal adjustment line of the target is parallel to the horizontal indicator line of the sight.
2. Set sight 4 on the M.G. scale and, operating the elevating and traversing gears, bring into line the central inverted 'V' of the TSh scale with the inverted 'V' of the target: not losing the aim, fire four single shots.
3. If 3 of the 4 shots are in a circle of 15 cm diameter and the MPI is not more than 3 cm from the centre of the circle on the board, the M.G. may be considered zeroed.

If the MPI deviates from the centre of the circle by more than the given dimensions, then the extent of the deviation must be measured and adjusted by means of the divisions on the bushes of the adjusting mechanism. E.g. the MPI is 30 cm high and 15 cm right:

1. To move the MPI down 30 cm unscrew the lower bush of the vertical nut (rear stand) of the adjusting mechanism by three large divisions and screw up the upper nut by 3 large divisions.

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2. To move the MPI left 15 cm unscrew the left-hand nut of the horizontal screw of the adjusting mechanism by 1.5 large divisions and screw up the right-hand nut 1.5 divisions. (A turn of the nut one large division corresponds to a displacement of the MPI by one thousandth of the range: for 100m - 10cm).

After this adjustment repeat the described check with four single shots.

Having checked with four single shots, check the operation of the mounting with automatic fire. After sighting, a burst of 10 rounds is fired at the target.

The zeroing is considered acceptable if 8 out of 10 rounds are in a circle of 20 cm diameter and if the MPI does not deviate from the centre of the circle more than 6 cm. If the MPI is more than 6 cm away, the adjustment as above must be carried out again more accurately, and firing repeated until satisfactory results are achieved.

When the co-axial MG has been zeroed the nuts (bushes) must be split-pinned with wire.

Erecting a check target. To fix the position of the zeroed MG SGMF and always be in a position to check **without** firing the axis of the bore, a check target must be constructed, as follows:-

1. At a distance of 20 m from the muzzle of the gun at the height of the line of fire and perpendicular to the axis of the bore, erect a board with a mark for the gun so that the horizontal adjustment line of the board is parallel to the horizontal indicator line of the sight.
2. Looking through the striker mechanism aperture and the cross wires on the muzzle face, aim the axis of the bore at the centre of the sign on the target.
3. Note the points of aim with a hand indicator through the telescopic sight and through the axis of the bore of the co-axial MG. For greater accuracy do this three times and note the mean point of aim. The axis of the barrel of the co-axial MG may be found using the aiming tube (TKIP).
4. From the points of aim of the sight and the MG describe a circle radius 7.5 cm and paint it black (fig. 49).

The positions of the points of aim on the check target on a reduced scale are entered on a checks record card which is stuck into the MG gun history sheets. With a check target it is possible at any time to check and establish the position of the zero sighting line and the axis of the MG barrel.

(e) Faults and stoppages of the MG during firing and their remedies.

A well serviced and handled MG is a reliable and dependable weapon.

However, during sustained battle firing as a result of possible wear and breakage of the parts, dirt on the mechanisms, faults in the belts and rounds, and of careless and negligent maintenance the normal operation of the MG is interrupted and stoppages occur.

To avoid stoppages:-

- strictly adhere to the regulations for preserving dismantling, oiling, cleaning, assembling and inspection of the gun.
- preserve the gun parts and mechanisms from dirt and knocks which might damage them.
- during intervals in the firing periodically check the parts and mechanisms of the MG, remove coagulated oil and dirt, oil the working parts with rifle oil, clean the gas parts of the barrel, block regulator and piston.
- do not overheat the barrel, change or cool it during prolonged firing after every 500 rounds.

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An attempt must be made to remedy all stoppages by pulling back the reloading lever.

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If this fails to remedy the stoppage or after remedying it, it repeats itself, the handle must be pulled back, the gun set to safe, magazine removed, reason for the stoppage determined and removed. In all cases where dismantling is required the MG must be removed from its mounting.

## List of possible stoppages during firing and their remedies

Stoppage	Reason	Remedy
1. Incomplete return movement of the working parts.	Dirt on the moving parts: insufficient momentum of the moving parts on the return motion.	Pull the <b>moving parts back</b> by the reloading handle and continue firing: If stoppage continues open the feed block and oil the moving parts through the upper body opening: if necessary set the gas regulator to the largest aperture and clean the MG at earliest opportunity.
2. Incomplete movement forward of moving parts: breech block does not go right forward.	Weakening of the return spring: dirt on the moving parts.	Pull the moving parts back and continue firing. If the stoppage repeats itself, oil the moving parts through the upper body opening, if necessary inspect the return spring and if defects are apparent, change it.
3. Cross tears on the cartridge case: the moving parts do not reach the extreme forward position (shoulder of the cartridge remains in the chamber and does not allow the next round to enter the chamber.	Clearance between breech face and breech block face recess to large	Pull the moving parts sharply back: if the cartridge case is removed with the round, continue firing: if necessary extract the cartridge shoulder with an extractor tool: oil the chamber with gun oil, using a wire brush: if not, displace the barrel lock bed by 1-1.5 divisions with the screw.
4. Round not gripped by transporter grips when moving parts move back round falls from  and moving parts stop half-way.	Weakening or breakage of the transporter grips (?)	Open the magazine opening cover, remove the belt, lift the body of the feed block: holding the moving parts by the handle, place a round in the magazine opening and push it forward: load the gun and continue firing: if the stoppage continues change the magazine and inspect and repair it at the first opportunity.
5. "Run-away gun": when the firing button is released automatic fire continues.	Insufficient momentum of the moving parts on the back-ward motion.	To stop the firing, hold the belt by hand: inspect and clean the MG if stoppage re-occurs, turn the gas regulator to the largest port.

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Stoppage	Cause	Remedy
6. Cartridge case obstruction: cartridge case jams between the wall of the opening and the breech.	Insufficient momentum of the moving parts on the backward motion, faulty extractor horns: broken or weak extractor spring or broken ejector.	Pull back the moving parts: eject the cartridge case and the next round through the ejection opening: if the stoppage re-occurs, inspect the extractor and ejector and repair if necessary: if the extractor and ejector are faulty, set the regulator to the biggest <b>part.</b>
7. Misfire: round in the chamber, moving parts to the rear, but no shot.	Dirt on the moving parts: weak return spring: broken firing pin, faulty percussion cap.	Pull back the moving parts, continue firing. If no shot, inspect the firing pin and return spring. If faulty, replace. If moving parts dirty, clean and oil.
8. Round jams in breech face.	Feed arm spring weak.	Pull back the moving parts, eject round through opening and continue firing: if stoppage re-occurs, change the spring.
9. Non-extraction of the round: after firing cartridge case remains in chamber.	Faulty or broken extractor horn: broken extractor spring dirty chamber.	Unload, remove barrel and push out the case with a cleaning rod: change the faulty part; clean and oil the chamber if the parts indicated above are serviceable

## Sec. 6.

The **DSbK** A.A. M.G. Equipment

The 12.7 mm modernized anti-aircraft M.G. 1938/46 model (**DSbK**), is designed to engage both aerial and ground targets.

The M.G. with its special mounting is mounted on the turret on a rotating stand on the loader's hatch.

The gun is fired by the loader, standing up on his seat.

A lensatic sight K.10-T is used to engage aerial targets, and a tangent sight for ground targets, although the lensatic sight may be used for ground targets.

To apply the necessary angles of elevation to the M.G. there is an elevating mechanism with a clamping device, which enables the M.G. to be clamped at any angle of elevation or depression.

The gun is aimed in the horizontal plane by turning the swivel stand.

The firing equipment consists of a mechanical firing device and a firing button (lever), which is situated on the horizontal laying handle.

The feeding is a belt feed system. There are 50 rounds in a belt. The belts are stored in metal magazine boxes (four to a M.G.).

The rounds for the **DSbK** may be used with AP bullets B-30, AP-incendiary B-32 or BS-4,1 and also with AP-incendiary-tracer E.T.

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The AP bullet's task is the destruction of armoured targets of ranges of up to 400 m. The tip of the AP bullet is painted black.

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The AP-incendiary bullet is also designed for the destruction of armoured targets: having penetrated the armour it ignites the highly inflammable fuel. The tip is painted red and black.

The BS-41 in comparison with the B-32 has increased penetrative power.

The EZT is used to correct fire by its tracer: it is painted black, red and green.

Operation of the Equipment. The construction of the MG allows all round fire from 4°30' depression to 82° elevation.

The equipment may be fastened in 3 positions: fighting, fighting-travelling, and travelling.

In the fighting-travelling position the MG is clamped so that it does not interfere with the opening or closing of the hatches.

The mounting (fig. 50) consists of the following main parts: swivel (12), fork (19), cradle (45), slide (2), floating plate (13), upper bracket (31) and the lensatic sight case (6) balancing and elevating mechanisms and firing device.

The swivel (12) is the base of the AA mounting and allows all-round traverse in the horizontal plane.

In the swivel there is a bracket with an aperture into which the feet of the fork are fitted. The aperture is grooved and tightened by 2 locking screws (15).

To clamp the swivel in the fighting and fighting-travelling positions there is a clamp (19) and to clamp the fork in the same positions another clamp (16). On the right of the swivel bracket is welded a pipe to take the reloading lever mounting (41). The lever is attached to the bracket by a chain.

The fork (19) feet fits into the swivel bracket recess. On the flat upper portions of the fork are holes in which are fitted the 4 trusion bolts of the cradle. On the left flat portion is welded the horizontal laying handle, on which is fitted the firing lever (17). There is also on the left portion a groove in which is fitted the cradle horizontal clamping bolt. To the left and right sides of the fork are welded brackets (42 and 43) with holes for clamping it in the fighting and fighting-travelling positions.

The cradle (45) is a cast metal part of complex shape. On the front part there are grooves in which fit a slide (2), and on the rear the aperture for the floating plate (13). On the right side of the cradle is a lug to which is fastened the elevating arc (40). On the left side of the cradle is welded a bracket (20) with a catch for the magazine-box mounting. Beneath the cradle are welded the two cylinders (23) of the balancing mechanism.

The cradle is mounted on a fork by means of trusions (11). On the left of the cradle is a hole for a clamp. Above the cradle is welded the lower sight bracket (44). On the lower sight bracket is a vertical slot for the upper sight bracket (31). A thread tightened by a clamp (35) is fitted into the wall of the slot to hold the bracket. On the lower bracket are the horizontal sight adjusting screws.

Beneath the cradle is a bracket (46) to eject spent cartridge cases and lugs (22) for the clamping of the mounting in the fighting-travelling position.

The slide (2) is designed to provide an elastic connection between the M.G. and the mounting by means of the shock absorber spring (24).

The shock absorber spring rests at one end on the vertical wall of the cradle, to which is attached the guide bolt (27) of the shock absorber, and at the other end on the front wall of the slide. Initial pressure on the spring is produced by a crown nut, screwed on to the outside end of the bolt.

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During firing the slide moves along the cradle guide ribs. Above the slide are trunnion recesses with locking screws to attach to the M.G.

The floating plate (15) is designed to join the rear part of the M.G. with the cradle. This attachment is made by connecting with a pin the lugs of the body with the lugs of the floating plate. The floating plate fits into the cradle aperture by a circular shaft.

At every shot the M.G. together with the slide and floating plate recoils and compresses the shock absorber spring between the walls of the slide and the cradle. The recoil force's effect on the A.A. mounting is thus decreased. When the spring has absorbed the recoil energy, the moving parts (M.G., slide and floating plank) return to the run-out position under the influence of the spring.

The lensatic sight upper bracket (31) is mounted in a slot on the lower bracket (44). On the upper bracket is a horizontal slot for the sight casing. In the slot wall there is a through recess with a tightening bolt (30), by means of which the sight casing may be fixed in any given position. On the bracket is a flange on which are the adjusting screws.

The lensatic sight casing consists of the sight box, rear wall (5), cover (4) with a lock (29) and 2 collars.

On the rear wall are slots into which are screwed the vertical adjusting screws (32). On the ring shoulder of the adjusting bolt is an index mark: the value of one division equals 2 thousandths. On the edges of the rear wall is a packing to ensure that the casing is sealed when the cover is closed.

The sight is attached to the box and to the rear wall of the casing by clamps. The cover is hinged. It is held open by a spring attached by a joint pin to the cover and rear wall.

The casing in session is mounted by the box shaft in the horizontal slot of the upper bracket.

The balancing mechanism is designed to balance the moving parts of the A.A. equipment. It consists of two cylinders (23) 2 large and 2 small (25 and 21) balancing springs and 2 pistons with rods (26).

The base for the balancing mechanism is at one end the fork, to which the rods are attached, and at the other the nuts on the pipes on which the springs are pressing. The cylinders are welded to the cradle.

Uniformity of effort on the handle of the elevating mechanism at different angles of elevation is achieved by adjusting the spring pressure, using the nuts.

The elevating mechanism allows vertical laying angles to be applied to the A.A. equipment. It consists of an arc (40) attached to the cradle (45) and a hand-wheel (38) with a toothed gear (39) and a clamping device on the right face of the fork.

The clamping device operates at any angle of elevation. It is mounted on the hand-wheel lever and consists of a hand-wheel sleeve (38) a clamp (35), clamp spring and key (36). To work the elevating mechanism, press the key: the clamp disengages from the sleeve and the A.A. equipment is unclamped. To clamp up, release the key and the clamp re-engages the sleeve under the influence of the spring.

The firing device consists of a sleeve (9), a roller with a balance arm and spring, a key (17) and cable (10) in session, consisting of a cable, braiding socket (34) and washer with a nut (47).

The sleeve is attached to the butt plate of the M.G. The roller with the balance arm and spring are in the sleeve, and the balance arm is connected to the M.G. trigger (8). The cable is joined at one end to the roller and at the other to the key on the horizontal laying handle.

When the key is pressed, the cable pulls on the roller and the balance arm presses on the trigger; a shot is fired (if the gun is cocked). Firing is automatic.

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To stop firing, release the key: the roller and balance arm return to the original position under the influence of the spring. the balance arm releases the trigger and firing stops.

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Attachment of the M.G. to the mounting. The M.G. is attached to the mounting in the following sequence:

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1. Set the swinging part of the mounting horizontal.
2. Unscrew the clamping bolts of the trunnion recesses on the slide (2).
3. Remove the trunnion recess caps.
4. Remove the pin of the rear M.G. fastening from the lug of the floating plate (13).
5. Two members of the crew pick up the M.G. from the muzzle and breech, place it on the mounting so that the trunnions fit into the trunnion recesses in the slide (2), and the hole of the body lugs coincide with the hole of the floating plate lugs (13).
6. Insert through the hole of the body lugs and the hole of the floating plate lugs the rear fastening pin.
7. Fasten the trunnion caps and lock bolts.
8. Fasten the trigger mechanism.

Removing the M.G. is done in the reverse order.

(a) DShK A.A. M.G. Firing Drills.

#### Preparations for Firing.

A cleaned and assembled M.G. is inspected after assembly and before firing to check assembly and serviceability of the M.G. The following are checked:-

1. Formness of barrel on body: firmness of muzzle brake on barrel and gas system parts.
2. Correct assembly of the gas cylinder to the barrel.
3. Correct assembly of the butt plate and trigger group with the body, (There must be no looseness), reliability of the safety catch.
4. Correct assembly of the feed block and its attachment to the body.
5. Inter-operation of the parts. The moving parts must move right back without jamming - the breech group must catch reliably on the sear when moving forward.
6. Serviceability of the amm. belt. Remove all surplus oil from the movable parts, as this may cause stoppages during firing.

In winter it is recommended that before firing these movable parts be washed in paraffin, then wiped and oiled with winter rifle oil.

(b) Handling the M.G.

Bringing the M.G. into the fighting position.

To bring the A.A. mounting into the fighting position:-

1. Open the loader's hatch: remove the cover from the mounting and bring the M.G. from the fighting-travelling to the fighting position.
2. Check firmness of forks in the swivel stand; if necessary tighten the locking screws with the reverse side of the reloading handle. The degree of tightness should be such that the equipment will turn round the axis of the feet of the fork from a push of the hand applied 400-600 mm on the shoulder (This is not clear whether the shoulder is part of the gunner or a hitherto unspecified part of the gun. Russian original very vague - Translator).

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3. Clamp the mounting in the working position using the clamp on the swivel stand: the cone shaped part of the clamp should go right into the cone-shaped aperture in the fork bracket.
4. Check the fastenings of the M.G. and if necessary tighten nuts of slide attachment.
5. Fit the magazine, open the lid and guide the belt into the feed block.
6. Unclamp the cradle (clamp on the left of the fork) and cock the gun with the reloading handle.
7. Unclamp swivel stand, open sight casing (or in the case of ground targets, raise the tangent sight).

## Loading and firing

## To load:-

1. With the thumb of the right hand press on the hatched part of the magazine opening catch and lift smoothly, without jarring, the rear end of the cover until it engages with the feed block catch on the body.
2. Move forward the free front end of the belt from the magazine by 6-8 links.
3. Insert the rounds in the first links into the magazine opening so that the first link fits on to the upper edges of the top pawls, and the second round with the link fits between the bottom pawls and the magazine opening.
4. Supporting the free end of the belt, close the magazine opening cover.
5. Set the safety lever to "Fire".
6. Insert the reloading handle, cartridge or round into the breech recess.
7. Pull back the breech group vigorously by the reloading handle so that the **sear** catches on the bend of the breech.

Firing. Aiming the M.G. at its target, the gunner presses smoothly on to the firing key with his left hand and fires. Firing will continue automatically. If the key is released, firing ceases and the moving parts remain in the rear position, held by the raised **sear**.

Firing is in short bursts of 3-5 rounds, or if the gunner is well trained, by single shots.

To stop firing, release the key and set the safety lever to "STOP".

## To unload the M.G.:-

1. With the thumb of the right hand, press the top of the magazine opening cover catch and lift, without jarring, the rear end of the cover until it engages with the feed block catch.
2. Remove the belt from the feed block.
3. Remove from the magazine opening the round round from its link and replace it in the link.
4. Pack the free end of the belt into the magazine.
5. Inspect the chamber and ensure there is no round left in it.
6. Close the magazine opening cover and set the safety lever to "FIRE".

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7. Release the breech block.

Belt Filling.

Belts are filled by hand.

The following points must be observed when filling a belt:-

1. Inspect the rounds and remove defective rounds.
2. Place the belt on a clean level surface so that the rear face of the links is turned to the filler.
3. Take a round in the left hand, and placing it on the jaws of the rear horns of the link, press it between the horns with the thumb or palm, ensuring that the pip on the rear horns fits into the cartridge **case groove**.
4. With the palm of the right hand, press the round down between the front horns of the link.

Laying with the K.10-T sight. To lay on an aerial target, the gunner, standing on the loader's seat takes the elevating hand-wheel in his right hand and the handle on the left of the fork in his left and brings into coincidence one of the rings of the lensatic sight scale and the target, depending on its 'rakkurs'<sup>1</sup>. The head must be held at a distance of 165-250 mm from the sight.

When firing the aircraft must be held in the field of view of the sight, so that its movement is towards the centre of the ring.

The rings of the K.10-T sight are equal to a distance of 400 metres. Thus at a target speed of 400 km per hour the rings correspond to: large ring - rakkurs  $\frac{1}{4}$ , small ring rakkurs  $\frac{2}{4}$ .

When targets speeds differ from 400 k.m.p.h, corrections are made for bearing by the rings of the sight scale - higher speeds by the outer side of the rings and lower speeds by the inner side.

For ground targets use the vertical tangent sight and set the sight slide to the corresponding range to the target. Sighting is in the usual sequence for tangent sights.

Moving the mounting from the fighting to the fighting-travelling and travelling positions.

To move the M.G. from the fighting to the fighting-travelling position:-

- unload.
- close up the lensatic sight.
- clamp the cradle in the horizontal position.
- unclamp the fork and turn the mounting in the swivel bracket until the aperture in the bracket on the right face of the fork comes against the clamp.
- fit the mounting in the fighting-travelling position and clamp the swivel.
- covers on.
- insert the free end of the locking bar into the cradle lug and fasten it with a split pin.

To revert to the fighting position the sequence is reversed.

To move the M.G. from the fighting to the travelling position:-

- unload.
- close up the lensatic sight.
- clamp the cradle in the horizontal position.
- unclamp the fork and slacken the fork feet clamping nuts.

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1. 'Rakkurs' (**pakkye**) is defined as the relationship of the apparent length of the fuselage of an aircraft, flying at an angle to an observer, to its real length, expressed as a simple fraction in quarters:- 0,  $\frac{1}{4}$ ,  $\frac{2}{4}$ ,  $\frac{3}{4}$  and  $\frac{4}{4}$ .

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- cover on the M.G., magazine and magazine
- lift the M.G. and the removable mounting parts (2 men) and remove the fork feet from the bracket.
- stow the M.G. and removable mounting parts in the stowing recesses on the brackets, sited externally on the rear of the turret.

To revert to the fighting position the sequence is reversed.

(c) Zeroing the AA MG

All MGs issued to units are zeroed at the factory.

Check zeroing and zeroing is carried out in units in the following circumstances: when a new or repaired MG is mounted, when parts have been changed e.g. the barrel, or when large deviations have been noticed during firing.

Zeroing the AA MG DShK has as its aim the arrangement of the tangent and lensatic sights, so that in normal meteorological and ballistic conditions the mean trajectory of the rounds at 400 m intersects the line of sight.

To zero the AA MG and adjust the lensatic sight K.10-T:-

1. Drive the tank on a level platform without lateral incline (not more than 2°), and at a distance of 100 m from the muzzle face of the MG, at the height of the line of fire and perpendicular to the axis of the bore, fasten a zeroing target (fig. 51) glued to a board 1 x 1 m. Set the target up so that the horizontal setting up line (see fig. 51) is parallel to the horizontal line of the lensatic sight cross-wires.
2. Check the MG on the zeroing target or on a distant object 400 m away.
3. Set the tangent sight to 4 and the back sight to 0 and with the same point of aim fire 8 single shots.

If no less than 6 out of 8 hits are in the check circle, the MG may be considered zeroed. If not, by moving the foresight guard right or left and screwing in or out the foresight (after each adjustment the nut must be tightened up) and repeating the firing, zero the MG.

Adjusting the lensatic sight K.10-T is carried out after the machine gun has been zeroed by using the tangent sight, in the following sequence:-

1. Carefully lay the MG by its tangent sight (set at 4 and backsight at 0) on to a point of aim on the zeroing target, and fasten it in the mounting.
2. By turning the adjusting screws of K.10-T sight, bring into coincidence the centre of the cross-wires of the lensatic sight with the point of aim on the zeroing target. (Fig. 51).

When turning the adjusting screws on the K.10-T, ensure that the point of aim is not disturbed.

The check target (fig. 52) is constructed after the MG has been zeroed and the lensatic sight adjusted.

On the check target is marked the position of the axis of the bore, the position of the line of sight with the foresight at 4 and the backsight at 0, and the position of the adjusted lensatic sight line of sight.

The check target for the AA MG is set up as follows:- at 20 m from the muzzle face set up a board with a target face: aim the MG barrel at the appropriate aiming mark on the board using an aiming tube, and clamp the MG in this position. With an aiming aid line the position of the line of sight to the target with the tangent sight set 4-0 as above, and the position of the line of sight of the lensatic sight. Paint in black on the target marks corresponding to the found points, as shown in fig. 52.

The check target for each MG is an individual part of it, and must be kept in the tank.

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After the check target has been set up, measure the points of aim of the K.10-T in relation to the axis of the MG bore and on the target, and enter it on the sight testing card record.

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To ensure dependable operation of MGs it is essential that they are always technically serviceable, correctly assembled and prepared for firing. When handling MGs, testing inter-operation of the parts and remedying stoppages, do not use excessive force.

On discovering jams or stoppages, find out their cause before remedying them.

Keep the MGs free from dirt, as dirt may cause a stoppage, do damage and cause premature wear of the MGs and their parts.

When MGs are mounted on tanks, they must be oiled and covered to preserve them.

Before opening fire after travelling with the gun in the fighting position uncovered, ensure that the barrel is not dirt-engrined.

On normal inspections check:-

- working of the electrical firing system.
- fastenings of covers.
- storage and serviceability of ammunition holding.

On technical servicing No. 1 check:-

- serviceability of ammunition holding.
- ease of turning of the vertical laying hand-wheel of the M. DShK: if stiff clean and oil the tooth gear and arc.
- serviceability of the electric firing mechanism: ensure the gun is unloaded, and having cocked the moving parts, fire the gun by pressure on the appropriate buttons.
- condition of barrels: if necessary oil and clean.

On Technical Servicing No. 2 carry out all tasks as above on condition check:-

- serviceability and reliability of the mounting fastenings on the swivel stand, ease of movement of the swivel stand: if it is stiff, wash out and oil the ball race of the swivel.
- condition of the swivel stand clamp: if necessary wash out and oil it.

On Technical Servicing No. 3 carry out all tasks as above on condition, oil the reservoir of the hand-wheel axle, the teeth of the arc and the tooth gear on the DShK mounting.

Cleaning and oiling is carried out before firing, after firing, after exercises and training in the field, and during long periods of inactivity to remove the oil.

For cleaning use: clean cotton waste, hemp, with the beam removed; cotton emus; wooden rods and cleaners to remove dirt from the grooves and recesses; gun oil; spindle oil; parafin; alkali oil or soda solution.

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Clean the gun only on a clean table or stand.

When cleaning MGs, pay special attention to the removal of carbon deposits, dirty oil, dust or streaks of rust. MGs must be cleaned and lightly oiled externally. After cleaning, the alkaline element (soda solution) must be thoroughly removed from the parts, as it causes corrosion.

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If it is impossible to clean the MG immediately after firing, the barrel must be cleaned with rag or cotton waste soaked in oil: to do this set the breech group in the **sear** and the safety lever in the "STOP" position.

Cleaning an assembled gun barrel must be carried out from the muzzle end with a folding cleaning rod. Cleaning a dismantled gun barrel is done from the breech end to protect the lands of the rifling from wear around the muzzle.

When oiling a cleaned barrel ensure that the oil is spread evenly over the lands, rifling and chamber.

Clean the gas vents of carbon deposits with cleaning sticks, wipe dry and oil to prevent rust. After prolonged firing remove the regulator from the block and clean it of carbon deposit with a special cleaning stick.

After oiling check assembly of the MG and reliability of the moving parts and mechanisms.

MG parts must be carefully preserved from blows. During storage MGs must be kept with the return spring slackened, or weakening will result.

Clean the mounting of dust, and mud and oil it without stripping it. Dismantle the mounting for cleaning and oiling only when necessary.

MGs in constant use should be oiled with rifle oil.

Remember that rifle oil does not protect MGs from corrosion during prolonged storage, and gun grease must be used in such cases.

(e) **DSHK** MG faults and stoppages and their remedies.

Fault	Cause	Remedy
1. Misfire	1. Dampness or absence of the percussion element in the cap recess. 2. Charge fails to ignite through dampness. 3. Firing pin broken. 4. Insufficient striker protrusion. 5. Weakening or breakage of the return spring. 6. Dirt in the body grooves and projections and ribs of the breech block. 7. Too much oil on the moving parts. 8. Accumulation of carbon deposits on the inner surface of the guide piston. 9. Obstruction of the gas parts of the gas block and regulator.	Cock the gun and eject the round. Cock the gun and eject the round. Change it. Unload: partially strip MG and replace with spare striker. Unload: partially strip MG and having removed piston rod from gas piston head change the return spring. Unload: partially strip MG and clean out projections of breech block: remove dirt and lightly oil with rifle oil. Unload: partially strip MG, remove surplus oil and lightly oil with rifle oil. Unload: partially strip MG, remove gas regulator and remove deposits. remove regulator and remove deposits.

Fault	Cause	Remedy 50X1-HUM
2. Spent cartridge case does not eject.	1. Incomplete back movement of the moving parts due to an increase of resistance to movement: dirt on the moving parts, burrs on the connecting parts, or too much oil on the moving parts.	Unload: partially strip MG, remove dirt and oil, clean parts and lightly oil with rifle oil.
	2. Accumulation of carbon on the inner surface of the gas ports and regulator.	Unload: partially strip MG, remove regulator and clean off deposits: if stoppage repeats due to insufficient return movement of the moving parts set the regulator to the largest opening.
	3. Ejector broken.	Unload: partially strip MG, remove ejector and replace with spare.
	4. Broken striker.	Partially strip MG, remove damaged striker and replace with spare.
3. Jamming of spent cartridge case by breech block.	1. Insufficient return movement of moving parts due to dirt or burrs on the moving parts and the parts attached to them.	Remove feed block, pull the moving parts back and extract the cartridge case from under the breech block, remove round from chamber fire, and replace feed block.
	2. Weakening of extractor spring.	Partially strip MG and replace spring with new one.
	3. Broken ejector.	Partially strip MG and replace ejector with new one.
4. Failure to extract spent cartridge case from chamber.	1. Wear or breakage of extractor horns.	Full back the feed block by the cocking handle, revealing the barrel. If the spent cartridge is not ejected, remove it from the chamber with a cleaning rod inserted from the muzzle end (ensure that it is a spent cartridge in the chamber and <u>not</u> a misfired round). Unload, partially strip the MG remove the extractor and fit a spare one.
	2. Weak extractor spring.	Replace with spare one.
	3. Cartridge case is not ejected.	Full back feed block, remove spent cartridge case: inspect rounds and clean dirty ones: wipe the barrel and chamber.
	4. Chamber covered in carbon deposit due to lateral burst of preceding round.	Clean 50X1-HUMmer, rounds and barrel.

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Fault	Cause	Remedy
5. Detonator cap pierced.	1. Excessive striker protrusion.  2. Chipped or damaged firing pin.  3. Wear and enlargement of the aperture in the breech block face recess.	Check with gauge: replace with spare firing pin and retaining pin, then check protrusion.  Remove breech change the firing pin and replace it.  Change the breech block.
6. Round falls from link (accompanied by cross denting of the round).	Broken or weakened horns on the links of the belt.	Remove the belt, remove broken pieces of link from feed block, and having unloaded, re-load with the same or another belt.
7. Lateral burst of the round.	Large clearance between the breech face and the breech block face recess.	Check the locking of the barrel with No. 9 gauge. If necessary fit spare locking lug.

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Chapter Nine

NOFORN/NO DISSEM ABROAD/LIMITED/BACKGROUND USE ONLY  
Fire Fighting and Smoke Generating Equipment

The Carbon Dioxide Fire Fighting Apparatus.

A Carbon Dioxide Fire Fighting apparatus, containing carbon dioxide gas, is used to fight fires which start inside tanks. During the extinguishing process the gas fills all free space in the tank compartment in which the fire has started. The carbon dioxide gas displaces all the air in the compartment, thus rendering the combustion process impossible.

The high concentration of carbon dioxide formed in the tank during this fire-fighting process, is not dangerous to life if the crew are only exposed to it in the tank for a short period.

The fire-fighting apparatus is of the semi-automatic type with a press-button control.

To extinguish a fire in one compartment one cylinder of carbon dioxide gas is used: to extinguish fires simultaneously in two compartments two cylinders are used.

Principle of the Apparatus

Sec 1

The carbon dioxide fire-fighting apparatus (see Fig 237) consists of three five litre cylinders (1) containing carbon dioxide, two pipes (9) connecting the cylinders with the fighting and engine compartments, six electric flame detector switches (6), a warning signal board (4), the loading number's button (3), a fire alarm horn (5), an automatic fire fighting mechanism (8) and eight spray nozzles (7).

The carbon dioxide cylinders are housed in the right rear corner of the fighting compartment. (See Fig 238).

Each cylinder is loaded with carbon dioxide (from 1.8 - 2.0 kg). The cylinder (7) (See Fig 239) is fitted with a cylinder head containing a siphon tube. The cylinder cap consists of the following parts: the body of the cylinder head (2), two stoppers (5) screwed on a thread into the body of the cylinder head, two pistons (6) with strikers and fixing rings, two sealing discs (3), and end caps (4), covering the outlets during storage and transportation of the cylinders.

A recess in the stopper (5) houses a pyro-cartridge with an electric igniter. It is covered by a adapter nut. Under the lock-on nut is fitted a gasket (8) which protects the recess from dirt during storage and transportation.

A stopper (9) with a gasket, is screwed into the charging point of the body of the cylinder head. This closes the aperture which is used for charging the cylinder with carbon dioxide gas. An end cap (10) with a washer (11) is fitted on to the charging point.

On the lower part of the cylinder head is a conical thread, by means of which the cylinder head is firmly screwed (in tin) into the neck of the cylinder.

The pipes carry carbon dioxide from the cylinders to the seat of the fire.

At the end of each main pipe connecting the cylinders with the fighting and engine compartments, are four spray nozzles.

In the fighting compartment two spray nozzles are situated in the hull, between the front stowage compartment and the fuel tanks, and two are situated on the bulkhead separating it from the engine compartment. 50X1-HUM

In the engine compartment two spray nozzles are situated by the planetary traverse mechanism, one on the fuel tank under the air-filter, and one between the

generator and the fuel tanks. The ends of the pipes are joined up to the spray nozzles (12) (see Fig 240), which are welded to the brackets of the flame detector switches. On the end of the pipe situated on the bulkhead of the engine compartment are two spray nozzles, welded directly to the pipe and without flame detector switches.

The flame-detector switch closes an electrical circuit of warning instruments, thereby, informing the driver by light and sound signals of a fire in the engine compartment, or by light signal in the event of a fire in the fighting compartment.

The flame-detector switch (see Fig 240) consists of the detector head (5), made from voloknite and forming a fitment for all the parts of the flame detector switch: the brass bush (3), in which is inserted a screw with a silver contact surface, thus ensuring a reliable closure of the electrical circuit: an outer jacket (11): discs with a silver contact plug (14), placed between the main part of the flame detector switch and the ring (6): a copper connector (8) with a cap (10), providing a reliable contact between the disc and the detector head: an adaptor nut (16) with a contact (2) which is pressed by the adaptor nut (16) through a rubber packing against the contact screw (4).

The casing (11) is attached to the detector head by two rivets. Four grooves are cut into the bottom of the casing opposite the disc to ensure that the apparatus heats quickly in case of fire.

The warning signal board (see Fig 241) has mounted on it buttons (7 and 8) to set the carbon dioxide apparatus in operation, warning lights (1 and 3) to warn the driver of fire, and a button to test the lights.

There are shock absorbers (5) in the apertures of the board clamps. One of the clamps has a connector (6) to make a contact with the hull. The board is fixed by two bolts to the hull of the tank to the right of the driver. Both warning lights should light up when the button is pressed. The warning lights are 10 watt 28 volt, of single contact type, and are fitted in plastic sockets attached to the warning signal board.

In the fighting compartment on the hull top plate above the carbon dioxide cylinders, is the loader's button to extinguish fires in the fighting compartment.

The fire alarm horn is fitted on the sloping hull front-plate in front of the driver.

The automatic fire-fighting mechanism switches off exhausted cylinders, prepares the next cylinders for operation, and also calculates how many cylinders have been exhausted. It consists of a main casing (8), a cover (9), a push-rod relay (11), a drum with a ratchet, panels (4) with contacts and a disc (3) with contacts.

On the main casing, cast in an aluminium alloy, are fitted the other parts of the mechanism. The mechanism is fitted to the hull of the tank by three lugs. Inside the casing is a push-rod relay type RP 1.

On the apertures of the lower part of the casing and the panel with the contacts is housed a drum (6) with a ratchet. On the drum there is a flange (2) with a pawl (7), a disc (3) with contacts and a numbered (1) scale. A screwdriver slot is situated in the end face of the drum to enable the figures to be set back to zero when the cylinders are changed or the electrical circuit tested.

In the lower side walls of the casing are three holes on each side for wires leading to the electric igniters in the cylinders. In the left side wall there is another hole for a wire carrying electric current to the coil in the push-rod relay. Wires lead through two holes in the lower part of the casing to the terminals of the B & T panels. These wires are connected to the corresponding buttons on the warning signal board in front of the driver. In all these holes there are rubber packings (5) to prevent the wires rubbing against the sides of the holes.

/The



The back of the casing is closed by a covering (9). Between the casing and the covering is a rubber gasket. 50X1-HUM

The push-rod relay (11) consists of a coil, a core and two contacts. The upper contact is connected to the casing, the lower to the electric wire leading to the warning signal board.

The core of the relay is joined to a push-rod (16), on the other end of which is a plate (16), which serves as a base for the return for the return spring (17). A sleeve piece (14) is screwed into the lower part of plate. This is joined to the flange by a joint pin.

On one end of the drum (6) is a flexibly mounted scale bearing the figures 0, 1, 2, 3: on the other end is a disc (3) with contacts. The flange (2) is joined to the ratchet only by a pawl (7). When the core is drawn in, the flange, mounted freely on the drum, turns and causes the pawl to engage the next tooth of the ratchet.

When the core is released, the pawl, acting under the pressure of the spring turns the drum, together with the ratchet and disc (3), as a result of which the disc contacts close the next circuit on the panel.

On the panel (4) are two rectangular and six circular contacts. The terminals of the rectangular contacts are marked with the letters B and T, corresponding to the electric igniters of the pyro-cartridge in the fighting compartment or engine compartment circuits. The circular terminal contacts are marked with the numbers 1, 2, 3, and are joined by electric leads to the pyro-cartridges in the cylinders. To ensure a more reliable fit between the disc contacts and the panel contacts, a leaf spring (13) is fitted between the flange and the disc.

#### The Operation of the CO<sub>2</sub> Apparatus

##### Sec 2.

In the event of fire in the fighting or engine compartment the thin disc of the flame detector heats up, straightens out and closes the circuit. One of the lamps on the warning signal board lights up, and in the case of fire in the engine compartment the alarm horn sounds.

When the button on the warning signal board is pressed, the pyro-cartridge igniter circuit is closed through the B and T panel contacts and the contacts on the moving disc in the automatic fire-fighting mechanism. The relay is simultaneously switched on. The core of the relay draws in and, turning the flange, transfers the pawl to the next tooth of the ratchet. When the button is released, the push-rod relay switches off and the core returns to its original position under the pressure of the spring, turning the ratchet with the moveable scale. The disc contacts are thus connected to the pyro-cartridge igniter contacts of the next cylinder and prepare it for operation.

The numbered plate turns and in the opening (12) appears a figure, showing how many cylinders have been used.

When the electric igniter circuit is closed, the pyro-cartridge detonates; the piston 6 (Fig 239) with the striker is displaced by the action of the gases and pierces the scaling discs, and CO<sub>2</sub> from the cylinder is delivered along the pipes to the compartment where the fire has started.

#### Action of the crew on discovering a fire in the tank and safety precautions

##### Sec 3.

To extinguish the fire it is essential that the driver-mechanic switches off the engine and that the tank-commander and loader switch off all fans. In this

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way CO<sub>2</sub> will not be expelled from the tank. Then the driver-mechanic presses the button, over which the warning light is glowing. In the event of fire in the fighting compartment the loaders button must be pressed fully home.

In the event of fire in the engine compartment the members of the crew must stay in the tank and continue their duties. When the fire has been extinguished, if circumstances permit, it is essential to carry out an inspection and establish the nature of the damage caused by the fire.

In the event of fire in the fighting compartment, the tank commander and the loader open the turret hatches. When the fire has been extinguished, the tank commander and the loader switch on the fans and the loader opens the escape hatch. If circumstances permit, the crew leave the tank, leaving the ventilators switched on for 3-5 minutes. If it is impossible to leave the tank, the crew carry out the above drill, but put on respirators and wear them for 3-5 minutes.

In the event of fire both in the fighting and engine compartments, both lamps on the warning signal board will light up. In this case it is essential to press and release both buttons in turn.

Simultaneous pressure on both buttons is not permissible for two reasons. Firstly, both sealing discs of the same cylinder will be punctured and CO<sub>2</sub> will enter both compartments simultaneously. Effectiveness of the apparatus will be less than if the buttons are pressed alternately, because then the fire-fighting is carried out in each compartment by separate cylinders. Secondly, in the event of another fire, wherever it may start, CO<sub>2</sub> will be pumped into both compartments of the tank from the cylinder, both of whose sealing discs have been pierced.

When the button has been pressed and the cylinder exhausted, the warning light will go out, as the released CO<sub>2</sub> lowers the temperature sharply and the flame detector breaks the warning lamp circuit.

If the lamp glows again, it means that the fire has not been extinguished, and the button must be pressed again.

When the cylinder has nearly been exhausted (within 40-50 seconds after the button has been pressed), there will be a concentration of gas in the lower part of the tank hull. To stay in the lower part of the hull (from which the CO<sub>2</sub> has not been removed) for a prolonged period may lead to unconsciousness. Therefore after the fire has been extinguished the fighting and drivers compartments must be cleared by the fans.

The driver-mechanic must open the ventilation hatch in the driver's door and breathe through it.

#### Changing the Cylinders

##### Sec 4.

The drill for changing cylinders in a tank is as follows:

1. Switch off the battery master switch.
2. Unscrew the lock-on nut (7) (See Fig 239), disconnect the electric leads and bind the ends with insulating tape.
3. Disconnect the pipes from the cylinder charging points.
4. Remove the cylinder, and replace it with a new one containing the normal quantity of CO<sub>2</sub>. Ensure it is firmly fixed.
5. Carefully wipe the hollow of the neck of the cylinder and place the pyro-cartridge in it.
6. Turning the drum and ratchet clockwise, arrange the numbered plate so that the

figure 0 appears in the opening.

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7. Having checked the electrical circuit, connect the electric leads from the automatic fire-fighting mechanism in the following order: join the wires marked 1B, 2B, 3B to the cartridges in the necks of the cylinders on the front side of the tank: the wires 1T, 2T, 3T to the cartridges in the cylinder necks on the engine compartment bulkhead: the wires 3B and 3T to cylinder No.3 (by the engine compartment bulkhead): the wires 2B and 2T to cylinder No.2 (first from the front of the tank): the wires 1B and 1T to cylinder No.1 (the middle one).

8. Join up the pipes, tighten the charging-point nuts and check that every connection has a sealing gasket.

#### Testing the Electric Circuit and Flame Detector Switches

##### Sec 5.

The drill for testing the electrical circuit of the fire alarm system is as follows:-

1. Switch off the battery master switch and disconnect the wires from the cylinder heads.
2. Connect a bulb to the end of each wire.
3. Switch on the battery master switch: the bulbs on the ends of the wires and on the warning signal board should NOT light up.
4. When the button on the driver-mechanic's warning signal board is pressed, the bulb on the end of lead 1B should light up: when the button is released the bulb should go out and the figure 1 should appear in the opening of the automatic fire-fighting mechanism.

When the same button is pressed again, the bulb on the end of lead 2B should light up and go out when the button is released. The figure 2 should appear on the automatic fire-fighting mechanism. This process is repeated for all the leads, and then the circuit is checked from the loader's button.

5. Check the contact between the pyro-cartridges and the wires attached to them on the cylinder necks, while the engine is not working:

- check fuse 80a on the main junction box.
- switch on the battery master switch; turning the drum and ratchet in the automatic fire-fighting mechanism clockwise, set the figure 0 in the aperture.
- unscrew the wing-nut on the rear panel of the warning-signal board and remove from the bolt the wire which gives a minus reading on the driver's voltmeter.
- connect the end of this wire in turn to the outlet contact bolts of the warning signal board, at the same time pressing the button of the driver-mechanic's voltmeter. A flicker of the needle will prove that contact has been made between the electric igniter of the pyro-cartridge and the wire.
- set the figures on the automatic fire-fighting mechanism to 1 and 2 in turn, and check in the same order the contacts between the pyro-cartridges and the wires.

In conclusion, switch off the battery master switch, set the numbered plate back to 0, place the end of the negative lead of the voltmeter on the bolt of the warning signal board and fasten it with the wing-nut.

To test the operation of the flame detector switches in the fighting compartment a flame should be held underneath each one in turn. The warning light on the signal warning board should light up. When the flame is removed, the light will go out in a short time.

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The flame detector switches in the engine compartment are tested in the same way.

### Portable Fire Extinguishers

#### Sec 6.

To extinguish small fires in a tank a portable CO<sub>2</sub> fire extinguisher type OU-2 is fitted.

The portable fire-extinguisher (see Fig 244) consists of a 2-litre cylinder (1) a shut-off valve (3) with a syphon tube, a safety-valve (2), a connecting tube with a sealing nut (4), a funnel (5) and a handle (6).

On the lower part of the shut-off valve is a conical thread, which enables it to be screwed home tightly into the cylinder neck. On one charging-point on the shut-off valve is fitted a safety device, consisting of a plug with six openings and a brass sealing disc. The sealing disc will tear if the pressure of the CO<sub>2</sub> in the cylinder exceeds 160-180 kg/cm<sup>2</sup>. This prevents the cylinder from exploding. To the other charging-point on the shut-off valve is connected (by means of a sealing nut) a pipe, on the threaded end of which is screwed the funnel.

The CO<sub>2</sub> fire extinguisher type OU-2 is housed in the fighting compartment next to the fire alarm system CO<sub>2</sub> cylinders.

In the event of fire the fire extinguisher is taken from its bracket and held upright. Turn the funnel in the direction of the fire and then with the aid of the milled nut release the shut-off valve. The extinguisher discharges itself within 25 seconds.

While using the extinguisher, do not allow the cylinder to come into contact with the heat of the sun's rays or any other source of heat, as when CO<sub>2</sub> in a cylinder is heated up to 50°-60°C, the pressure rises above danger level and CO<sub>2</sub> is forced from the cylinder through the safety device.

### Care and Maintenance of the Fire Alarm System

#### Sec 7.

During technical servicing 1 and 2, the lights and horn alarm of the fire-fighting system are checked. (On pressing the control button, situated on the warning signal board, the lights should glow, and the horn alarm sound).

During technical servicing 3, servicing as in 1 and 2 is carried out, together with the following:-

- check operation of flame detectors.
- check electric circuit (during the charging or reloading the cylinders).

Every 10-12 months check the weight of the CO<sub>2</sub> in the cylinders. The weight should correspond to that on the stencilled inscription and should not be less than 1.8 kg.

If the weight of the CO<sub>2</sub> does not correspond to the stencilled inscription, the cylinder must be charged or replaced by a charged one (from the standard spare parts store). After charging a cylinder, enter the weight of CO<sub>2</sub> and the date of weighing in paint on the stencil and note it in the log-book.

Keep the charged CO<sub>2</sub> cylinders in the standard spare parts store in a dry place at not more than 50°C.

### Care and Maintenance of the Portable Fire Extinguisher Type OU-2

The quantity of CO<sub>2</sub> should be checked every 3 months while the extinguisher is being stored. The weight of the CO<sub>2</sub> is the difference between the weights of a

Each canister is fastened on a bracket by 2 steel bands (14) with a regulating screw (8) (draw bar) and by a mechanical lock (7). The mechanical lock discharges the canisters from the vehicle and operates the cable (6) leading into the fighting compartment to a handle (5), fastened to the left and right sides.

The lock (7) consists of a cylindrical frame (13) with a nut, an arresting device (9), turning on an axle, a catch (11) with a spring (12), to which is joined the cable (6) and a fabric cover (10) protecting the lock from dust and dirt.

The BDSL-5 canisters are ignited by electric igniters (15) screwed into them. These are joined to buttons, mounted on a BDSL-5 board situated on the left side near the engine compartment bulkhead. The right hand button ignites the right canister, the left - the left.

The adaptor (3) for the attachment of the BDSL-5 igniter wires (4) are mounted on the bracket to which the canisters are fixed.

To provide a smoke screen the BDSL-5 canisters are ignited by the layer or tank commander by means of the electric igniters, either on the move or at the halt.

Either both canisters simultaneously or each one separately, may be used for a smoke screen.

To discharge the BDSL-5 canisters the cable must be pulled by means of the handles situated on the left and right sides. The loader discharges the right-hand canister and the layer or tank commander the left-hand one.

#### Care and Maintenance of the Smoke Canister Equipment

Before fixing the BDSL-5 canisters check the condition of the band and screws, and the electric lead leading to the adaptor. The lock and adaptor must be carefully cleaned of mud, snow and ice. Check the operation of the catch and arresting device. When the catch is pulled back the arresting device should turn freely on its axle. The action of the spring should return the cable with the catch to their original positions.

Before setting off the fastenings of the BDSL-5 must always be checked.

full and an empty extinguisher, as shown on the shut-off valve. 50X1-HUM

The normal weight of CO<sub>2</sub> in the cylinder of a fire-extinguisher is 1.4-1.5 kg. The minimum permitted weight is not less than 1.25 kg.

Fire extinguisher cylinders are re-charged at field CO<sub>2</sub> charging stations, according to special instructions.

It is necessary to charge a fire extinguisher if the weight of CO<sub>2</sub> is less than 1.25 kg or if it has discharged itself, or to replace it if the connecting tube or the milled nut of the shut-off valve have been damaged.

When in use do not permit:

- moisture to get on the shut-off valve of funnel.
- the cylinder, shut-off valve, funnel or connecting tube to be damaged by blows.
- objects to be hung up on the fire-extinguisher.

If the seal is torn off, check the quantity of CO<sub>2</sub> in the cylinder and if necessary re-charge and re-seal.

#### Possible Faults in the Fire Alarm System

##### Sec 8.

Fault	Reason	Method of Correction
Cylinder discharges without the button on the warning signal board being pressed.	Short circuiting of the wires leading to the buttons of the warning signal board.	Repair short circuit. Re-charge cylinder.
Warning lights glow without the presence of a fire.	Short circuit of the wire from the flame detector to the hull.	Repair short-circuit.
Warning signal board test button is pressed, but lights do not glow.	1. Unserviceable bulbs. 2. Wire leading to button disconnected. 3. Wire leading to warning lights disconnected.	Change the bulbs. Rejoin wire to button Rejoin wire to lights.
On pressing the buttons, the cylinders do not work.	1. Electric lead from the cylinder neck disconnected. 2. No pyro-cartridges in the cylinder necks.	Re-connect lead. Replace pyro-cartridge, and re-join lead.

#### Smoke Canisters

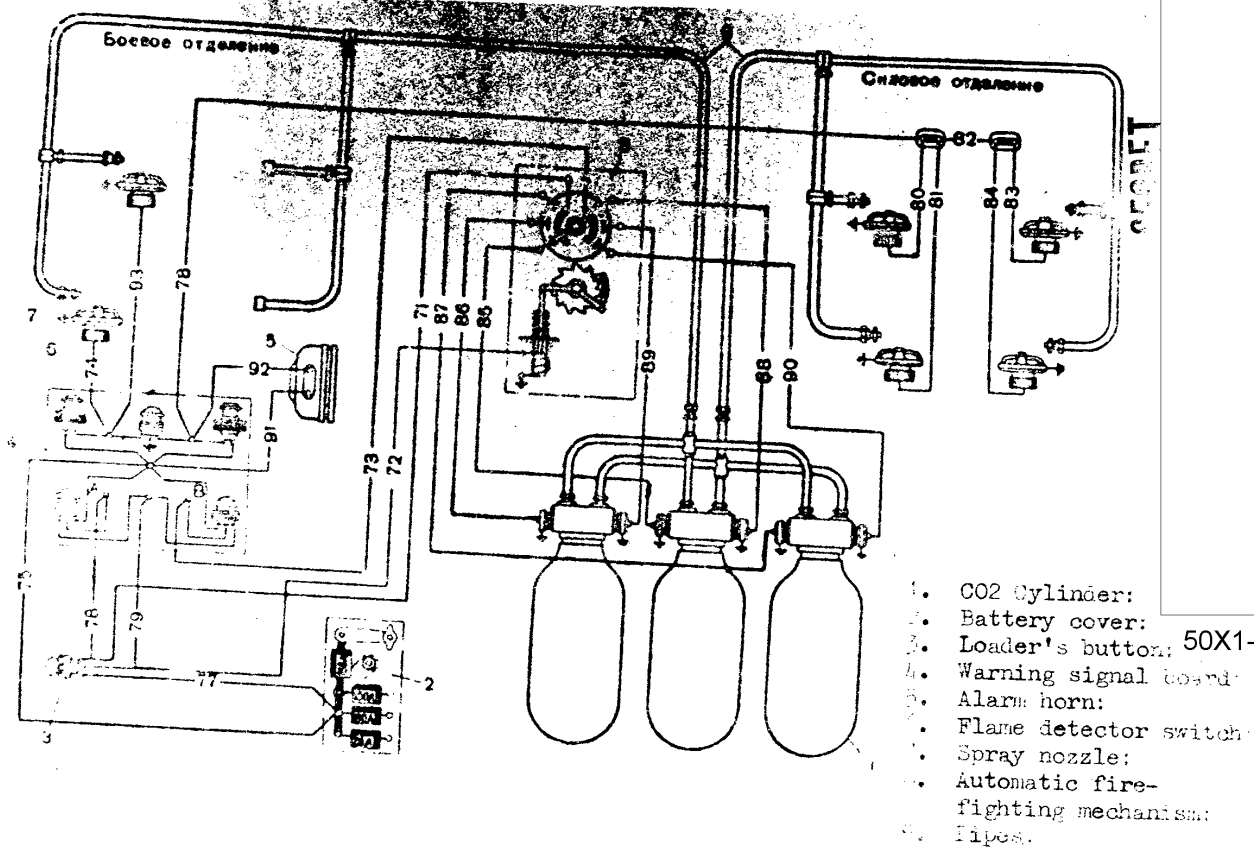
##### Nomenclature and Short Description

##### Sec 9.

On the hull rear plate of the tank on the right and left sides are fitted two large smoke canisters BDSL-5 (see Fig 245). The canisters are used to provide a smoke screen. 50X1-HUM

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Fig 237. General lay-out of the fire fighting system



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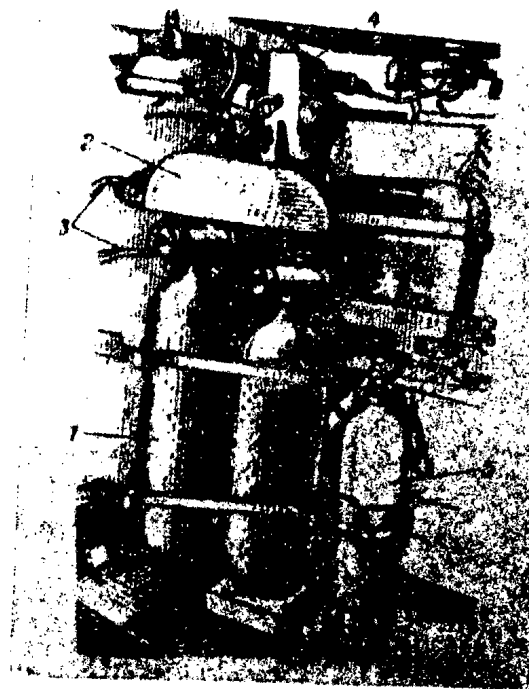


Fig 238. Lay-out of fire equipment in the fighting compartment.

1. CO<sub>2</sub> Cylinder:
2. Protective casing:
3. Pipes:
4. Automatic fire fighting mechanism:
5. Portable fire extinguisher:

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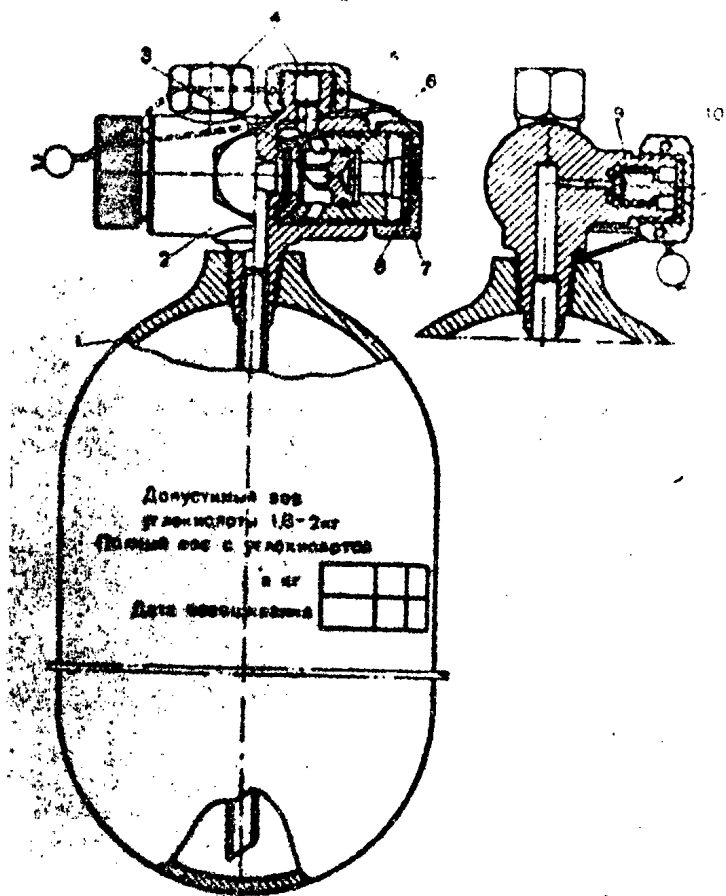


Fig 239. CO2 Cylinder.

1. Cylinder:
2. Cylinder head and syphon tube:
3. Sealing disc:
4. End caps:
5. Stopper:
6. Piston with fixing ring and striker:
7. Adaptor nut:
8. Gasket:
9. Stopper:
10. End cap:
11. Gasket:

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1. Rubber packing:
2. Wire contact:
3. Bush:
4. Contact screw:
5. Main frame:
6. Ring:
7. Bolt:
8. Connector:
9. Disc:
10. Cap:
11. Jacket:
12. Spray nozzle:
13. Bracket:
14. Contacts:
15. Contacts:
16. Adaptor nut:

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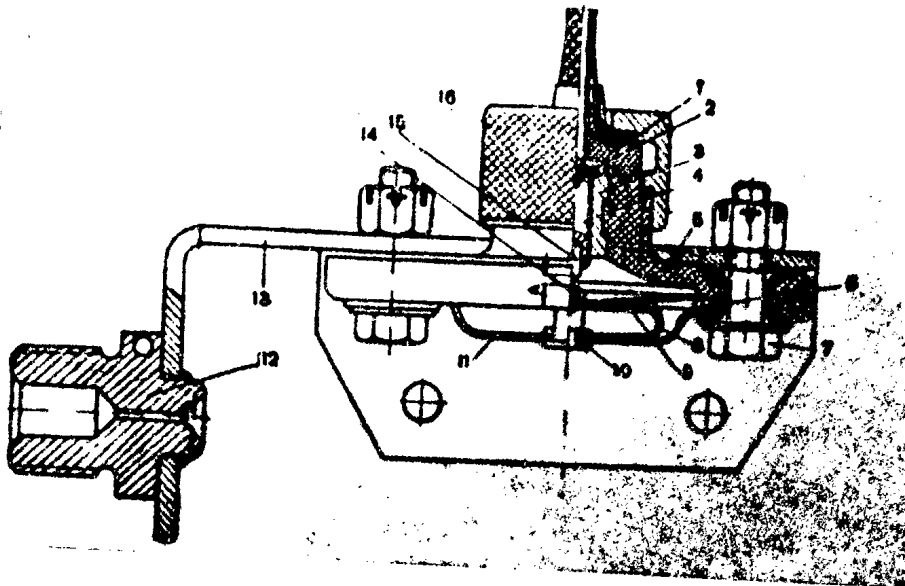
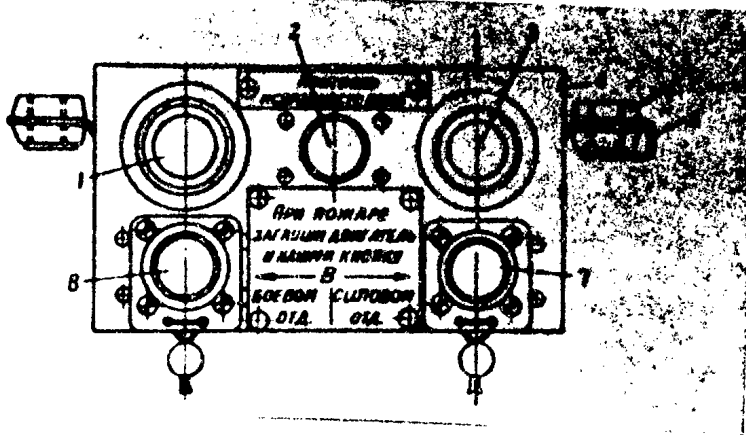


Fig 241. Warning signal board.



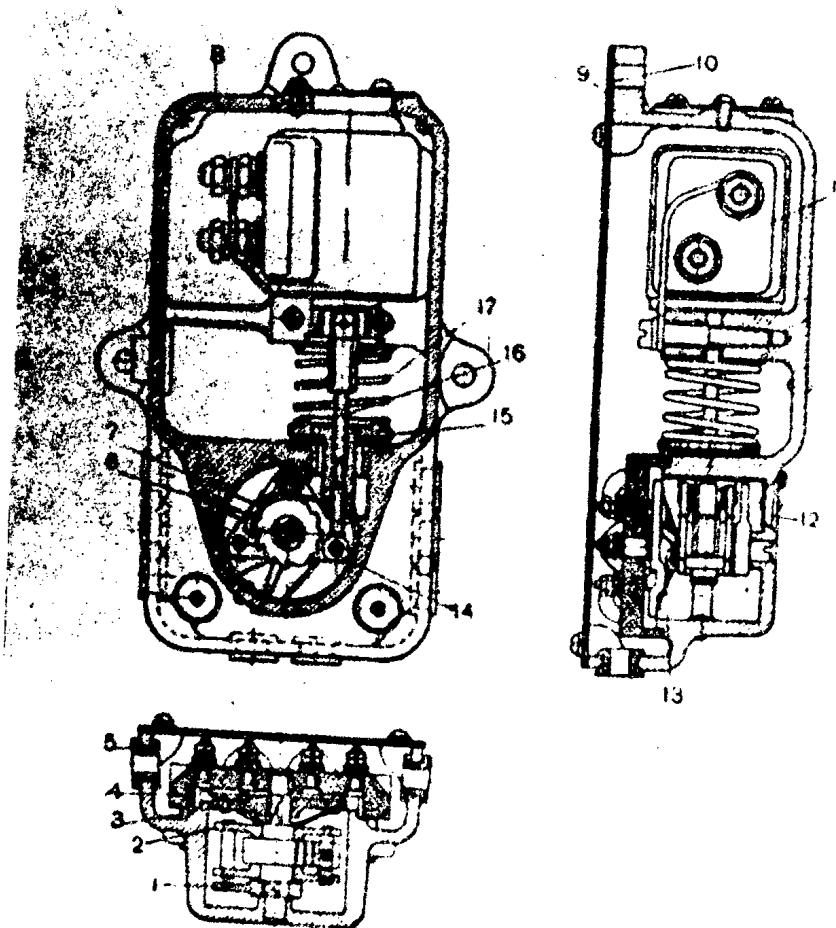
1. Fighting compartment warning light:
2. Warning light testing button:
3. Engine compartment warning light:
4. Casing:
5. Shock absorber.
6. Connector:
7. Engine compartment:
8. Fighting compartment button:

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- 1. Plate numbers:
- 2. Flange:
- 3. Disc:with contacts:
- 4. Panel with contacts:
- 5. Rubber packing:
- 6. Drum with ratchet:
- 7. Pawl:
- 8. Main frame:
- 9. Covering:

- 10. Gasket:
- 11. Push-rod relay:
- 12. Aperture:
- 13. Spring:
- 14. Sleeve:
- 15. Plate:
- 16. Push-rod:
- 17. Spring:

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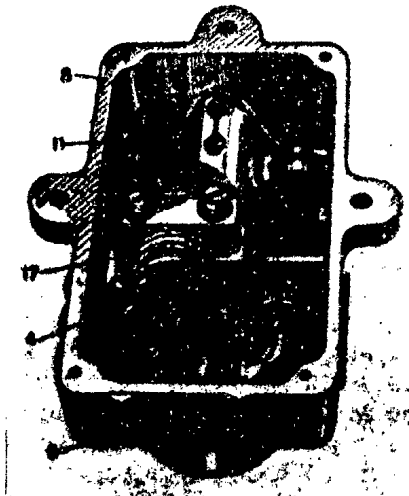


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Fig 243. Automatic fire fighting mechanism.

1. Plate with numbers:
2. Flange:
3. Disc with contacts:
4. Panel with contacts:
5. Rubber packing:
6. Drum with ratchet:
7. Pawl:
8. Main frame:
9. Covering:
10. Gasket:
11. Push-rod relay:
12. Aperture:
13. Spring:
14. Sleeve:
15. Plate:
16. Push-rod:
17. Spring:

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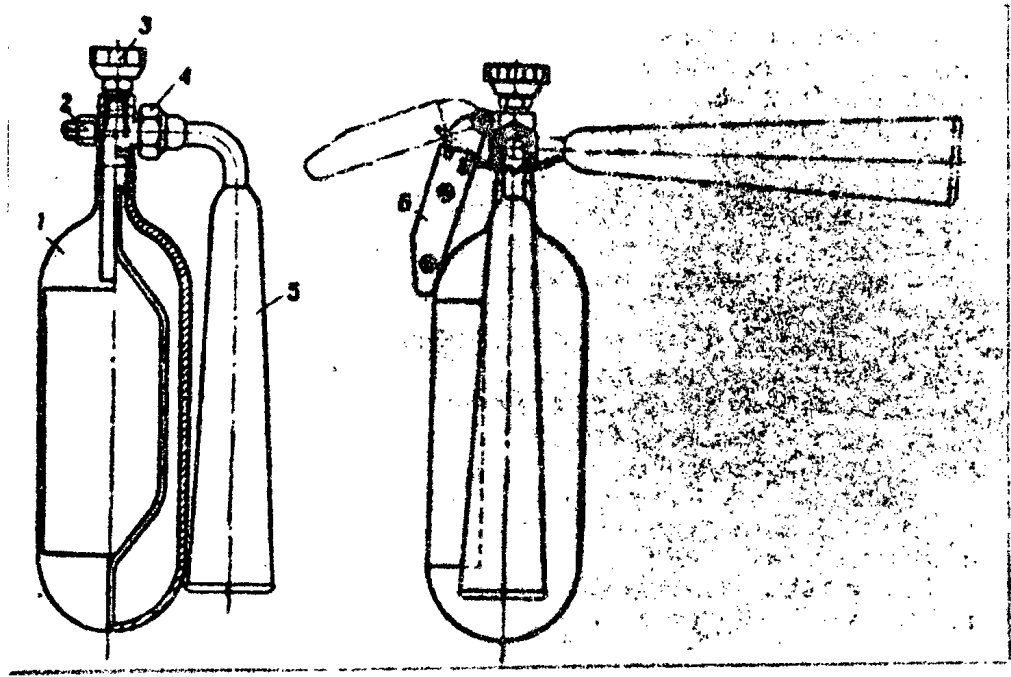


Fig 244. Portable fire extinguisher type OU-2.

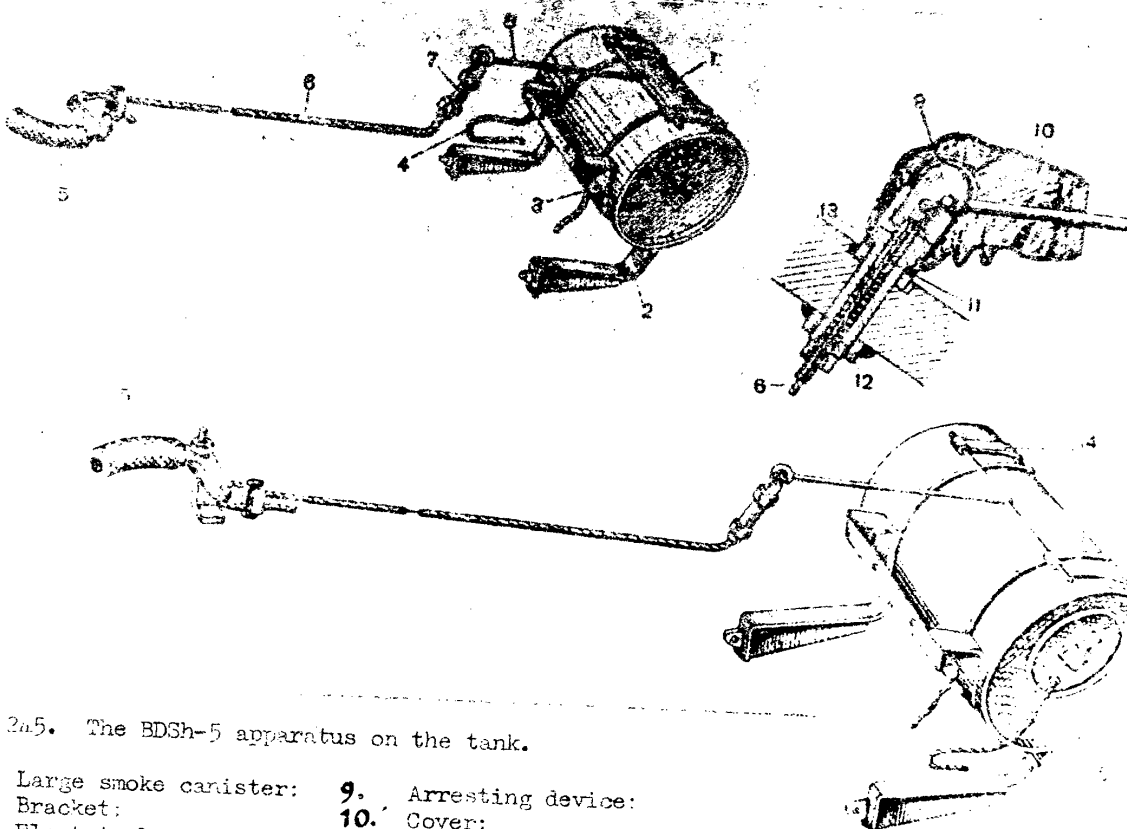
- 1. Cylinder:
- 2. Safety-valve:
- 3. Shut-off valve:
- 4. Sealing device:
- 5. Funnel:
- 6. Handle:

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Fig 2a5. The BDSH-5 apparatus on the tank.

- |                           |                       |
|---------------------------|-----------------------|
| 1. Large smoke canister:  | 9. Arresting device:  |
| 2. Bracket:               | 10. Cover:            |
| 3. Electrical adaptor:    | 11. Catch:            |
| 4. Electric igniter lead: | 12. Lock spring:      |
| 5. Ejector handle:        | 13. Lock casing:      |
| 6. Cable:                 | 14. Steel bands:      |
| 7. Mechanical lock:       | 15. Electric igniter: |
| 8. Screw:                 |                       |

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## Chapter 11. Instructions for driving the tank

Sec 1. Preparing the tank for the road.

Before driving the tank a quick inspection should be carried out. The driver should ensure that the fuel and cooling systems are in order and that his seat is properly adjusted and then the engine prepared for starting and warming up.

Starting up drill - phase 1

- (a) Ensure that the tank is filled with fuel and lubricant;
- (b) Switch the fuel switch through to whichever tank is selected for use;
- (c) Open the air bleeder valve and keep it open for 5-10 secs by hand; at the same time activate the (diesel) fuel supply hand pump;
- (d) Switch on the battery master switch and check that the warning light is functioning properly;
- (e) Check the working of the pedals and the steering levers; put the gear lever into neutral, and the fuel supply handwheel into the upper position;
- (f) Switch on the oil pump and build up the pressure to not less than  $3 \text{ kg/cm}^2$ .

Note that when the air temperature is  $5^{\circ}$  centigrade or less the engine must be warmed up with the pre-heater. The drill for doing this is given in chapter 12.

Starting up drill - phase 2

- (a) Press the warning signal;
- (b) Depress the main clutch pedal;
- (c) Again switch on oil pump and at the same time press the starter motor button sufficiently for the crank shaft to make 2 or 3 revolutions without injecting fuel;
- (d) Push the fuel supply pedal approximately one third down its length of travel and again press both pump and starter buttons; note that the starter should not be engaged for longer than 5 secs, and should it be necessary to re-engage the starter 10-15 secs should not be exceeded;
- (e) When the engine fires, release both buttons and gradually release main clutch pedal;
- (f) Build the revolutions up to 700-800 per minute and fix the position of the fuel supply pedal by means of the hand throttle, to maintain this speed.

Note: engine speed must not exceed 700-800 revs per minute until the engine has warmed up.

- (g) Check the oil pressure by means of the manometer<sup>o</sup>. This must not be less than  $2 \text{ kgms/square centimetre}$ .

Note: if the pressure is not above  $2 \text{ kg/cm}^2$  the engine must be stopped and the fault found and put right.

In the event of the starter being damaged the engine may be started by means of the compressed air in the following manner:-

- (a) Press the warning signal;
- (b) Depress the main clutch pedal;
- (c) Open the valve of one of the cylinders; 50X1-HUM
- (d) Switch on the oil pump and at the same time turn the handle of the air regulator valve to the left by about one turn (this should move the

crank shaft through 2 - 3 revolutions without fuel being injected). Close air regulator valve;

- (e) Push the fuel supply pedal approximately one third down its length of travel and again press the pump button and turn the handle of the air regulator valve by one turn;
- (f) As soon as the engine fires release the pump button and close the air regulator valve; shut off valve to air cylinder;
- (g) Build up engine revs as in (f) above.

Note: in the case of an engine that has been switched off for only a short period the above drill may be modified by omitting the preparatory turning over of the crank shaft.

#### Warming up the engine after starting

After the engine has been started, it should be warmed up in the following manner:-

- (a) 700-800 revolutions per minute until the temperature of the oil reaches 8-10° centigrade;
- (b) 1200-1600 revolutions per minute until the temperature of the coolant and the oil has reached 30° centigrade.

When the oil and coolant temperatures have reached 30°C the vehicle can be moved off; it can be taken up to maximum speed when these temperatures exceed 55°C.

Note: labouring the engine when the temperature of the coolant is below 55°C is not permitted as such practise causes "gumming up" of engine components.

#### Checking the engine performance

It is essential that a close check be kept on the various instrument readings both when starting up and during normal running. When the engine is operating normally instrument readings should be as follows:-

Oil pressure - 6-9 kg/cm<sup>2</sup>  
Oil temperature - between 70 and 90°C. (N.B. temperatures of up to 110°C are permitted for short periods)  
Coolant temperature: 70-90°C. (up to 105°C permitted for short periods)  
Engine revolutions 1600-1800 per minute.

Oil and coolant temperatures are regulated by opening the engine louvres or by reducing engine revolutions and engine load. If normal working temperatures are still exceeded when the louvres are fully open, the hatch above the ventilators must be raised. (This is done by lifting both hatch covers and securing them with bolts). Should the temperature of the coolant remain above the normal with louvres fully open and with the hatch above the ventilators raised, then a lower gear must be engaged and the revolutions increased.

If the oil temperature rises above the permissible limit, engine revolutions must be reduced and a lower gear engaged (i.e. engine load reduced).

#### Stepping the engine

Stepping the engine when the coolant temperature is higher than 70°C is not permitted. A break in the circulation at such temperatures may give rise to engine over-heating and cause the coolant to sheet out through the valves in the filler plug in the neck of the radiator.

When coolant temperatures exceed 70°C the engine should be stepped gradually as follows:-



- (a) Open louvres fully;
- (b) Allow the engine to idle - at 1500-1600 r.p.m. until the coolant temperature drops to between 60-70°C;
- (c) Allow the engine to idle at 700-800 rpm for between 1 and 2 minutes, then release fuel supply pedal and move the hand throttle lever up to its highest position.

Having stopped the engine, throw out the battery master switch and if the tank is not to be run for more than 24 hours, close the fuel tank selector switch, hatches and louvres.

## Sec 2. Steering the tank

The epicyclic gear system for turning the tank permits a high degree of manoeuvrability, a good cruising speed, and facilitates the work of the driver-mechanic in steering the vehicle. When overcoming small obstacles and when starting off from sandy or muddy surfaces or slopes (i.e. where there is a large amount of resistance to movement) the driver-mechanic is not forced to engage low reduction but need simply engage first gear. (This has approximately the same effect as engaging low reduction).

Prolonged driving with the epicyclic system engaged is forbidden otherwise over-heating of the assembly units is likely to result. Syncre-mesh gears are fitted. This facilitates gear changing since the driver does not need to "double declutch" or "rev up". Revving up is only required when changing down from third to second. In this case the syncre-mesh does not quite guarantee smooth meshing on the part of the cog-wheels.

When travelling over varying road conditions the driver-mechanic must engage the gear which will give a steady speed at normal working revolutions. (1600-1800 r.p.m.).

A regulator working at all speeds automatically alters the amount of fuel injected for small changes in the amount of engine load. This simplifies steering and increases cruising speed.

To steady the tank on a forward course and also to change direction on a radius greater than 10m the driver must pull steering lever towards him, but it is not necessary to pull the lever as far as the first position. (i.e. the steering brake is slipped). In so doing the steering brakes are not fully engaged and therefore such practice is only permitted for short distances otherwise wear, over-heating and distorsion of the brake shoes will result.

If the steering lever is pulled back to the first position the tank will turn smoothly in a radius of 9-10m. It is possible to make such turns at any speed, road conditions permitting. When moving the tank in top gear the steering lever must be pulled back smoothly into first position or else a violent turn will result the higher the speed, the more gradual this movement must be. Having made the turn return the steering lever to its original position.

If the engine labours when a turn is being made let the tank travel forward a short distance and then re-apply the steering brake (steer by short bursts). Turns of this nature requiring two or three applications of the steering brakes are usually made in heavy ground. Should it happen that both steering levers are pulled back into the first position the tank can be steered by freeing one of them. The lever selected should be released gradually or else a violent turn will result. To make a steep turn either low gear or reverse should be engaged, and the steering lever pulled back to the second position to lock the track. In heavy ground the turning effect of the free running track may be increased by pulling the second steering lever back to the first position.

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In all circumstances when a turn is made the engine r.p.m.s should be low at the commencement of the turn and gradually increased as the turn is achieved.

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The number of applications of the steering levers when making a turn will depend upon the radius of turn and the nature and state of the ground. Each time the brake is applied the tank should be allowed to go forward by an amount no less than half the tank's length before the steering lever is again pulled. If the free-running track should start to slip when a turn is being made (causing the tank to stop) the track which has been braked should be freed and the tank allowed to continue in a forward direction.

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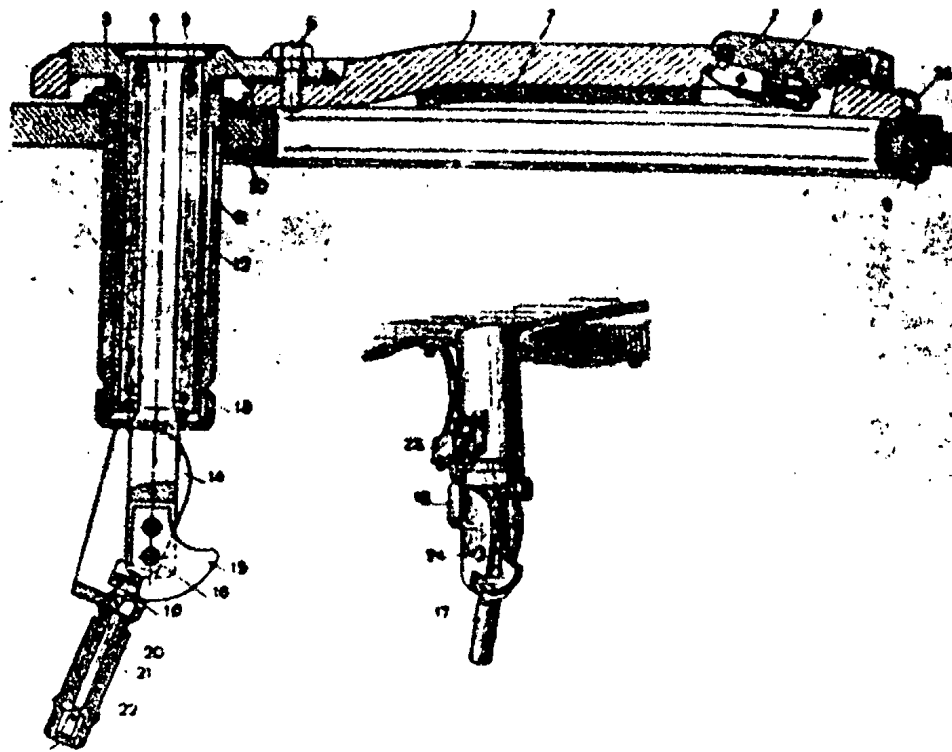


Fig 13. Driver-mechanic's hatch.

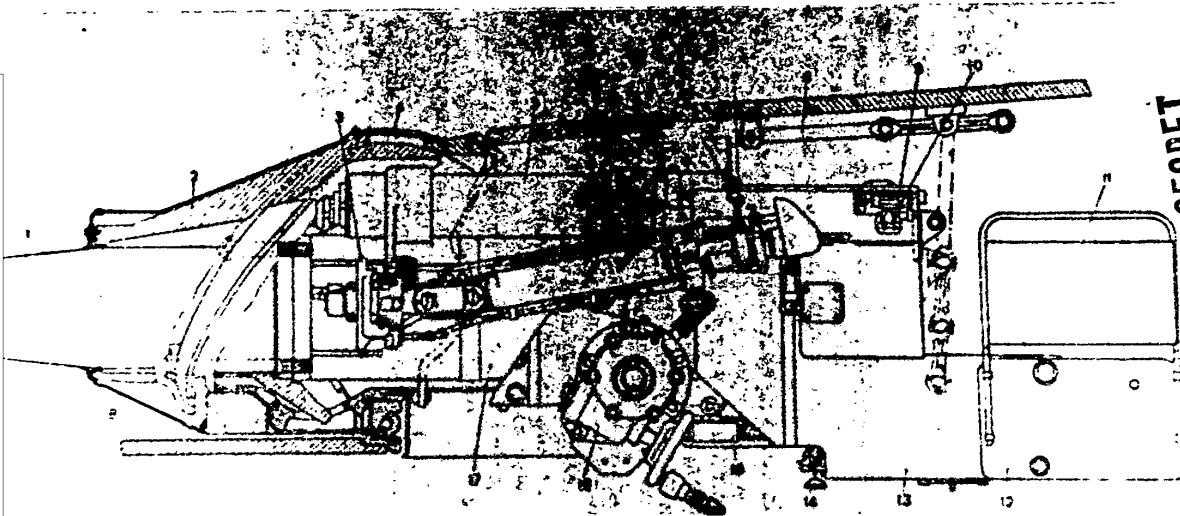
- 1 - hatch cover: 2 - ventilation hatch cover: 3 - bracket:  
 4 - rod: 5 - springs: 6 - bolt: 7 - pod: 8 ventilation hatch  
 cover: 9 - clamping ring: 10 - pressure ring: 11 - socket:  
 12 - bracket tube: 13 - nut: 14 - cam fork: 15 - cam:  
 16 - pin: 17 - handle: 18 - cam: 19 - catch: 20 - catch  
 sleeve: 21 - catch spring: 22 - rivet: 23 - PS-5 switch:  
 24 - axis: 25 - protective light blidage: 26 - stop.

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Fig. 25. The gun ( viewed from the left ).

1. Barrel.
2. Armoured plate.
3. Sight bracket.
4. Rain shield.



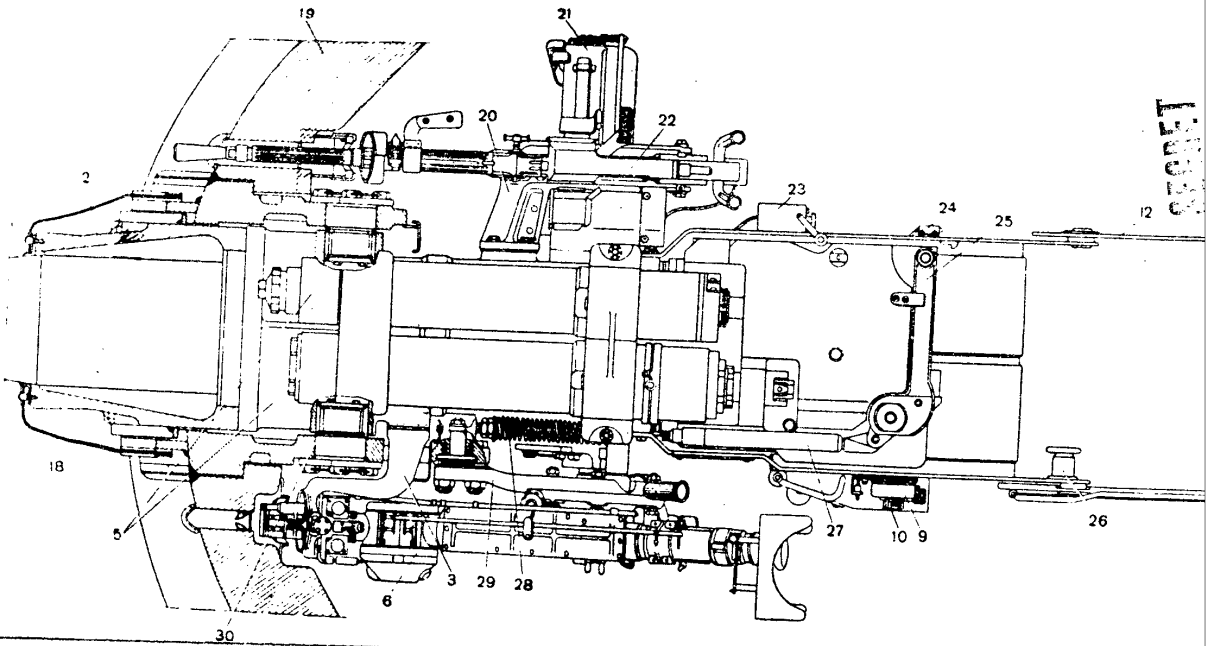
5. Recoil system.
6. TSh 2-22 sight.
7. Sight holder.
8. Gun travelling clamp.
9. Folding sight clino light.
10. Sight clinometer.
11. Removable recoil guard.
12. Foldin, part of recoil guard.
13. Fixed part of recoil guard.
14. Hand firing lever.
15. Semi-automatic opening device.
16. Elevating mechanism.
17. Cradle.
18. Cover of the gun embrasure,

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Fig. 26. The gun ( viewed from above ).

- 19. Turret.
- 20. Co-axial mounting bracket.
- 21. Magazine box of co-axial MG.



- 22. Co-axial MG.
- 23. Loaders safety switch.
- 24. Recoil indicator folding lamp.
- 25. Breech lever.
- 26. Clamp for folding part of recoil guard.
- 27. Semi-automatic closing device.
- 28. Compensating mechanism.
- 29. Elevating mechanism bracket.
- 30. Trunnion.

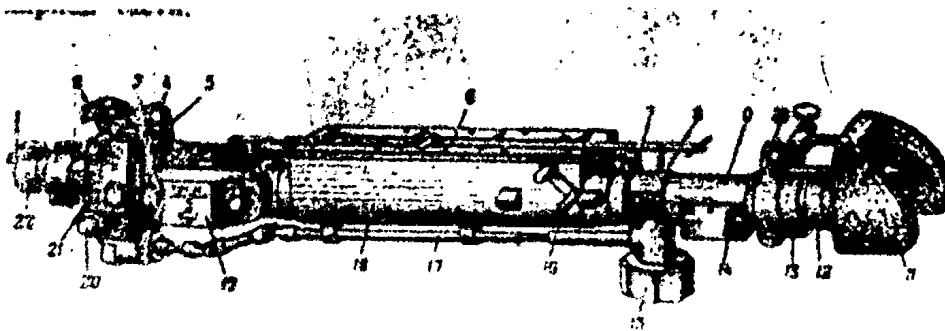
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Fig. 27. The TSh 2-22 Telescopic pivot sight.

1. Wiper.
2. Plug.
3. Direction adjusting screw.
4. Clamping screw.
5. Height adjusting screw.
6. Key.
7. Wiper handle.
8. Sight handwheel sleeve.
9. Eye-piece.
10. Pivot clamp flange.
11. Brow pad.
12. Eye-piece sleeve.
13. Brow pad bracket.
14. Light filter lever.
15. Sighting nut.
16. Variable magnification lever.
17. Cardan shaft.
18. Variable magnification box.
19. Pivot.
20. Trunnion.
21. Sight head.
22. Cap with protective glass.

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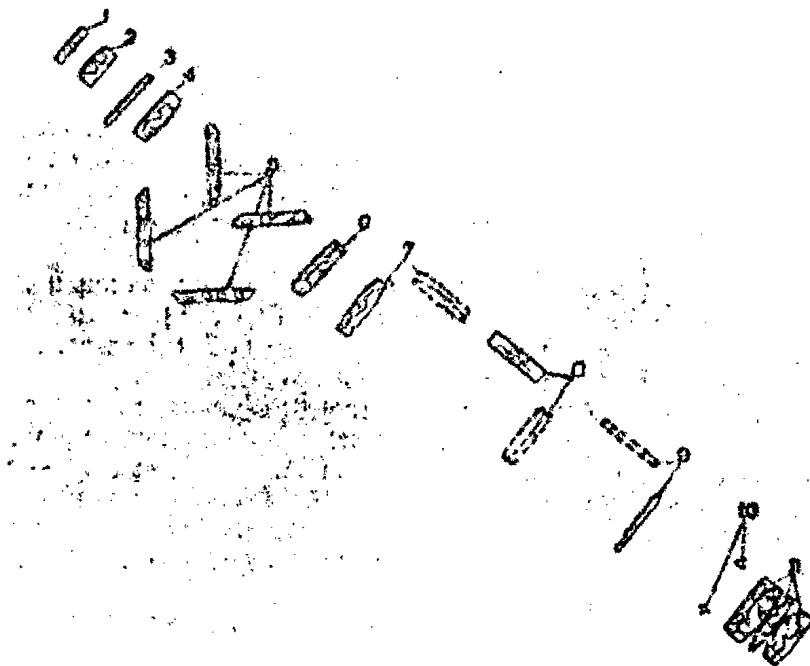


Fig. 28. Optical system of T3h 2-22 sight ( from above).

1. Protective glass.
2. Object glass.
3. Graticules.
4. Condenser.
5. Mirrors of the "straightening" system.
6. Fixed lens.
7. Movable lens.
8. Movable lens.
9. Light filter.
- 10.. Diaphragm.
11. Eye-piece..

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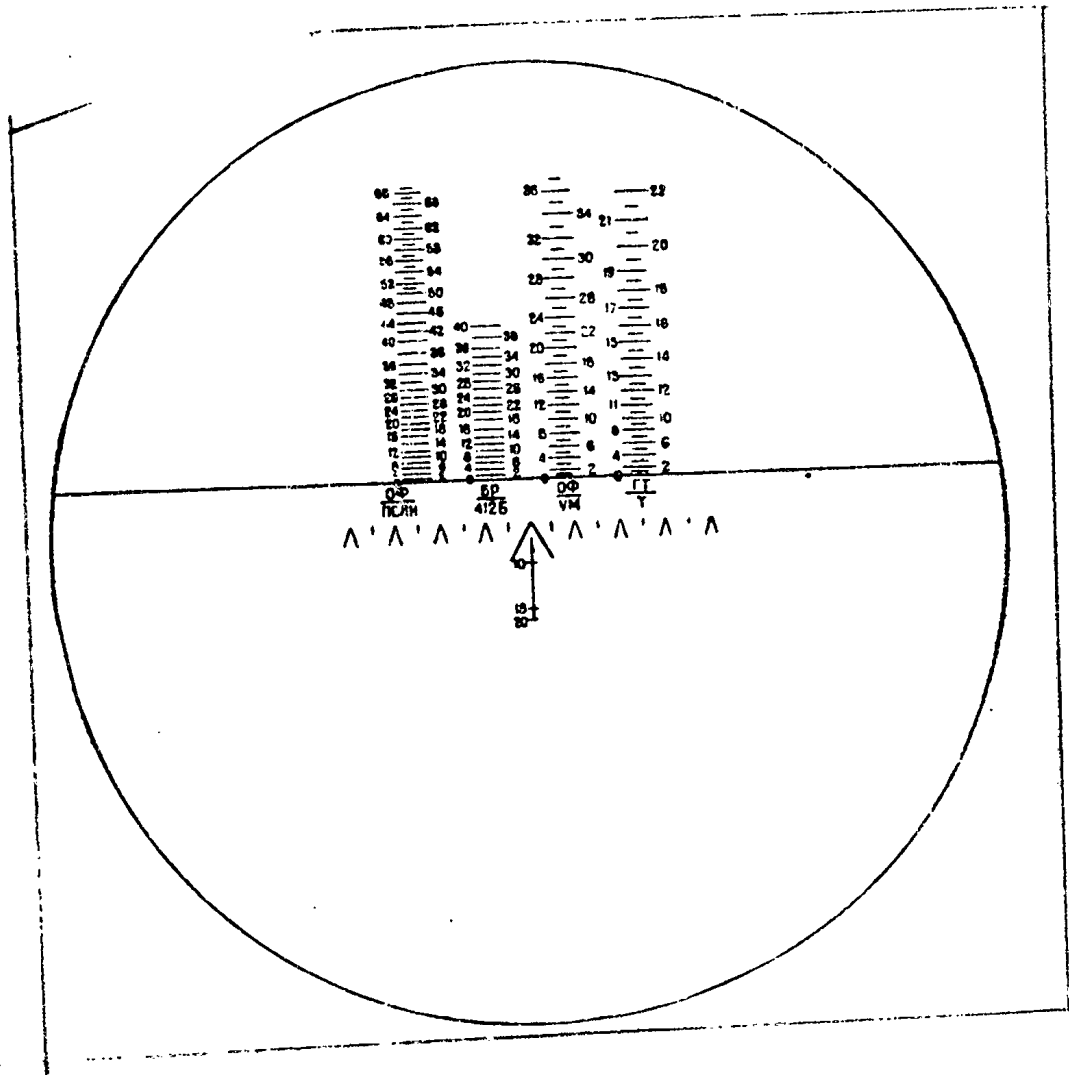


Fig. 29. Graticule scale of TSh 2-22 sight.

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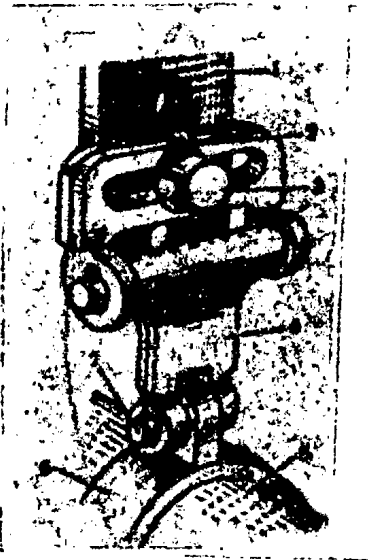
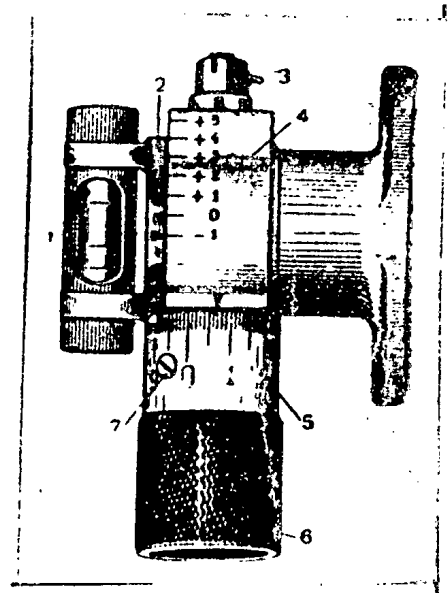


Fig. 30. Pivot clamp of TSh 2-22 Sight.

1. Bracket.
2. Locking washer.
3. Bolt.
4. Clamp.
5. Eye-piece.
6. Pivot clamp sleeve.
7. Bolt.

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**Fig. 31. Sight Clinometer.**

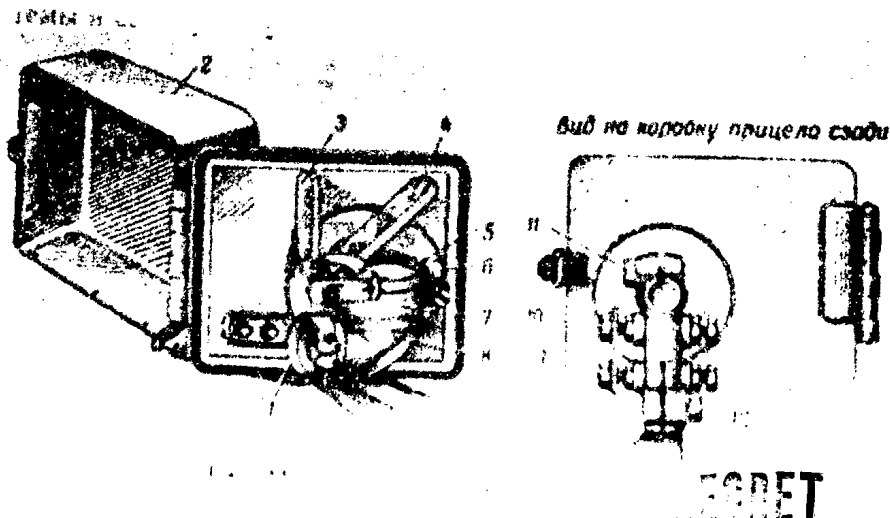
1. Spirit bubble.
2. Cradle.
3. Nut.
4. Drum.
5. Ring.
6. Knurled knob.
7. Tightening screw.

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Fig. 32. K 10-T Lensatic sight

1. Sight holding collar.
2. Lid.
3. Removable light filter.
4. Reflector.
5. Object glass.
6. Sight mount.
7. Sight holding collar.
8. Body of sight,
9. Horizontal regulating bolt.
10. Vertical regulating bolt.
11. Clamping bolt for vertical regulating bolt.
12. Clamping bolt for horizontal regulating bolt.



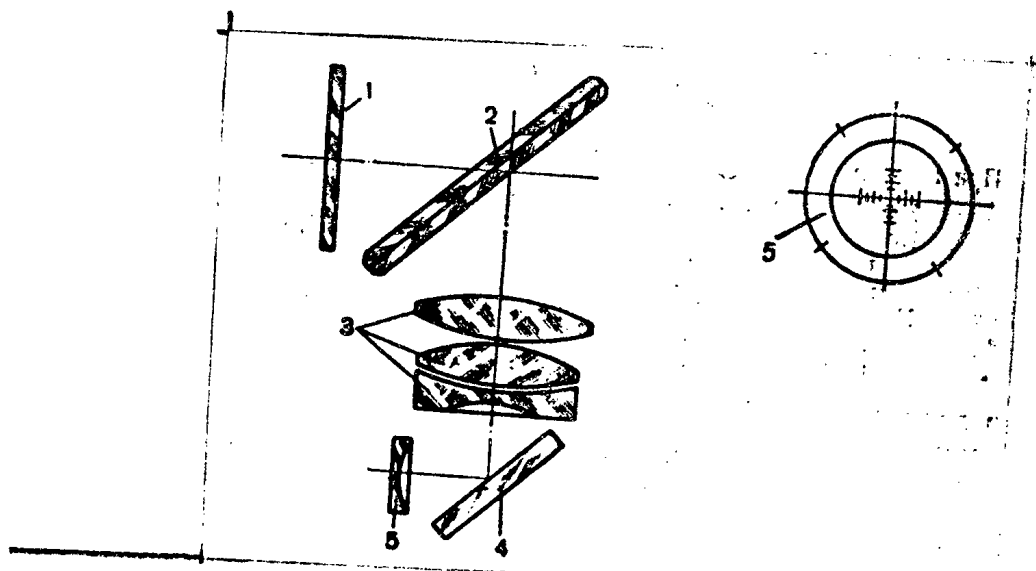


Fig. 33. Optical system of K 10-T lensatic sight.

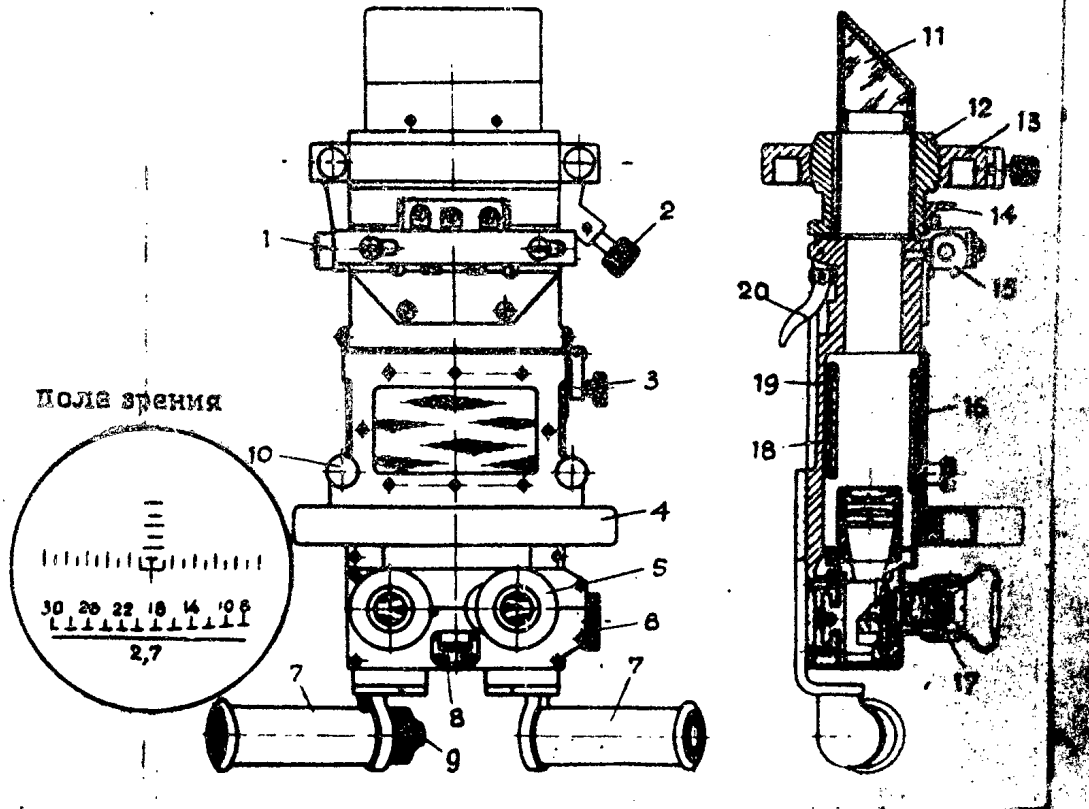
1. Removable light filter.
2. Reflector.
3. Object glass.
4. Mirror.
5. Glass with graticules.

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Fig. 34. TPK-1 Periscope.

- 1. Pressure plate.
- 2. Binder bolt ( tilting ).



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- 3. Mirror turning knob.
- 4. Brow pad.
- 5. Eye-piece.
- 6. Eye-piece adjuster knob.
- 7. Handles.
- 8. Eye-piece adjuster scale.
- 9. Commanders control button.
- 10. Screw.
- 11. Upper prism.
- 12. Head.
- 13. Flange.
- 14. Tongue.
- 15. Pivot mechanism linkage.
- 16. Protective glass.
- 17. Eye-piece sleeve.
- 18. Mirror.
- 19. Body.
- 20. Locking lever.

Inset diagram. Field of view.

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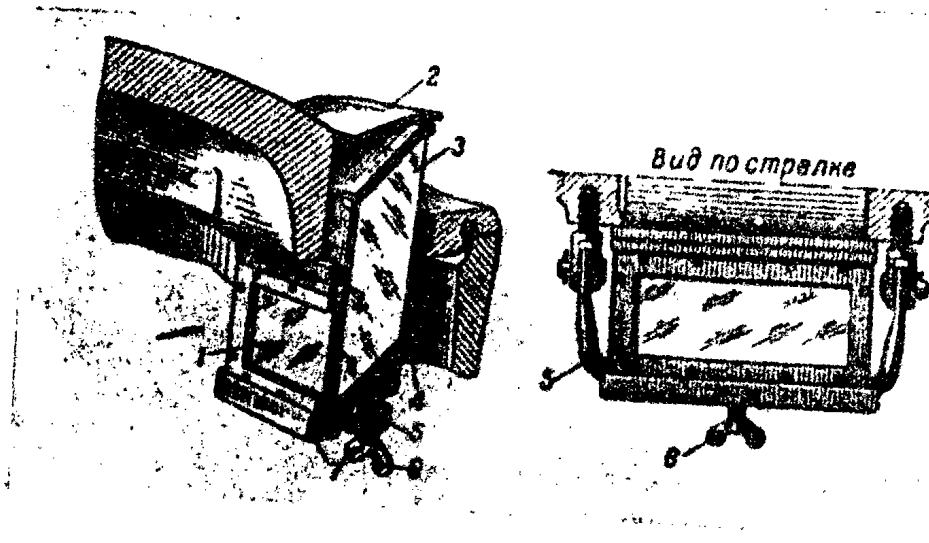


Fig. 35. Tank Commander's episcopes.

1. Protective glass.
2. Armoured cover.
3. Prism.
4. Body.
5. Bracket.
6. Fastening screw.
7. Rubber pad.

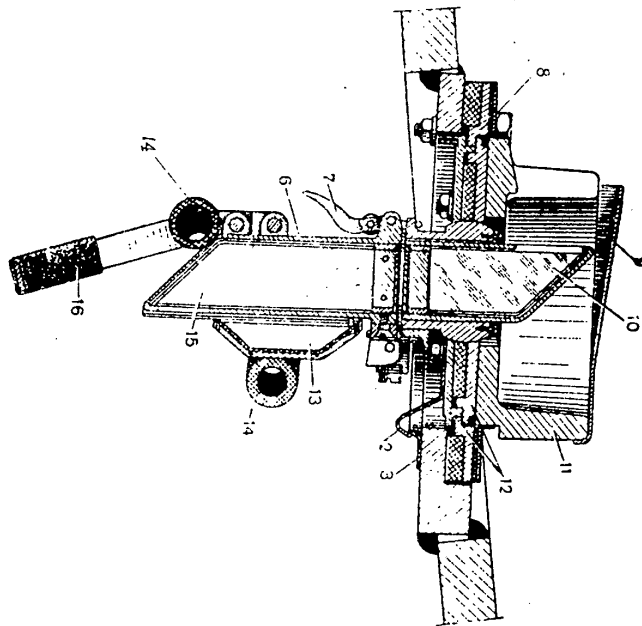
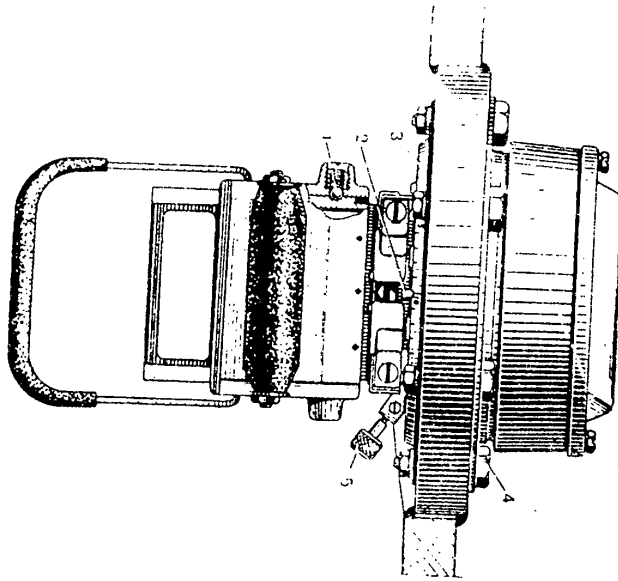
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Fig. 36. MK-4 episcope.

- 1. Holding ball.
- 2. Indicator.

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- 3. Scale.
- 4. Fastening bolt.
- 5. Tilt screw.
- 6. Body.
- 7. Locking lever.
- 8. Bush.
- 9. Protective cap.
- 10. Upper prism.
- 11. Housing.
- 12. Flanges.
- 13. Movable prism.
- 14. Brow pad.
- 15. Lower prism.
- 16. Handle.

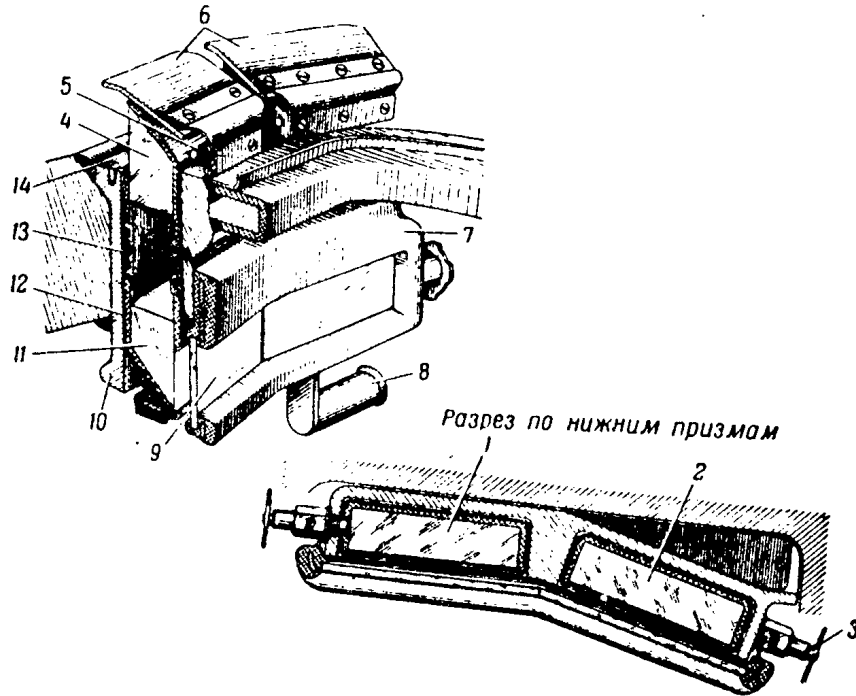
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Fig. 37. The driver mechanics observation instruments.

- 1. Left hand instrument.
- 2. Right hand instrument.
- 3. Bolt.
- 4. Prism.
- 5. Armoured plate spring.
- 6. Armoured plates.

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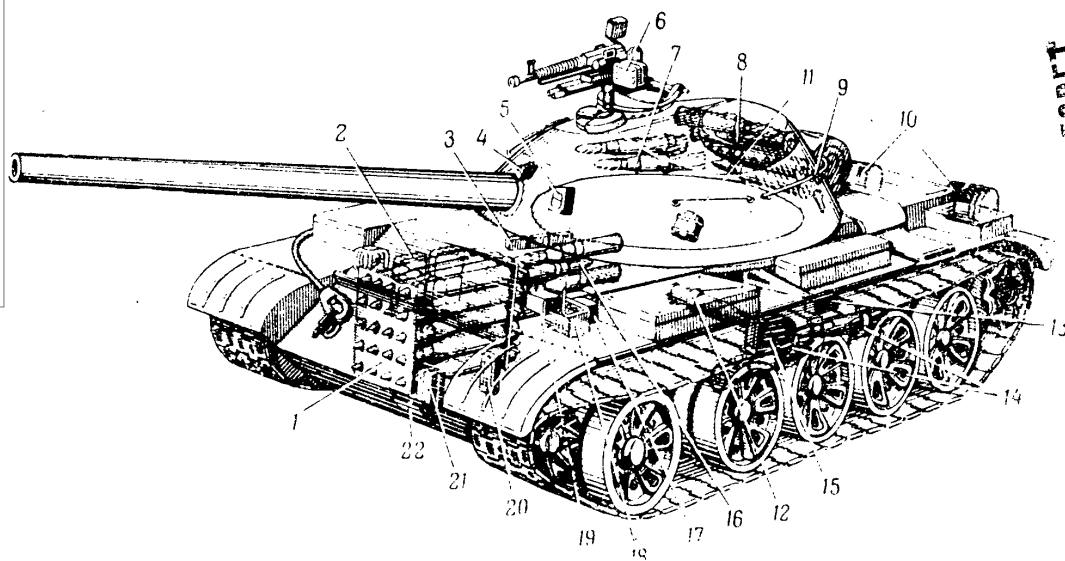
- 7. Brow pad.
- 8. Handle.
- 9. Protective glass.
- 10. Base.
- 11. Prism.
- 12. Clip.
- 13. Packing.
- 14. Rubber wiper.

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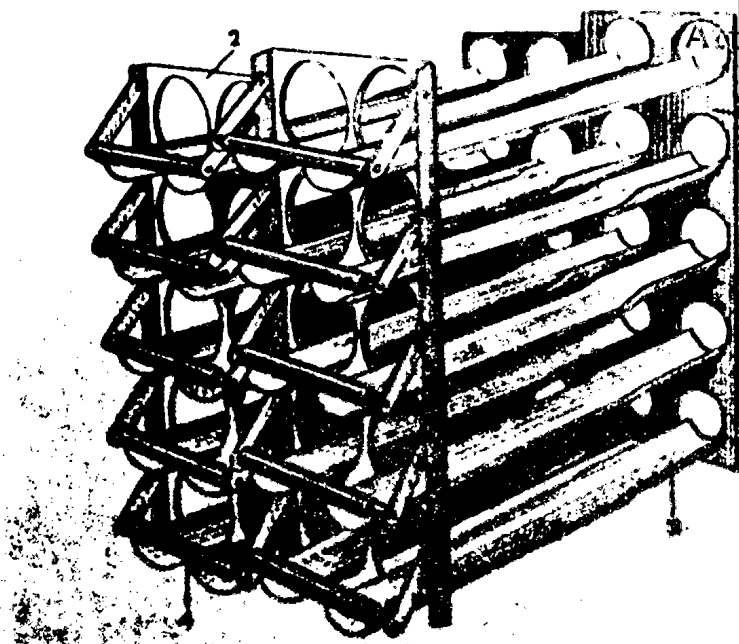
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Fig 38. How ammunition is carried in the tank



- |   |   |
|---|---|
| 1. Main rack for 20 rounds                    | 12. Clip for 1 round                          |
| 2. Racks for 4 MG magazine boxes              | 13. Rack for F-1 hand grenades                |
| 3. Racks for F-1 hand grenades                | 14. Clips for two rounds                      |
| 4. Bag with magazines for Kalashnikov carbine | 15. Magazine-box for DShK MG                  |
| 5. MG magazine box                            | 16. Clips for 4 rounds                        |
| 6. Magazine box for DShK MG                   | 17. Magazine-box rack for DShK MG             |
| 7. Clips for two rounds                       | 18. Rack for 4 magazine boxes for co-axial MG |
| 8. Rack for five rounds                       | 19. Rack for magazine-box for DShK MG         |
| 9. Bag with signal pistol cartridges.         | 20. Magazine box for hull MG                  |
| 10. Smoke canisters                           | 21. As 20                                     |
| 11. Magazine-box for co-axial MG              | 22. Magazine box for co-axial MG              |

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Fig 39. Rack

1. Rear plate. 2. Front plate. 3. Groove. 4. Safety device

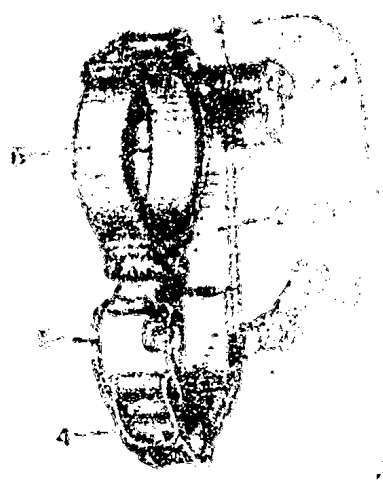
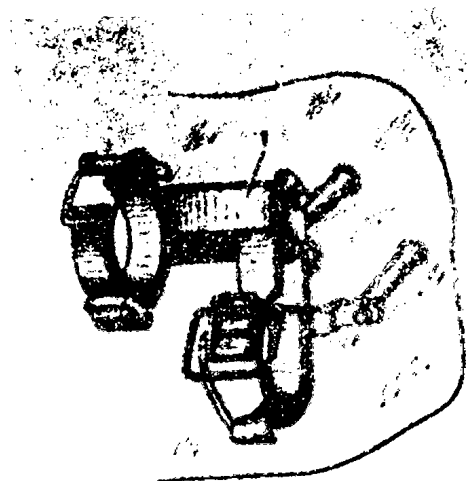


Fig 40. Clip for 2 rounds

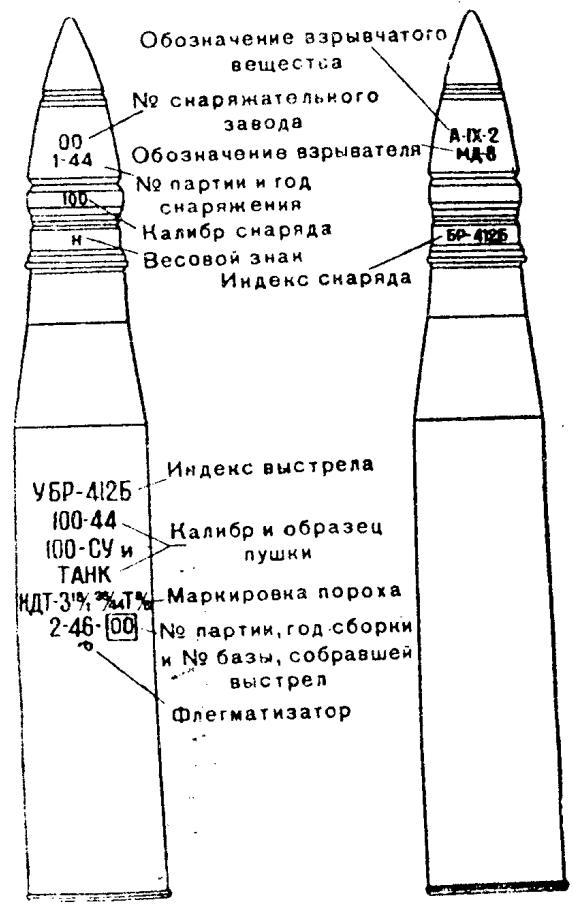
1. Small bracket  
2. Spring  
3. Large bracket  
4. Notch  
5. Clip  
6. Folding clip

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Fig 41. BR-412B AP tracer shell with ballistic cap.

Markings from the top downwards:-

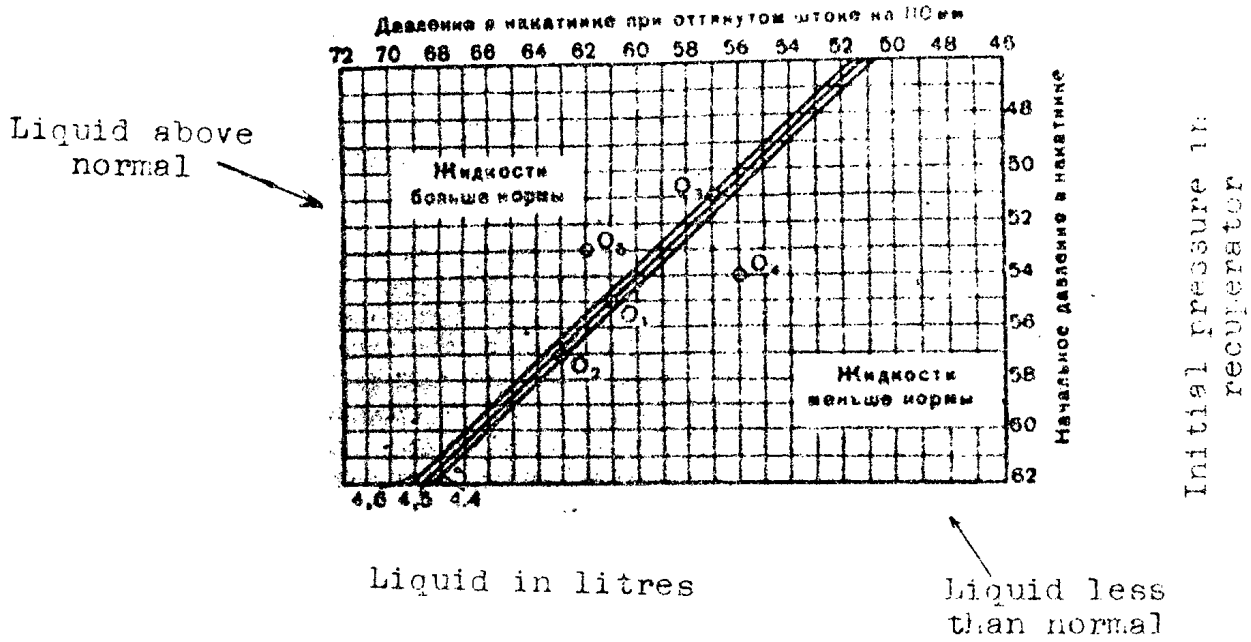
- A-1X-2 = Explosive marking
- 00 = Factory of Origin
- МД-8 = Fuze
- 1-44 = Lot number and year
- 100 = Calibre
- Н = Weight marking
- БР-412Б = Shell marking
- УБР-412Б = Round marking
- 100-44 100CY and ТАНК = Calibre and model of gun
- НДТ-3 1/8 3/4 1/4 Т 5/8 = Propellant
- 2-46-00 = Lot number, year of assembly and number of base making round
- ⊕ = Desensitizer



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Fig 42. Graph for determining amount of liquid in recuperator

Pressure in recuperator - piston pulled back by 110 mm.



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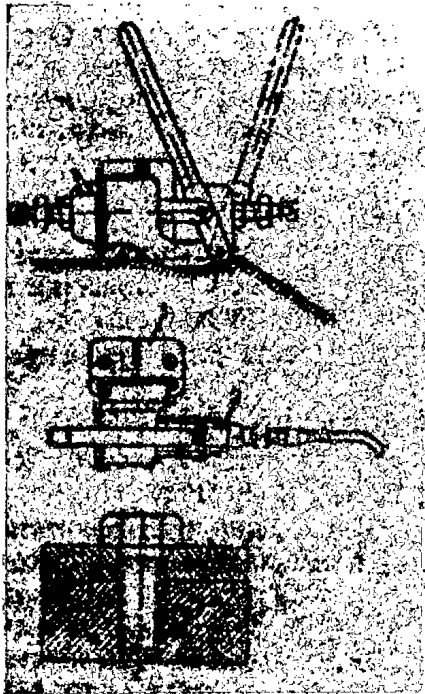


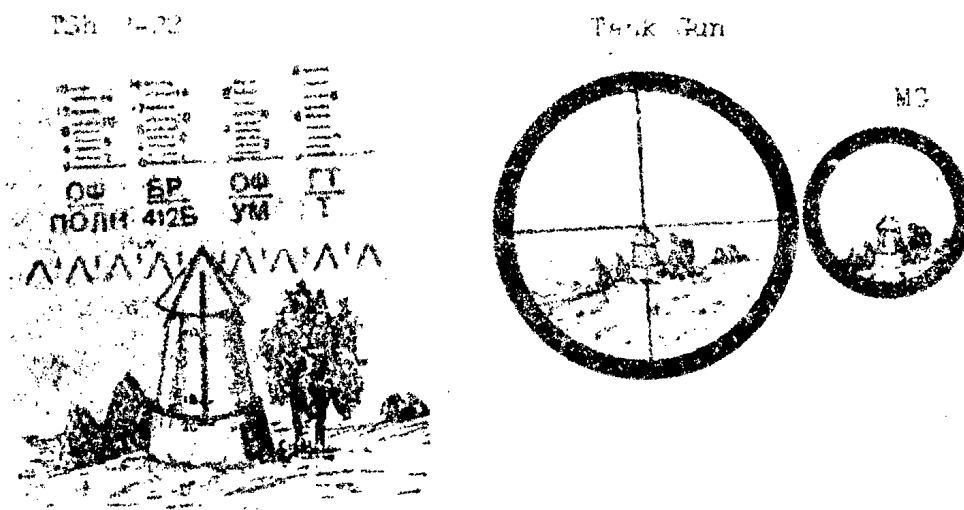
Fig 43. The NVG 52 I 035 pump mounting.

1. Bracket
2. Pump

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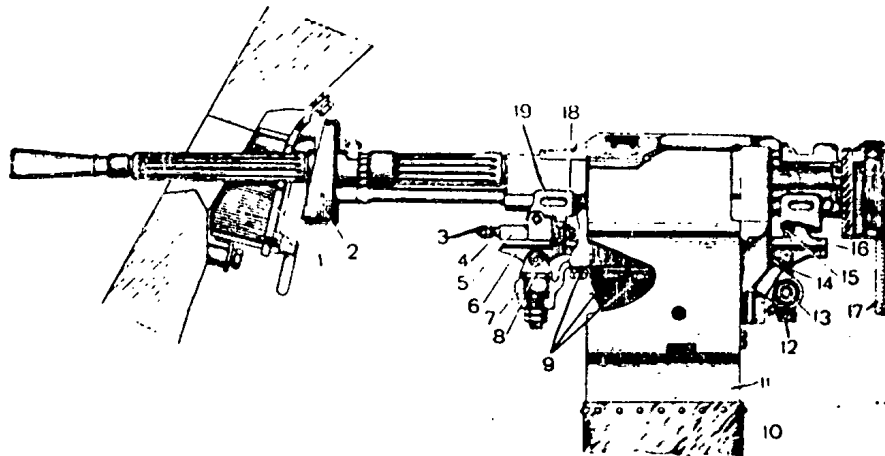
Fig 44. Adjusting the TSh 2 22 sight by distant object method



For meanings of abbreviations on sight see note.

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**Fig 46. The SGM co-axial MG**

- 1,2. Protective plates from lead fragments
3. Shock absorber belt
4. Shock absorber front spring
5. Front slide
6. Frame
7. Bracket
8. Front stand
9. Bolts
10. Spent cartridge case holder
11. Holder jacket
12. Adjusting mechanism collar
13. Adjusting mechanism screw
14. Rear stand
15. Pin
16. Rear slide
17. Cable
18. Rest
19. Rear shock absorber spring

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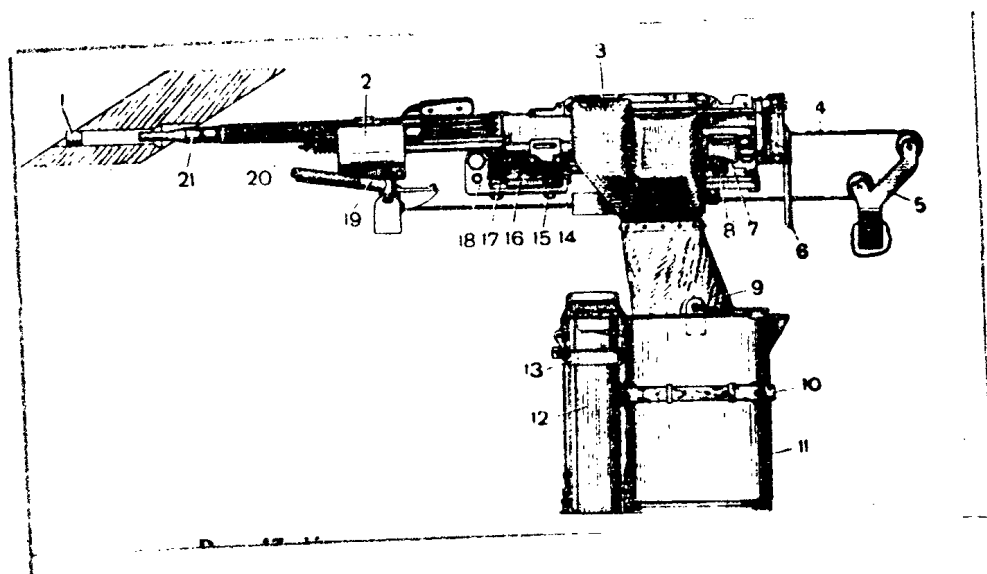


Fig 47. The SCMT hull MG.

1. Rubber plug
2. Shield
3. Magazine opening cover
4. Cable
5. Bracket with rollers
6. Cable
7. Rear slide
8. Pin with ring
9. Tarpaulin sleeve
- 10,13. Strap
11. Bucket
12. Magazine-box
14. Bolt
15. Front guide
16. Front slide
17. Shock absorber
18. Bracket
19. Cocking handle
20. Spring
21. Barrel extension piece

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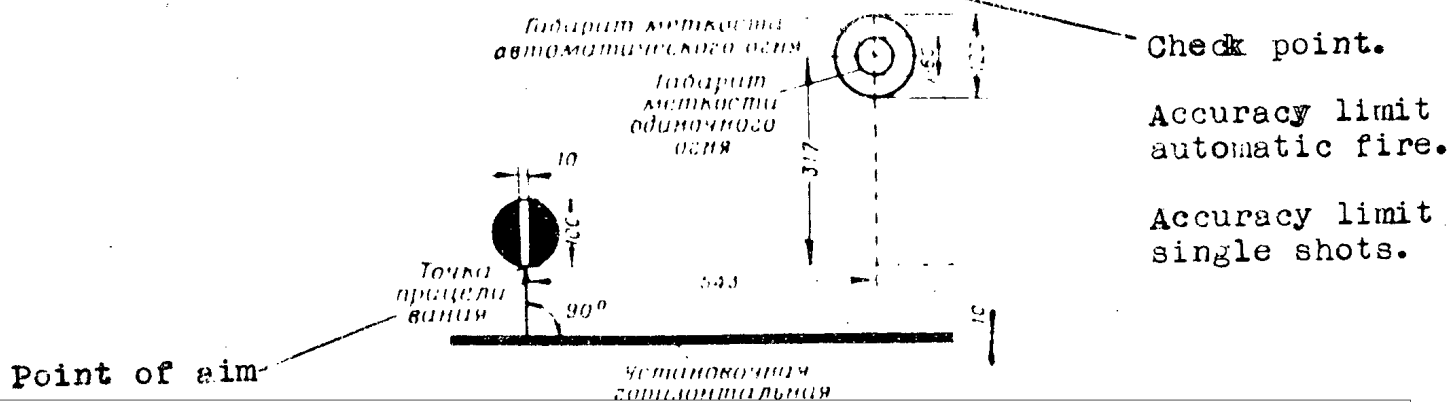


Fig. 48. Zeroing target for the co-axial SGMG.

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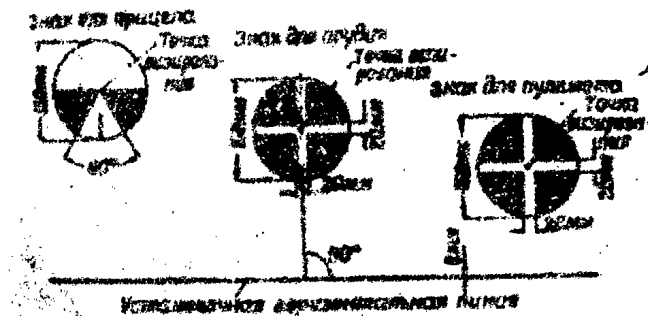
Fig. 49. Type of check-zero target.



Sight mark  
point of aim.

Top mark  
Point of aim.

Bottom mark  
point of aim.



Horizontal adjustment line.

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- 2. Slide
- 3. Cradle clamp
- 4. Lid
- 5. Rear wall of sight box
- 6. Lensatic sight
- 7. Tangent sight
- 8. Firing trigger
- 9. Collar
- 10. Cable
- 11. Trunnion
- 12. Swivel
- 13. Floating plate
- 14. Horizontal laying handle
- 15. Swivel clamp
- 16. Fork clamp
- 17. Key
- 18. Locking screws
- 19. Fork
- 20. Magazine bracket
- 21. Small spring of the balance mechanism
- 22. Lug
- 23. Balance mechanism pipe
- 24. Shock absorber spring
- 25. Large spring of the balance mechanism
- 26. Piston rod
- 27. Shock absorber guide bolt
- 28. Magazine box
- 29. Lensatic sight box catch
- 30. Locking bolt
- 31. Upper sight bracket
- 32. Regulating screws
- 33. Locking bolt
- 34. Socket
- 35. Clamp bolt
- 36. Key
- 37. Collar
- 38. Handwheel
- 39. Tooth gear
- 40. Arc
- 41. Cocking handle
- 42. Right fork bracket
- 43. Left fork bracket
- 44. Sight bracket
- 45. Cradle
- 46. Bracket
- 47. Coupling and spring

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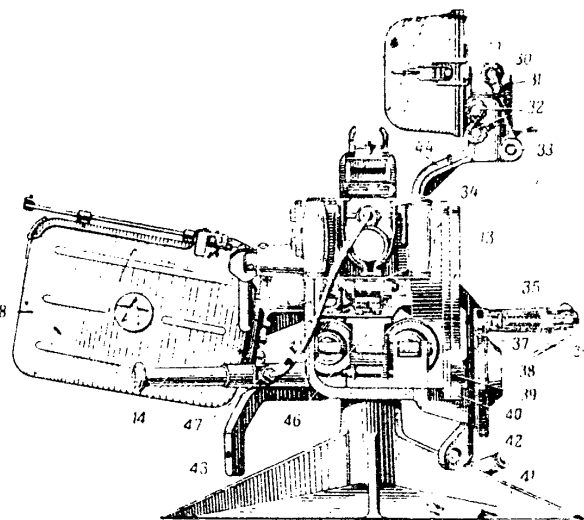
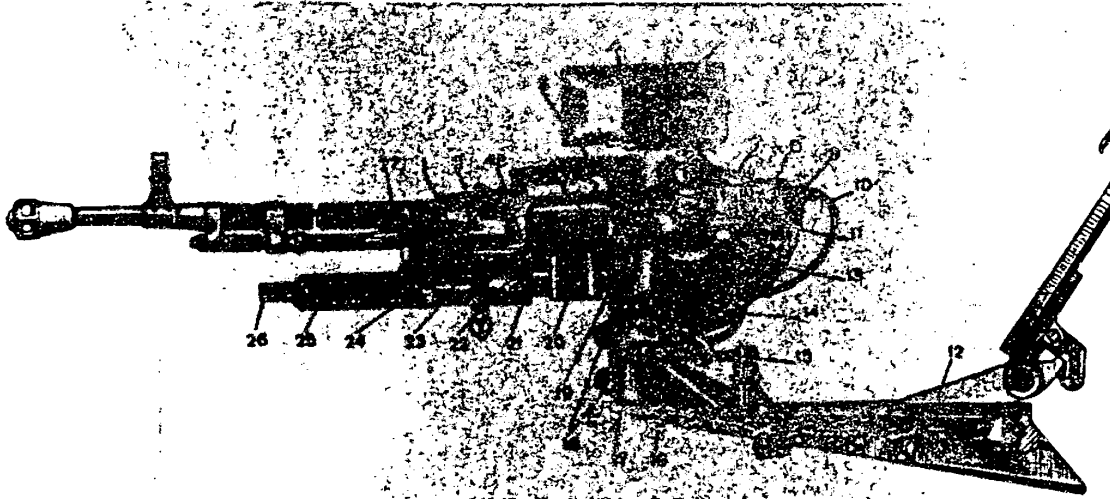


Fig 50. The AA MG DShK.

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- |                           |   |
|---------------------------|---|
| 1. MG                     | 13. Floating plate                        |
| 2. Slide                  | 14. Horizontal laying handle              |
| 3. Cradle clamp           | 15. Swivel clamp                          |
| 4. Lid                    | 16. Fork clamp                            |
| 5. Rear wall of sight box | 17. Key                                   |
| 6. Lensatic sight.        | 18. Locking screws                        |
| 7. Tangent sight          | 19. Fork                                  |
| 8. Firing trigger         | 20. Magazine bracket.                     |
| 9. Collar                 | 21. Small spring of the balance mechanism |
| 10. Cable                 | 22. Lug                                   |
| 11. Trunnion              | 23. Balance mechanism pipe                |
| 12. Swivel                | 24. Shock absorber spring                 |



- |   |                        |                        |
|---|------------------------|------------------------|
| 25. Large spring of the balance mechanism | 36. Key                | 47. Coupling and screw |
| 26. Piston rod                            | 37. Collar             |                        |
| 27. Shock absorber guide bolt             | 38. Handwheel          |                        |
| 28. Magazine box                          | 39. Tooth gear         |                        |
| 29. Lensatic sight box catch              | 40. Arc                |                        |
| 30. Locking bolt                          | 41. Cocking handle     |                        |
| 31. Upper sight bracket                   | 42. Right fork bracket |                        |
| 32. Regulating screws                     | 43. Left fork bracket  |                        |
| 33. Locking bolt                          | 44. Sight bracket      |                        |
| 34. Socket                                | 45. Cradle             |                        |
| 35. Clamp bolt                            | 46. Bracket            |                        |

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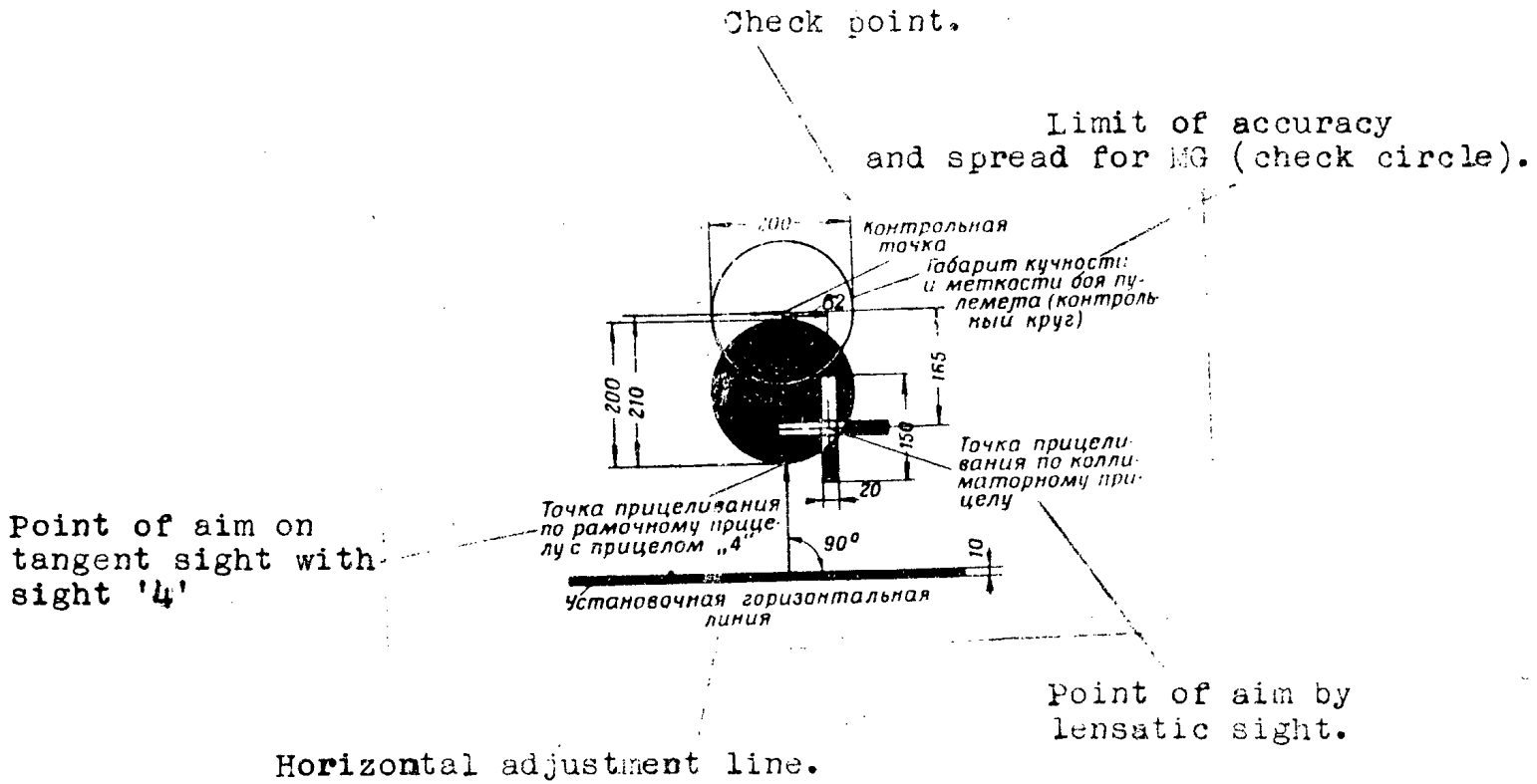
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Fig. 51. Zeroing target for the AA MG DShK.

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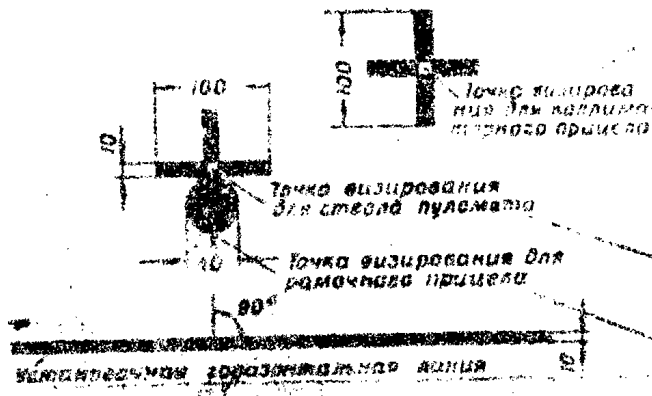


Fig. 52. Check-zero target for MG DSK.

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Point of aim for  
lensatic sight.

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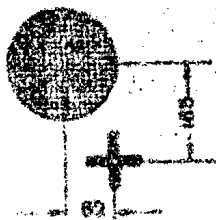
Point of aim through  
MG barrel.

Point of aim by  
tangent sight.

Horizontal adjustment line.

Fig. 53. Record card.

To be stuck in gun history sheet.



Record card,  
 Hite copied from original target.  
 MG DSK No..... with K10-T sight.  
 Zeroed at a range of 100m.  
 " " 195... (year) signed.....

**SECRET**

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50X1-HUM

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2013/02/26 : CIA-RDP80T00246A028600720001-5

DOCUMENT "A-1"

(MISCELLANEOUS DOCUMENTS)

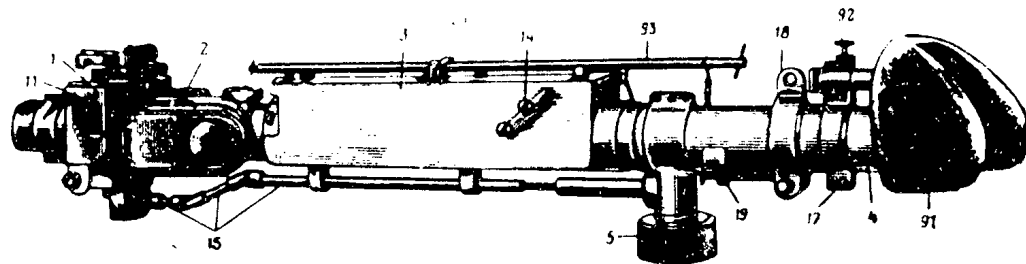
BOOK OF DIAGRAMS



Fig. 1. GENERAL VIEW OF THE SIGHT (from left)

1. Headpiece.
2. Swivel mechanism.
3. Magnification change mechanism body.
4. Ocular piece.
5. Sighting angle mechanism pilot wheel.
11. Electric heater contact.
14. Magnification change handle.
15. Universal jointed shaft.
17. Forehead piece bracket.
18. Collar.
19. Light filter ON/OFF switch.
91. Rubber forehead piece.
92. Screw adjusting key.

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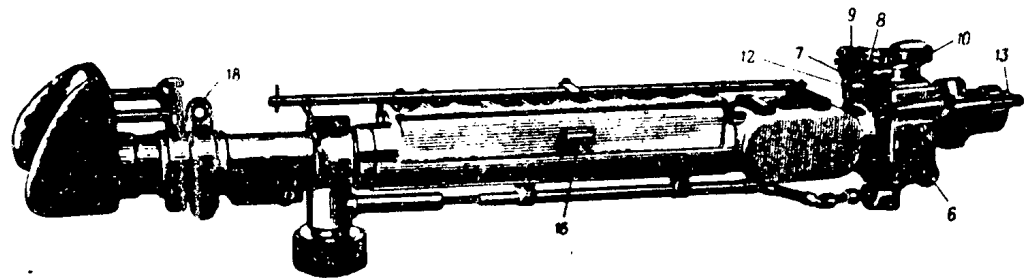


Fig 2. GENERAL VIEW (from right)

- 6. Pin;
- 7. Screw recess of the alignment control;
- 8. Screw recess of the height control;
- 9. Adjusting screw;
- 10. Right angled shaped tooth;
- 12. Electric bulb contact;
- 13. Rubber leaf;
- 16. Tongue for the key;
- 18. Collar;

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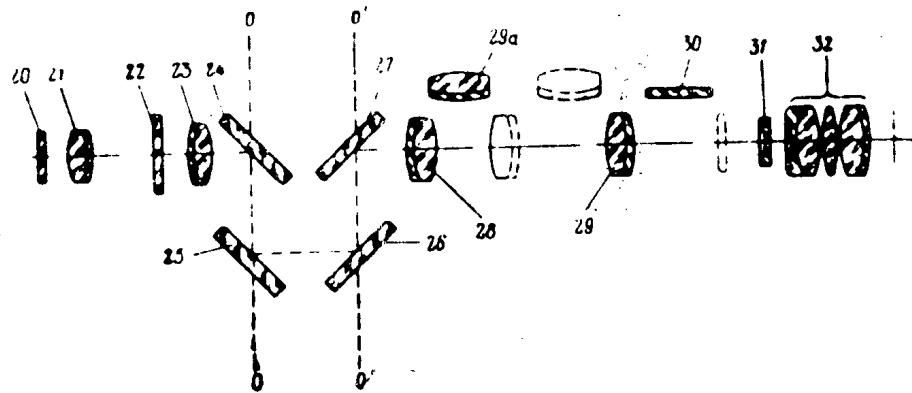
50X1-HUM

Fig. 3. OPTICAL LAYOUT OF THE SIGHT.

50X1-HUM

- 20. Protective glass.
- 21. Objective.
- 22. Plane parallel plate (grid).
- 23. Condenser.
- 24. Mirror.
- 25. Mirror.
- 26. Mirror.
- 27. Mirror.
- 28. First turning lens.
- 29. Second turning lens for 3.5x and 7x (29a) magnification.
- 30. Light filter.
- 31. Planoconcave lens.
- 32. Eye-piece lenses.

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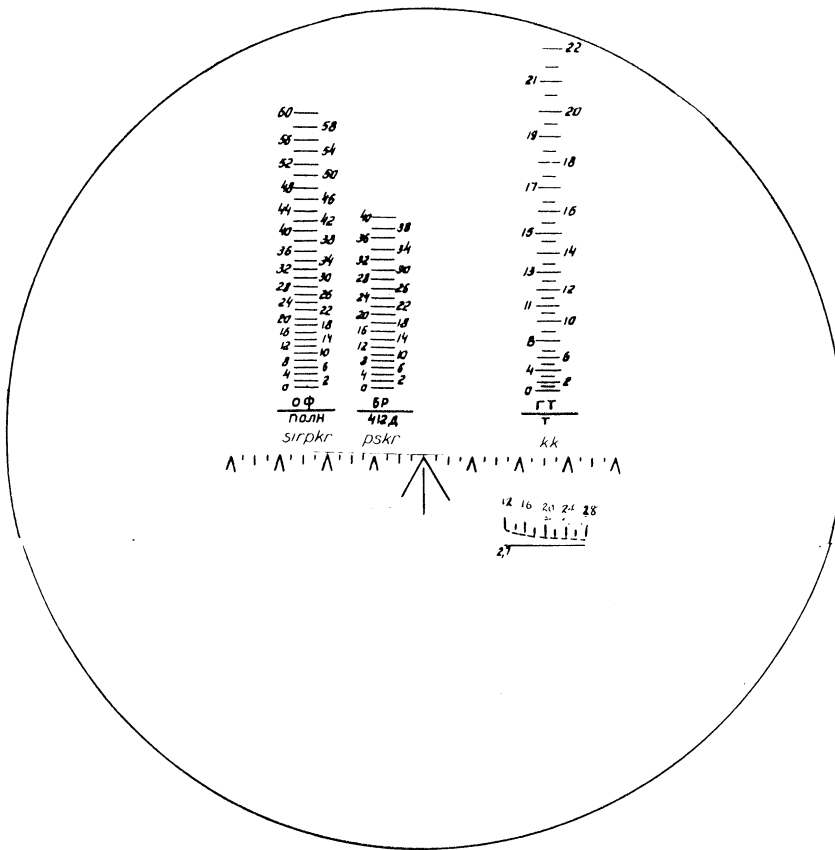
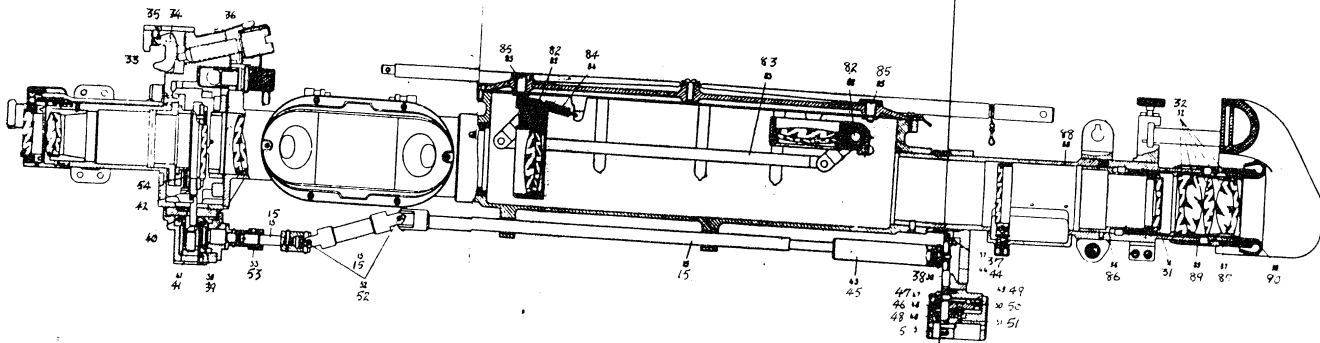


Fig.4. Scales of the TSh2-22 sight.

$\frac{OF}{FULL}$

$\frac{BB}{412D}$

$\frac{QT}{T.}$

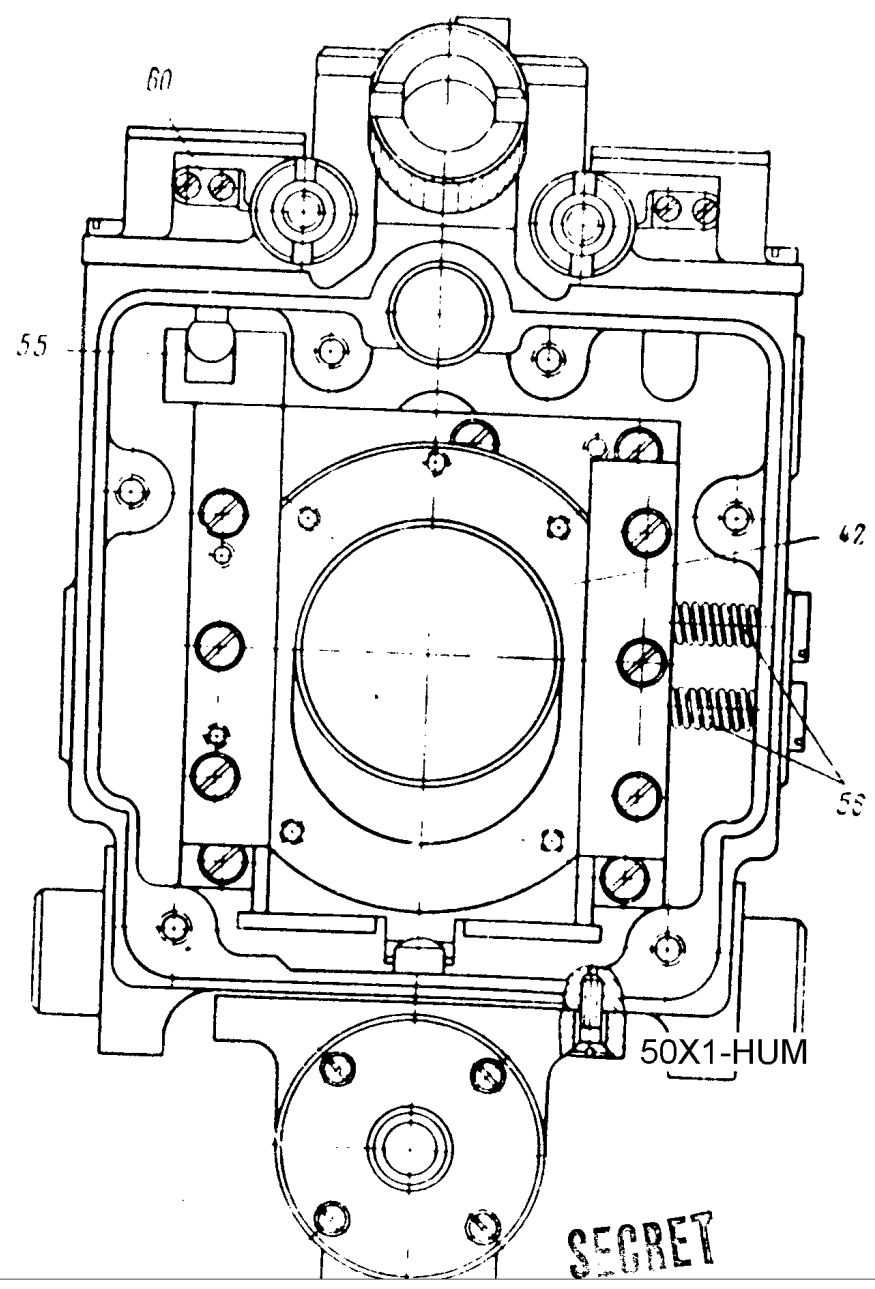


- |     |                                      |     |                           |     |                    |
|-----|--------------------------------------|-----|---------------------------|-----|--------------------|
| 5.  | Sighting angle mechanism pilot wheel | 41. | Screw                     | 54. | Spiral spring      |
| 15. | Universal jointed shaft              | 42. | Carrier with grid         | 82. | Axis               |
| 31. | Lens                                 | 44. | Axis                      | 83. | Parallelogram      |
| 32. | Lens                                 | 45. | Tube                      | 84. | Spiral spring      |
| 33. | Cam                                  | 46. | Plate                     | 85. | Screw              |
| 34. | Cam axis                             | 47. | Bush                      | 86. | Holder             |
| 35. | Spiral spring                        | 48. | Half collar               | 87. | Holder             |
| 36. | Flat spring                          | 49. | Ball                      | 88. | Eye piece tube     |
| 37. | Conical pinion                       | 50. | Pin                       | 89. | Cylindrical collar |
| 38. | Conical pinion                       | 51. | Screw                     | 90. | Rubber "Blinker"   |
| 39. | Conical pinion                       | 52. | Universal jointed section |     |                    |
| 40. | Conical pinion                       | 53. | Coupling nut              |     |                    |

Fig 5. Section of the Sight

Fig 6. Head piece of the sight (view from the <sup>grid</sup> carrier side). 50X1-HUM

- 42. Carrier with grid
- 55. Carrier
- 56. Spiral springs
- 60. Flat spring



Section along AB

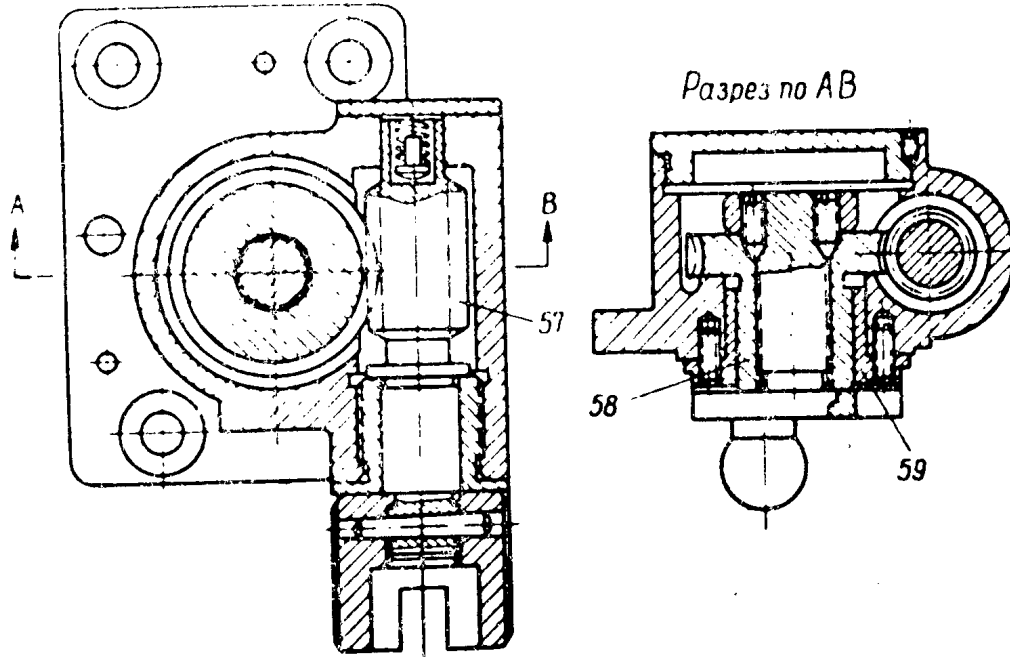


Fig 7. Mechanism for direction alignment of the sight.

- 57. Worm
- 58. Cog wheel
- 59. Cam gear

SECRET

Fig 8. Carrier of the horizontal thread

- 43. Carrier
- 61. Spiral springs
- 64. Wedge

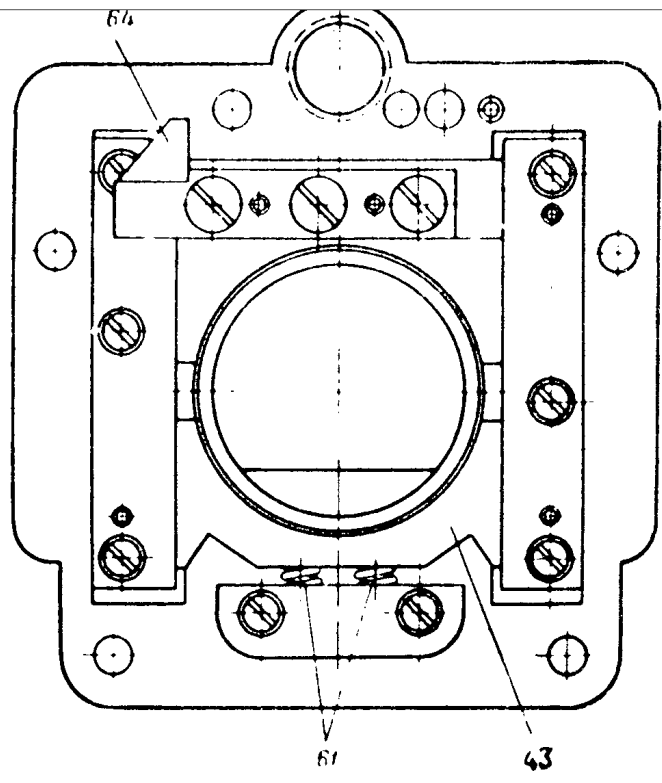
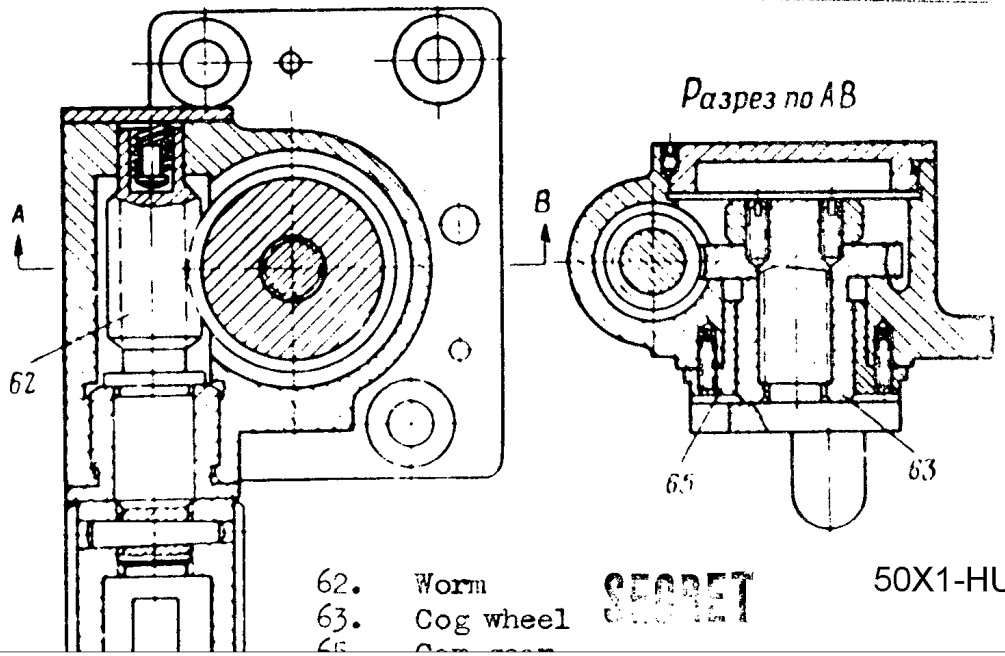


Fig 9. Height alignment mechanism



- 62. Worm
- 63. Cog wheel
- 65. Cog wheel

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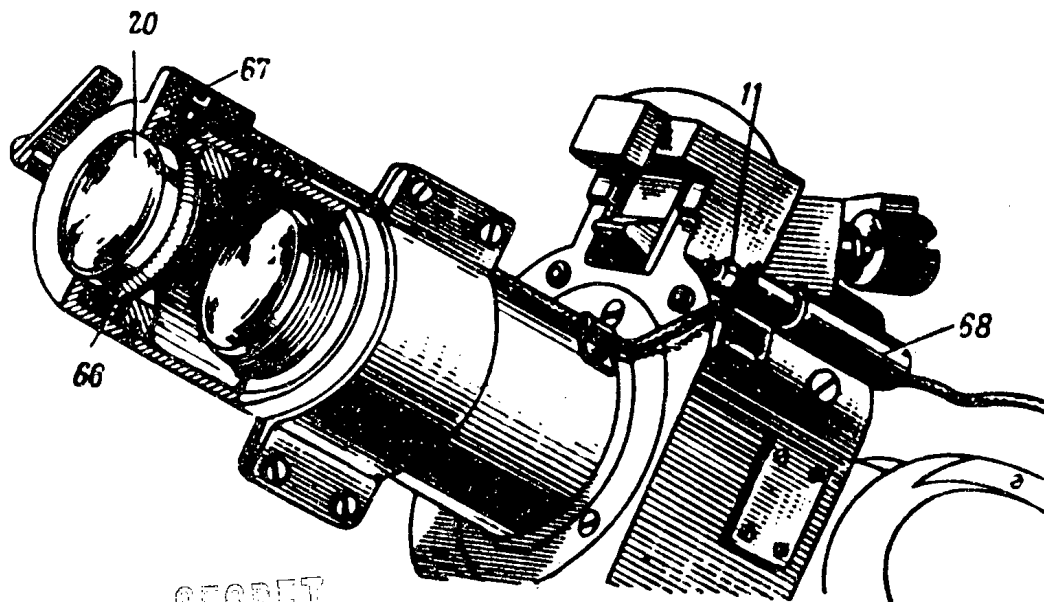


Fig 10. Head piece of the sight.

- 11. Contact
- 20. Protective glass
- 66. Spiral
- 67. Contact
- 68. Bracket

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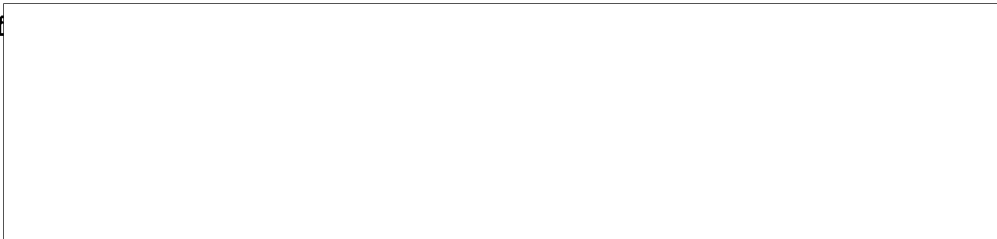
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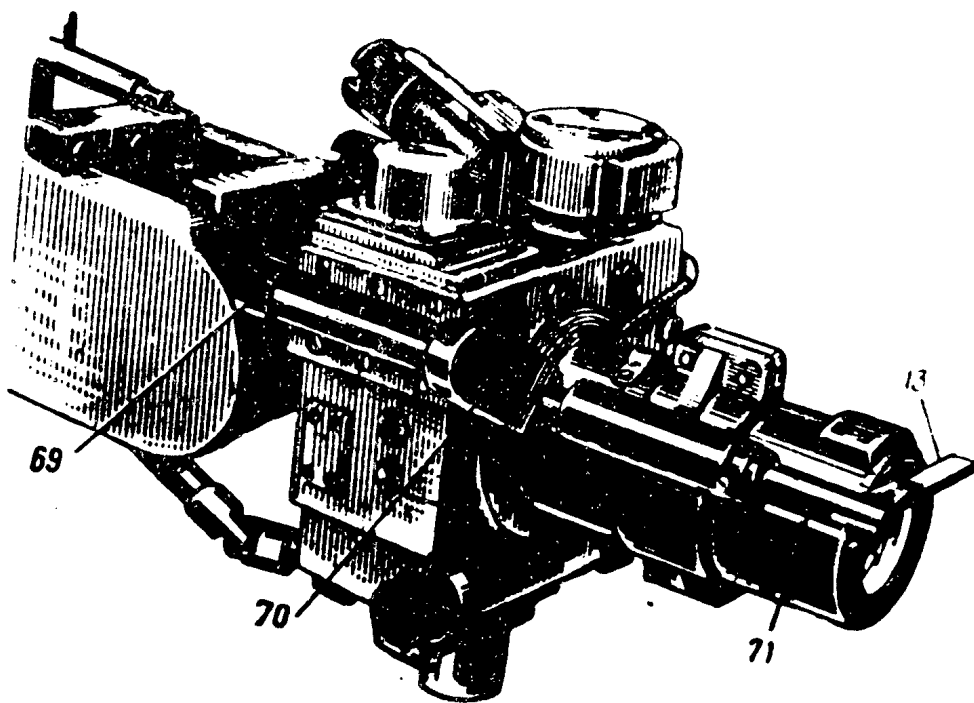
Fig 11. Head piece of the sight.

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- 13. Rubber leaf
- 69. Recess
- 70. Housing
- 71. Shaft



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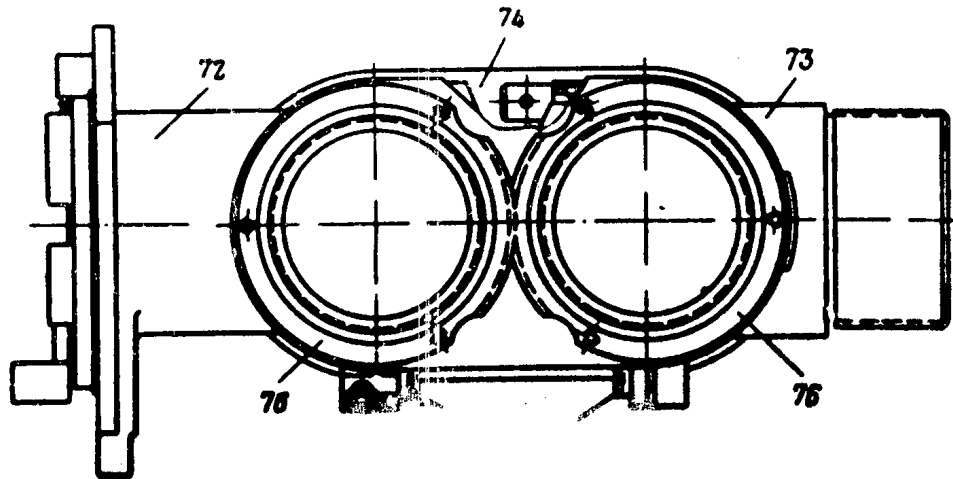
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Fig 12. Swivel mechanism

- 72. Housing of the forward joint
- 73. Housing of the rear joint
- 74. Plate
- 76. Cylinder
- 77. Screws

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50X1-HUM



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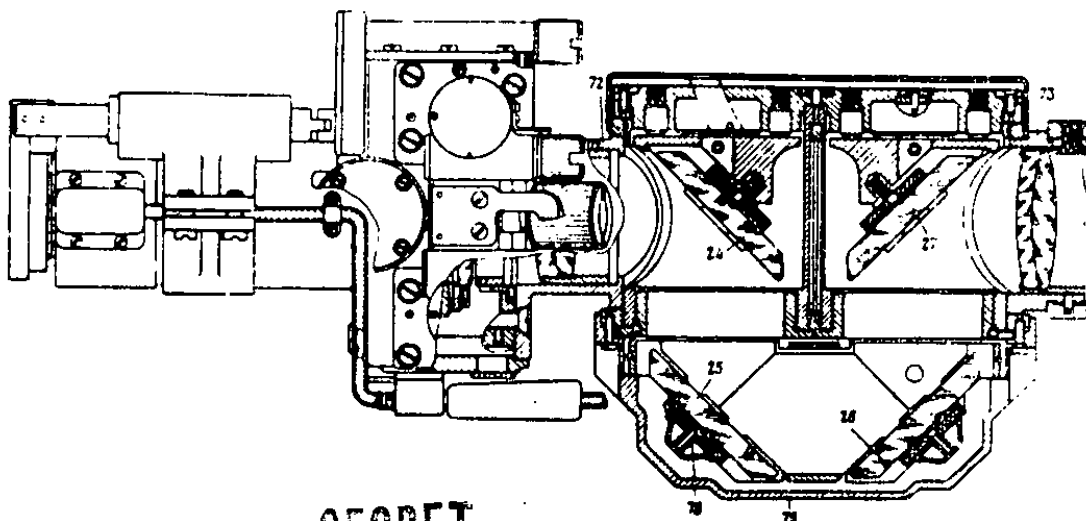
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**Fig 13. Section of the swivel mechanism.**

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- |     |        |     |                              |
|-----|--------|-----|------------------------------|
| 24. | Mirror | 72. | Housing of the forward joint |
| 25. | Mirror | 73. | Housing of the rear joint    |
| 26. | Mirror | 75. | Housing with lateral mirrors |
| 27. | Mirror | 78. | Spring                       |



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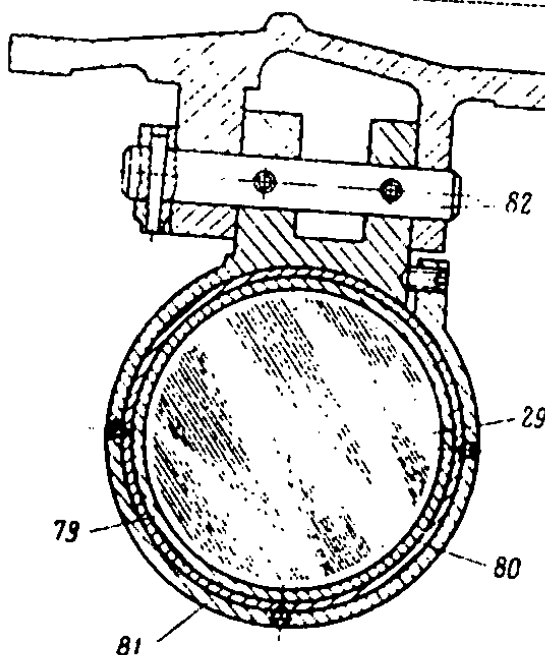
Fig. 4. Fixing of the change-over turning lens

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- 29. Lens
- 79. Lens holder (inner)
- 80. "Eccentric" collar
- 81. Holder
- 82. Axis



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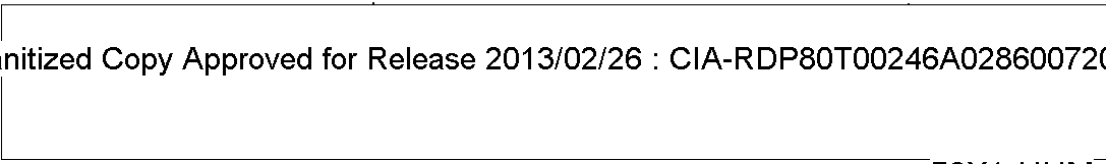
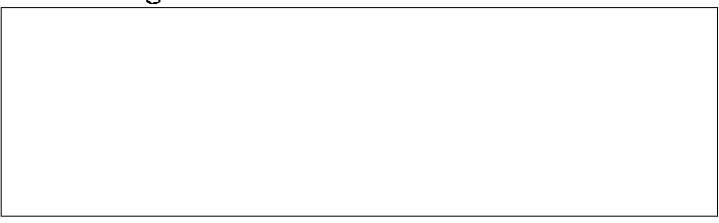


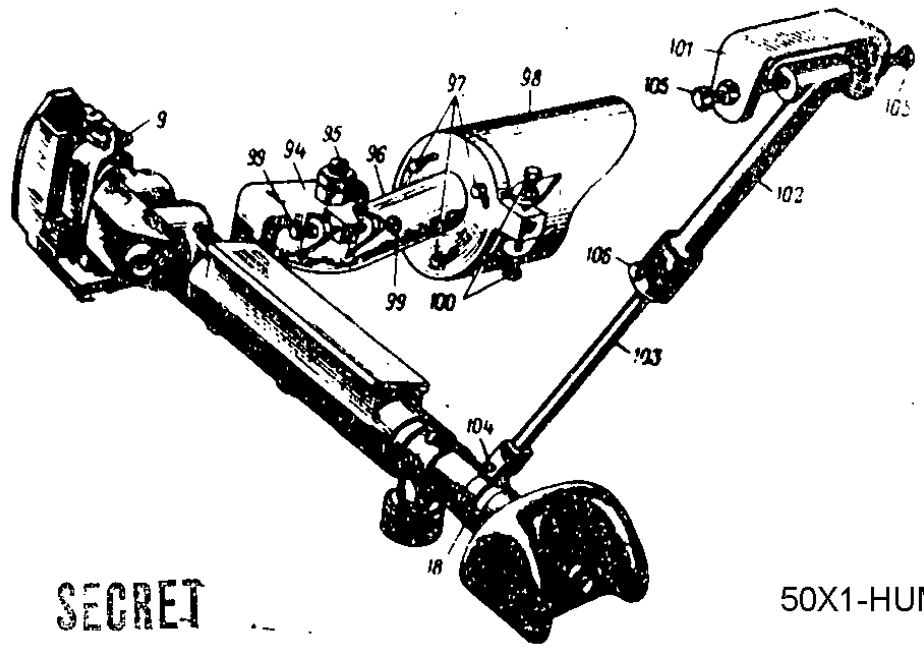
Fig 15. Layout of the arrangement of the sight.

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- 9. Adjusting screw
- 18. Clip
- 94. Bracket
- 95. Bolt
- 97. Bolts
- 96. Support
- 98. Boss of the cradle of the gun
- 99. Bolts of the direction alignment
- 100. Bolts of the height alignment
- 101. Bracket
- 102. Guiding tube
- 103. Extension rod
- 104. Connecting pin
- 105. Bolts
- 106. Screw

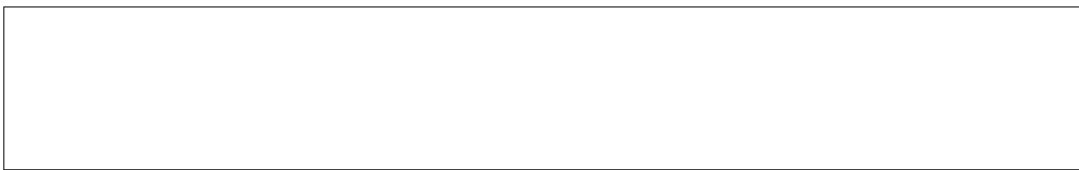


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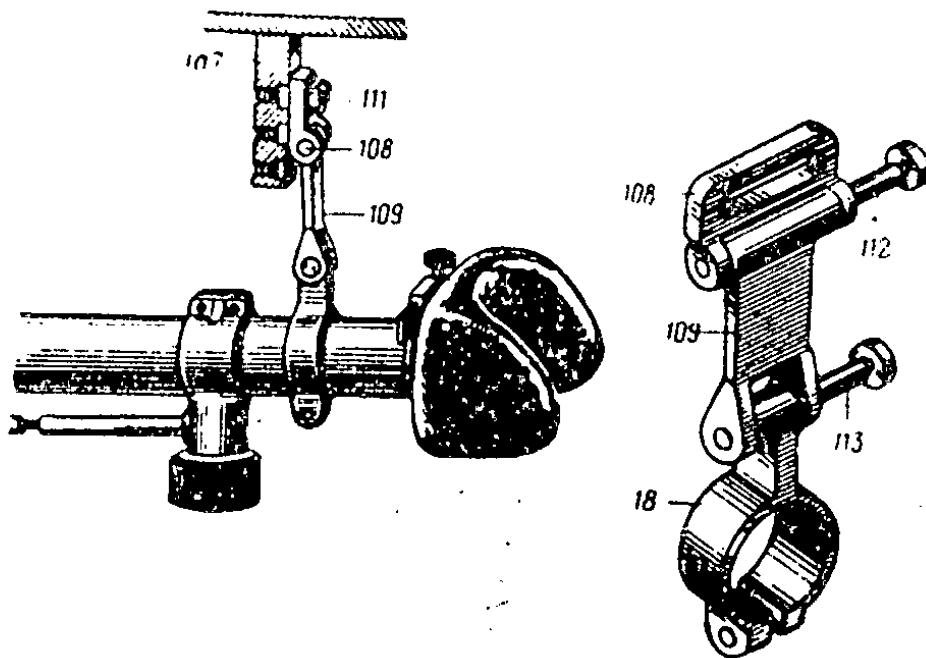
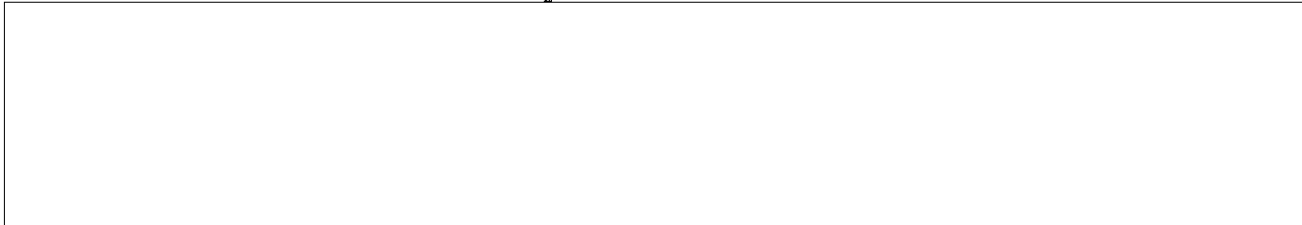


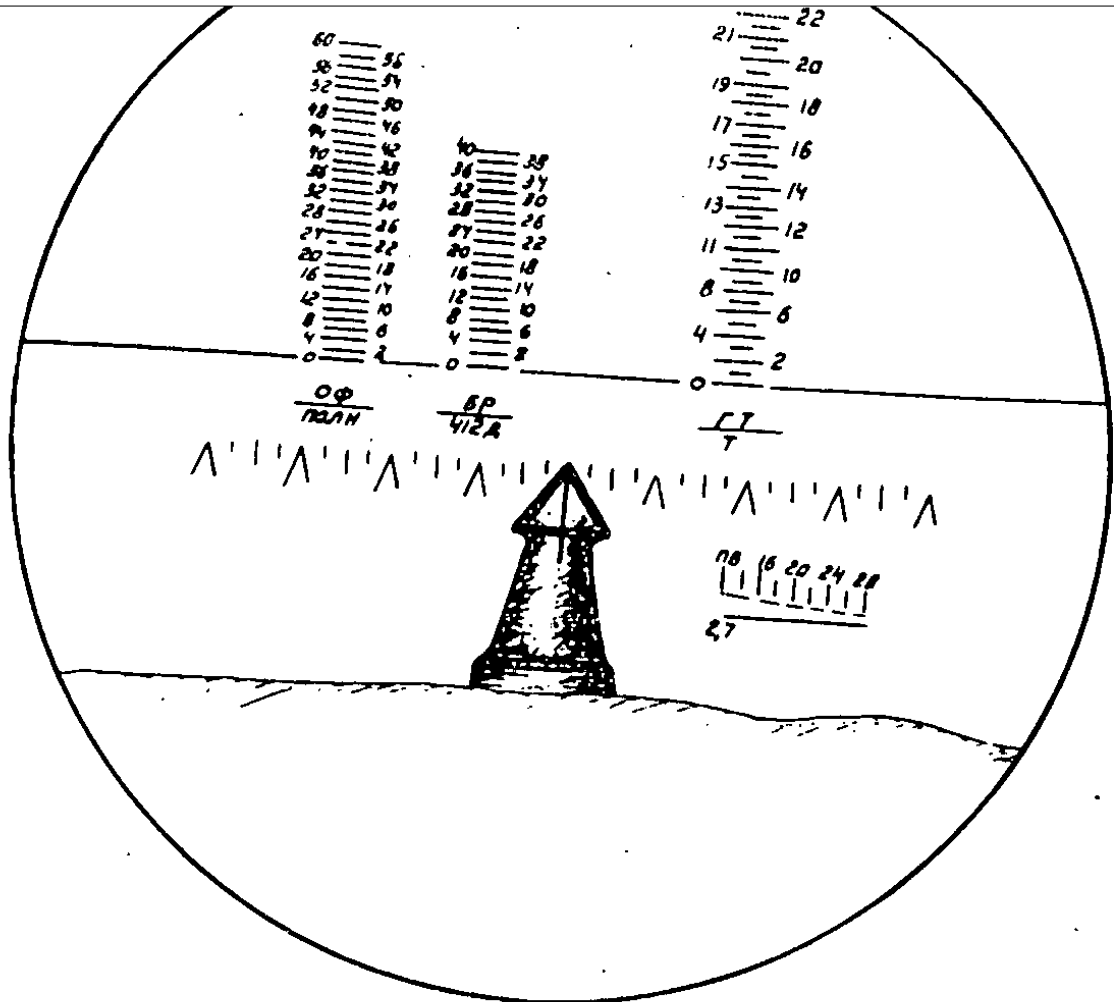
Fig 16. Modified hinged suspension support.

- |      |         |      |           |
|------|---------|------|-----------|
| 18.  | Collar  | 111. | Bolt      |
| 107. | Bracket | 112. | Upper pin |
| 108. | Brace   | 113. | Lower pin |
| 109. | Link    |      |           |

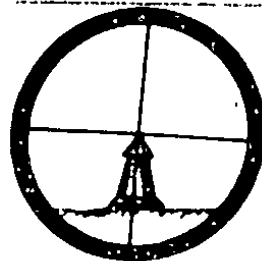
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View through sight



View through the bore of the barrel

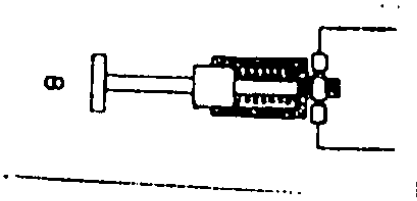
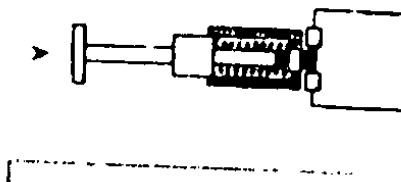
Fig 17. Position of the scales and the central square of the aligned sight and the crosswire on the muzzle face.

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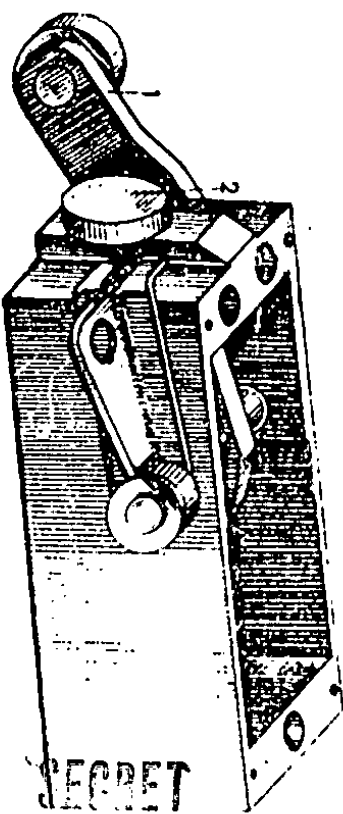
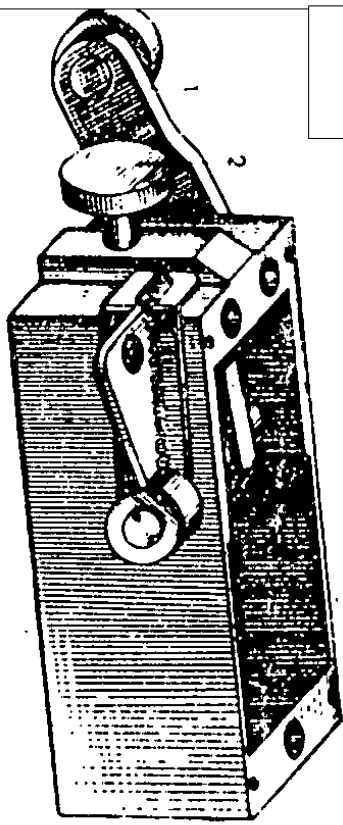


Fig 25. VS-11 Locking device.

- 1. Lever
- 2. Button
- A. Position of the device for loading
- B. Position for firing

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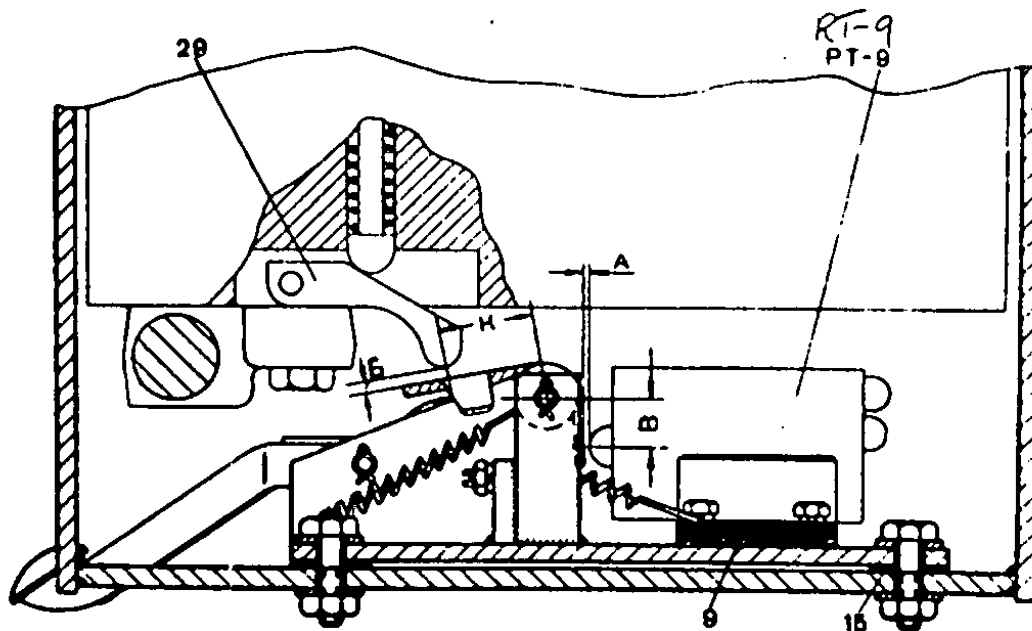


Fig 26. Layout of the arrangement of the trigger mechanism.

- 9. Washer (10-188)
- 15. Washer (10-199)
- 29. Firing lever (02-60)
- A. Clearance between the RT-9 core and the edge of the clamp
- b. Clearance between the upper edge of the clamp and the firing lever
- RT-9. Electromagnet
- B. Shoulder
- K. Shoulder

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Fig. 27. POSITION OF THE PARTS OF THE SEMIAUTOMATIC DEVICE WHEN THE BREECH IS CLOSED.

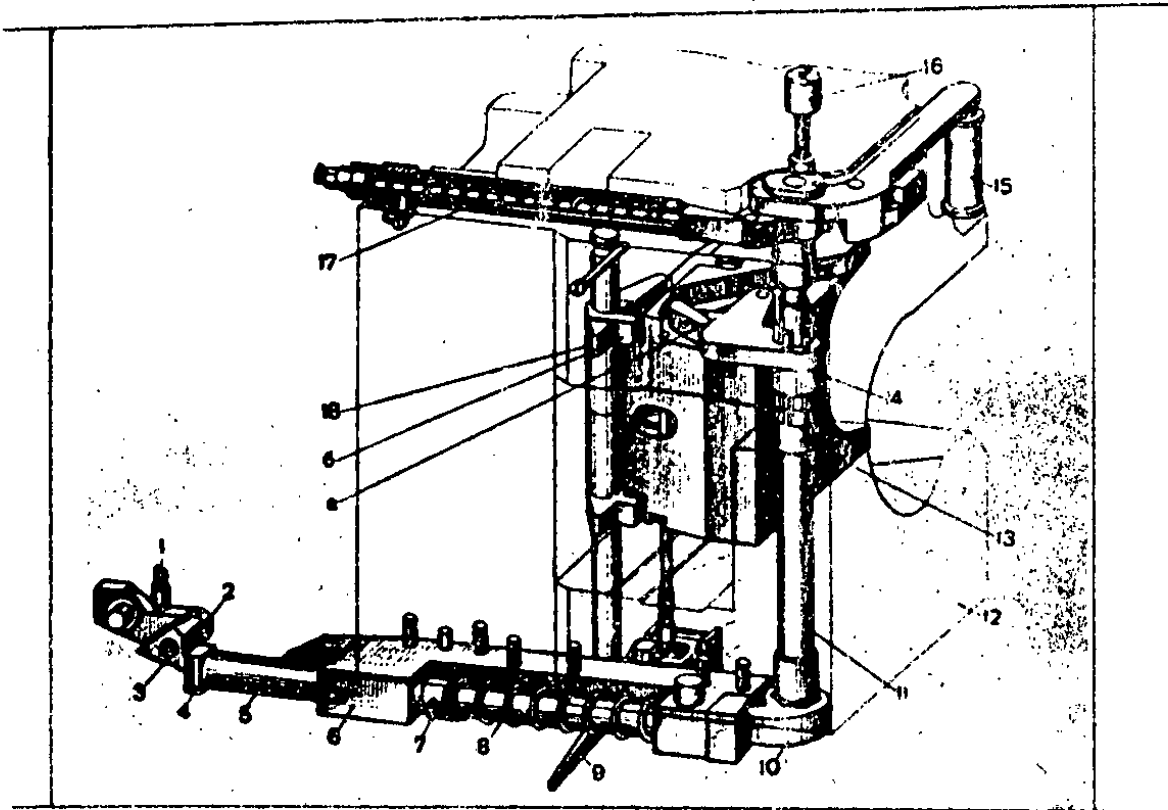
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- 1. Spring (30-5).
- 2. Roller (30-27).
- 3. Catch (30-51).
- 4. Stop (30-52).
- 5. Plunger (30-58).

NOFORN/NO DISSEM ABROAD/LIMITED

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- 6. Straightedge(30-56).
- 7. Collar(30-60).
- 8. Spring(30-55).
- 9. Trigger mechanism(SB 10-46).
- 10. Cam of the semiautomatic device(30-61).
- 11. Axis of the crank mechanism(02-19).
- 12. Breech(01-20).
- 13. Breech block wedge(02-1).
- 14. Crank(02-29).
- 15. Grip of the handle(02-27).
- 16. Bearing bush(02-17).
- 17. Closing mechanism(Sb 02-4).
- 18. Upper extractor(02-87).
- a. Tooth of the crank.
- b. Shoulder of the extractor.

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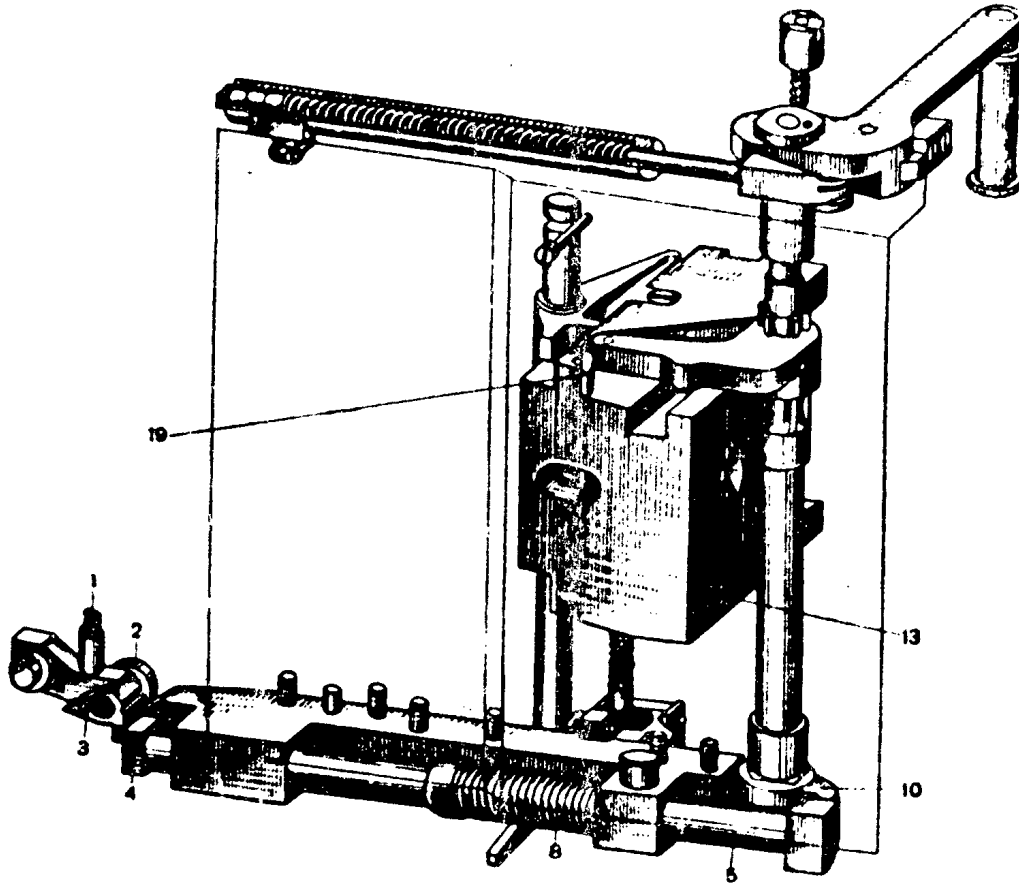


Fig 28. Position of the parts of the semi-automatic device when the breach is open.

- |                    |  |
|--------------------|--|
| 1. Spring (30-5)   | 8. Spring (30-55)                            |
| 2. Roller (30-27)  | 10. Cam of the semi-automatic device (30-61) |
| 3. Catch (30-51)   | 13. Breech block wedge (02-1)                |
| 4. Stop (30-52)    | 19. Axis of the sear (02-5)                  |
| 5. Plunger (30-58) |  |

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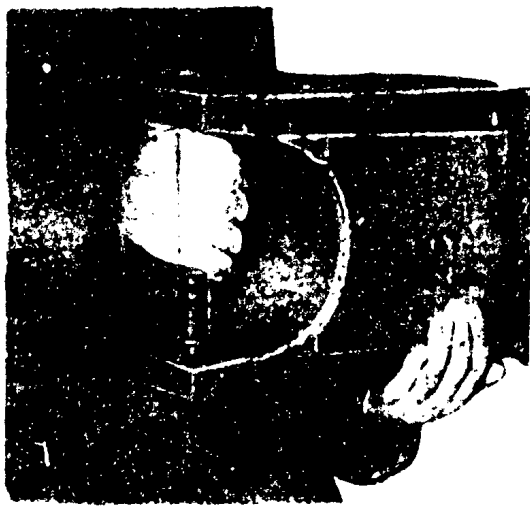


Fig 29. Withdrawal of the wedge from the breech.

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Fig 30. Withdrawal of the axis of the sear and the stop of the sear of the firing pin from the wedge.

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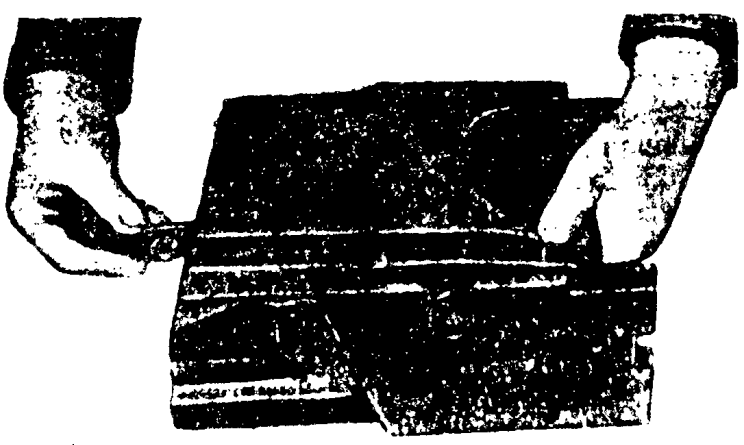
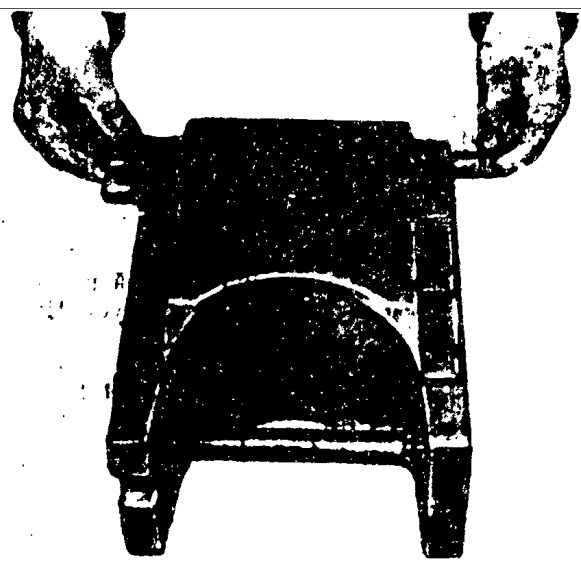


Fig 31. Withdrawal of the sear of the firing pin from the firing pin.

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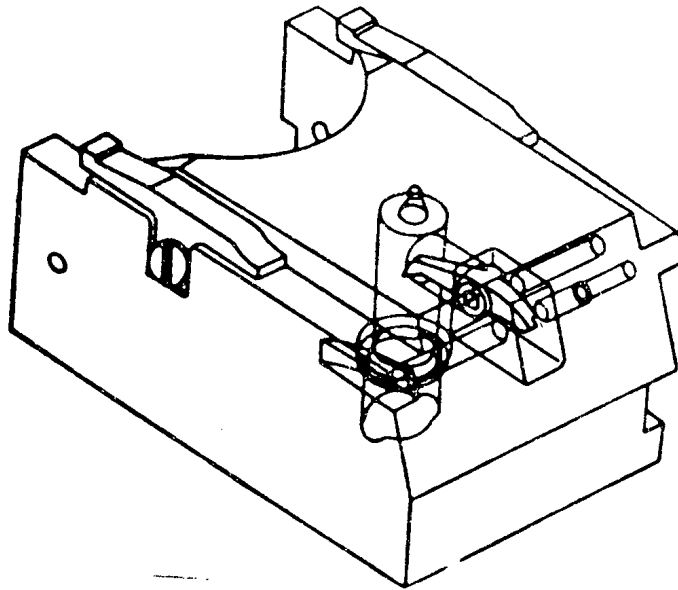
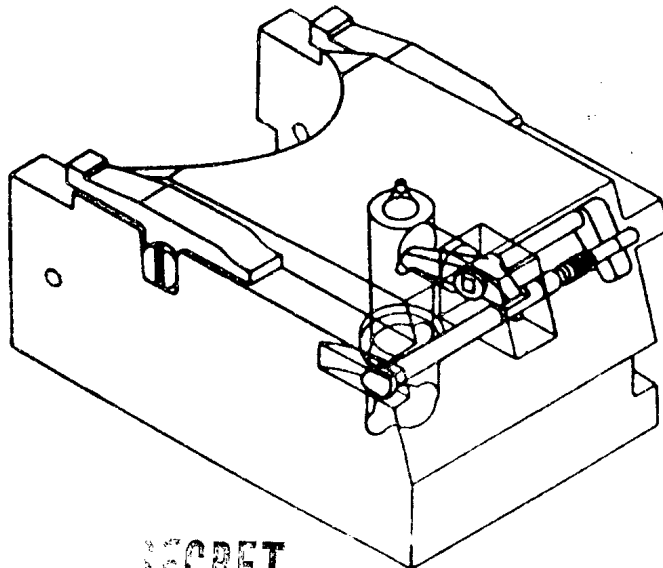
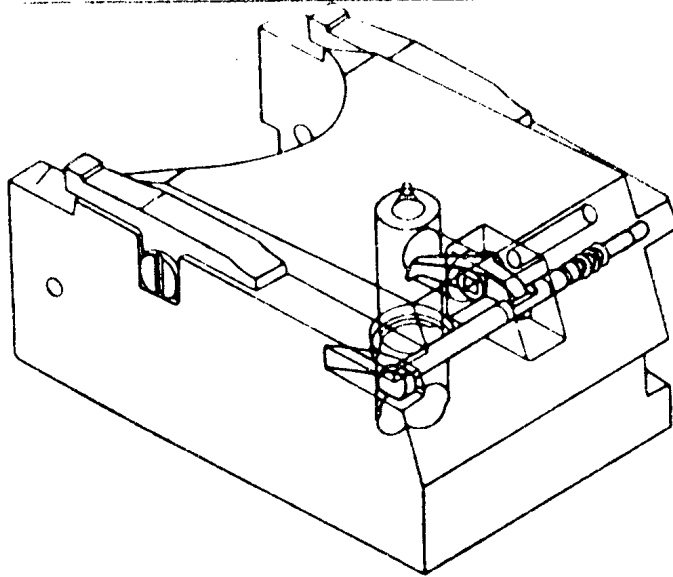


Fig 32. Position of the parts of the firing pin mechanism of the breech when assembled (1st operation)

SECRET

Fig 33. Position of the parts of the firing pin mechanism of the breech when assembled (2nd operation)

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Fig 34. Position of the parts of the firing pin mechanism of the breech when assembled (3rd operation)



- 1. Forward ring (09-206)
- 2. Rear ring (09-207)
- 3. Cover (09-208)
- 4. Nut (A51011-4)
- 5. Bolt (A51000-211)
- 6. Rack (09-175)
- 7. Bolt (09-213)
- 8. Fin (A51041-37)
- 9. Bracket of the TSN-22 sight (09-214)
- 10. Inserts (09-53)
- 11. Buffer (09-20)
- 12. Cotter (09-101)
- 13. Bracket of the catch (09-170)
- 14. Screws (A51060-17)
- 15. Bolt (09-202)
- 16. Washer (09-203)
- 17. Sleeve (09-201)
- 18. Screw (A51060-13)
- a. Boss
- b. Apertures for the trunnions
- c. Collar to which the bolts of the armour are attached
- d. Lubricating aperture provided seam

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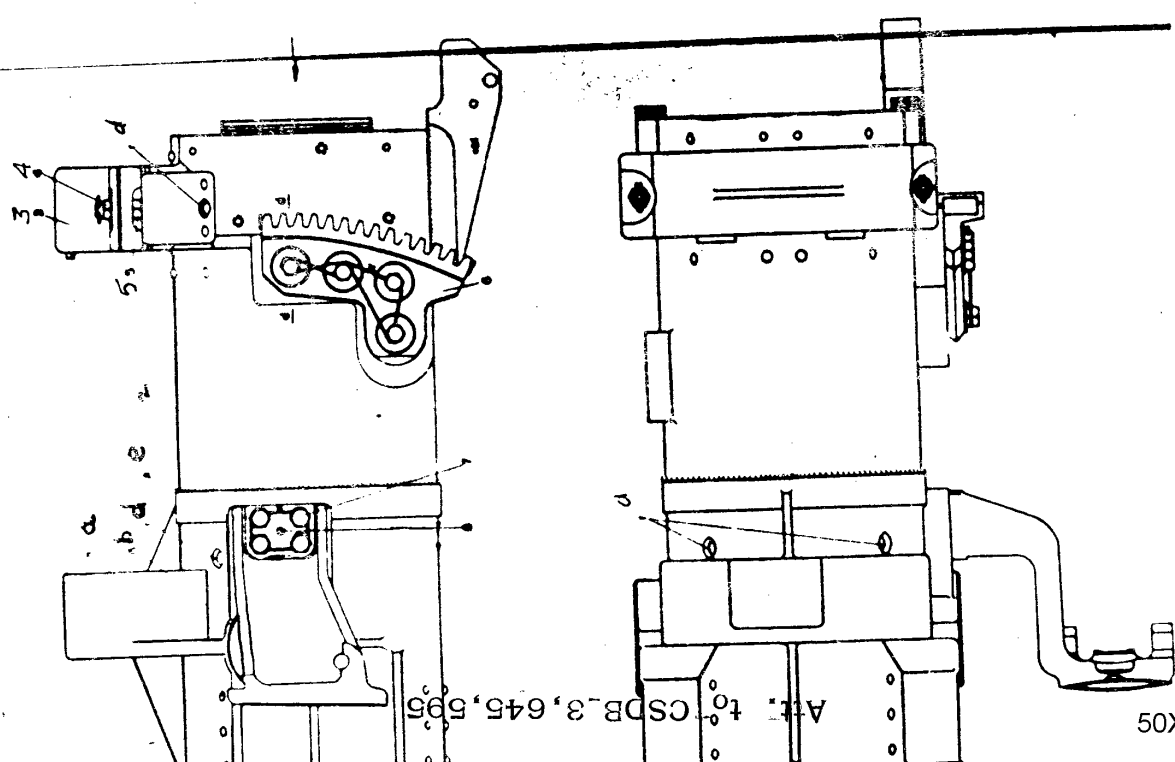
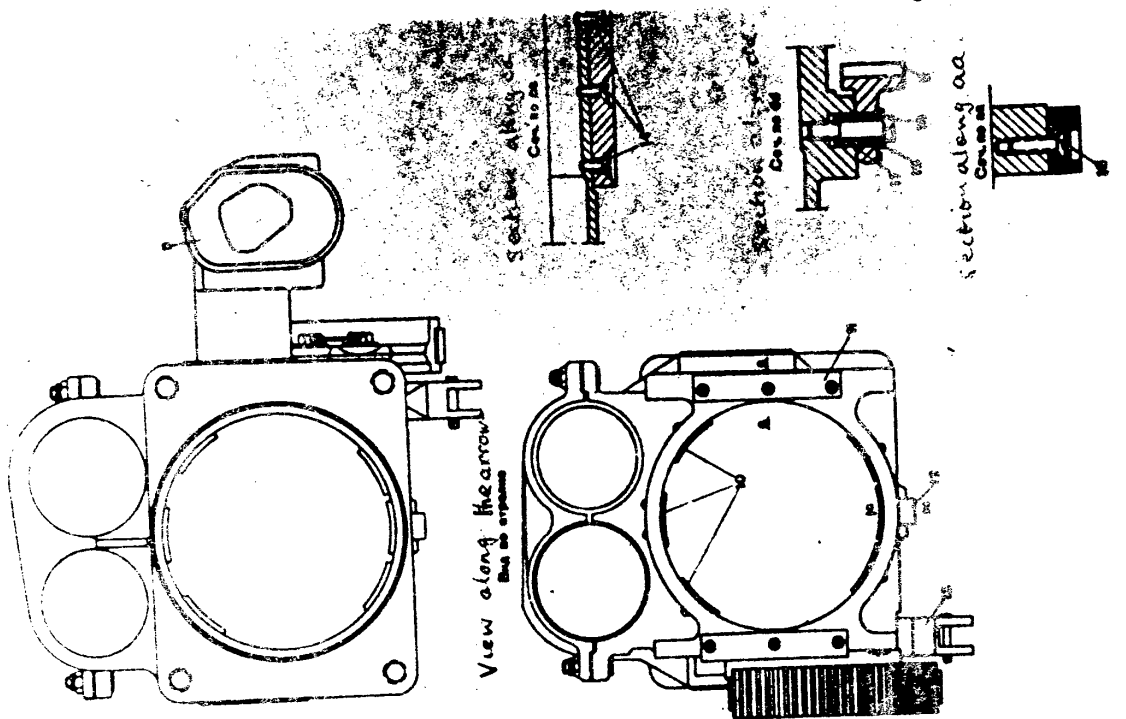


Fig 35. Cradle

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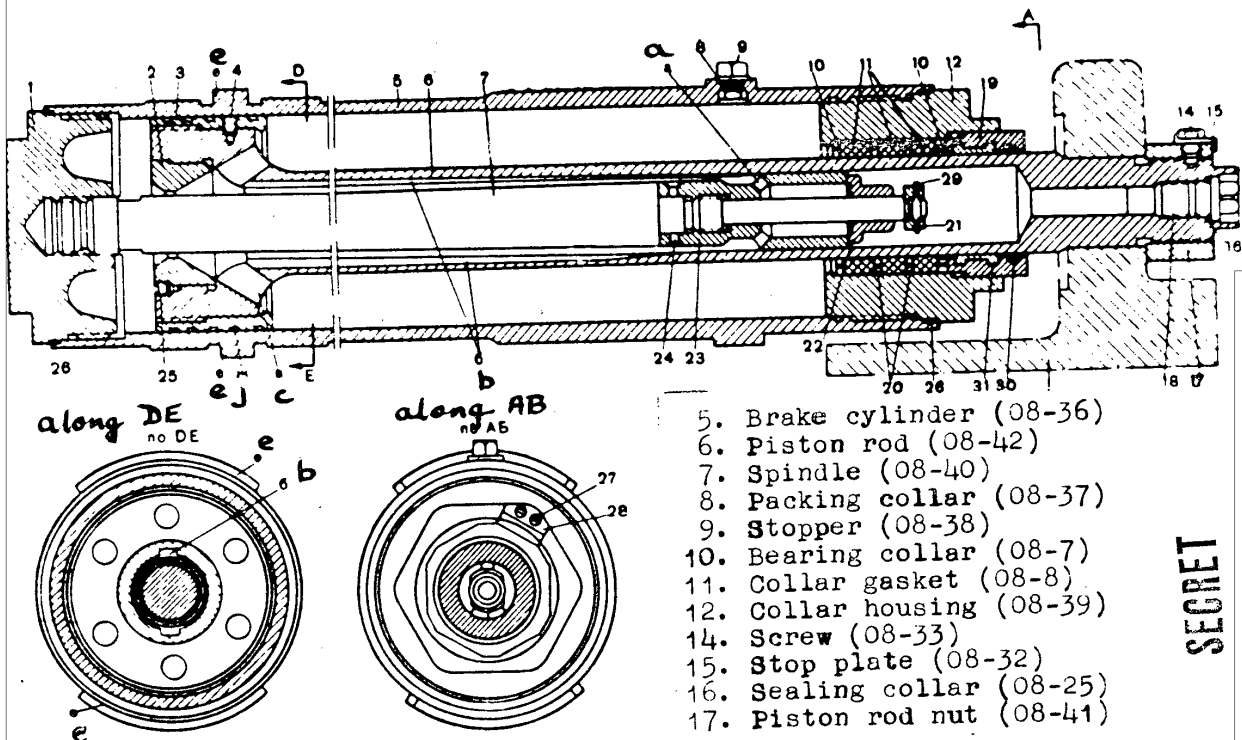


Fig 36. Recoil brake.

1. Forward cap (08-22).
2. Regulation collar (08-3)
3. Piston rod sleeve (08-2)
4. Stop screw (08-4)

a-Buffer aperture;b-variable depth grooves;  
c-aperture in the piston rod;e-segments of  
block engagement;j-circumferential groove  
on the sleeve of the piston.

5. Brake cylinder (08-36)
6. Piston rod (08-42)
7. Spindle (08-40)
8. Packing collar (08-37)
9. Stopper (08-38)
10. Bearing collar (08-7)
11. Collar gasket (08-8)
12. Collar housing (08-39)
14. Screw (08-33)
15. Stop plate (08-32)
16. Sealing collar (08-25)
17. Piston rod nut (08-41)
18. Screw (08-26)
19. Gasket nut (08-10)
20. Intermediate collars (08-9)
21. Nut (08-20)
22. Buffer valve (08-19)
23. Buffer (08-15)
24. Pin (08-16)
25. Screw (A51065-40)
26. Sealing collar (08-18)
27. Screw (A51066-40)
28. Stop plate (08-13)
29. Split pin (A51040-21)
30. Felt collar (08-11)
31. Babbit.

SECRET

Fig 37. Recoil brake when assembled.

- 9. Stopper (08-38)
- 17. Piston rod nut (08-41)
- H. Machined surface
- e. Segments of block engagement

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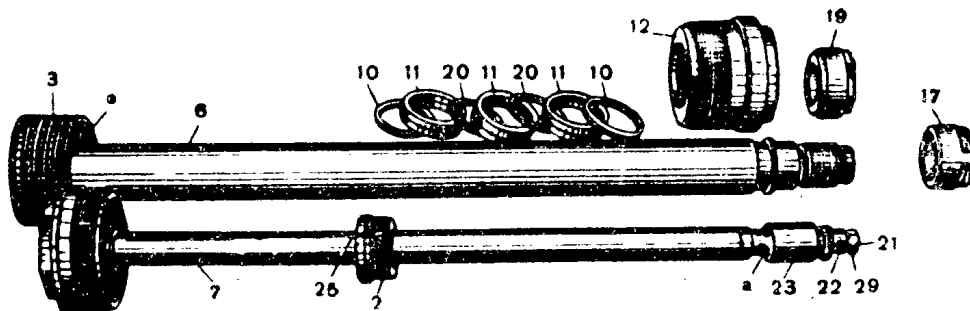
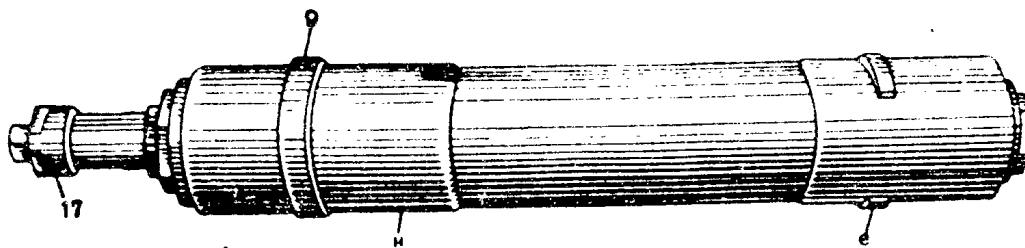


Fig 38. Parts of the recoil brake.

- |                             |                                 |
|-----------------------------|---------------------------------|
| 1. Forward cap (08-22)      | 19. Gasket nut (08-10)          |
| 2. Regulating collar (08-3) | 20. Intermediate collars (08-9) |
| 3. Piston rod sleeve (08-2) | 21. Nut (08-20)                 |
| 6. Brake piston (08-42)     | 22. Buffer valve (08-19)        |
| 7. Spindle (08-40)          | 23. Buffer (08-15)              |
| 10. Bearing collar (08-7)   | 25. Screw (A 51065-40)          |
| 11. Gasket collar (08-8)    | 29. Split pin (A 51040-21)      |
| 12. Gasket housing (08-39)  | a. Buffer aperture              |
| 17. Piston rod nut (08-41)  | b. Piston aperture              |

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- 1. Cap (SbM07-6).
- 2. Housing of the recuperator piston (07-16).
- 3. Forward cap (07-2).
- 4. Plate spring (07-11).
- 5. Cylinder (07-37).
- 6. Outer cylinder (07-38).
- 7. Recuperator piston (07-42).
- 8. Tube (07-41).
- 9. Rear end (07-36).
- 10. Spring 100p (07-21).
- 11. Piston nut (07-28).
- 12. Split pin (A51040-36).
- 13. Gasket nut (07-29).
- 14. Clamping collar (07-19).
- 15. Packing collar (07-23).
- 16. Rubber collar (07-16).
- 17. Washer (07-15).
- 18. Plate spring (07-14).
- 19. Nut (07-13).
- 20. Guiding bush (07-12).
- 21. Washer (07-10).
- 22. Rubber collar (07-8).
- 23. Packing collar (07-22).
- 24. Leather washers (07-9).
- 25. Valve cap (07-35).
- 26. Shut off valve (07-33).
- 27. Valve check nut (07-34).
- 28. Clamping nut (07-32).
- 29. Gasket collar (07-30).
- 30. Flange (07-31).
- 31. Gasket housing (07-17).
- 32. Leather washers (07-18).
- 33. Pin (07-44).
- A. Window.
- D. Electrically welded seam.
- K. Stopper.
- P. Connecting channel.
- T. Blind channel.
- Sh. Through channel.

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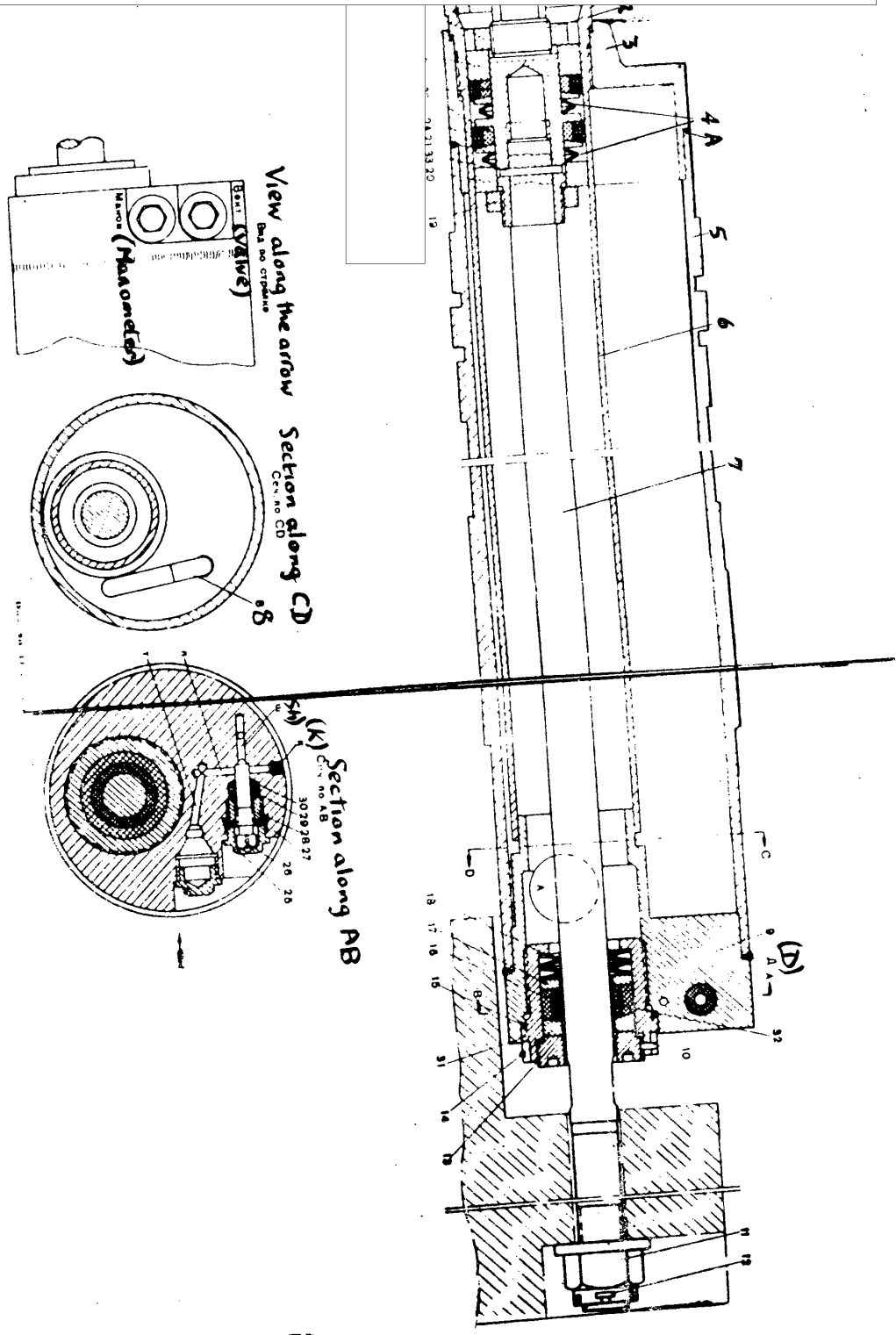


Fig. 39. Recuperator.

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Fig 40. Recuperator assembled

- 5. Cylinder (07-37)
- 7. Recuperator piston (07-42)
- 11. Piston nut (07-28)

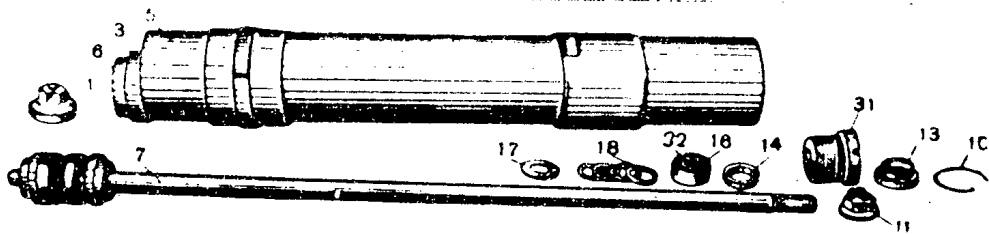
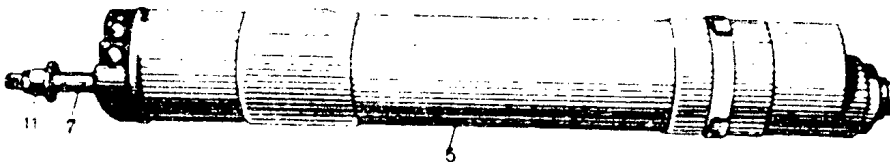


Fig 41. Parts of the recuperator.

- |                               |                             |
|-------------------------------|-----------------------------|
| 1. Cap (S6 07-6)              | 13. Gasket nut (07-20)      |
| 3. Forward cap (07-2)         | 14. Clamping collar (07-19) |
| 5. Cylinder (07-37)           | 16. Rubber collar (07-16)   |
| 6. Outlet cylinder (07-38)    | 17. Washer (07-15)          |
| 7. Recuperator piston (07-42) | 18. Plate spring (07-14)    |
| 10. Spring loop (07-21)       | 31. Gasket housing (07-17)  |
| 11. Piston nut (07-28)        | 32. Leather collar (07-18)  |

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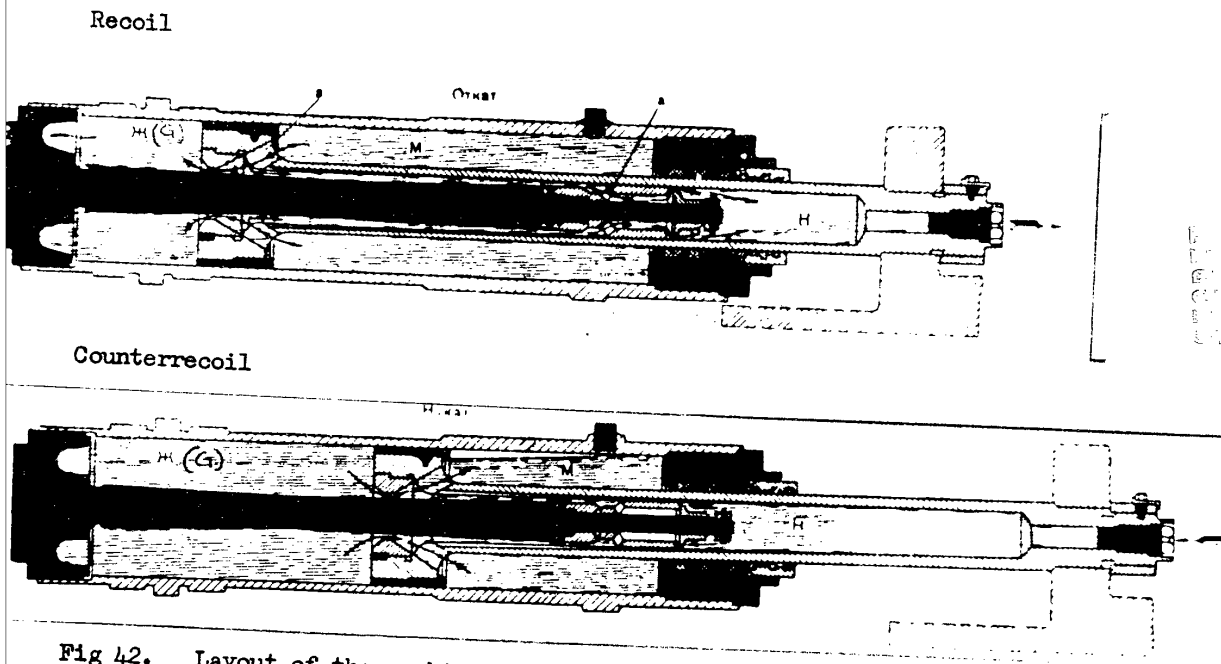


Fig 42. Layout of the working of the recoil brake.

- a. Buffer aperture
- B. Piston aperture
- G. Space in front
- M. Space behind the piston
- H. Buffer space

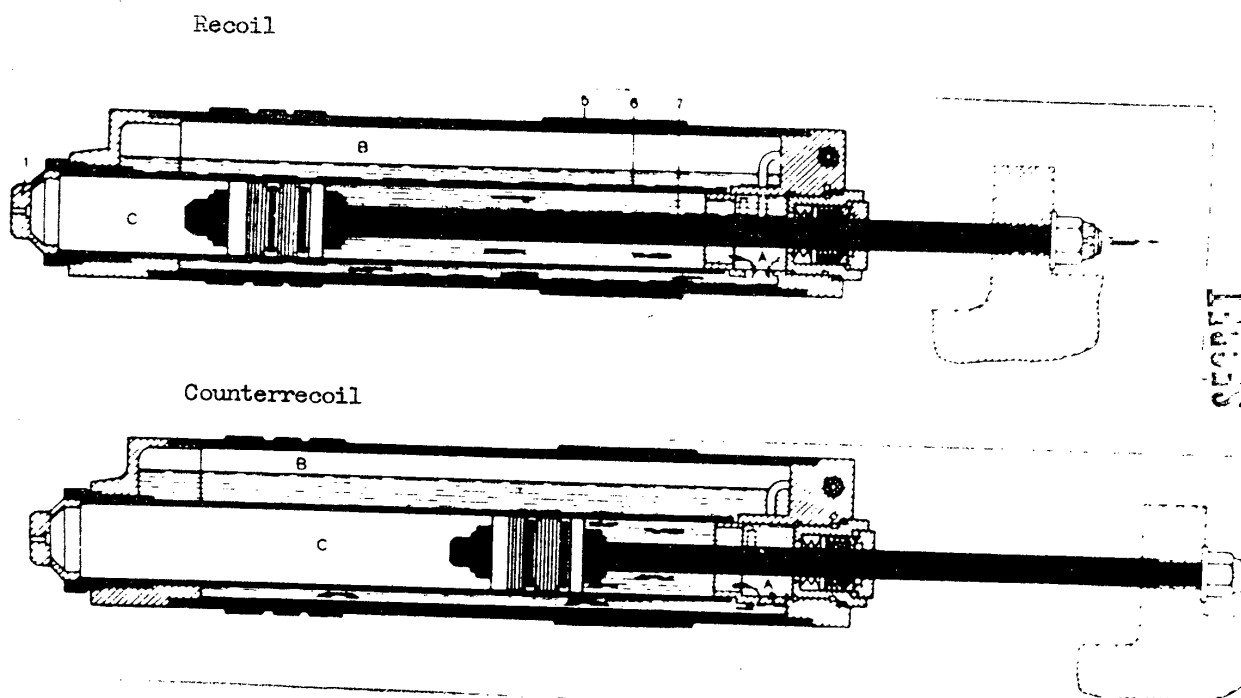


Fig 43. Layout of the working of the recuperator.

- |                                   |                                 |
|-----------------------------------|---------------------------------|
| 1. Cap (S6 07-6)                  | A. Window                       |
| 5. Outer cylinder (07-37)         | B. Outer cylinder void          |
| 6. Inner cylinder (07-38)         | C. Space in front of the piston |
| 7. Recuperator piston rod (07-42) |                                 |



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1. Housing (Sb21-54).
2. Bearing flange (21-417).
3. Rim of the worm gear (21-418)
4. Friction cone (21-419).
5. Cap of the housing. (21-411).
6. Spring washer (A51027-6).
7. Bolt (A51000-25).
8. Plate spring (21-420).
9. Tongue (A51027-18).
10. Screw (A51061-8).
11. Cover (21-413).
12. Tightning nut (21-409).
13. Stopper (21-424).
14. Clamping bush (21-412).
15. Bush (21-410).
16. Bushes (21-35).
17. Shaft from the cog wheel (21-416).
18. Stop (21-47).
19. Screw (A51061-4).
20. Cover (A52100-2).
21. Flywheel (A71502-1).
22. Weight (A51150-1).
23. Insulating collar (A52612-11).
24. Nut (A51910-2533).
25. Tongue (A51050-21).
26. Washer (A51027-8).
27. Nut (A51012-7).
28. Plate (A71362-1).
29. Lever of the electrical trigger (A51812-13).
30. Pin (A51640-11).
31. Handle (A71513-1).
32. Rod (51961-1).
33. Pin (A51041-151).
34. Screw (A51065-85).
35. Regulating collar (A51915-41).
36. Bush (A51910-252).
37. Spring (A51231-9).
38. Bush (A51931-2).
39. Slide (A71631-2).
40. Collar (A52332-26).
41. Packing collar (A52321-126).
42. Screw (A51060-145).
43. Screw (A51061-25).
44. Washer (A51021-33).
45. Nuts (A51010-21).
46. Eccentric clamp (A52427-81).
47. Bush (21-6).
48. Worm (21-209).
49. Bush (21-208).
50. Bush (21-6).
51. Wire (21-422).
52. Nut (21-421).
53. Cap (21-423).
54. Screw (A51066-7).
55. Pin (A51041-157).
56. Nut (A51012-6).
57. Washer (A51027-7).
58. Bolt (21-68).
59. Screw (A51064-3).
60. Axis (A51640-10).
61. Sheet contacts (A72631-1).
62. Contact collar (A52642-10).
63. Screw (A51065-84).
64. Insulating bush (A52644-7).
- A. Graduation line.
- B. Graduation line.
- C. Cylindrical cog wheel.
- D, E. Lubricating mechanism.
- P. Socket.

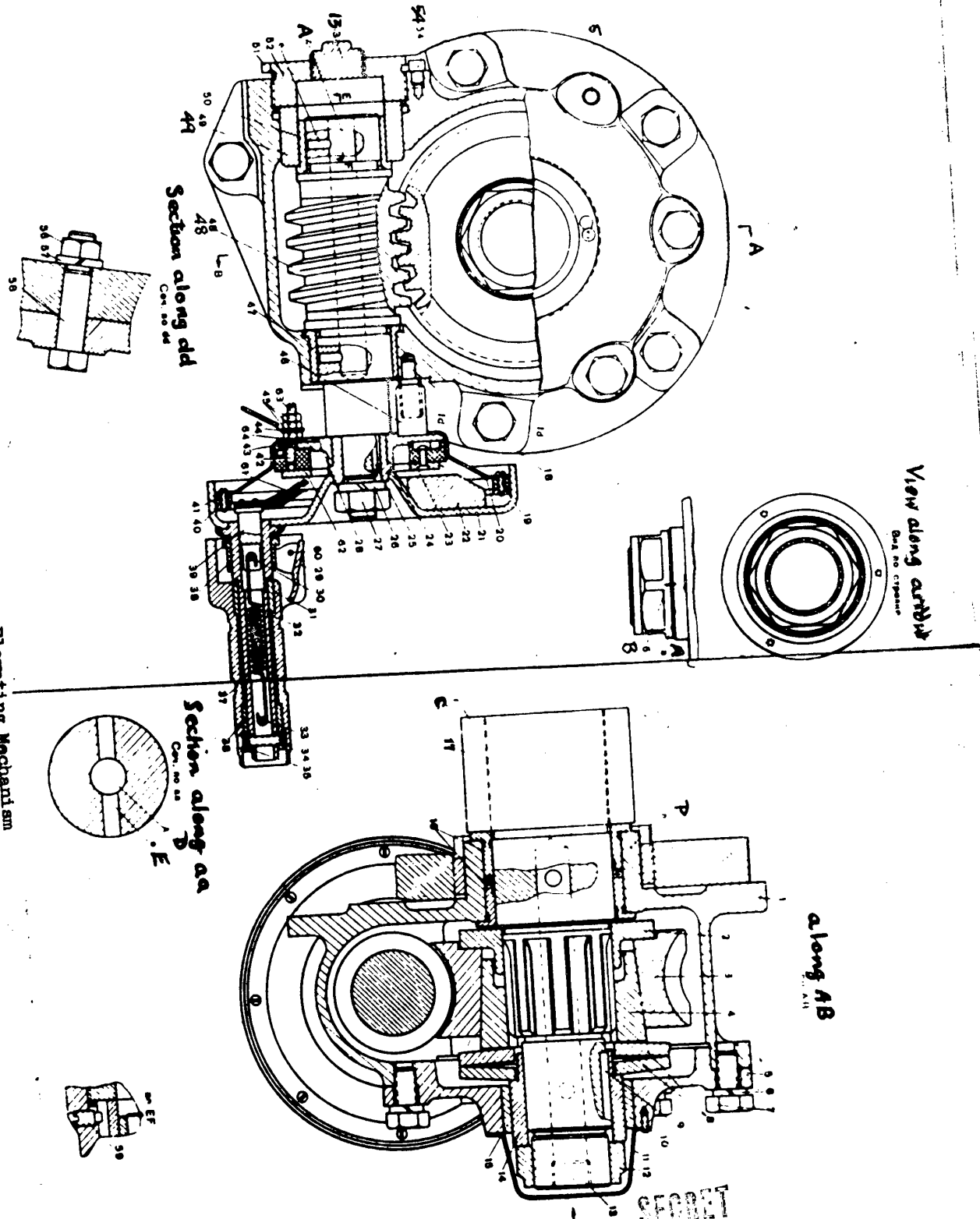
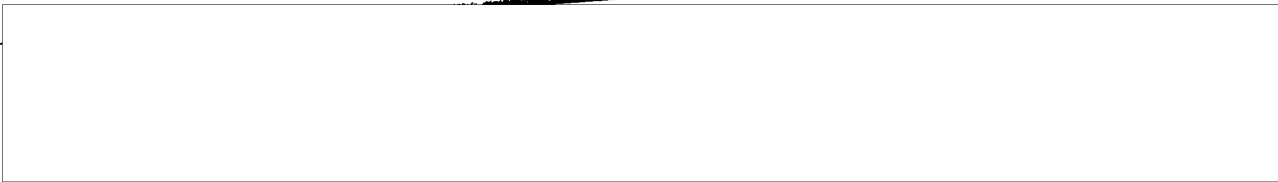


Fig. 14. Elevating Mechanism

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Fig.45. Guard.

49. Lug (10-266).
  50. Bolt (A51001-155).
  51. Recuperator checking graph (10-95).
  52. Screw (A51061-6).
  53. Left shield (10-160).
  54. Handle (10-207).
  55. Spirit level (8b-10-14).
  56. Plate (10-205).
  57. Brace (10-240).
  58. Screw (10-221).
  59. Socket (10-241).
  60. Screw (A51061-6).
  61. Cap (10-93).
  62. Special bolt. (10-98).
  63. Bracket (10-233).
  64. Screw (A51060-62).
  65. Bolt (A51001-155).
  66. Right shield (10-163).
  67. Base (10-164).
  68. Right side shield (10-238).
  69. Rear wall (10-236).
  70. Socket (10-202).
  71. Grip (10-203).
  72. Left side shield (10-237).
  73. Housing (10-3).
  74. Screw (A51060-7).
  75. Straightedge (10-215).
  76. Recoil indicator (10-214).
  77. Spring (A51240-4).
  78. Bush (10-208).
  79. Catch (10-210).
  80. Spring (10-229).
  81. Release mechanism axis (10-228).
  82. Lower cam (10-227).
  83. Upper cam (10-209).
  84. Pin (10-97).
  85. Nut (A51012-5).
  86. Spring washer (A51027-6).
  87. Bolt (10-191).
  88. Bolt (10-192).
  89. Weights.
  90. Washer. (10-212).
  91. Split pin. (A51040-15).
  92. Journal (10-220).
  93. Screw.
- A: Aperture for access to the extractor axis catch and the catch of the closing mechanism semiautomatic device catch.
- B: Aperture for withdrawal of the extractor axis.
- C: Stop.

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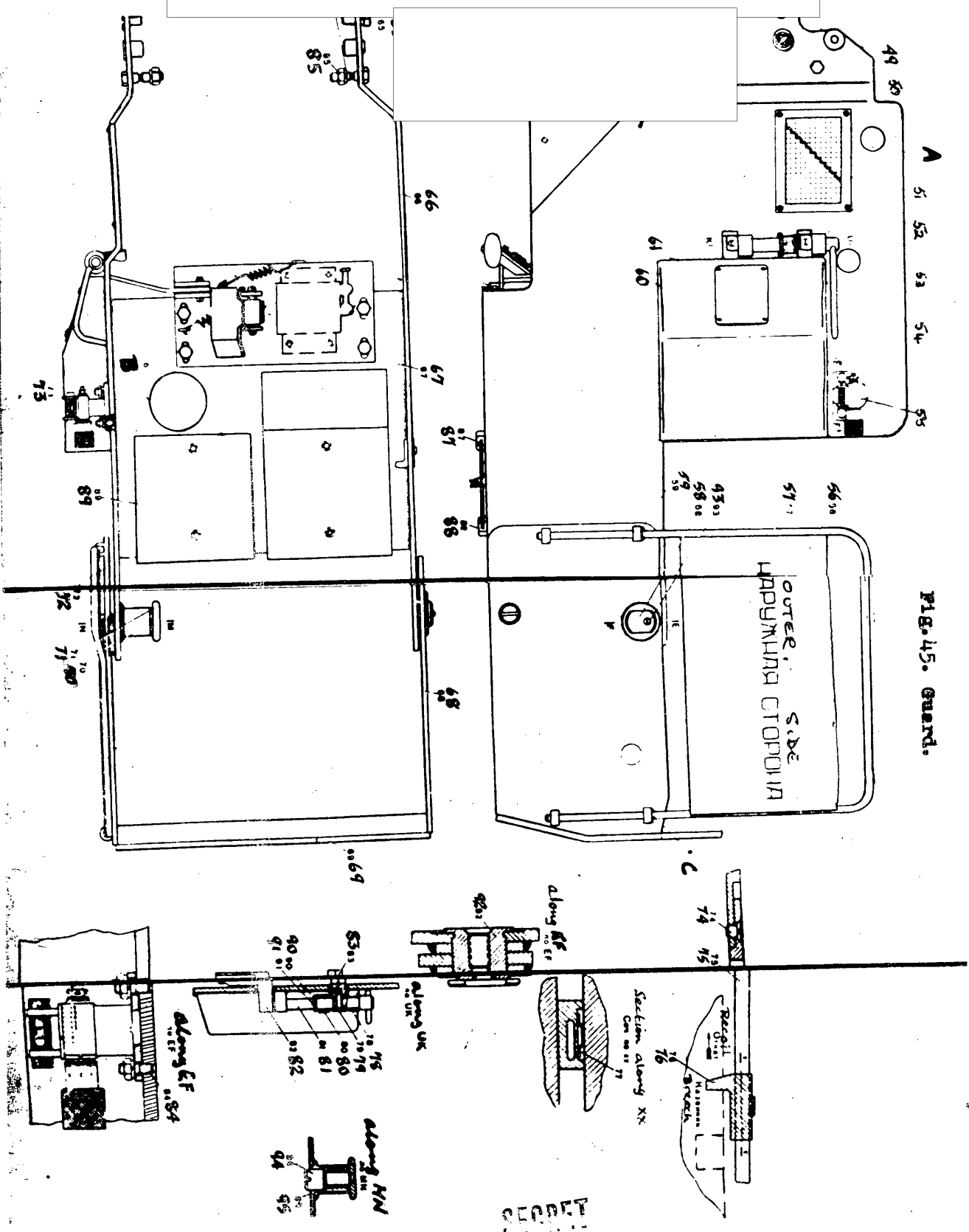


FIG. 45. Guard.

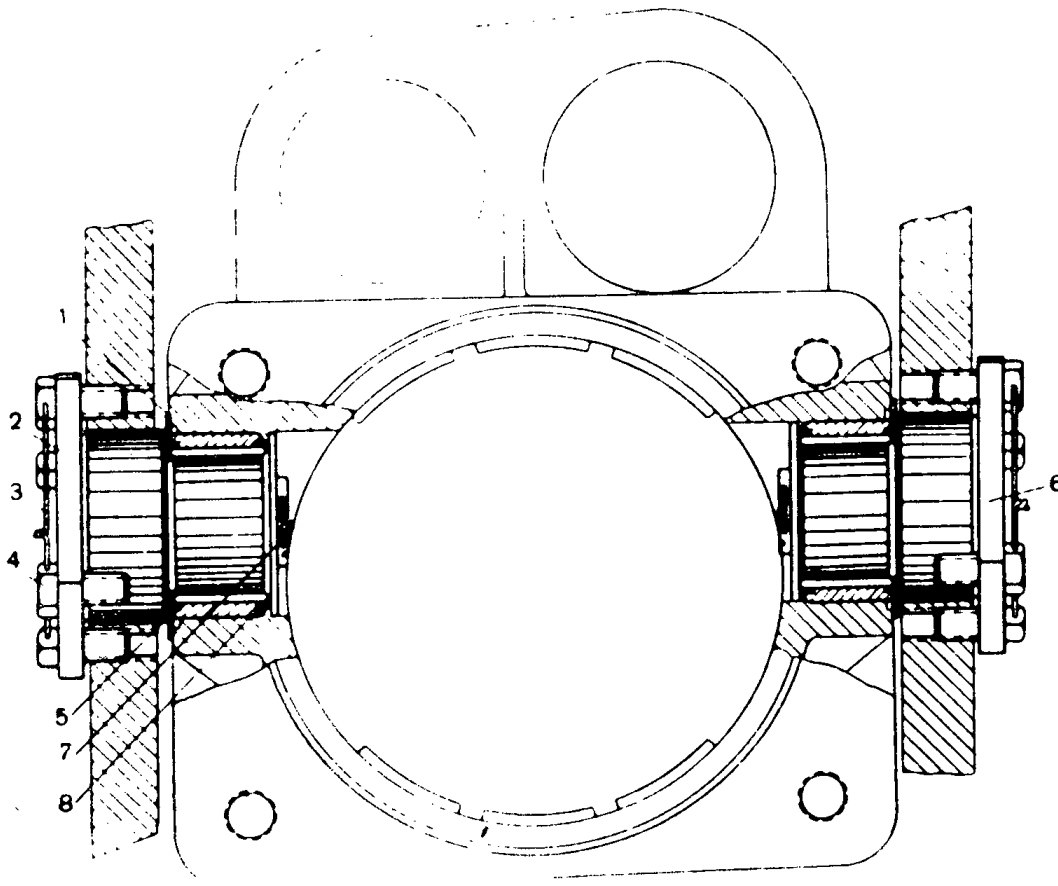
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Fig 46. Coupling of the gun by means of trunnions to the frame of the turret.

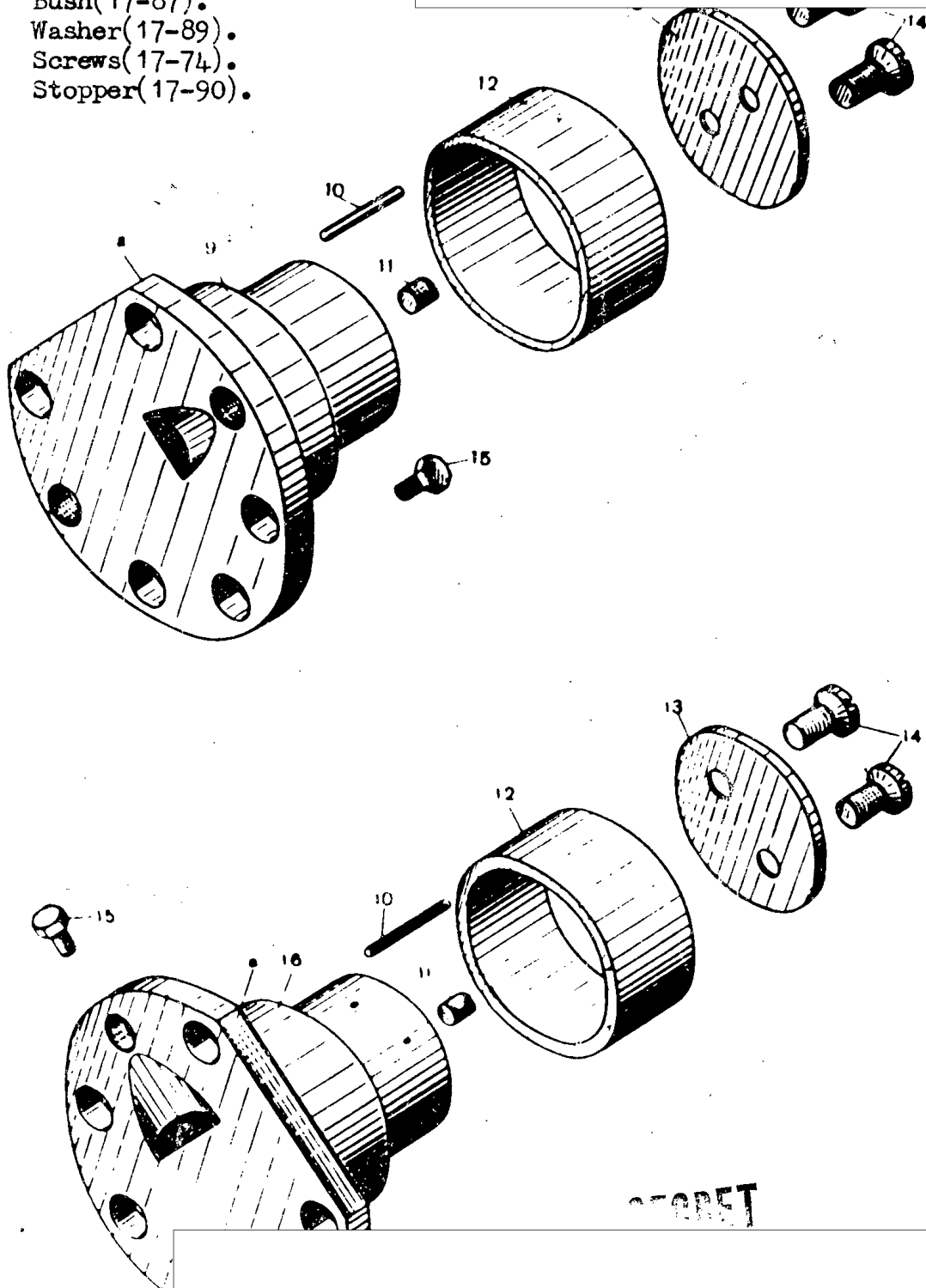
1. Collar (17-81)
2. Right trunnion (S6 17-18)
3. Wire (17-9)
4. Bolt (17-8)
5. Packing collar (17-86)
6. Left trunnion (S6 17-17)
7. Wire (17-75)
8. Packing collar (17-88)

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Fig. 47. TRUNNION

- 9. Left trunnion(17-84).
- 10. Needle(17-71).
- 11. Screw(A51065-13).
- 12. Bush(17-87).
- 13. Washer(17-89).
- 14. Screws(17-74).
- 15. Stopper(17-90).

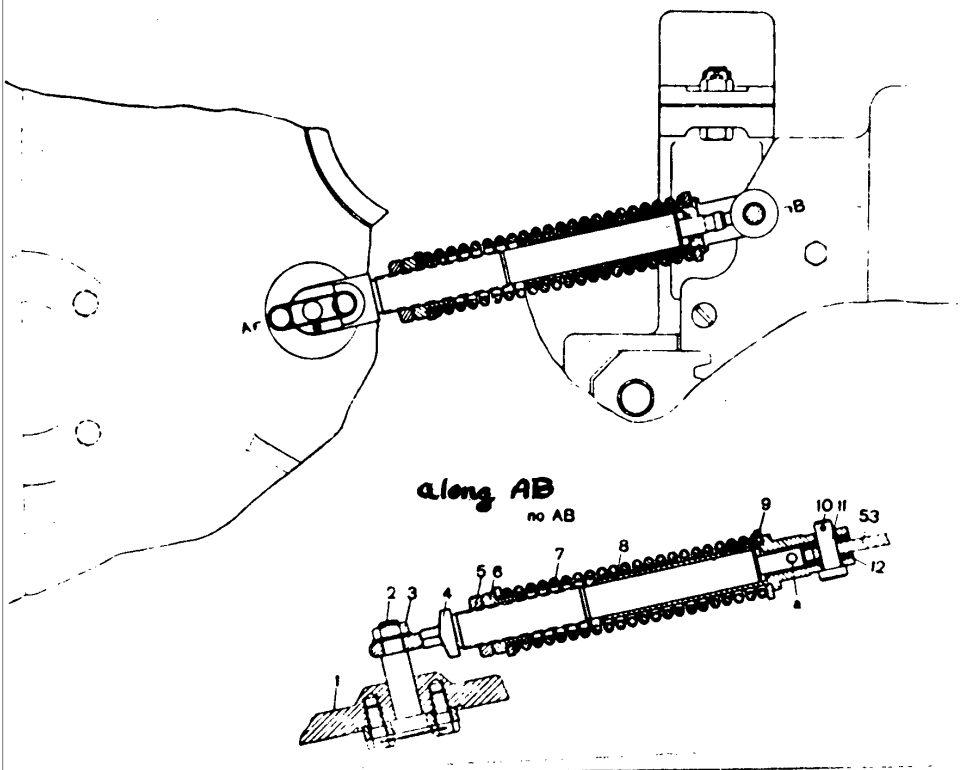


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- 16. Right trunnion(17-85).
- a. Champfer.

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Fig. 48. COMPENSATING MECHANISM.

- |                          |                                       |
|--------------------------|---------------------------------------|
| 1. Bracket.              | 8. Yoke(113-2).                       |
| 2. Pin.                  | 9. Washer(A51020-55).                 |
| 3. Nut.                  | 10. Split pin(A51040-26).             |
| 4. Shaft(113-1).         | 11. Axis(113-6).                      |
| 5. Lock nut(113-15).     | 12. Washer(113-7).                    |
| 6. Clamping nut(113-14). | 53. Left shield of the guard(10-160). |
| 7. Spring(113-19).       | a. Aperture for cotter pin            |

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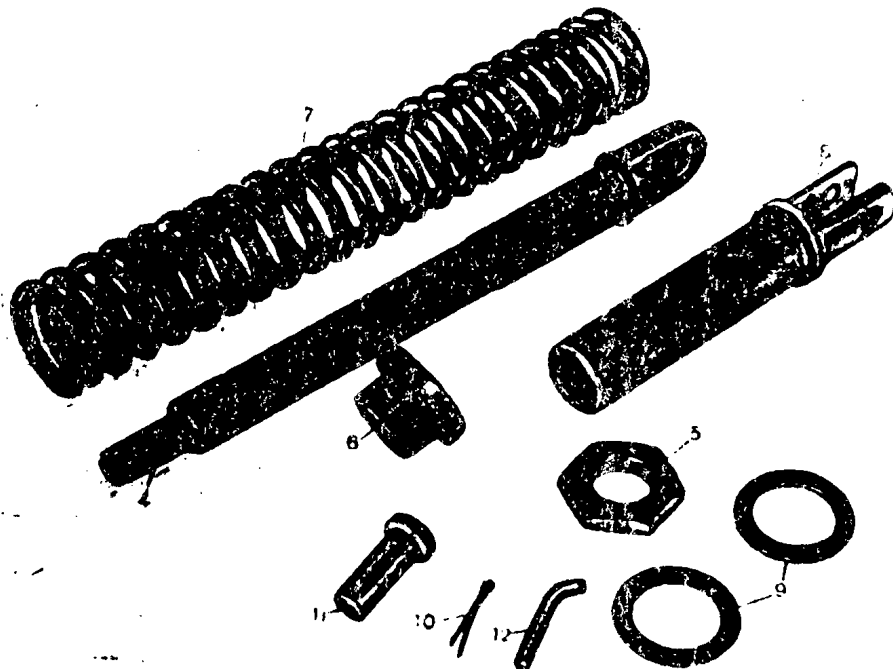


Fig 49. Parts of the compensating mechanism

- 4. Rod (113-1)
- 5. Lock nut (113-15)
- 6. Clamping nut (113-14)
- 7. Spring (113-19)
- 8. Yoke (113-2)
- 9. Washers (A 51020-55)
- 10. Split pin (A 51040-26)
- 11. Axis (113-6)
- 12. Cotter pin

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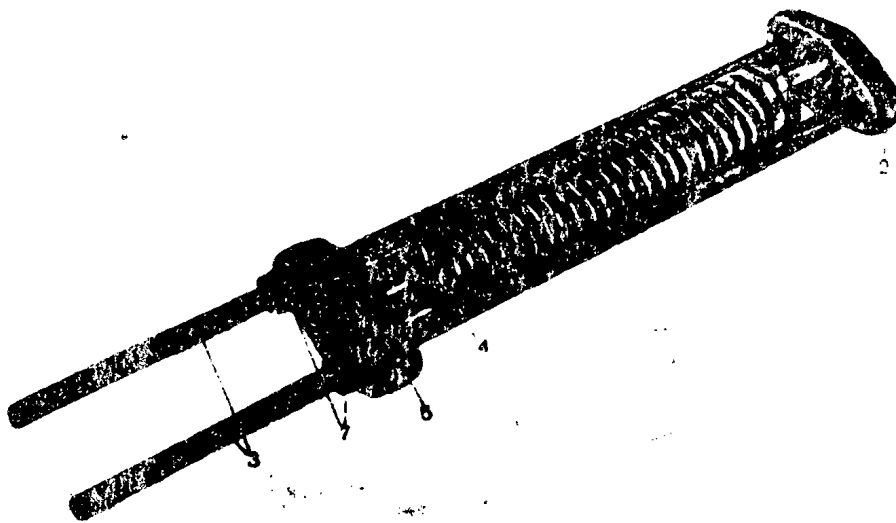


Fig 50. Tool for dismantling and assembling the compensating mechanism.

2. Forward flange (42-602)
3. Arms (42-600)
4. Cotter pin (42-604)
5. Rear flange (42-603)
7. Nuts (A 51012-6)

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## 51. TSh2-22 tank telescopic jointed sight.

Forepart.

Right angled shaped tooth.

End housing.

Flywheels for the alignment of the sight for direction and height.

Adjusting screw.

Key for aligning the sight.

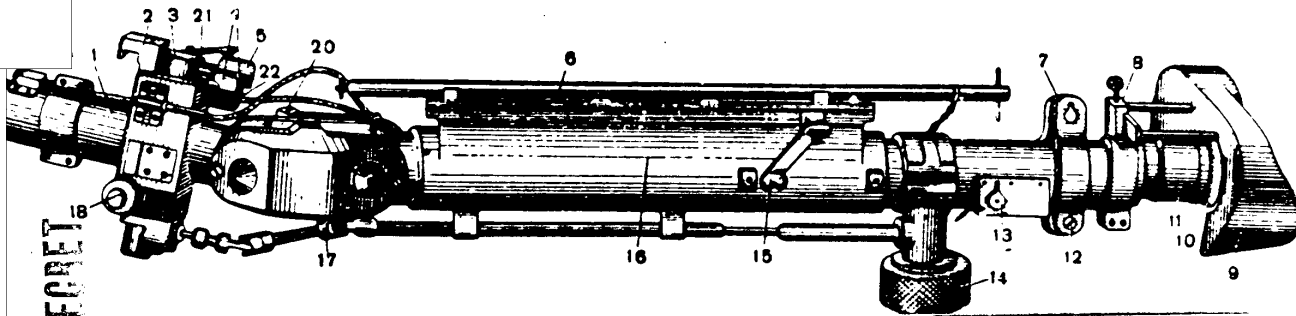
Clip for the suspension arm of the sight.

Forehead piece bracket.

Forehead piece.

"Blinker".

Eye piece..



- 12. Screw.
- 13. Handle of the light filter.
- 14. Flywheel.
- 15. Handle of the magnification change,
- 16. Mechanism of the magnification change.
- 17. Universal jointed shaft.
- 18. Pin.
- 19. Rectifier.
- 20. Joint.
- 21. Flat spring(index pin).
- 22. Contact with cable.

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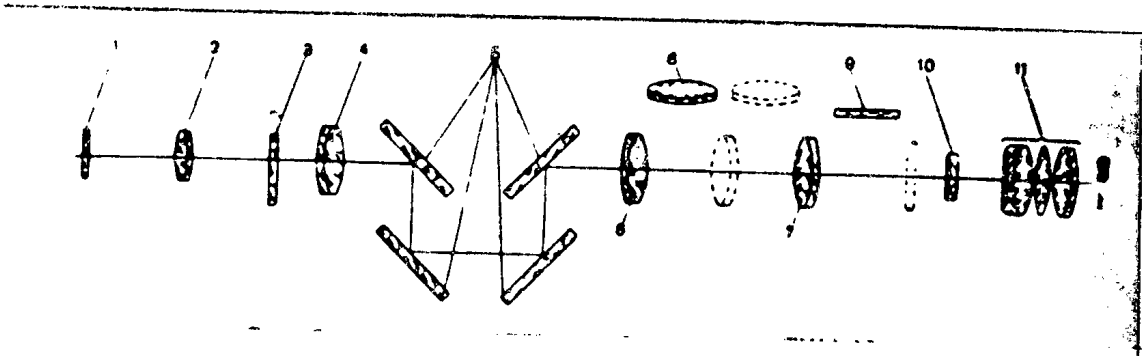


Fig 52. Layout of the optical parts of the TSh 2-22 sight.

1. Protective glass
2. Objective
3. Grid
4. Condensor
5. Mirrors
6. First turning lens
7. Second turning lens for 3.5x
8. Second turning lens for 7x
9. Light filter
10. Planoconcave lens
11. Eye piece

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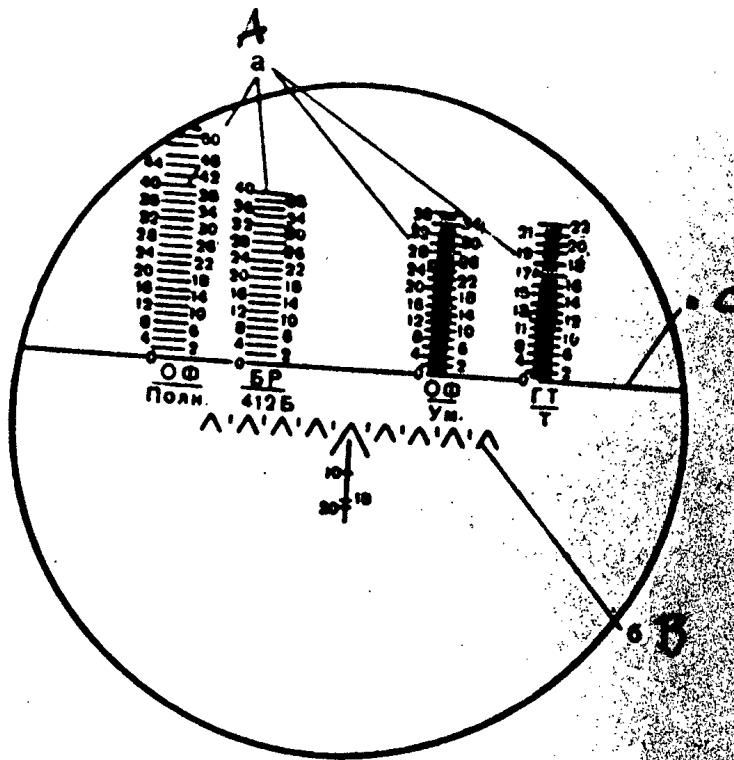


Fig 53. View of the field of vision of the TSh 2-22 tank telescopic sight

- A. Range scales
- B. Lateral correction scale
- C. Fixed horizontal wire indicator

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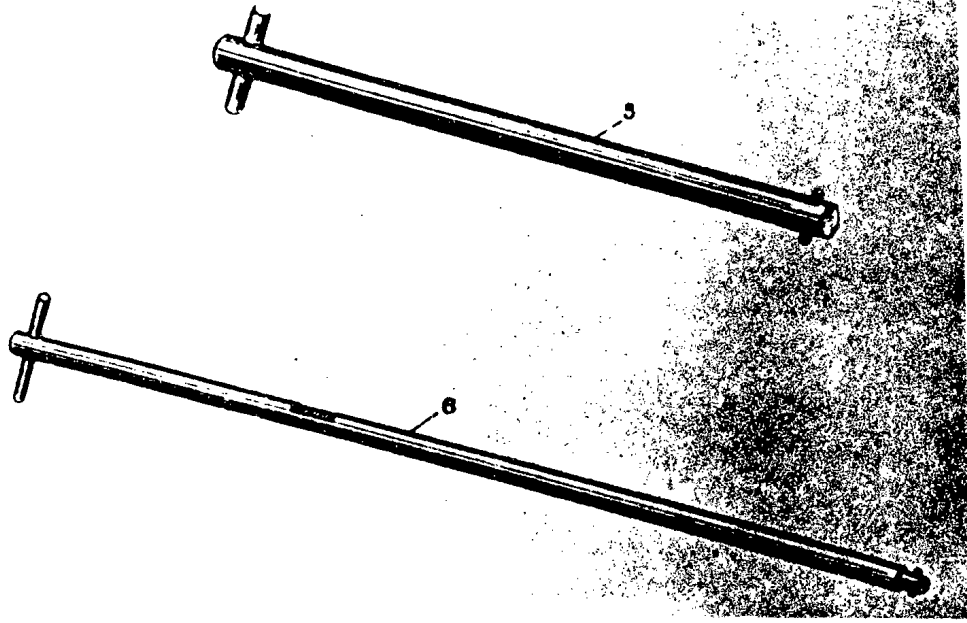
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Fig 54. Keys for aligning and fixing the TSh2-22 sight.

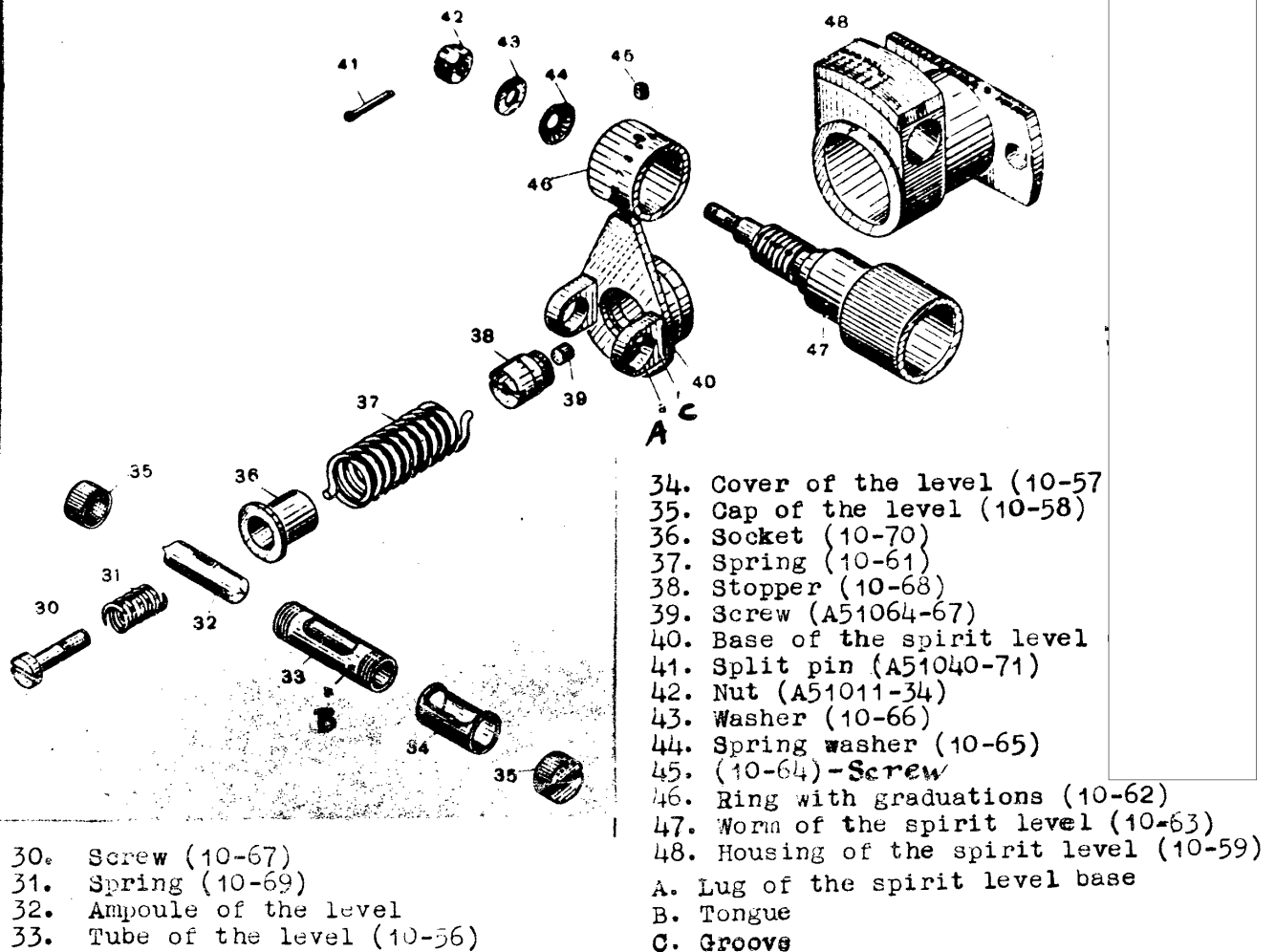
- 5. Key for setting up the sight
- 6. Key for aligning the sight

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Fig 55. Spirit level.



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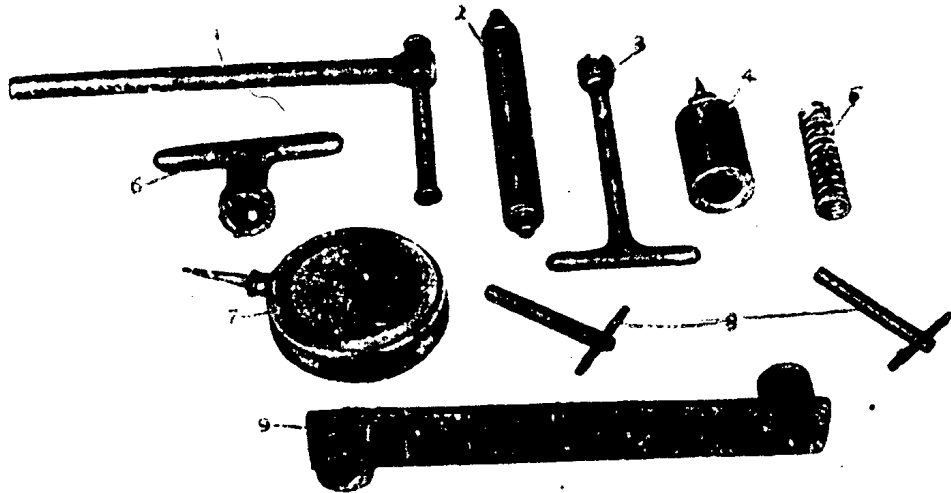


Fig 56. Z.I.P. gun outfit packed in an instrument wallet.

1. Key for the shut-off valve of the recuperator (S6 42-15)
2. Handle for withdrawing the wedge (S6 42-60)
3. Key for the cover of the firing pin (A 52840-36)
4. Firing pin (A 51605-3)
5. Firing pin spring (02-7)
6. Primer cup key (A 52840-39)
7. Oil can (A 72276-11)
8. Keys for setting up the fuze tap (A 72930-46)
9. Key for the stopper of the recoil brake piston rod (S6 42-14)

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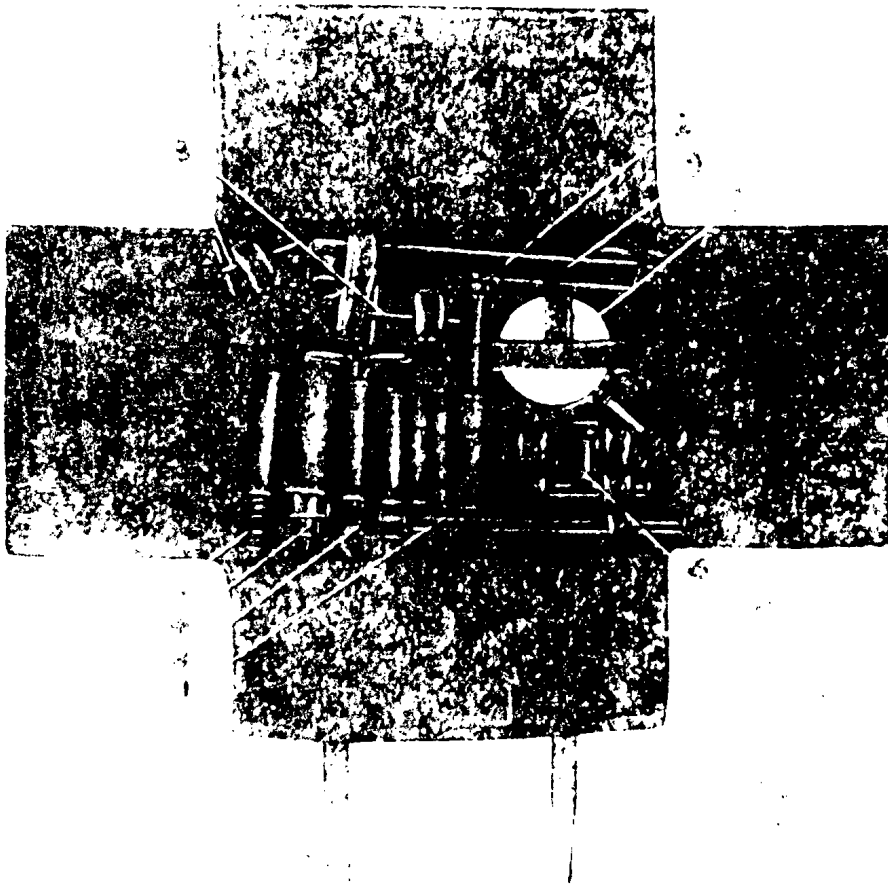


Fig 57. Packing of the Z.I.P. in the gun outfit instrument wallet.

1. Key for the snut-off valve of the recuperator (S6 42-15)
2. Handle for withdrawing the wedge (S6 42-60)
3. Key for the cover of the firing pin (A 52840-36)
4. Firing pin (A 51605-3)
5. Firing pin spring (02-7)
6. Primer cup key (A 52840-39)
7. Oil can (A72276-11)
8. Keys for setting up the fuze cap (A 72930-46)
9. Key for the stopper of the recoil brake piston rod (S6 42-14)



Fig 58. Hand shell case extractors

1. Screw with reinforced extractor eye (S6 41-303)
2. Reinforced extractor lever (41-258)
3. Hand extractor (S6 4-63)

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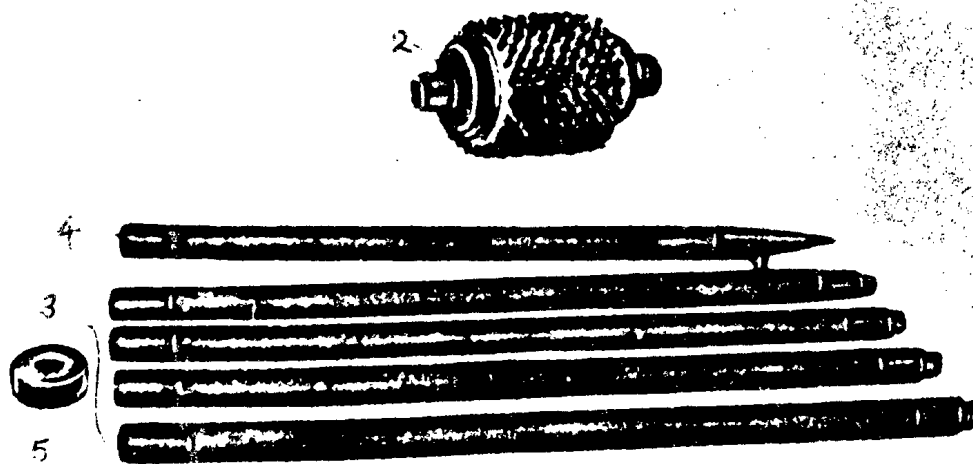
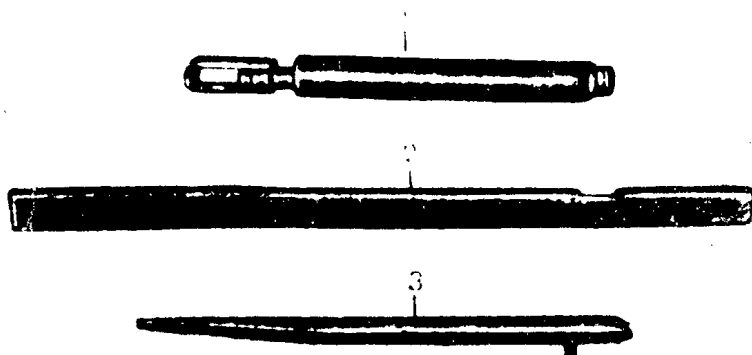


Fig 59. Bore brush outfit.

2. Bore brush (S6 41-400)
3. Rod (S6 41-407)
4. Rod (S6 41-406)
5. Guiding washer (S6 41-403)

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1. Tin for 1.5 Kg. of gun lubricant (A 72957-16)
2. Tin for 2 Kg. of Steol (A 72957-19)
3. Funnel (A 72950-4)

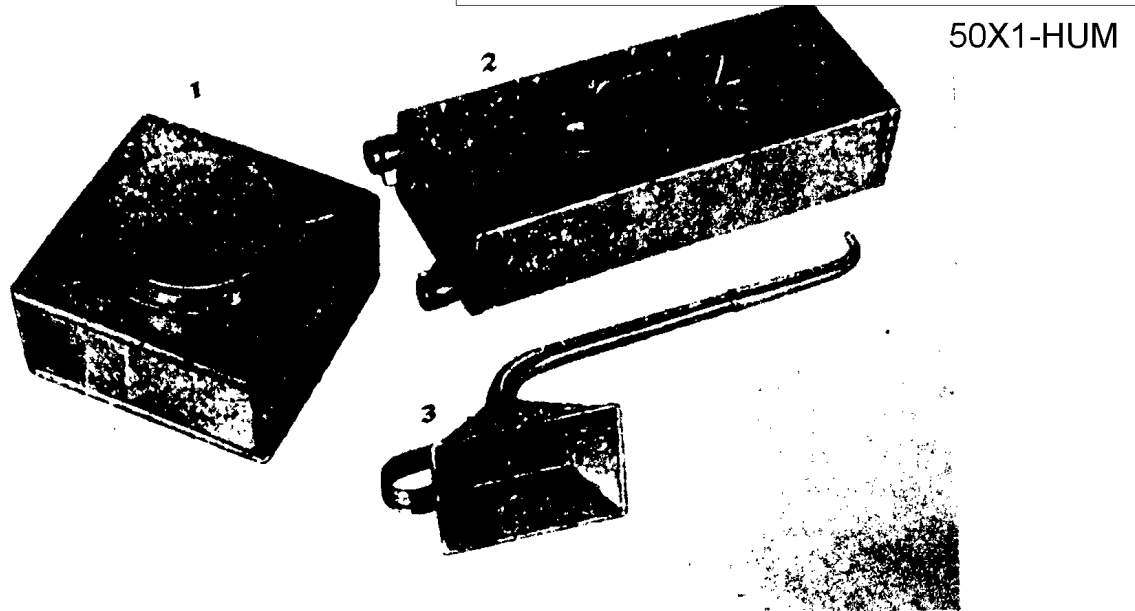


Fig 61. Instrument outfit for determining the pressure in the recuperator.

- |                         |   |
|-------------------------|---|
| 1. Manometer            | 7. Nipple (42-75)                         |
| 2. T-joint (A 52233-2)  | 8. Cover (A 52132-13)                     |
| 3. Socket (A 52231-3)   | 9. Connecting sleeve (A 52230-5)          |
| 4. Stopper (A 52151-4)  | 10. Transition connecting sleeve (41-260) |
| 5. Packing (A 52321-13) | a,b. T-joint branches                     |
| 6. Cover (A 52132-14)   |   |



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Fig 62. Compressed air cylinder (nitrogen)

- 3. Compressed air cylinder
- 4. Connecting sleeve
- 5. Flywheel of the cylinder tap

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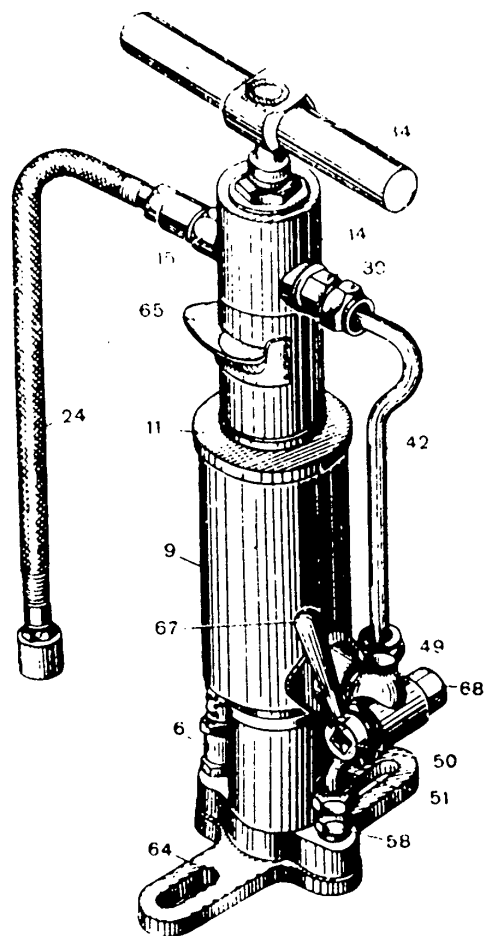


Fig 63. Double Action Pump (General View).

- 6. Connecting pipe of the low-pressure suction valve (03-1)
- 9. Reservoir housing (Sb 11-2)
- 11. Reservoir cap (11-8)
- 14. Pump head (10-2)
- 15. Connecting pipe of the high-pressure delivery valve (02-1)
- 24. Covered rubberized hose (01-9)
- 34. Pump handle (04-2)
- 39. Connecting pipe of the upper suction valve (06-1)
- 42. Upper pipe (05-1)
- 49. Tap housing (08-3)
- 50. Tap stopper (08-1)
- 51. Lower pipe (07-1)
- 58. Connecting pipe of the low-pressure outlet valve (09-1)
- 64. Base of the pump (12-1)
- 65. Funnel (11-6)
- 67. Tap handle (08-2)
- 68. Nut (08-5)

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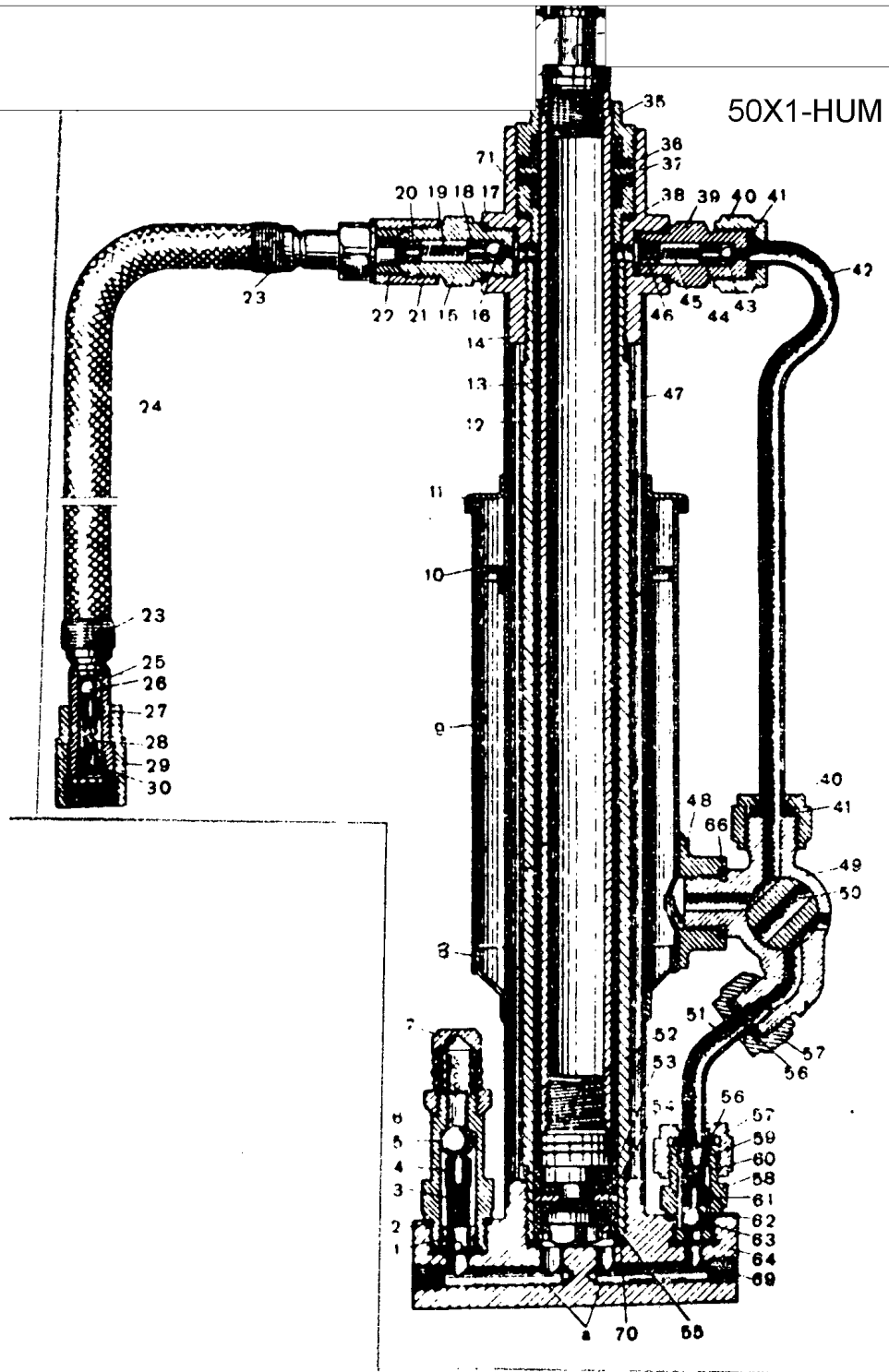


Fig. 64. Double action pump ( longitudinal section ). 50X1-HUM

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2. Gasket (03-7)
3. Spring (03-4)
4. Ball support (03-3) 50X1-HUM
5. Ball (03-2)
6. Connecting pipe for low-pressure suction valve (03-1)
7. Cover (03-6)
8. Vent (11-4)
9. Reservoir housing (Sb 11-2) 50X1-HUM
10. Filter-screen (Sb 11-5)
11. Reservoir cap (11-8)
12. Cylinder (10-1)
13. Piston rod (04-5)
14. Pump head (01-2)
15. Connecting pipe of the high-pressure delivery valve (02-1)
16. Ball (01-2)
17. Gasket (02-2)
18. Ball support (01-5)
19. Spring (01-6)
20. Bearing bush (01-7)
21. Nut to the pump (01-2)
22. Nipple to the pump (01-1)
23. Wire (01-10)
24. Covered rubberized hose (01-9)
25. Nipple to the T-joint (01-3)
26. Ball (01-4)
27. Ball support (01-5)
28. Spring (01-6)
29. Nut to the T-joint (01-8)
30. Bearing bush (01-7)
31. Shaft (04-1)
32. Pin (04-4)
33. Washer (04-3)
34. Pump handle (04-2)
35. Upper nut (05-3)
36. Washer (05-2)
37. Upper ring (04-13)
38. Gasket (04-10)
39. Connecting pipe of the upper suction valve (06-1)
40. Nut (05-3)
41. Washer (05-2)
42. Upper nut (05-1)
43. Ball (01-4)
44. Ball support (01-5)
45. Spring (01-6)
46. Bearing bush (01-7)
47. Casing (11-5)
48. Tap flange (11-1)
49. Tap (08-3)
50. Tap stopper (08-1)
51. Lower tube (07-1)
52. End of the piston rod (04-6)
53. Cup (04-7)
54. Lower ring (04-8)
55. Lower nut (04-9)
56. Washer (05-2)
57. Nut (05-3)
58. Connecting pipe of the low pressure valve (09-1)
59. Bearing bush (09-5)
60. Spring (09-4)
61. Ball support (09-3)
62. Gasket (02-2)
63. Ball (09-2)
64. Base of the pump (12-2)
66. Gasket (08-7)
69. Stopper (12-2) 50X1-HUM
70. Gasket (12-3)
71. Bushes (04-11)

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a - base channels.

50X1-HUM

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For Air

For Fluid

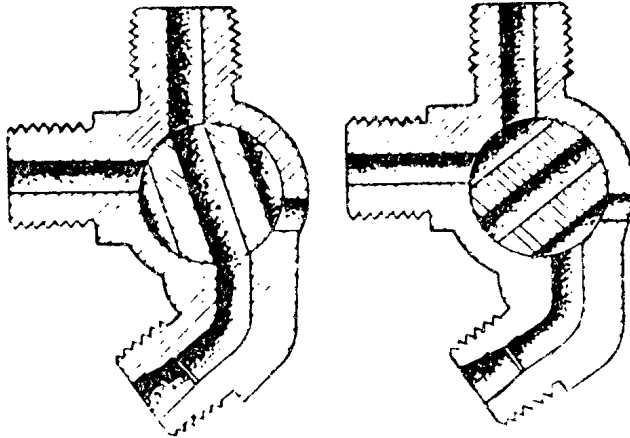


Fig 65. Layout of the tap.

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Fig 66. Double action pump with the Z.I.P. in the case.

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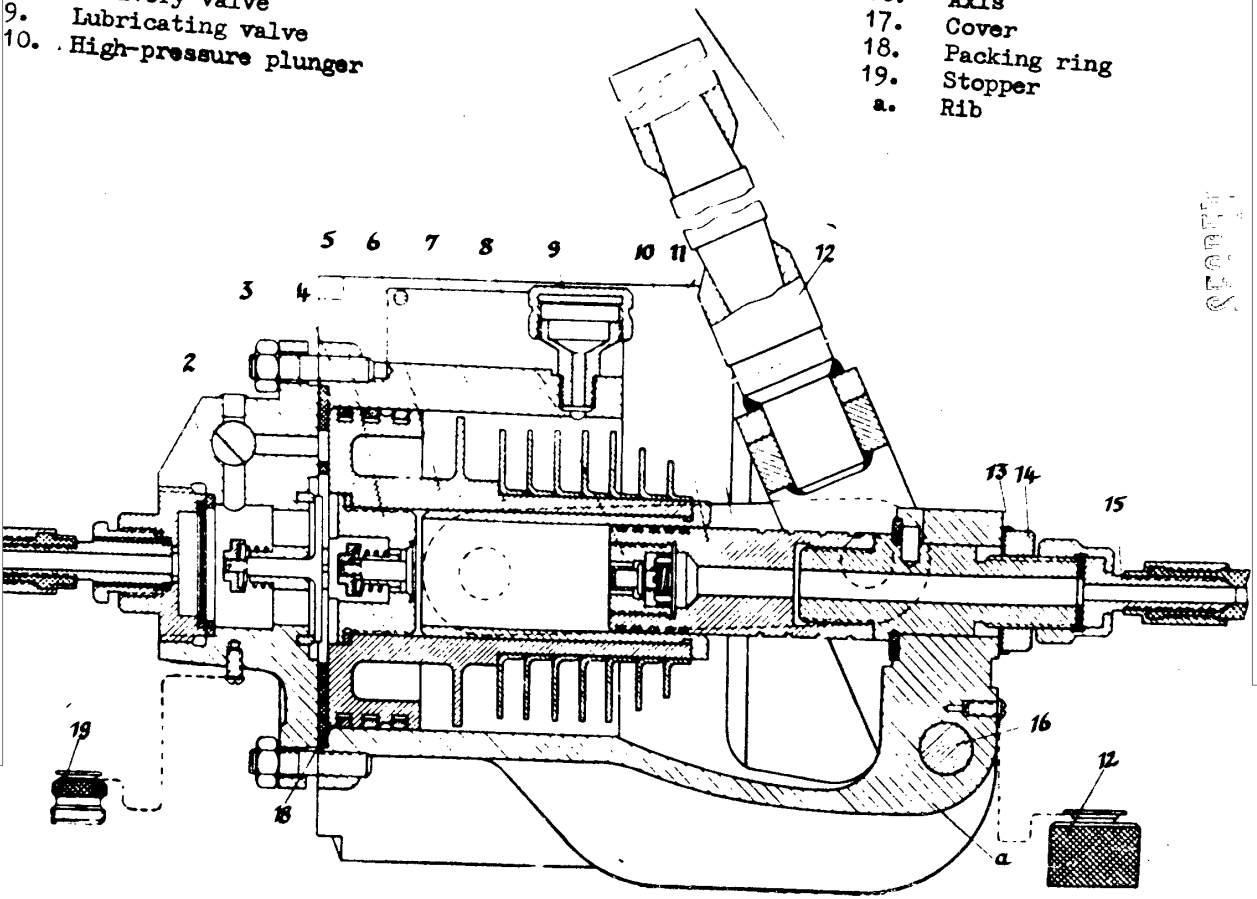


Fig 67. Air-hydraulic pump (50X1-HUM)

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- 1. Suction hose
- 2. Housing cover
- 3. Nut
- 4. Cotter pin
- 5. By-pass valve
- 6. Low pressure plunger
- 7. Pump housing
- 8. Delivery valve
- 9. Lubricating valve
- 10. High-pressure plunger

- 11. Connecting rod
- 12. Yoke with handle
- 13. Check washer
- 14. Nut
- 15. Connecting hose
- 16. Axis
- 17. Cover
- 18. Packing ring
- 19. Stopper
- a. Rib



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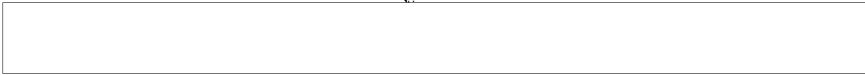
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- 2. Housing cover.
- 6. Low-pressure plunger.
- 10. High pressure plunger.
- 15. Connecting hose.
- 20. Tap.
- 21. Inlet valve.
- 22. Ring.
- 23. Spring.
- 24. Ring.
- 25. Filter.
- 26. Screw.
- 27. Cover.
- 28. Valve nut.
- 29. Split pin.
- 30. Nut.
- 31. Spring.
- 32. Washer.
- 33. Screw.
- 34. Piston ring.
- 35. Aluminium ring. (rib).
- 36. Bush.
- 37. Valve.
- 38. Ring.
- 39. Valve seat.
- 40. Split pin.
- 41. Spring.
- 42. Valve nut.
- 43. Ring.
- 44. Pin.
- 45. End.
- 46. Spring.
- 47. Valve seat.
- 48. Valve.
- 49. Socket.
- 50. Gasket.
- 51. Piston ring.
- 52. Special nut.
- 53. Gasket.
- 54. End.
- 55. Nipple.
- 56. Union.
- 57. Sleeve.
- 58. Connecting pipe.
- 59. Ball.
- 60. Spring.
- 61. Support.
- 62. Packing.
- 63. Nipple.
- 64. Special nut.
- 65. Transition nipple.
- 66. Base of the handle.
- 67. Handle.
- 68. End of the handle.
- 69. Yoke.
- 70. Pivot.
- 71. Nipple.
- 72. Clamping nut.
- 73. Union.
- 74. Hose.
- 75. Connecting pipe.
  - a. Threaded recess.
  - b. Elbow channel.
  - c. Conical aperture.
  - d. Pivot.
  - e. Groove.
  - g. By-pass aperture.
  - i. Channel.
  - k. Aperture.
  - l. Aperture.



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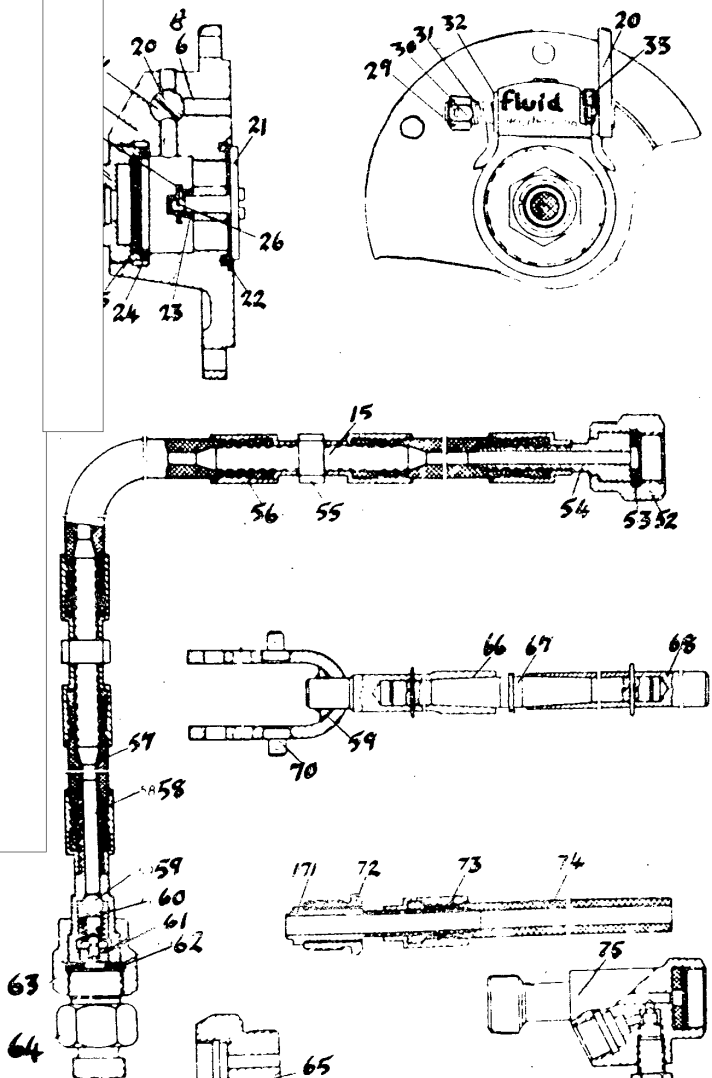
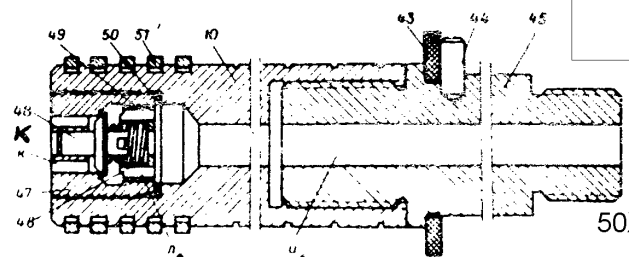
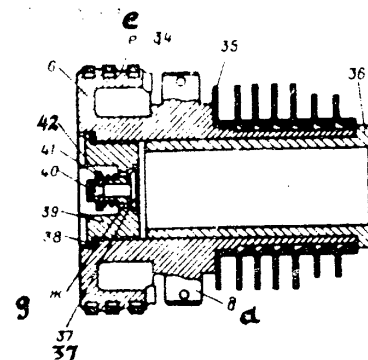
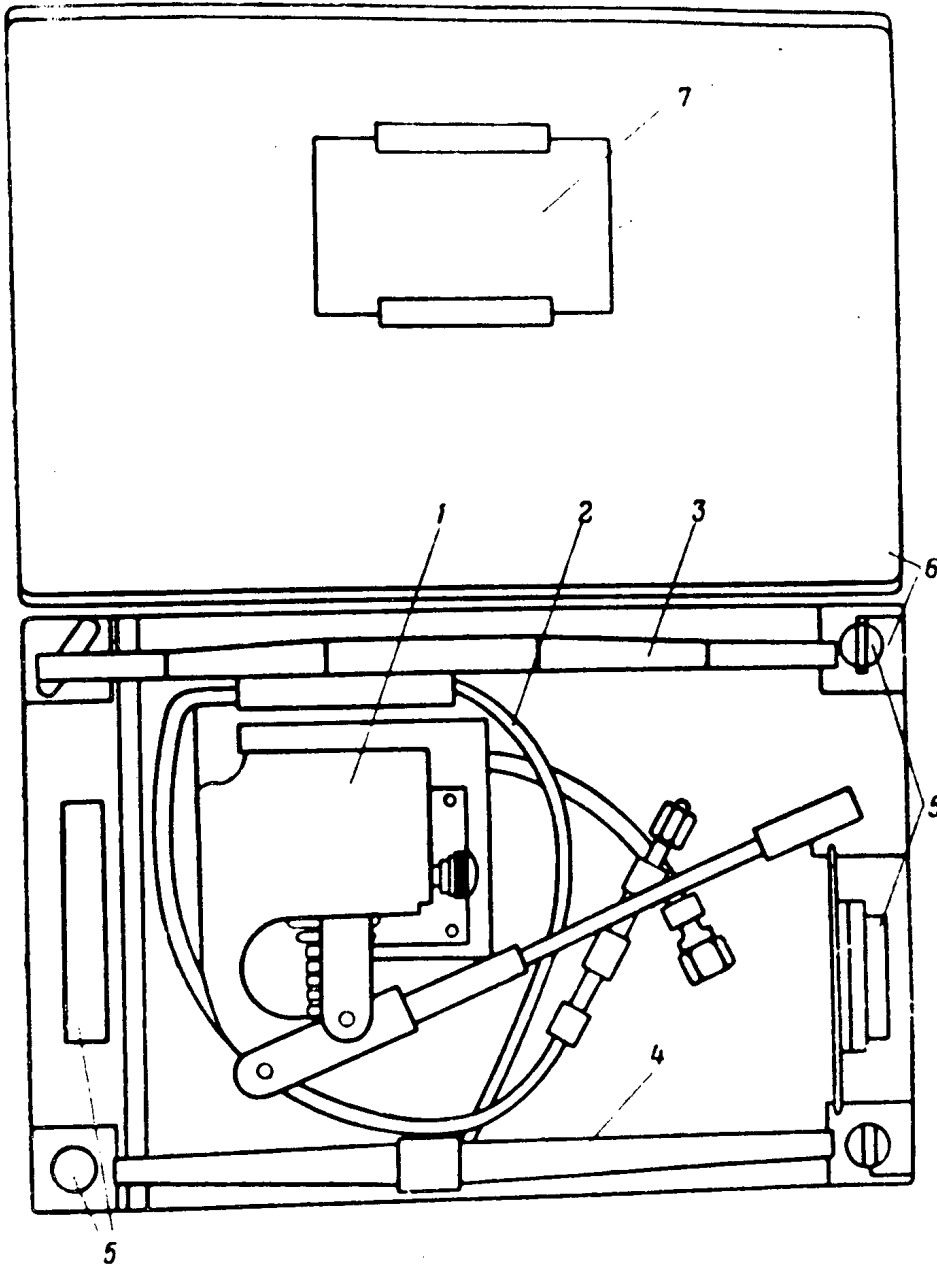


Fig.68. Parts of the air-hydraulic



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Fig 69. Packing of the air hydraulic pump.

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- 1. Pump
- 2. Hose
- 3. End of the handle
- 4. Handle
- 5. Recesses for packing the Z.I.P.
- 6. Case
- 7. Description of contents

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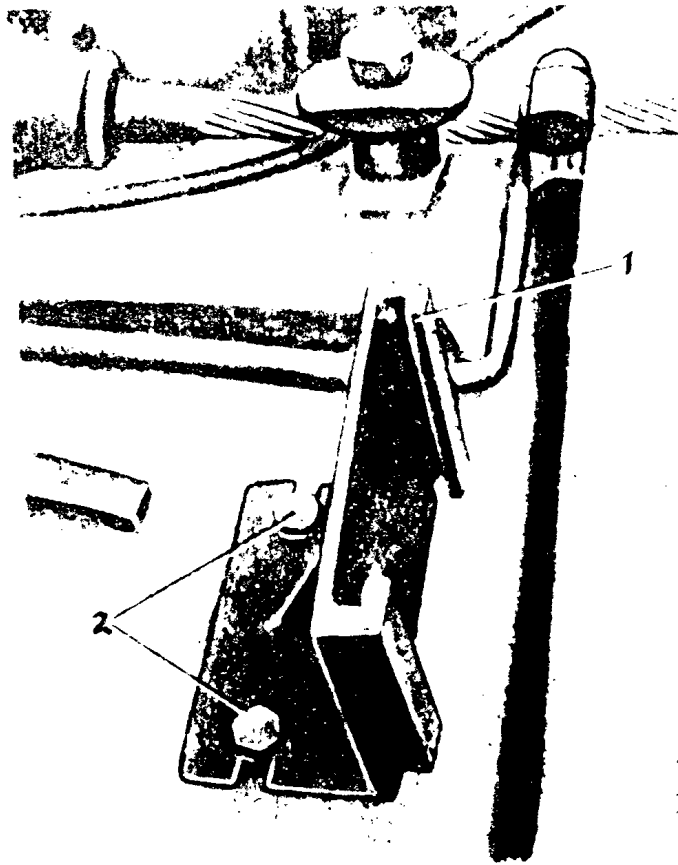


Fig 70. Layout of the 28-1050 bracket on the filling hatch of the fuel tank.

- 1. 28-1050 Bracket.
- 2. Bolts.

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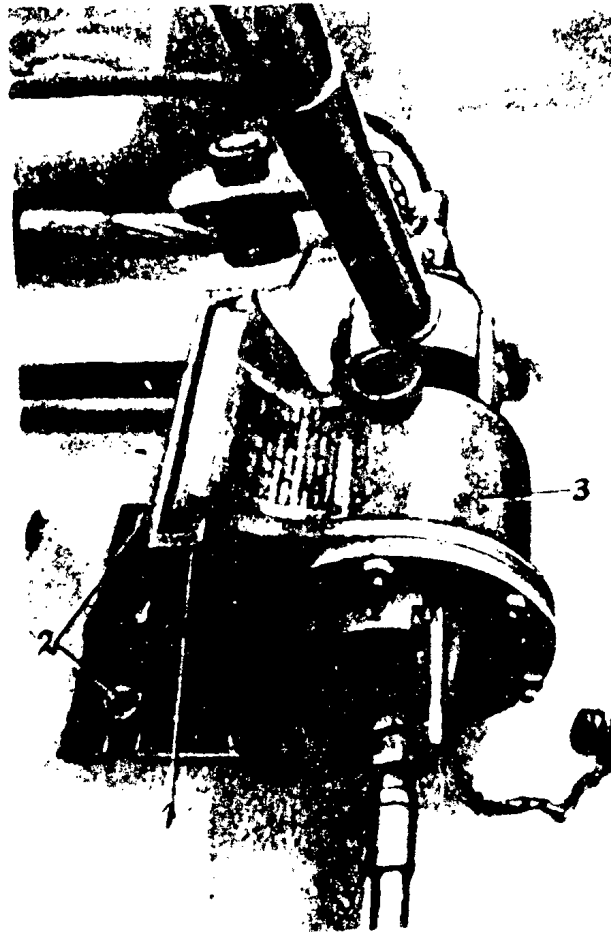


Fig 71. Layout of the pump for work.

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1. 28-1050 Bracket.
2. Bolts.
3. Air-hydraulic pump.(52-I-035)

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Fig 72. Tool for pushing in the recuperator piston.

- 1. Bush (42-100)
- 2. Nut (42-101)
- 3. Screw with tommy-bar (S6 42-101)

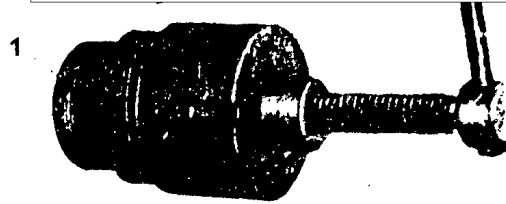
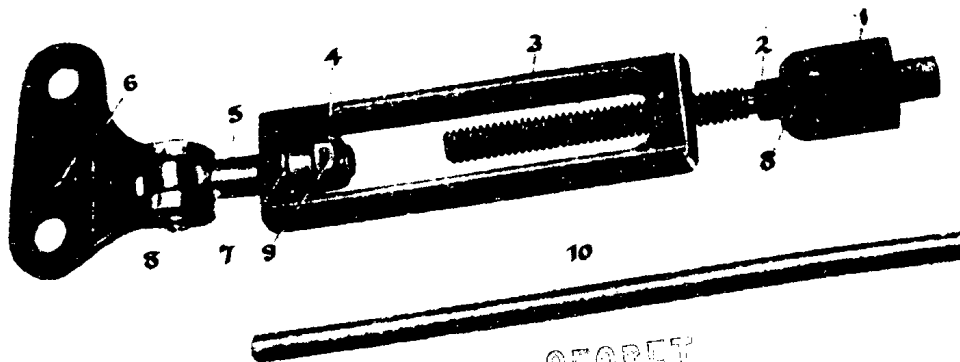


Fig 73. Tool for drawing out the Barrel.

- 1. Union joint (42-103)
- 2. Connecting rod(42-104)
- 3. Connecting piece (42-105)
- 4. Nut (42-106)
- 5. Connecting Rod (42-107)
- 6. Bracket (42-108)
- 7. Swivel bearing (A 71958-308)
- 8. Cylindrical pin (A 51011-51)
- 9. Split pin (A 51040-24)
- 10. Tommy-bar



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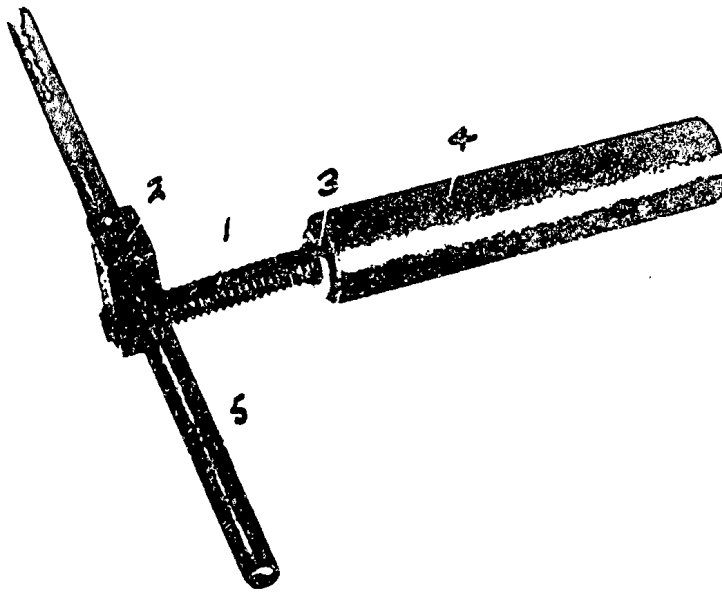
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Fig 74. Tool for determining the quantity of fluid in the recuperator.

1. Screw (42-507)
2. Nut (42-508)
3. Washer (42-509)
4. Tube (S6 42-409)
5. Tommy-bar (A 52844r6)

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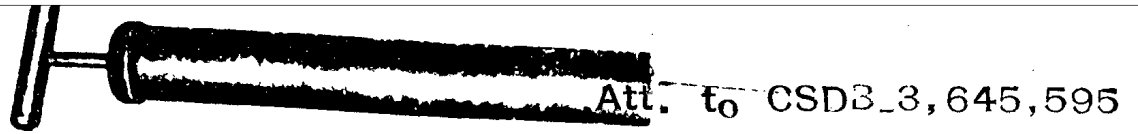


Fig 75. Syringe

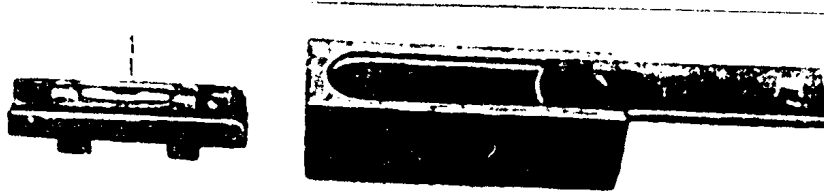


Fig 76. Spirit level and its case.

- 1. Spirit level (52-I-012)
- 2. Case for spirit level (S6 41-15)

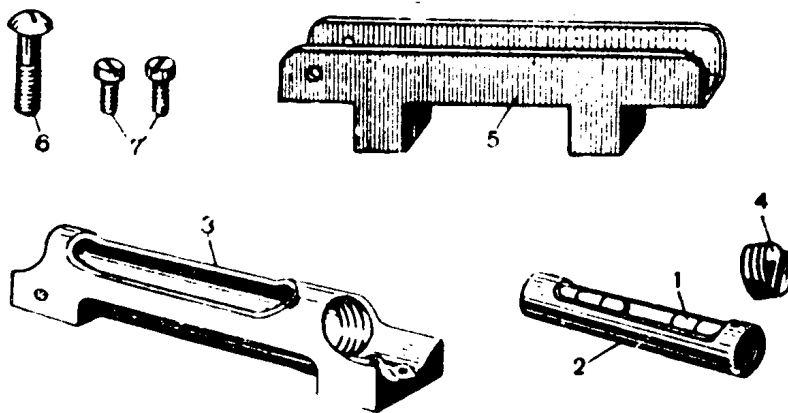


Fig 77. Parts of the spirit level

- 1. Glass level (ampoule)
- 2. Holder
- 3. Housing of the level
- 4. Cap of the housing
- 5. Base of the level
- 6. Axis of the level
- 7. Clamping and stop screws

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00 = Code of the armament factory.  
 200 Batch number & code of year of filling  
 100 = Calibre in mm.  
 H = Weight mark.

T = Code of explosive material  
 ОФ-412: Index of the shell

Полный = Full charge

УОФ-412: Abbreviated Index of the round.  
 100-44 } Calibre & designation of  
 100С4 и ТАНК } the system for which  
 the round is used.

НДТ 3 0 = Mark of the powder, batch  
 number, code of year of  
 preparation, mark of the  
 factory which prepared the  
 powder.

1-0-00 = Batch of assembly of  
 round, code of year of  
 assembly and number of  
 the arsenal (base) which  
 assembled the round.

φ = Designation of the  
 adulterant.

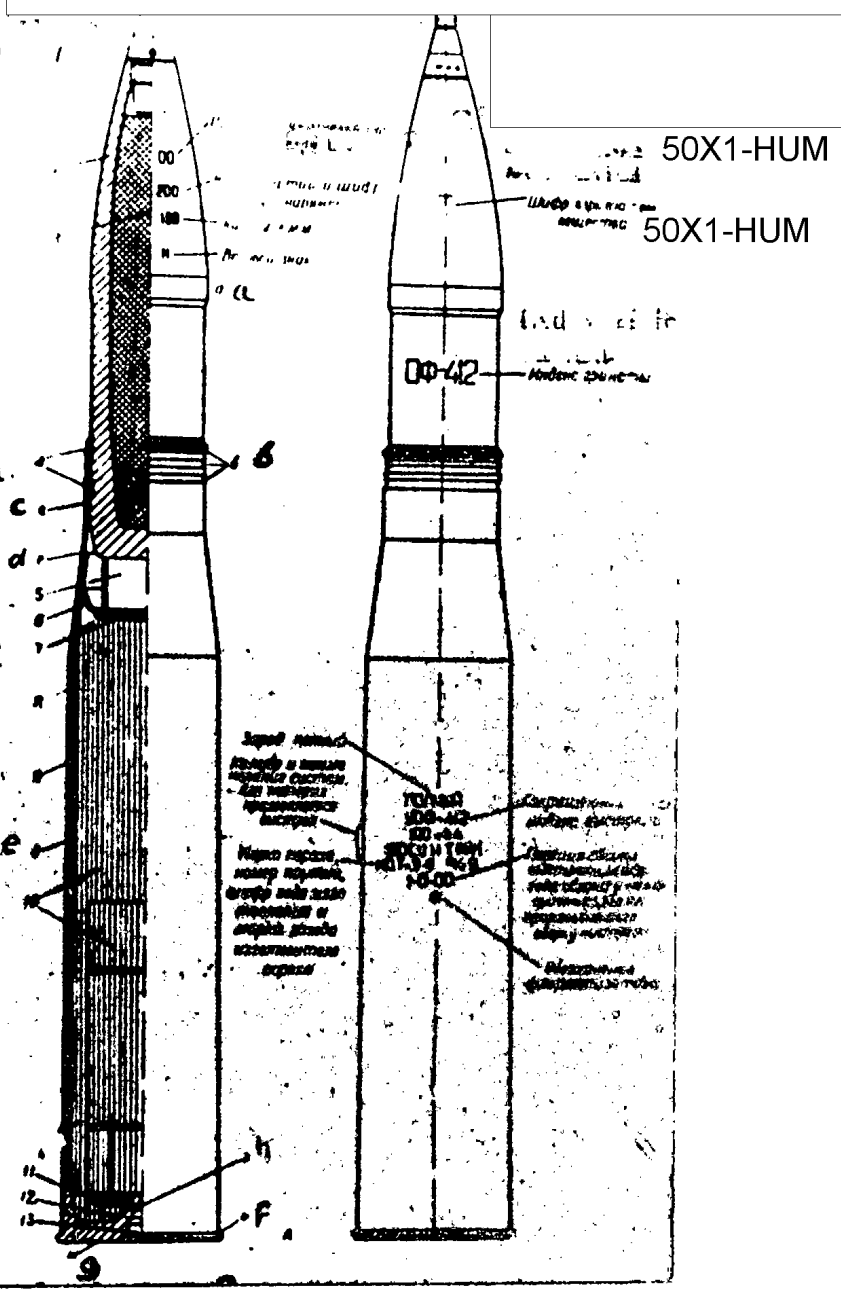


Fig. 78. 100m.m. round with fragmentation-H.E. OF-412 one-piece steel shell.

- |                       |  |
|-----------------------|--|
| A. With full charge.  | 12. Paper disc. with the charge mark.                |
| 1. Fuze.              | 13. KV-13 primer cup.                                |
| 2. Body of the shell. | a. Straightening shoulder.                           |
| 3. Explosive charge.  | b. Places where the neck is compressed on the bands. |
| 4. Driving bands.     | c. Neck.   |
| 5. Cylinder.          | d. Slope.  |
| 6. Obturator.         | e. Casing.   |
| 7. Anti-fouling.      | f. Flange.   |
| 8. Adulterant.        | g. Base.   |
| 9. Shell case.        | h. Nipple.   |
| 10. Powder charge.    |  |
| 11. Igniter.          |  |

- 00 = Code of armament
- 1-0 : Batch number and code of year of firing
- 100 H = Calibre in mm. & weight mark.
- A-IX-2 : Code of explosive material.
- БР = Mark of explosive
- БР : Index of shell
- УБР-42Д : Abbreviated index of round.
- НАТ 3  $\frac{3}{0}$  } Mark of the powder, number of batch, code of the year of preparation and mark of the factory preparing the powder
- 100-44 } Calibre & designation of the system for which the round is used.
- 100-С4 и ТАИК }
- 12-0-00 = Batch of assembly of round, code of year of assembly and number of arsenal (base) which assembled the round.
- Ф : Designation of the adulterant.

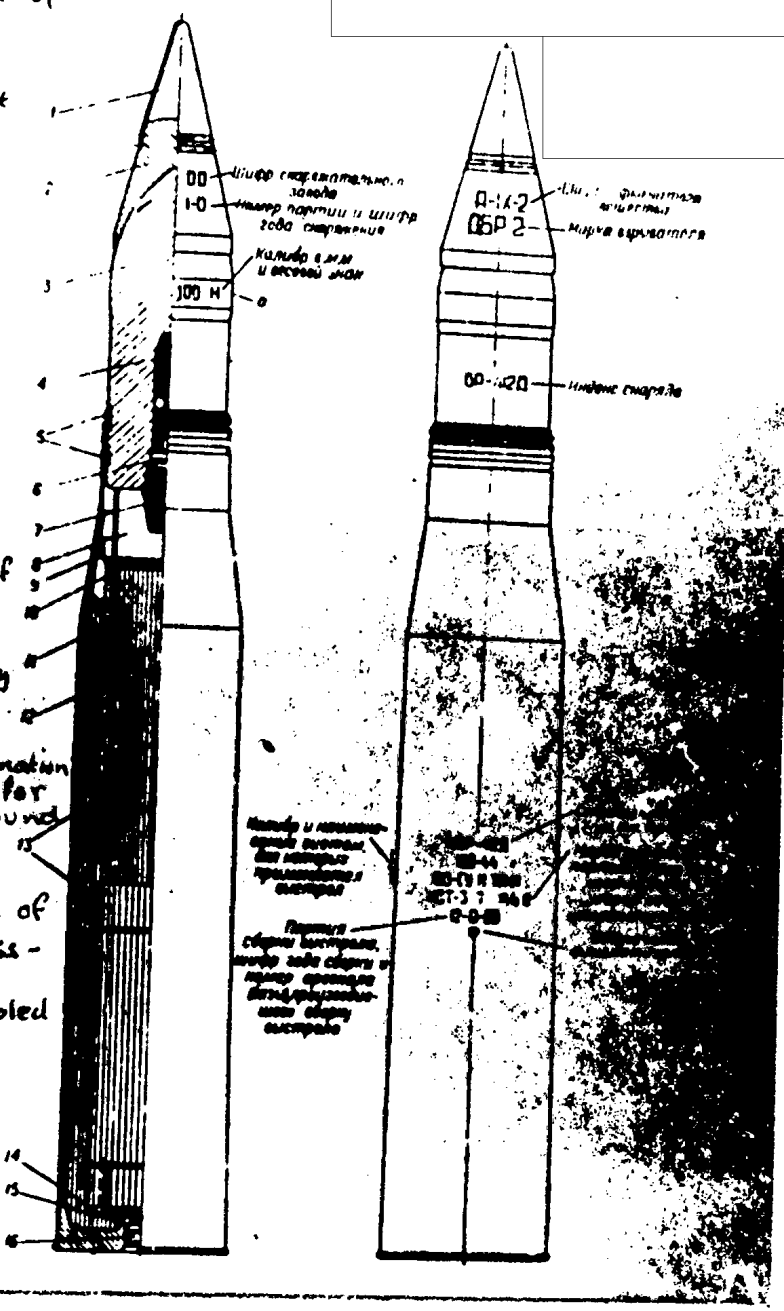


Fig. 79. 100m.m. round with B.R.-412D armour piercing tracer shell.

- |                         |                    |
|-------------------------|--------------------|
| 1. Ballistic cap.       | 9. Obturator.      |
| 2. Armour piercing cap. | 10. Anti-fouling.  |
| 3. Body of the shell.   | 11. Adulterant.    |
| 4. Explosive charge.    | 12. Shell case.    |
| 5. Driving bands.       | 13. Powder charge. |
| 6. Fuze.                | 14. Igniter.       |
| 7. Tracer.              | 15. Paper disc.    |
| 8. Cylinder.            | 16. Primer cap.    |

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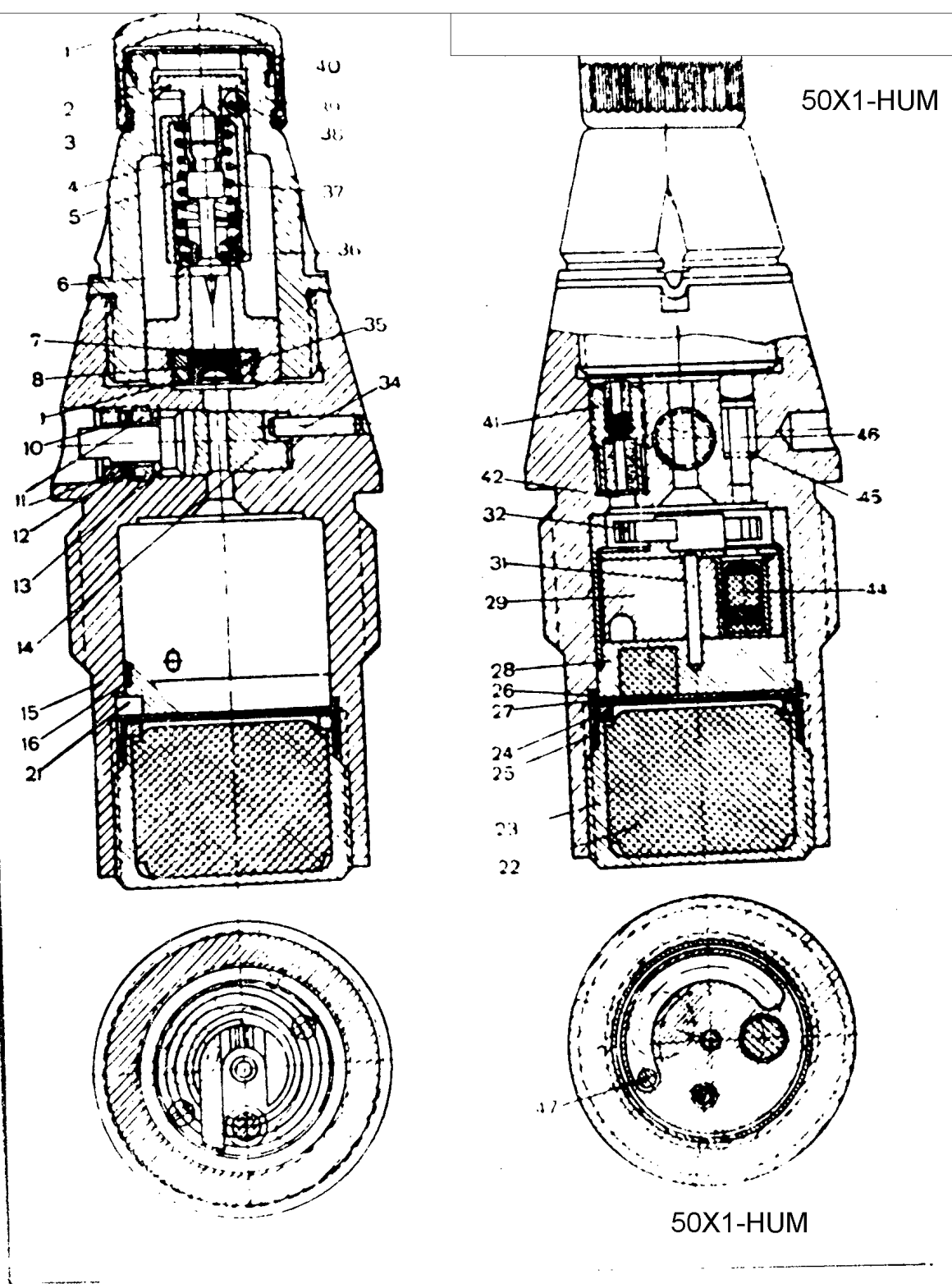


Fig.80. RGM-6 Fuse ( sectional view ). **SECRET**

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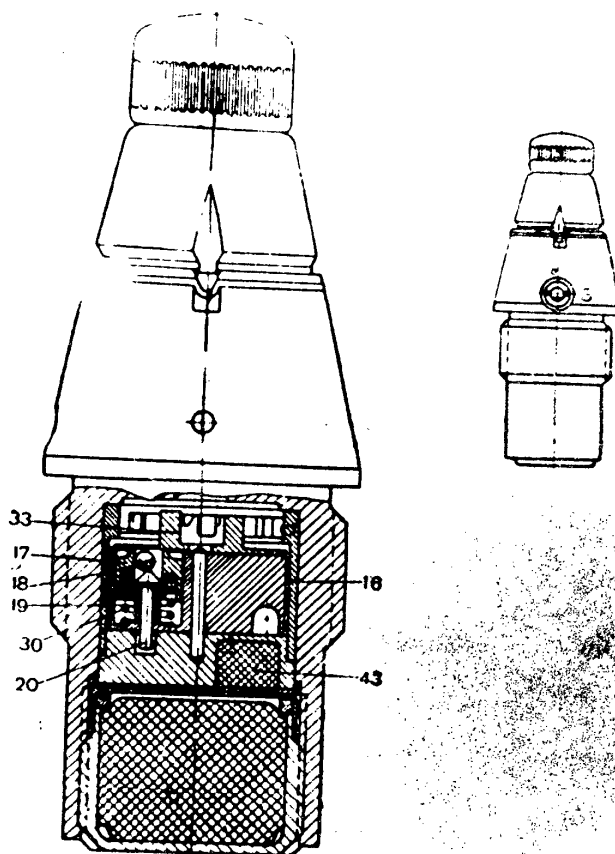
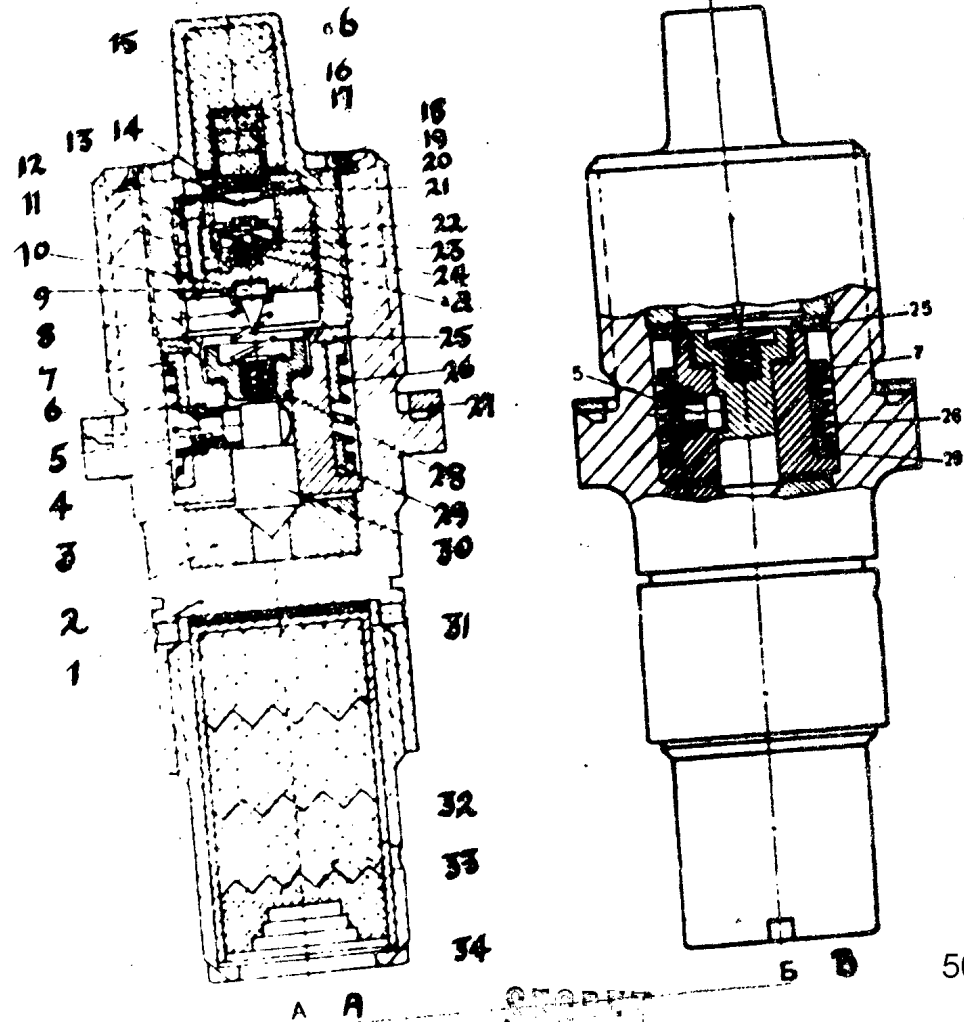


Fig. 80 R.G.M. Fuze.

- |                                       |  |
|---------------------------------------|--|
| 1. Cap.                               | 17. Yielding bush.                         |
| 2. Firing pin holder.                 | 18. Stop ball.                             |
| 3. Silk thread.                       | 19. Firing spring.                         |
| 4. Yielding sleeve.                   | 20. Catch.                                 |
| 5. Firing spring.                     | 21. Dowel.                                 |
| 6. Plunger.                           | 22. Tertranitromethylaniline<br>detonator. |
| 7. Paper pad.                         | 23. Bottom bush.                           |
| 8. Friction primer.                   | 24. Washer.                                |
| 9. Paper pad.                         | 25. Cap.                                   |
| 10. Leather ring.                     | 26. Lead bearing disc.                     |
| 11. Bushes.                           | 27. Lead disc.                             |
| 12. Washer.                           | 28. Detonator bush.                        |
| 13. Lead ring.                        | 29. Revolving bush.                        |
| 14. Tap.                              | 30. Safety spring.                         |
| 15. Housing.                          | 31. Axis.                                  |
| 16. Lining.                           |  |
| 32. Revolving spring.                 | 40. Membrane.                              |
| 33. Cover.                            | 41. Sleeve with retarder.                  |
| 34. Cotter pin.                       | 42. Disc under the retarder.               |
| 35. Bush under the<br>primer element, | 43. Transmission charge.                   |
| 36. Ball.                             | 44. Detonator.                             |
| 37. Firing pin.                       | 45. Cotter pin.                            |
| 38. Ball.                             | 46. Plunger.                               |
| 39. Head bush.                        | 47. Stop.                                  |

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Fig. 81. DBR-2 fuze.

- |     |                        |     |                   |     |                  |
|-----|------------------------|-----|-------------------|-----|------------------|
| A.  | Section.               | 11. | Sleeve.           | 25. | Ring.            |
| B.  | On firing.             | 12. | Cover.            | 26. | Spring.          |
| C.  | In flight.             | 13. | Ring.             | 27. | Closing ring.    |
| D.  | On landing.            | 14. | Pad.              | 28. | Friction primer. |
| 1.  | Housing.               | 15. | Detonator socket. | 29. | Lower sleeve.    |
| 2.  | Split washer.          | 16. | Cloth pad.        | 30. | Firing pin.      |
| 3.  | Firing pin bush.       | 17. | Detonator.        | 31. | Packing.         |
| 4.  | Spring.                | 18. | Aluminium ring.   | 32. | Tracer housing.  |
| 5.  | Catch.                 | 19. | Bearing.          | 33. | Tracer.          |
| 6.  | Cup.                   | 20. | Plastic ring.     | 34. | Celluloid disc.  |
| 7.  | Upper sleeve.          | 21. | Diaphragm.        | a.  | Booster.         |
| 8.  | Counter safety spring. | 22. | Valve bush.       | b.  | Tertranitrometh- |
| 9.  | Firing pin.            | 23. | Valve spring.     |     | ylaniline.       |
| 10. | Brush.                 | 24. | Valve.            |     |                  |

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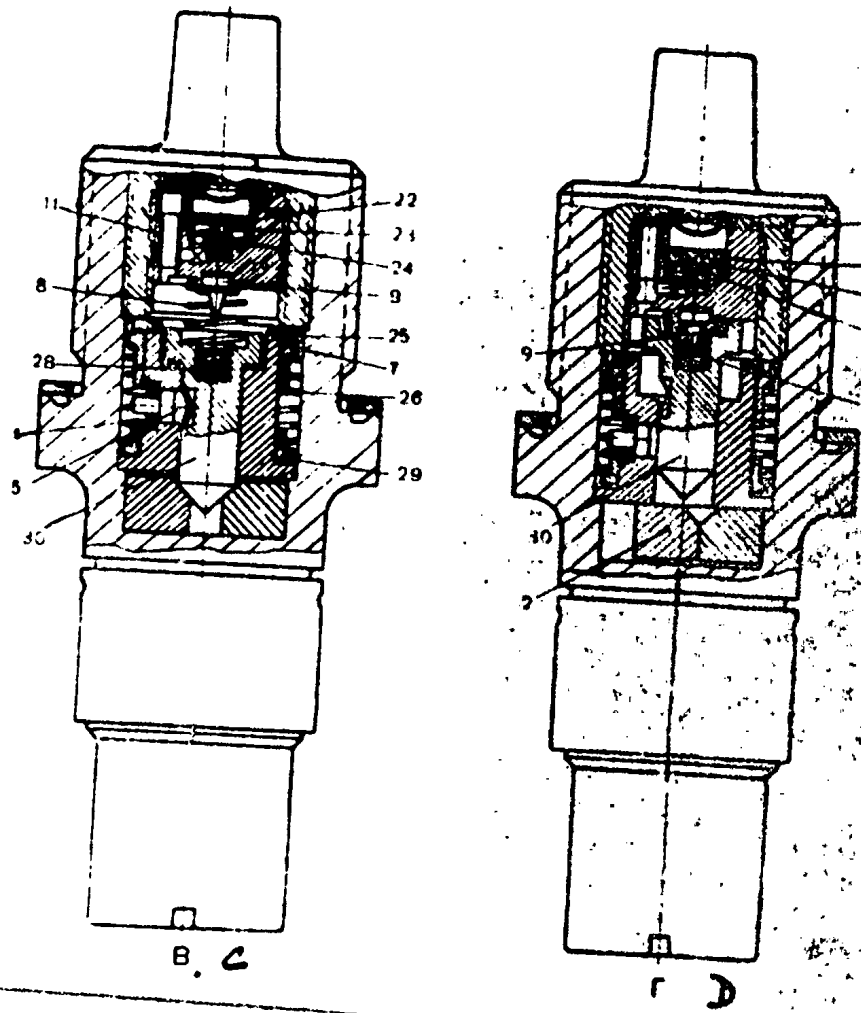


Fig. 81. DBR-2 Fuze.

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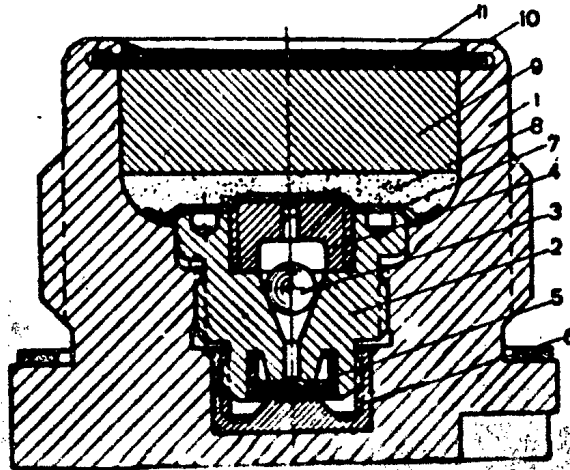


Fig 82. K.V. Primer cup

- |    |                 |     |   |
|----|-----------------|-----|---|
| 1. | Housing         | 7.  | Packing made of saltpetre treated paper |
| 2. | Anvil           | 8.  | Powder filling                          |
| 3. | Closing ball    | 9.  | Powder detonating cartridge             |
| 4. | Bush            | 10. | Closing ring                            |
| 5. | Friction primer | 11. | Brass disc                              |
| 6. | Obturator       |     |   |

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ЖН-412 Р = Index of charge

РАЗРЯД = Designation of charge

100 СУ И ТАНК = Calibre and designation of system for which charge is used

НДТ-39 19/1 00 = Mark of powder, batch number, code of year of preparation and mark of the factory which prepared the powder

5-0-00 = Batch of assembly of the charge in the shell case, code of year of assembly and number of the arsenal (base) which assembled the shell.

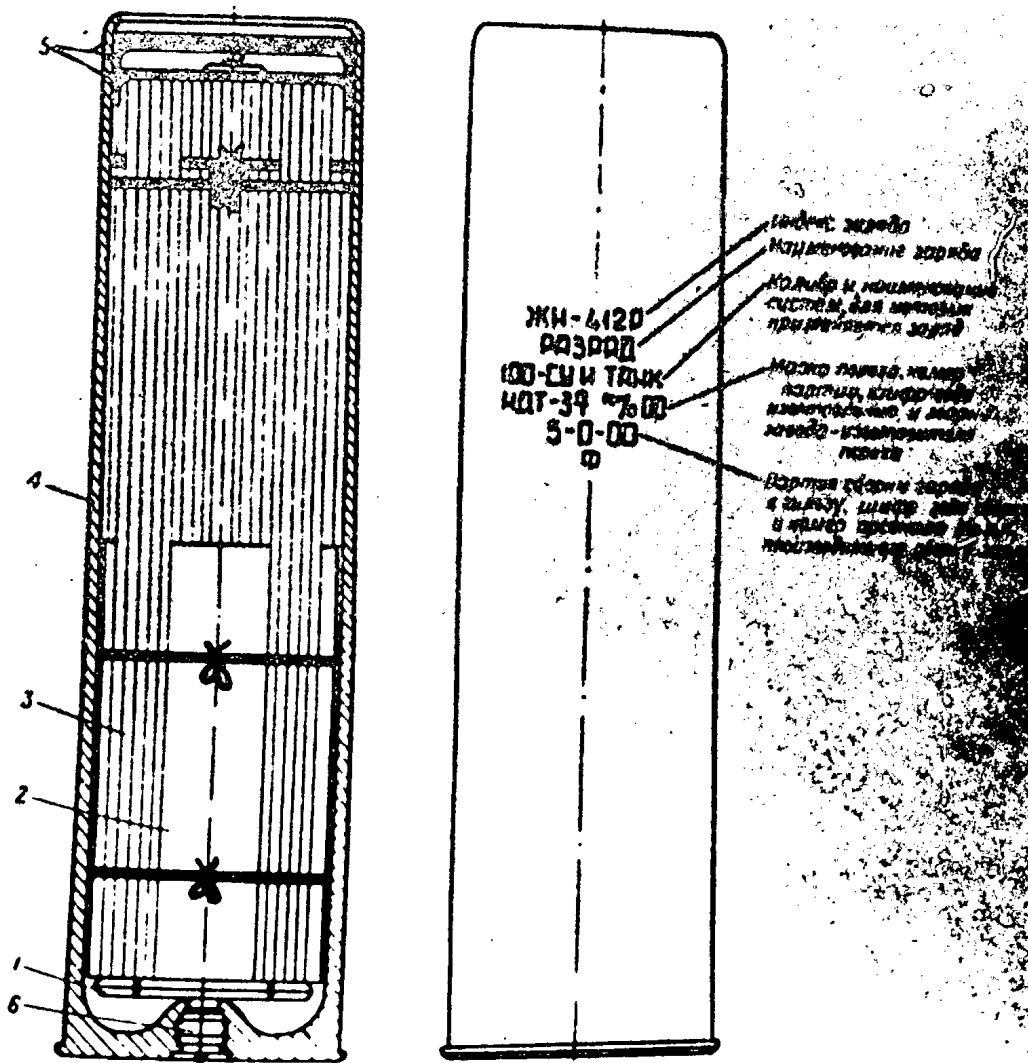


Fig. 83. Discharge charge.

- 1. Igniter.
- 2. Adulterant..
- 3. Powder type NDT-3 19/1.
- 4. Shortened shell case.
- 5. Normal and strengthened covers.
- 6. KV-13 primer cup.



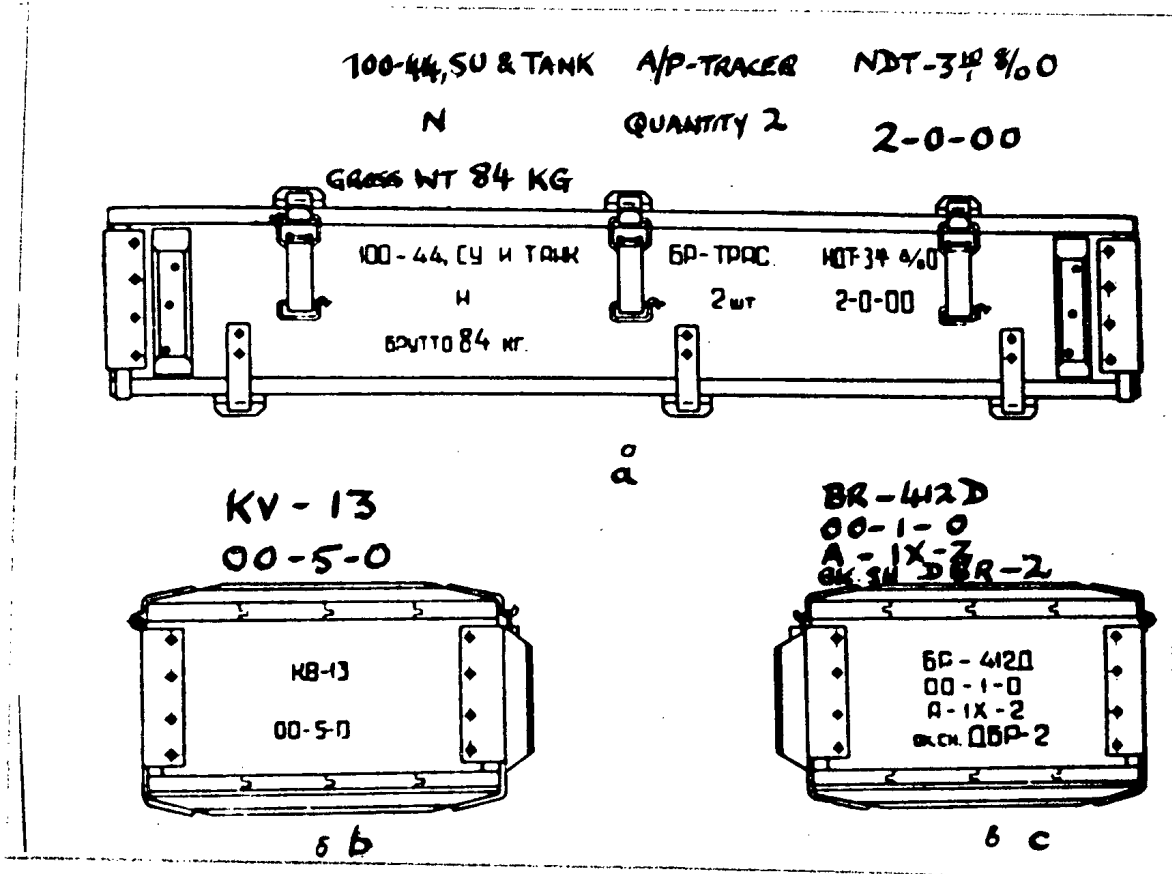
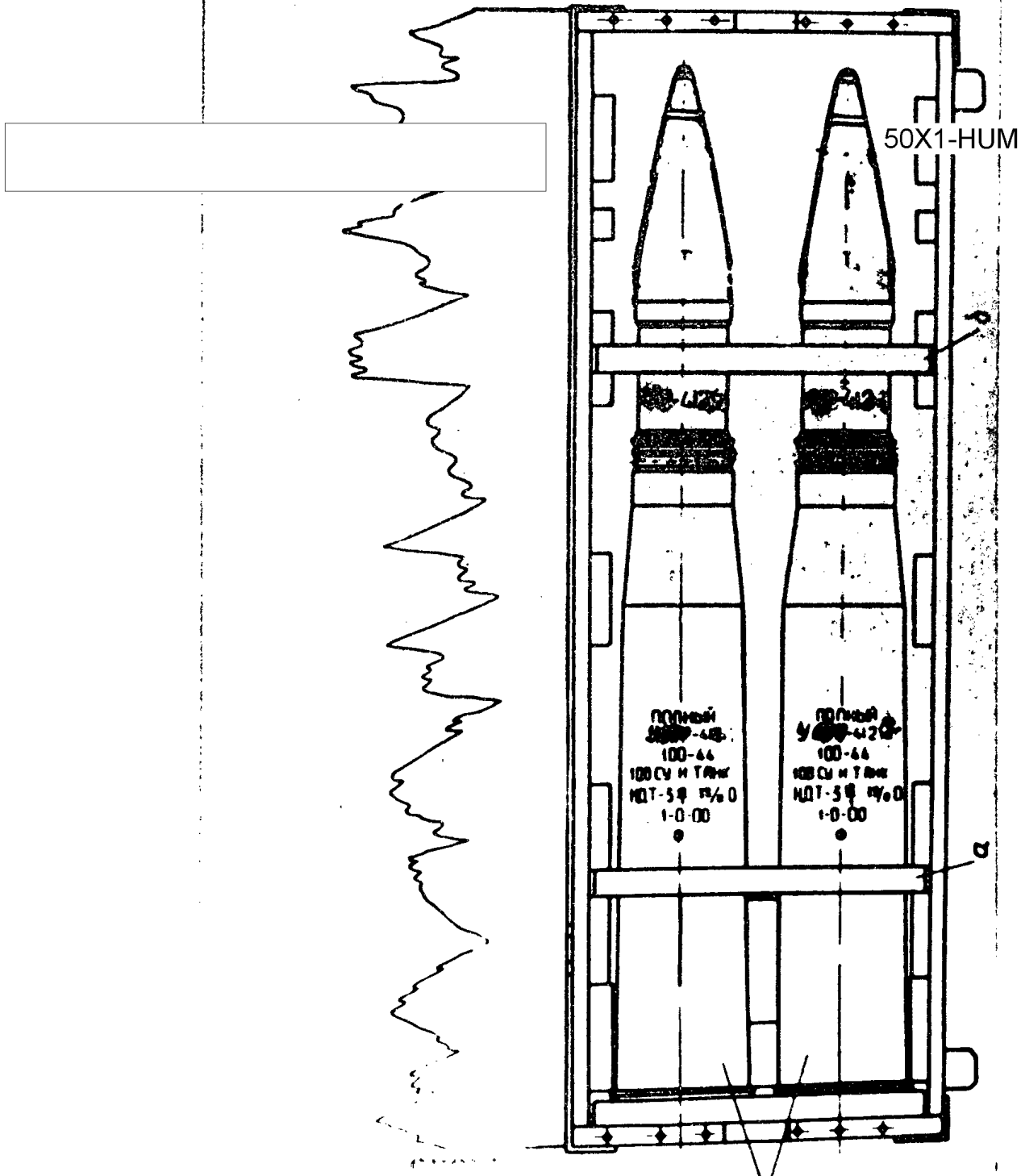


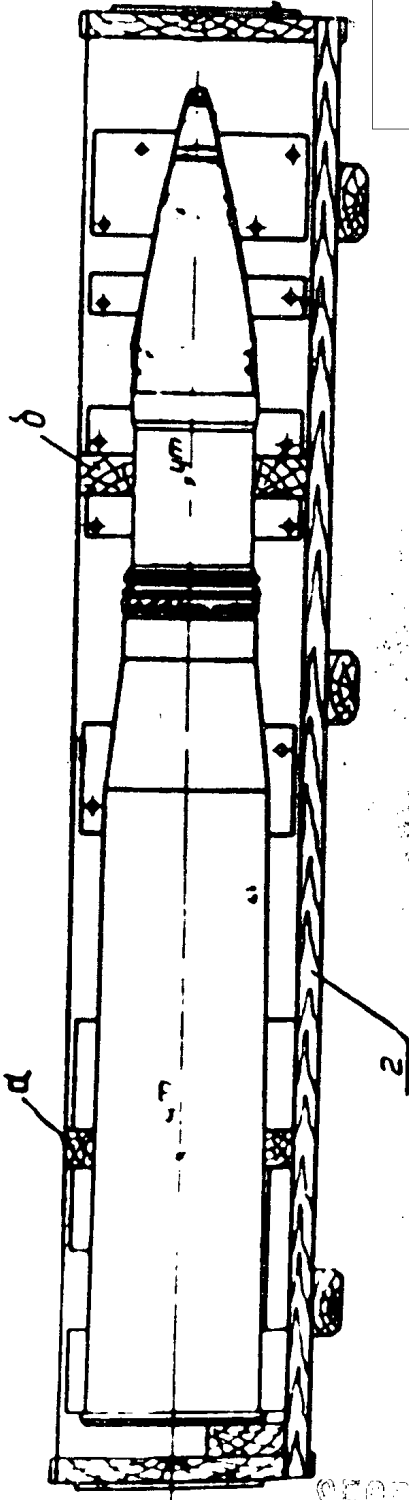
Fig 85. Marking on the case for 100 mm rounds with BR-412D armour-piercing shells with armour-piercing and ballistic caps.

- a - on the top side of the case.
- b - on the left end of the case.
- c - on the right end of the case.

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- 1. Round with OF-412 fragmentation-H.E. shell.
- 2. Packing case **NOFORN**
- a. Removable battens for fixing the rounds in the case. 50X1-HUM
- b. Removable battens for fixing the rounds in the case.
- 3. Removable battens for fixing the rounds in the case.





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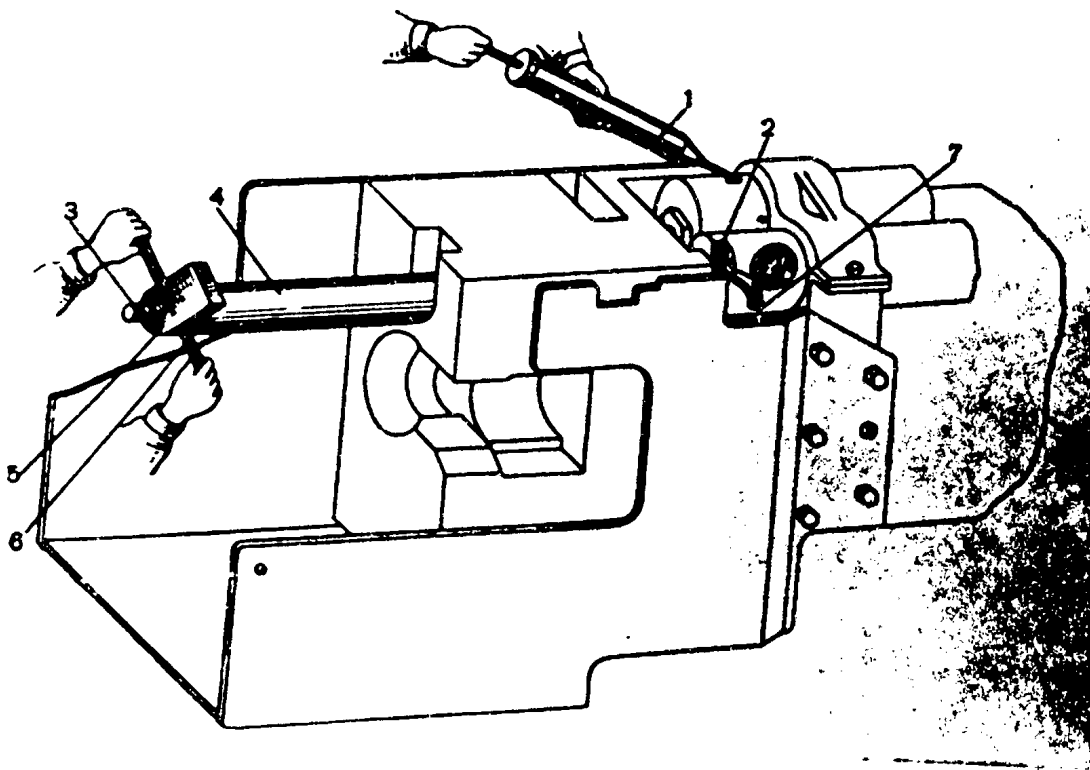


Fig 87. Adding fluid to the recoil brake and determining the quantity of fluid in the recuperator.

- |                            |                       |
|----------------------------|-----------------------|
| 1. Syringe                 | 5. Nut                |
| 2. Valve                   | 6. Tommy-bar          |
| 3. Cover of the instrument | 7. Cover of T - joint |
| 4. Tube                    |                       |

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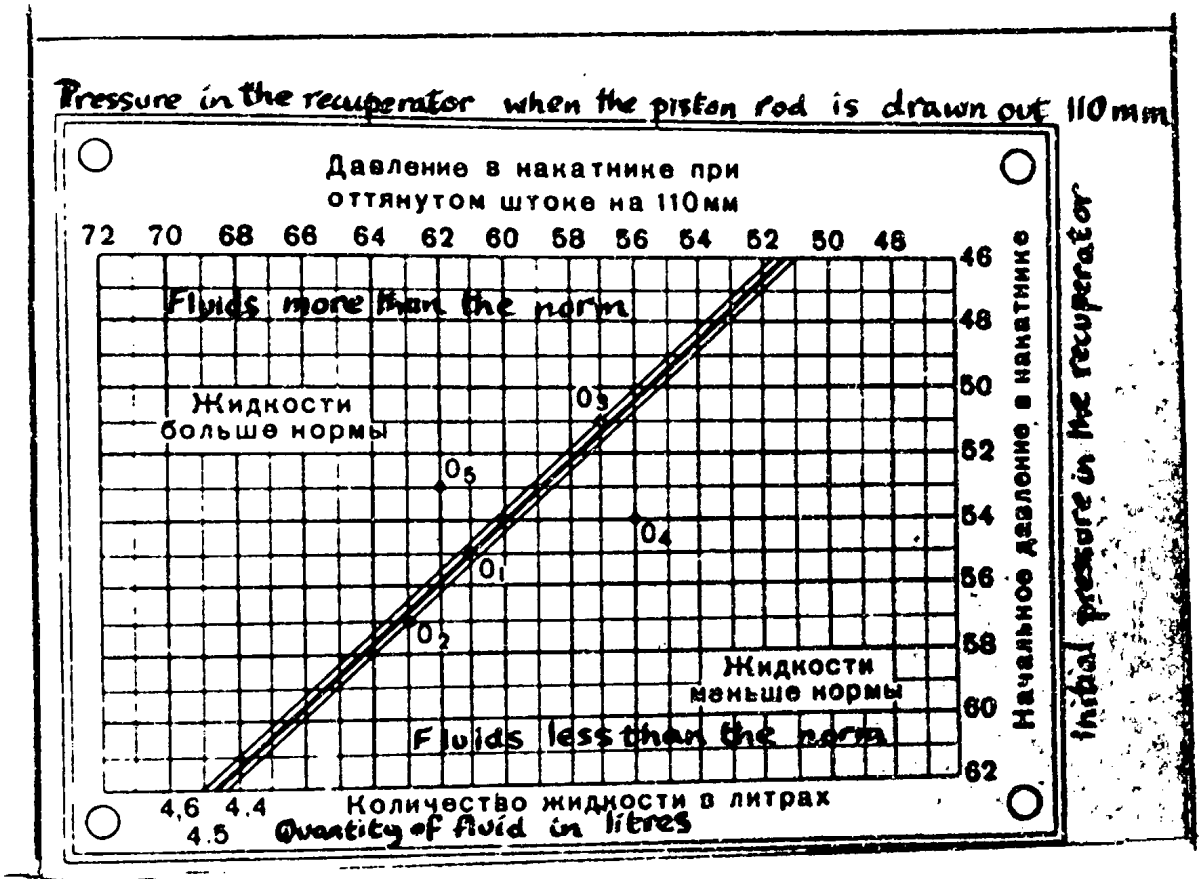
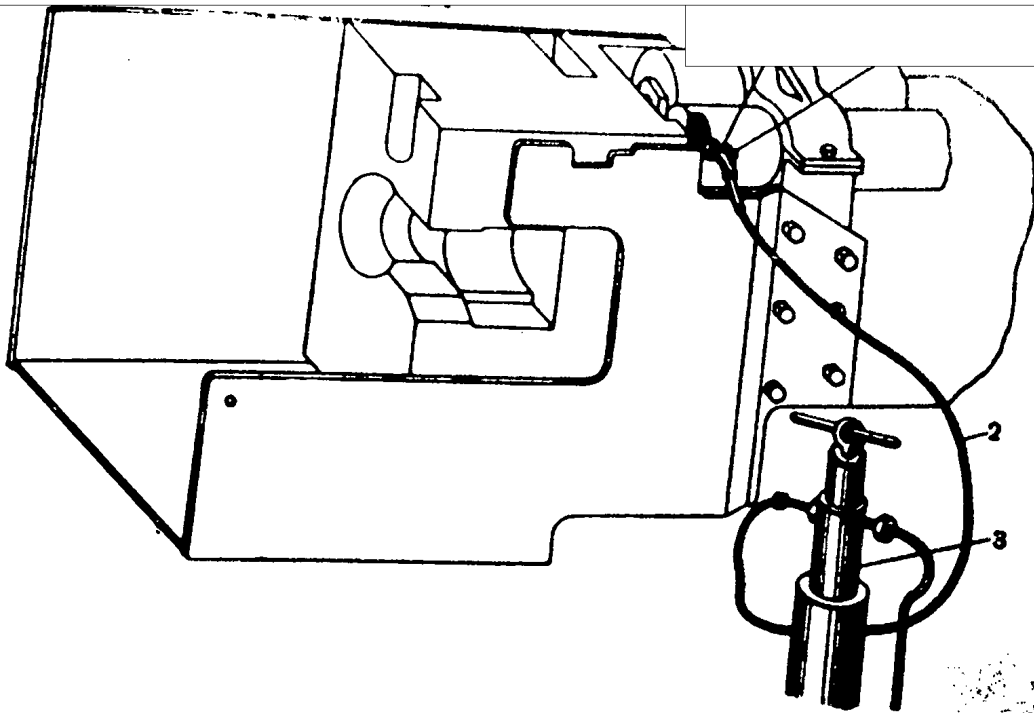


Fig 88. Graph for determining the quantity of fluid in the recuperator.

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- 1. T-joint
- 2. Double action pump hose
- 3. Double action pump
- 4. Stopper

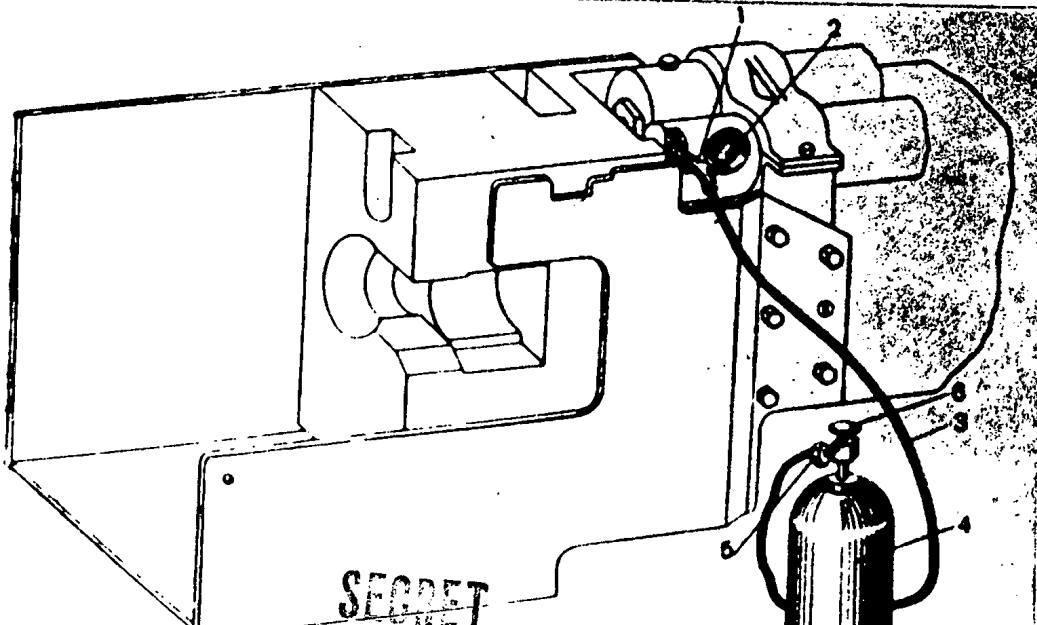


Fig 90. Adding nitrogen (air) to the recuperator.

- 1. T-joint
- 2. Manometer
- 3. Hose
- 4. Nitrogen cylinder
- 5. Transition connecting pipe (41-260)
- 6. Flywheel



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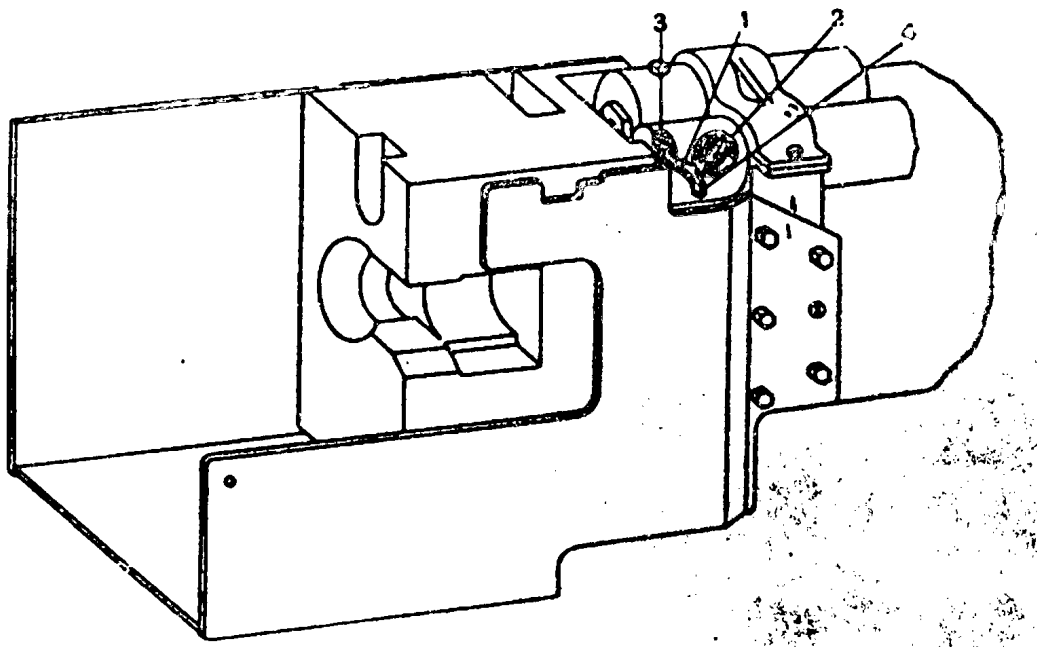


Fig 91. Determining the pressure in the recuperator.

- 1. T-joint
- 2. Manometer
- 3. Valve
- 4. Cap

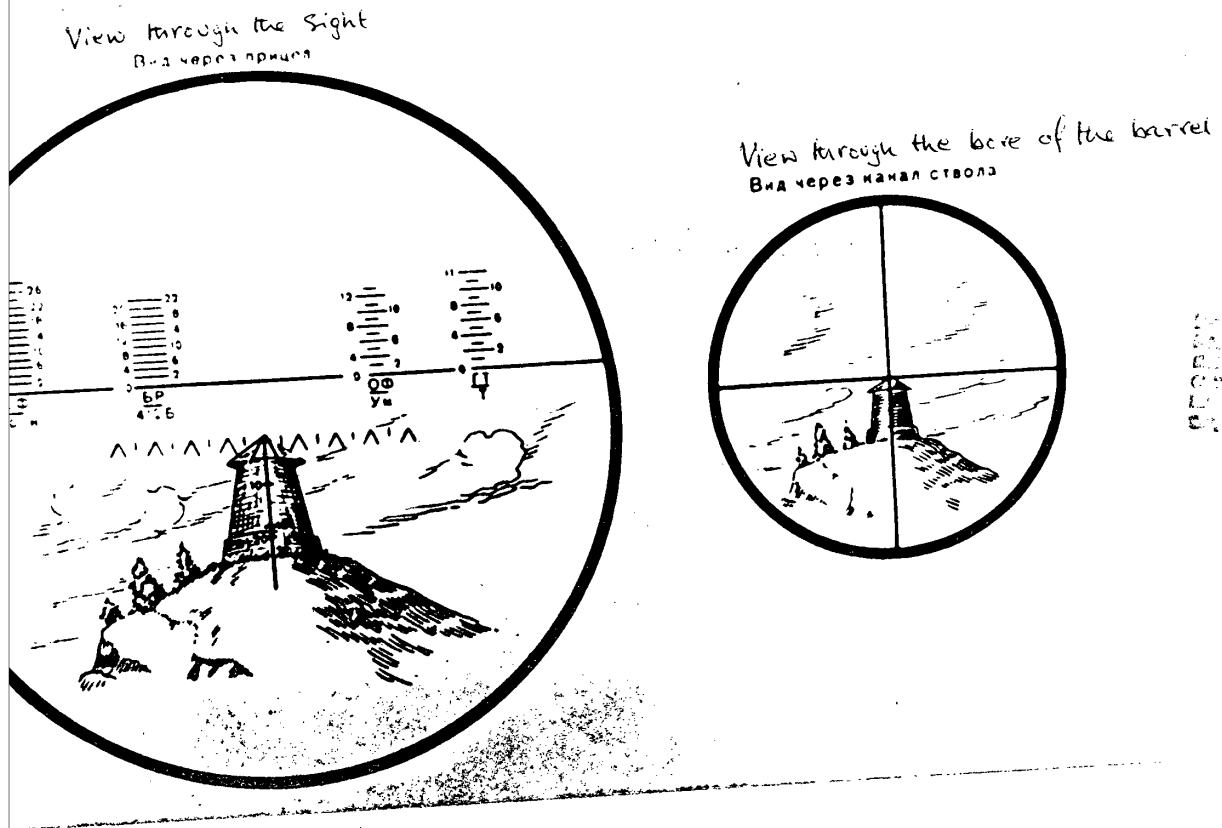
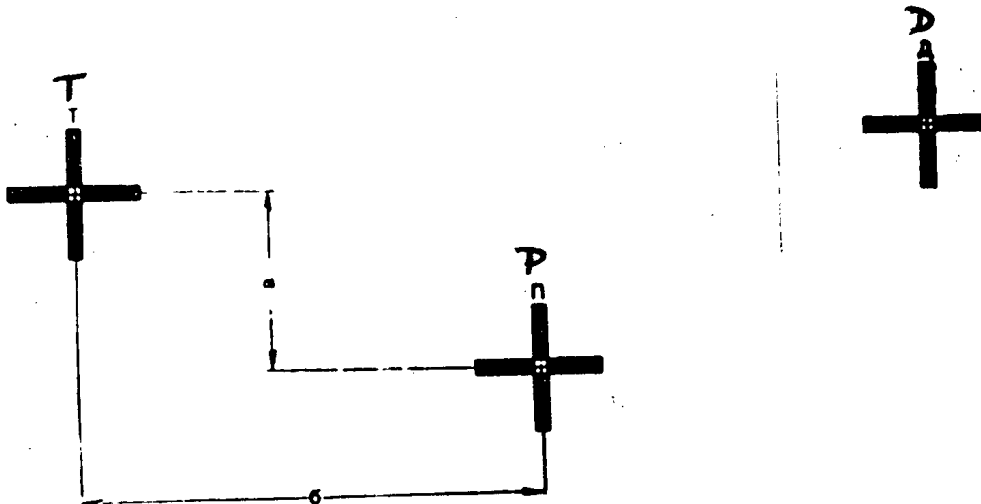


Fig. 92. Checking TSh2-22 tank telescopic jointed sights on a distant point.

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DESIGNATION OF THE SIGHT	DRAWING NO. OF BRACKETS FOR FIXING SIGHTS	Co-ORDINATES IN MM	
		a	b
TSh-2-22	09-212 WITH GUN No. 2638	16	375
TSh-2-22	09-212 WITH GUN No. A 304 A 0501	21	390

Fig. 93. Arrangement of co-ordinates for checking TSh-2-22 tank telescopic jointed sights.

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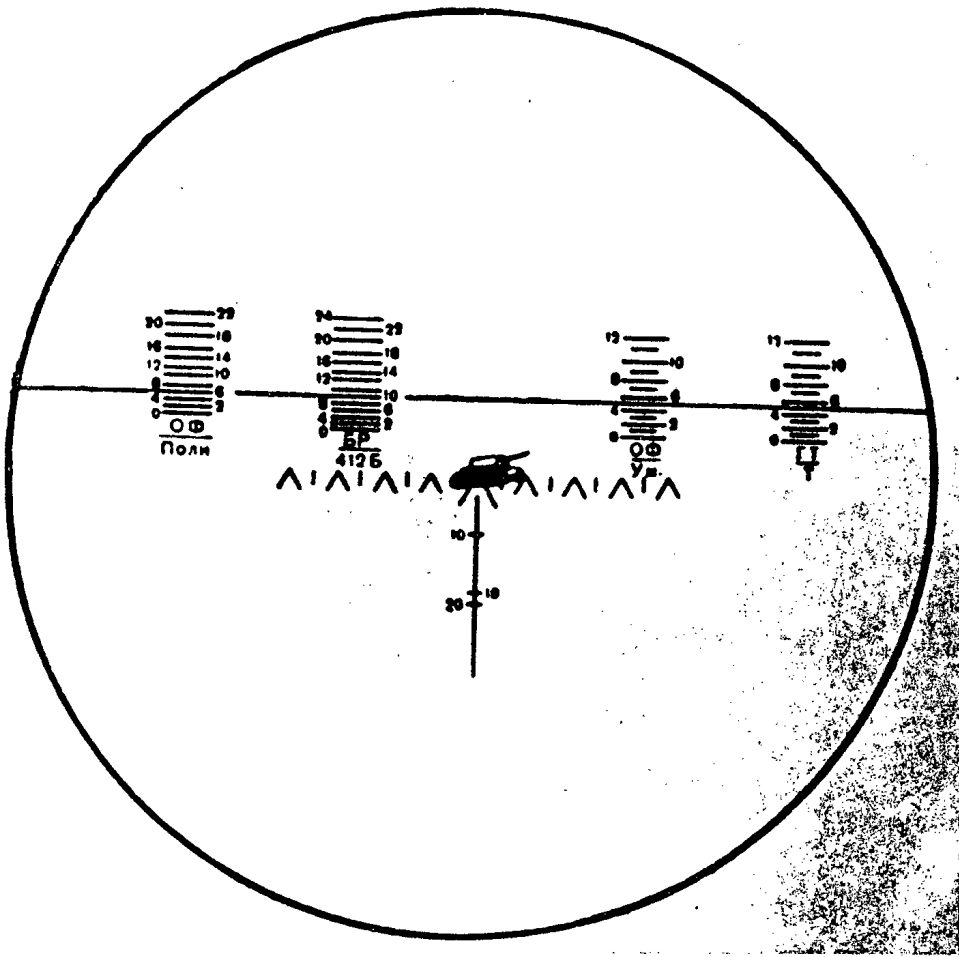


Fig 94. View in the field of vision of the TSh 2-22 sight v firing on a halted tank using an A/P tracer shell with elevation 10 and lateral correction.0.

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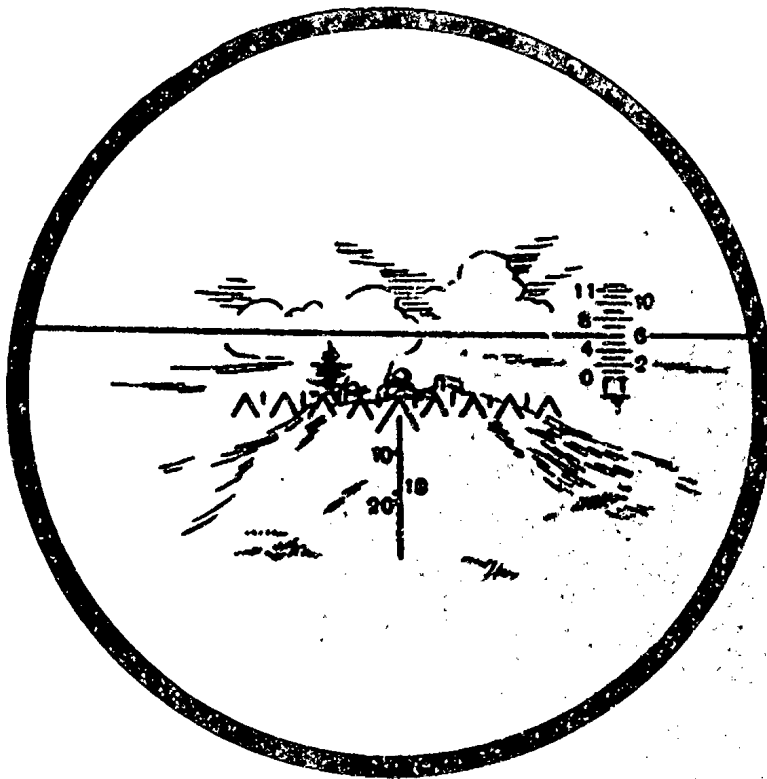


Fig 95. View in the field of vision of the TSh 2-22 sight when firing on infantry with the machine gun with elevation 6 and lateral correction 0.

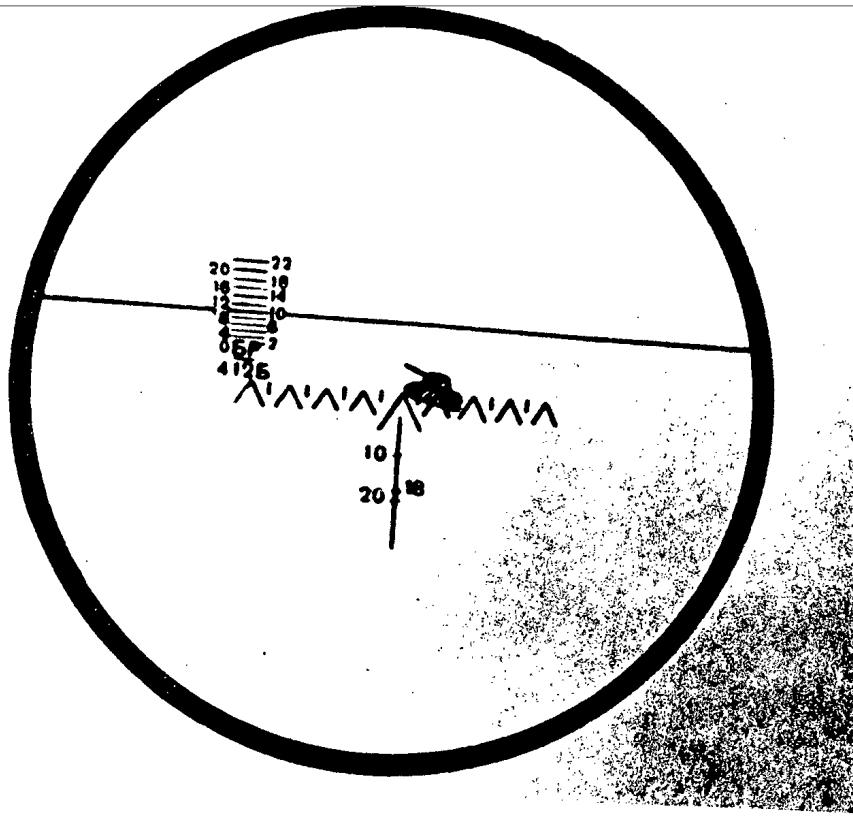


Fig 96. View in the field of vision of the TSh 2-22 sight when firing on a moving tank using A/P tracer shell with elevation 10 and lateral correction 0-08.

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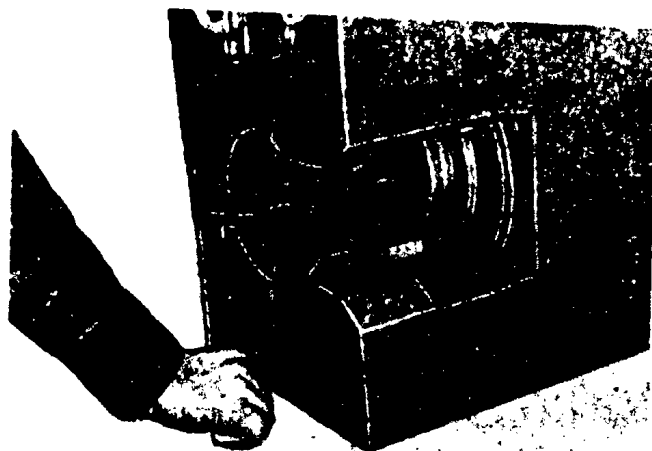


Fig 97. Withdrawing a shell case using a hand powered extractor.

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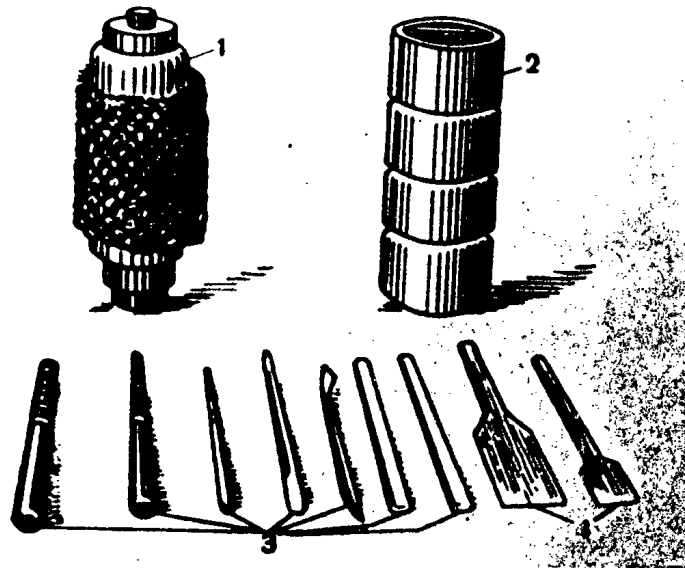


Fig 98. Equipment for cleaning the gun.

1. Brush (S6 41-400 called according to diagram "Brush 110")
2. Wooden wad.
3. Outfit of wooden rods for cleaning holes and groove
4. Wooden trowels for applying grease

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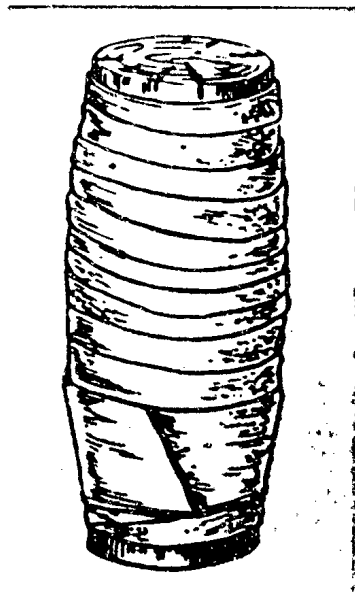


Fig 99. Wad wound round with rag (fabric strip).

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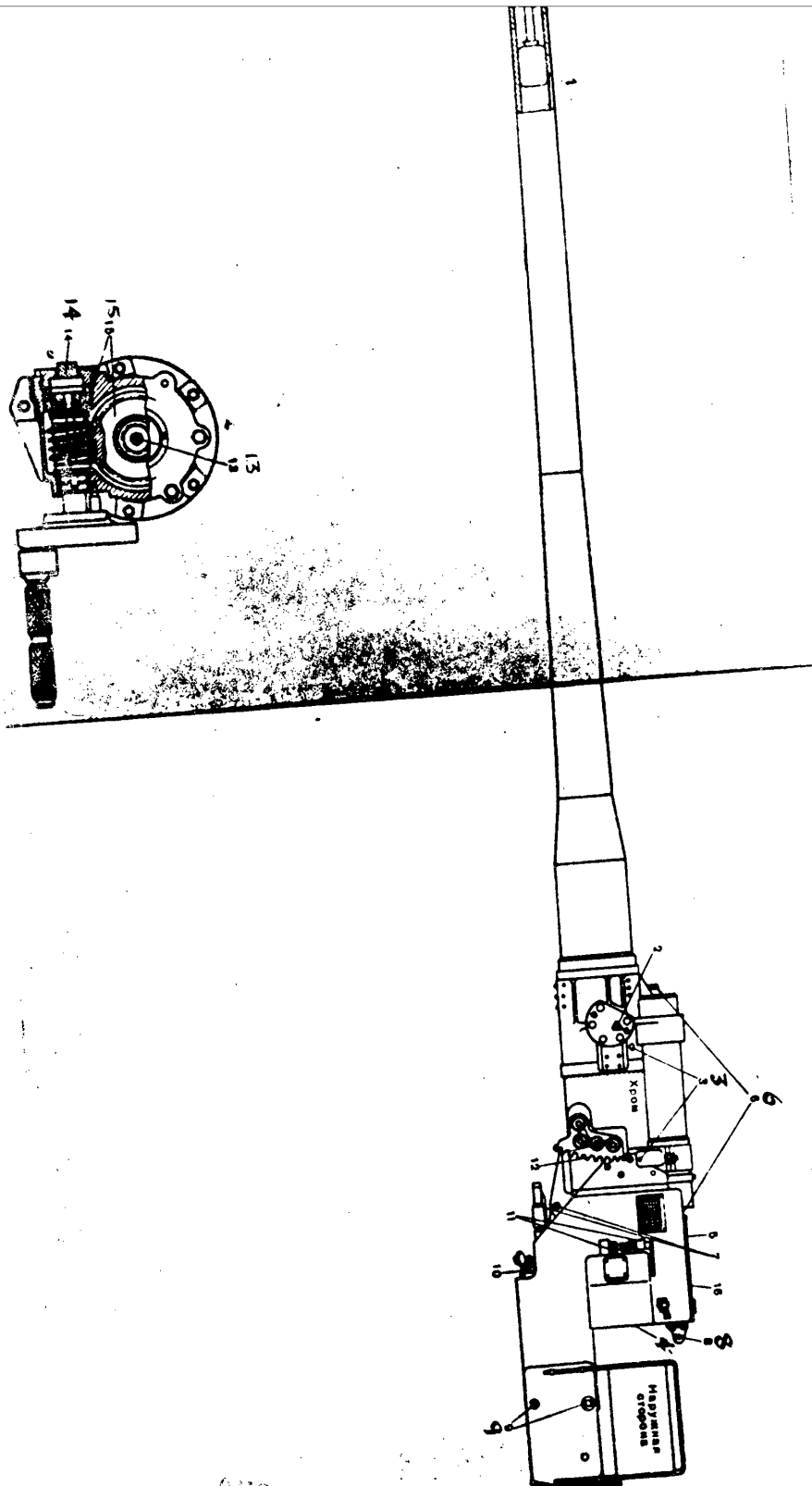


Fig 100. Plan for lubricating the gun (cf. Appendix 3)