

ARTICLE TPB-2

TECHNICAL DESCRIPTION
AND SERVICE MANUAL

3.803.024 TO

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04.04

INTRODUCTION

The technical description and service manual provide the user with information about the article TPB-2. The document contains specifications, information on design and type of operation, as well as the main requirements for the correct operation of the article. The document also covers the details of proper maintenance of the article.

TECHNICAL DESCRIPTION

1 APPLICATION

The article TPB-2 is designed for ground and air observation from the stationary and temporary observation posts in the daylight and in the nighttime with its searchlights on.

The device can be used at a temperature ranging from -50° to 50°C . Relative humidity shouldn't exceed 98%.

2 SPECIFICATIONS

The main parameters and dimensions of the article are shown in tab. 1.
Table 1

Specification	Value
Magnification	15x
Field of view, degrees	6
Exit pupil diameter, mm	7.3
Entrance pupil diameter, mm	110
Pupil relief, mm	15
Resolution	4''
Parallax between the image of the object remote to infinity and the reticle	1'
Light transmission, %	50
Interpupillary distance, mm	59-72
Diopter adjustment	-3 to +12
Overall dimensions, mm:	
length	445
width	318
height without tripod	320
Transporting case dimensions, mm:	
length	565
width	545
height	325
Net weight, kg	14.8
Gross weight, kg	35

3 COMPOSITION

The composition of the article is shown in tab. 2.
Table 2

Designation	Name of the part	Quantity
3.803.024	Article TPB-2	1
	Spare parts	
5.883.033	Desiccator	2
5.183.003	Round level	1
	Tools	
8.392.030	Wrench	1
6.890.030-08	Screwdriver	1
	Accessories	
6.430.256	Cap	2 (to be placed on device)
6.430.257	Cap	2 (to be placed on device)
	Round artistic brush	1
	made of the squirrel-hair	
8.890.001-01	Napkin	2
5.940.187	Light filter	2
5.940.187-01	Light filter	2
5.940.188	Light filter	2
4.165.006	Bag	1
6.454.018	Pipe connection	2
6.832.051	Cover	1
	Spare parts	
6.150.666	Pier	1
6.156.025	Tripod	1
	Package	
4.103.010	Packing case	1 interchangeable with 4.161.922 cover
4.171.348	Packing case	1
4.161.922	Cover	1 interchangeable with 4.103.010 packing case
	Documentation	
3.803.024 TO	Technical description and service manual	1
3.803.024 FO	Logbook	1

4 DESIGN AND OPERATION

4.1 Basic optical circuit

The optical circuit of the article is a telescopic system, which is composed of two branches. Each branch has an objective consisting of lenses 1, 2 (fig.1),

prisms 3, 4, 14, and an eyepiece consisting of lenses 5, 6, three agglutinate lenses 7, 8, 9 and removable light filters 10, 11, 12.

The beams of light coming from the object to be observed pass through the objective, converge in its focal plane and form the inverted image of the object.

For obtaining the direct image there is a prismatic relay system in the focal plane of the eyepiece, the system is composed of the prisms 3, 4 and 14. The prisms serve for deflection of the sighting line by 30° upwards as well and for changing the distance between the entrance and exit pupils.

The reticle 13 is located in the focal plane of the right objective; the reticle is a plane-parallel plate on which the following scales are marked: the vertical, horizontal and range-measuring ones. The field of view is shown on fig. 7.

The vertical and horizontal scales are designed for measuring the angular dimensions of the objects. The division value is 0-05. The average range of the vertical scale is 0-30; that of the horizontal one is $\pm 0-30$. The central sign (cross-hairs) determines the center of the field of view.

The range-measuring scale serves for measuring the distance to the target of 1.7 m (height of a man) high. The range-measuring scale is made of two lines: the horizontal, which is the lower one, and the curve having the marking with a division 2 hectometers each and figures at each second mark. The range of the scale is 4 to 30 hectometers.

The light filters 10, 11, 12 make the process of observation easier.

4.2 Design of the article

The article is composed of two barrels; the bodies 2 (fig. 2) and 4, which are connected with each other and with a pier 7 (fig. 5) by means of a special mechanism having a handwheel 6. The bodies are connected by means of the bushing 1, shaft 2 and fork 4.

Each barrel consists of a frame, objective 2 (fig. 4), the set of prisms 7, an eyepiece, a desiccator cartridge 15, a nipple 17 and a blind.

The objective 2 is mounted in the front section of the barrel and fixed by means of the ring 1. It is used for obtaining the real image of the object.

The set of prisms 7 is mounted in the middle part of the barrel and serves as a relay system.

The eyepiece composed of lenses 5 (fig. 1), 6, 7, 8 and 9 is fixed in the frame 8 (fig. 4) by means of the ring 10. It serves for viewing the image formed by the objective. It is fixed on the back side of the barrel. On the right eyepiece there is the reticle 14, on the left one there is a diaphragm 13. Focusing the eyepieces for obtaining the image sharpness is made by rotation of the scales 11. The value of the diopter adjustment of the eyepieces (in the range from minus 3 to plus 12 diopter) is determined by the scales 11 and indexes on the barrels 9 and 12. In case of necessity, the removable light filters 9 (fig. 8), 10, 11 of the definite color from the individual maintenance kit are put on. After operation the caps 4 and 5 from the individual maintenance kit are put on the objectives and eyepieces.

The headrest 6 (fig. 4) is inserted in the bracket fastened on the body 2

(fig. 2) and fixed by means of a handle 5 (fig. 4). The headrest facilitates the comfort for the head in operation.

The desiccator cartridge 15 filled with silica gel is fixed on the body and serves for constant desiccation of the inner cavity of device. The condition of silica gel is controlled with the help of safety glasses: the dry silica gel is blue; silica gel saturated with moisture is light pink.

There are the slots for the wrench 6 (fig. 8) from the individual maintenance kit on the caps of the desiccators 15 for unscrewing them in case of replacement of the desiccators.

The nipple 17 (fig. 4) screwed in the body of device serves for desiccation of the article in case of necessity. In this case the caps 16 (fig. 4) should be unscrewed by means of the wrench 6 (fig. 8), the pipe connection 12 (fig. 8) from the individual maintenance kit are screwed on the nipples 17. Then the device for drying the instrument with dry air is joined to the pipe connections. One of the screws holding the eyepiece must be unscrewed.

The blinds 1 (fig. 2) and 5 are put on the bodies 2 and 4 from the side of the objectives and protect them from high illumination.

The pier 7 (fig. 5) is to be put on a larger pier 25 (fig. 4) or on the removable tripod depending on the conditions of use. The design of the pier makes it possible to change the angle of observation by 360° in the horizontal plane. There is a scale 13 (fig. 5) with a division value of 5° and an indicator 9 fixed on the body 14 to determine the horizontal direction. The scale 13 is movable that makes it possible to set the zero position of the article to the chosen direction. The device is fixed in the horizontal plane by means of the handwheel 8.

Mounted on the pier 7 there is a brake controlled by means of the button 3 (fig. 4). It provides the fixed position of the article in the vertical plane.

The direction of the sighting line in the vertical plane is determined by the scale 3 (fig. 5) with a division value of 5° and by the index 1 (fig. 3) fixed in the frame 5 (fig. 5) with the zero value of the round level 3 (fig. 3). The round level is fastened on the pier 7 (fig. 5) and serves for leveling the article.

The tripod is used as a support for the article in operation in standing position. Its main parts are a head 3 (fig. 6), a pin 10 and three adjustable legs 5. For protection against damage in transportation the cap 4 should be put on the tripod's pin. The tripod is carried with the help of the shoulder belt 1 with a buckle.

The handles 2 (fig. 3) fixed on the bodies 2 (fig. 2) and 4 serve for managing the device.

The pier is used as a support for the article in operation. The main part of the pier is the bed 7 (fig. 10) inside which the rack 2 with the pin 1, which is the mounting seat for the device. The rack is moved by rotation of the wheel 4 by means of the handle 6 through the reducer 3. The button 5 fixes the handle 6 in the extreme positions. The key 11 provides the translation of the rack 2.

5 TOOLS AND ACCESSORIES

The wrench 6 (fig. 8) is designed for replacement of desiccators in the article.

The screwdriver 7 serves for replacement of the round level.

The desiccator cartridges 2 serve for isolating the desiccators 1, available in the individual maintenance kits. It is forbidden to store the desiccators without cartridges, because otherwise silica gel will be quickly saturated with moisture. Each cartridge is isolated with a rubber gasket.

The caps 4, 5 are intended for protection of the objectives and eyepieces of the article while it is transported and stored.

The brush 8 is intended for removing the dust from the outer surfaces of the optical parts.

The napkins 13 are for cleaning the outer surfaces of the optical parts.

The light filters 9 of light-orange color are to be used while observing in fog or in conditions of low illumination; the light filters 10 (neutral) are to be used while observing in the bright blinding light; the light filters 11 (blue-green) are intended to protect the eyes of the user from laser rays or radiation.

The bag 14 is for carrying the article, the tripod 25 (fig. 4), napkin 13 (fig. 8).

The pipe connections 12 are made for connecting the drying device to dry the inner cavities of the article with.

Extra desiccators 1 and round level 3 can be used for replacement the damaged ones.

The cover 15 is designed for protection of the article from aggressive environment (rain, snow, dust) in intervals between using the device.

6 MARKING AND SEALING

The trademark of the manufacturing plant, cipher of TPB-2 and the number of the article are marked on the nameplate 3 (fig. 2) of the article.

The cipher of TPB-2 and the number of the article are marked on the outer side of the cap of the packing case. The packing case containing complete set of spare parts is sealed with the seals of the customer's representative.

7 PACKAGE AND CARRING BAG

The packing case 1 (fig. 9) is intended for carrying and transporting the article 3, and individual maintenance kit.

Before packing the distance between eyepieces should be minimized with the help of a handwheel 6 (fig. 5), the screw 11 must be taken off the pier 25 (fig.4). or removable tripod depending on mounting.

The article is put into the packing case, where it is fixed on the blocks and pressed with a plank.

The individual maintenance kit is packed as described in the list of

enclosures 2 (fig. 9) available on the inner side of the packing case cover.

The eyepieces and objectives are covered with cotton wool and then with the caps.

The light filters 9 (fig. 8), 10, 11 and the round level 3 are wrapped with cotton wool and with two layers of cigarette paper.

The desiccators 1, pipe connections 12, screwdriver 7, brush 8, napkins and the service logbook are wrapped in vegetable parchment.

The bag 14 and the cover 15 are put on the bottom of the packing case.

Before packing the wrench 6 and the screwdriver 7 are lubricated with the grease GOI-54p and wrapped in the capacitor paper KON-1.

The hole «a» of the pier 7 (fig. 5) is lubricated with grease GOI-54-p, and the pier is wrapped in capacitor paper KON-1.

The removable tripod wrapped in vegetable parchment is packed in a wooden packing case in which the packing cases with the complete set of spare parts are packed.

The pier with the pin 1 (fig. 10) lubricated with GOI-54p grease and wrapped in capacitor paper KON-1 is put into the packing case.

When the tripod and the pier are delivered together, they are both put into the same transporting bag.

8 GENERAL DIRECTIONS

8.1 For ensuring the proper operation of the article, it is necessary to follow the rules listed below:

- protect the instrument from impacts and damage;
- avoid touching the optical parts with hands and oily waste;
- systematically remove dust, dirt and moisture from the optical parts with a clean napkin or brush from the individual maintenance kit;
- change the desiccators in time.

8.2 Use the bag 14 (fig. 8), while working with the article outside.

8.3 Use the pier or tripod 25 (fig.4) according to working conditions.

8.4 It is forbidden to change the vertical angle of the device with the button 3 being released.

9 ASSEMBLING

9.1 Preparing for operation

1) To use the tripod as a support of the article:

- take the tripod from the packing case and free it from packing material;
- release the belt 8 (fig. 6) and take a buckle fixing the legs 5 off;
- unscrew the locking nuts 9, adjust the legs 7 for the required height and fix them with the nuts 9;
- release the legs 5 by means of turning the pedals 2 upwards; turn them at an angle ensuring the stable position of the tripod and then fix them with the pedals 2;
- place the tripod rigidly on the ground, press the stops 6 by foot;
- take off the safety cap 4 from the tripod pin;
- wipe the tripod pin with the waste.

2) To use the pier as a support of the article:

- take the pier from the packing case after unscrewing the bolts and removing the packing material;
- fix the pier by means of using the bolts 10(fig. 10), the washer 8 and nuts 9 on the wooden board;
- wipe the pin with the waste;
- bring the handle 6 in operating position by pulling the button 5;
- place the rack at a required height by rotation of the handwheel 4 using the handle 6;
- fold the handle after pulling the button.

3) Take the article from the packing case with the screw 11 (fig. 5) been released and wipe the mounting seat «a» of the pier 7 with the waste.

9.2 Setting the Device

The device is to be set in the following order:

- place the hole "a" of the pier of the article on the respective mounting seat of the pier 25 (fig. 4), or tripod (depending on working conditions), fix the instrument by means of the screw 11 (fig. 5). Note that the article must be rigidly fixed;

- level the article with the round level 3 (fig. 3). When being mounted on the pier 25 (fig. 4), the article is leveled by laying some objects under the bed base.

Deviation of the bubble from the middle position must not exceed one division of the vial.

When mounting the article on the tripod with the help of the tripod legs, leveling is performed the following way:

- unscrew the nuts 9 (fig. 6);

- moving in or out the legs 7 (fig. 6) place the level bubble 3 (fig. 3) in the middle position with accuracy not less than one division of the vial;

- fix the nuts 9;

When the article is properly leveled, the level bubble should not shift to more than one division while the article is being turned for a 180-degree angle.

10 PREPARING THE ARTICLE FOR WORK

Preparation of the article for operation is performed in the following way:

- remove the safety caps from the objectives and eyepieces and wipe the instrument with clean waste if necessary, and wipe the outer optical parts with a clean napkin;

- use the diopter adjustment mechanism to adapt the sharpness of the eyepieces for your eyes. To do this release the brake of the horizontal laying turning the handwheel 8 (fig. 5). After that turn the article by means of the handles 2 (fig. 3) focus the lenses on any sharply-outlined object available in the area, the button 3 (fig. 4) must be pressed. Then release the button 3 and turn the handwheel 8 (fig. 5). Reach the sharp image of the object observed in the eyepieces of both barrels turning the scales 11 (fig. 4) (close your eyes in turn or darken the input ports of the article if you need);

- adjust the interpupillary distance of the eyepieces. Turning the handwheel 6 (fig. 5) while looking with the both eyes, try to obtain the total visibility of the reticle drawn on the field of view (fig. 7).

The field of view should be seen in form of an entire circle with the edges not cut;

- check the correctness of the headrest setting. The observer's eye pupils must coincide with the exit pupils of the eyepieces, so that the entire

field of view is visible. The headrest is moved in depth only when the knob 5 (fig. 4) is unscrewed;

- in case of working in a gas mask, adjust the headrest by unscrewing the knob 5 with 1.5-2 turns;

- orientation of the article can be performed with the help of well-known reference points as well as using the «North - South» direction in the following way:

- a) release the brake of the horizontal laying with the help of the handwheel 8 (fig. 5);

- b) coincide the central cross-hairs of the reticle with the chosen reference point or use a compass or aiming circle turning the instrument with the help of its handles when the button 3 (fig. 4) is pressed;

- c) set the scale 13 (fig. 5) of horizontal angles to zero position, having released it by turning the screw 23 (fig. 4) counterclockwise;

- d) fix the scale in the zero position by means of the screw 23 (fig. 4);

- e) the further measuring of the angles is performed with the help of a scale relative to the indicator index.

11 OPERATION ORDER

11.1 Use the article in a following way:

- If necessary, use one of the light filters from the individual maintenance kit (to fix it properly on an eyepiece, bend the lightfilter's frame in places it is cut);

- move out the blinds;

- release the brake of the horizontal laying turning the handwheel 8 (fig. 5) counter-clockwise;

- turning the handles 2 (fig. 3) (the button 3 (fig. 4) is pressed) point the article at a chosen object. Then release the button 3, fix the brake of the horizontal lying turning the handwheel 8 (fig. 5) clockwise. The device is ready for observation.

When observing the objects located at various distances from the user, the image sharpness is to be obtained by means of turning the scale 11 (fig. 4).

ATTENTION! It is forbidden to focus the instrument on the object with the button 3 is released.

11.2 Determination of the distance to the target by its angular value is performed in the following way:

- determine the angular value of the target by the vertical or horizontal scales;

- use the angular value of the target find the range D with the help of a table. For composing such tables make use of the formula:

$$D = B/Y \times 1000,$$

where: D – the range in meters;

B - the known size of the target in meters;

Y - the angular value of the target in thousandths of distance;

1.000 - coefficient converting the angular value in thousandths

into the abstract value.

11.3 Determination of the range to the target by the range-measuring scale is performed in the following way:

- release the brake of the horizontal laying by turning the handwheel 8 (fig. 5) counter-clockwise;
- focus the device on the target so that the lower point of the target lies on the horizontal straight line of the range measuring scale and the upper point of the target lies on the upper inclined line with divisions;
- take reading of range in hectometers to the target in the point of tangency of the upper point of the target with the upper inclined line.

12 TECHNICAL STATE CONTROL

12.1 The faultless operation, readiness for action and a long service life of instrument depends to the great extent on its timely checking and maintenance.

In service it is necessary to check timely the technical state of the instrument with the aim of detection of derangements and their elimination. The technical state of the instrument is characterized by its good order, completeness and readiness for action.

12.2 The way of checking the technical state of the article is given in tab. 3.
Table 3

Object being checked	Technical requirements
Presence of all the spare parts required	Presence of all the spare parts required
External examination of device, testing the reliability of its spare parts and mechanisms	There must be no cracks, splits, dents, corrosion and other defects on the outer surfaces of device. All knobs, mechanisms and spare parts must be properly fixed
Safety of eyepieces and objective lenses, light filters and level ampoule. The cleanness of the outer optics	Optical parts must be safe and clean
The accuracy of the forehead rest and the safety of its fastening	The forehead rest must be safe and integral. There must be no moving of the forehead rest after it has been fixed
The condition of desiccator (silica gel)	Silica gel must have a blue color
The softness of movement of the tripod legs and the telescopic support rack ranging from 1500 to 1700mm	The legs of the tripod should move softly, without jamming. The rack of the telescopic support should also move softly in the range of 1500-1700mm

Continue the table 3

Object being checked	Technical requirements
The softness of the telescopic support handwheel's rotation	The handwheel of the telescopic support must move and turn softly
The turning of the whole article around the horizontal and vertical axes with the handwheel 8 (fig.5) off and the button 3 (fig.4) on	The turning of the whole device around its vertical and horizontal axes must be smooth and soft. It must be fixed properly in the given position
Interpupillary distance adjustment mechanism	The interpupillary distance adjustment mechanism must work smoothly, without jamming, and provide the adjustment of interpupillary distance in ranging from 59 to 72mm
The movement of the eyepieces and diopter adjustment	The diopter adjustment mechanism must work smoothly, without jamming, and provide the diopter adjustment given on the scale

Note: If there are some defects revealed during the technical examination, which can not be mended with the help of maintenance kits, the device is to be send to the repair shop.

13 RULES OF USING INDIVIDUAL AND GROUP MAINTENANCE KITS

13.1 Rules of using individual set of STA

13.1.1 Replacement of the desiccator 15 (fig. 4):

- take the desiccator 1 (fig. 8) in the container 2 from the individual maintenance kit;

- unscrew the desiccator 1 from the container 2 by means of the wrench 6;

- unscrew the desiccator 15 (fig. 4) from the casing of the instrument by means of the wrench 6 (fig. 8):

- screw in the safe desiccator in the instrument casing.

The silica gel saturated with moisture should be regenerated.

The method of regeneration is shown in supplement 2.

13.1.2 Replacement of the ball level 3 (fig. 3):

- unscrew the screws 4;

- remove the damaged ball level 3;

- put a new ball level from the individual maintenance kit.

13.2 Rules of using the group maintenance kit

13.2.1 Application of the group maintenance kit.

The group maintenance kit is designed for completing the individual maintenance kit as well as for replacement of the damaged blinds, desiccators, headrests and objectives. The group maintenance kit is composed of 10 instruments:

13.2.2 Composition of the Group Maintenance Kit

The composition of the group maintenance kit is given in the table 4.

Table 4

Designation	Name	Qty
7.006.137	Blind	4
5.883.033	Desiccator	4
	Screw A.M2.5.6gx4.14H.016	5
8.916.031	Screw	5
8.392.030	Wrench	1
8.392.034	Wrench	1
8.240.709	Ring	1
8.240.710	Ring	1
6.548.042	Headrest	1
5.917.157	Objective	1
6.890.030-08	Screwdriver	1
	Screwdriver 7810-09283B1C15cr	2
5.940.187	Light filter	4
5.940.187-01	Light filter	4
5.940.188	Light filter	4
5.183.003	Round level	2

13.2.3 Replacement of blinds:

- mount the damaged blind 1 (fig. 2) or 5 in one of the extreme positions;
- unscrew the screw 21 (fig. 4) by means of the screwdriver from the maintenance kit;
- remove the damaged blind;
- insert a new blind from a maintenance kit;
- screw up the screw 21 and glue it up with adhesive BF-4.

13.2.4 Replacement of the headrest:

- unscrew the knob 5;
- remove the damaged headrest 6;
- insert a new headrest from a maintenance kit;
- set the headrest as described in section 10;
- fix the position of the headrest by means of the knob 5.

13.2.5 Replacement of the objective:

- set the blind in one of the extreme positions;

- unscrew the screw 21;
- remove the blind;
- unscrew the screw 20;
- unscrew the ring 1;
- remove the damaged objective 2;
- insert a new objective from a maintenance kit.

By this non-parallelism of the optical axes of the telescopes behind the eyepieces must not exceed:

- a) 20' in case of convergence of the rays in the horizontal plane;
- b) 60' in case of divergence of the rays in the horizontal plane;
- c) 20' in case of divergence of the rays in the vertical plane.

In case of non-compliance with the given requirement the following must be done:

- unscrew the screws 5 (fig. 3);
- turning the bushing 1 (fig. 5) ensure parallelism of the telescopes in the vertical plane;
 - drill the bushing 1;
 - screw up the screws 5 (fig. 3) and glue them up with adhesive BF-4;
 - remove the pins 16 (fig. 5);
 - unscrew the screws 17;
- turning the bushing 15 ensure parallelism of the telescopes in the horizontal plane;
 - screw up the screws 17 and glue them up with adhesive BF-4;
 - fix the bushing 15 with the help of pins 16 after having drilled two holes $\varnothing 2.9A_3$, with depth $12A_3$, purity of machining is Ra 2.5.

The parallax between the image of the remote to infinity objects and the reticle is maximum 1'. It is permitted to insert the ring 19 (fig. 4) additionally and cut the butt end of the ring 18 from the group maintenance kit. The roughness must be Ra 2.5 and parallelism of the butt ends is 0.01 mm;

- screw up the ring 1;
- drill the ring 1;
- screw up the screw 20 and glue it up with adhesive BF-4;
- insert the blind;
- screw up the screw 21 and glue it up with adhesive BF-4.

Note: Replacement of the objective must be conducted in the repair shop.

13.2.6 Replacement of Screw 8.916.031

- unscrew the defective screw 21 (fig. 4);
- insert a fit screw from the group maintenance kit and screw it up instead of the removed one and then glue it up with adhesive BF-4.

13.2.7 Replacement of the Screw A.M2.5.6gx4.14H

- unscrew the damaged screw 20 (fig. 4);
- take a fit screw from the group maintenance kit and screw it up instead of the removed one gluing it with adhesive BF-4.

13.2.8 The wrench 8.392.030 and light filters 5.940.187 - 5.940.188 are designed for completing the individual maintenance kit.

Note: Replacement of the desiccator 15 (fig. 4) and the round level 3 (fig. 3) must be conducted as described in section 13 of the present document.

14 MAINTENANCE

14.1 General Directions

14.1.1 For keeping the device in constant readiness, ensuring its faultless operation and long periods of time between repairs as well as for timely detection and elimination of the causes which bring about untimely wear and damage of the assembly units and parts one should conduct technical maintenance.

14.1.2 There are following types of maintenance:

- control inspection (C.I.);
- routine maintenance (R.M.);
- maintenance No. 1 (M. No.1);
- maintenance No. 2 (M. No. 2).

Maintenance No.2.is applied to devices, which have been stored and not used for a long time.

14.1.3 After conducting maintenance one should describe the operations, which have been carried out in respective graphs of the service log 3.803.024FO.

14.2 Control Inspection (C.I.)

The control inspection is carried out once a week by the personnel being responsible for the article.

Checking the technical state of the instrument is carried out in compliance with the tab. 3 before and during usage of the article with the purpose of timely detection of derangements and their elimination. The article also must be checked before it is delivered to the store-house for a short-term storage.

In case of necessity one should perform the following operations:

- wipe the outer surfaces of device of dust, dirt, moisture and clean the outer optical parts. For this purpose use waste, napkins and a brush;
- dry and clean the bag.

14.3 Routine Maintenance (R.M.)

14.3.1 The routine maintenance is carried out by the personnel responsible for the article in service at the hours intended for the daily routine and during parking days but minimum once a month.

In the store-houses the routine maintenance is carried out by the chief of the store-house on a daily basis.

The routine maintenance includes the control inspection and must be carried out under supervision of the respective commanders.

14.3.2 Except checkings included in the control inspection one should check the following:

- the condition of the packing cases, safety and condition of the tightening bolts and gaskets;

- correctness of packing the devices in the packing cases and reliability of their fixation;
- the condition of covers, temperature and humidity of the air in the storehouses.

14.3.3 While conducting the routine maintenance of the article the following operations must be done:

- wipe the instrument to remove dust and moisture;
- clean the outer surfaces of the metallic parts of article: the painted surfaces are to be wiped with the waste wet with alcohol and then wiped dry. The unpainted parts are lubricated with a thin layer of grease after cleaning;
- clean the outer optical parts of the instruments with a piece of flannel;
- replace the unfit desiccator by new one taken from the individual maintenance kit;
- replace defective parts of the article with spare parts from the maintenance kit;
- clean the packing cases of the dust and dirt, repair and paint them if necessary.

14.3.4 In case of considerable pollution of the outer surfaces of the optical parts, cleaning is performed in the following way:

- wind a cotton wool piece around a wooden stick;
- wet it in a mixture containing 15% of and 85% of ether. Shake a little bit to remove the excess;
- wipe the surfaces of the optical parts with a wet cotton wool piece, avoid touching the mount;
- renew the cotton wool piece and finish cleaning by circular movements from the center to the edge. Avoid penetration of solvent into the mount as it can be dangerous for packing sealant and tightness of the device.

14.4 Maintenance No. 1 (M. No.1)

14.4.1 Maintenance No. 1 is carried out only for devices being in service with the purpose of checking the technical state, eliminating detected derangements aroused in the process of service and preparing the device for the further use.

Technical maintenance No. 1 is carried out by the personnel under supervision of the platoon commander. If necessary the help of the specialists may be used).

14.4.2 Maintenance No. 1 is carried out:

- before using the article in the unit;
- after working with the instrument;
- minimum once every six months when the instrument was not in use.

In maintenance No. 1 (besides checking and operations included in the routine maintenance) it is necessary to check:

- reliability of fixation of the instruments on the seats;

- completeness of the individual maintenance kit;
- fixation of the mounts of light filters on the eyepieces;
- travel of the blinds and reliability of their fixation in the extreme positions.

14.4.3 In maintenance No. 1 it is necessary to perform the following operations:

- replace defective levels and light filters;
- eliminate the general derangements (dents and curves on the blinds, deformations and so on);
- regenerate the moisture-absorbing composition (silica gel) of the desiccators;
- clean and dry the tarpaulin covers, correct dents the packing cases;
- repair the clamps and locks of the packing cases and tripods;
- lubricate the rack of the telescopic pier with grease GOI-54p;
- paint the places with the damaged varnish coating;
- eliminate the detected derangements; in case of impossibility of eliminating them on the spot the instrument should be sent to the repair shop.

14.5 Maintenance No. 2 (M. No. 2)

14.5.1 Maintenance No. 2. of the articles in service is carried out once in 2-3 years. The maintenance for the articles being in a long-term storage is conducted once every 5 years.

Maintenance No. 2 is carried out in the unit shops with the use of the group maintenance kits, equipment and tools available in the shops.

Repair is carried out in compliance with the rules of using the group maintenance kit.

14.5.2 Maintenance No. 2. includes operations and checking assigned for M. No.1 and additional adjustment of the optical system of the article:

- convergence of the light beams behind the eyepieces;
- resolution of each monocular in the center and at the edges of the field of view;
- parallelism of the optical axes of the telescopes.

In case of necessity the grease GOI-54p on all parts, which are subject to repair should be renewed.

IT IS FORBIDDEN TO OPEN THE DEVICE ONLY FOR RELUBRICATION OF ITS PARTS

14.5.3 While preparing the article for a long-time storage, it is recommended to clean all the optical parts and light filters.

After that the article and the individual complete maintenance kit are packed in compliance with section 7 of the present technical description.

14.5.4 The tripod wrapped in vegetable parchment is stored together with the complete set of the article.

15 RULES OF STORAGE

15.1 While being in operation the article must be properly stored.

1. After operation the caps and cover must be put on the article.

2. In the fields after the article has been used:

- put the caps on the eyepieces and objectives;

- set the minimum interpupillary distance of the eyepieces by means of turning the handwheel 6 (fig. 5);

- with the help of the handles 2 (fig. 3) bend the article up so that it touches the pier 7 (fig. 5). The button 3 (fig. 4) must be pressed;

- pack the article in the bag or packing case;

- working with a tripod put the cap 4 (fig. 6) on the tripod's pin, assemble the tripod with the pedals 2 and nuts 9 being released, fix the pedals 2 and nuts 9 then, tighten the adjustable legs 5 with the use of the belt 8 and carry the tripod with the help of a shoulder strap 1.

15.2 Only carefully inspected, corrected and cleaned articles can be stored for a long period of time.

The articles with the complete maintenance kits are stored in the packing cases on the shelves.

Storage of the articles on the floor, near stoves or windows is not permitted.

The room where the instruments are stored must be dry and heated. The temperature in the room must be minimum plus 5°C and relative humidity (at a temperature of 25±10°C) must not exceed 70%.

Tripods and piers are stored together with the complete sets of the instruments.

16 TRANSPORTATION

16.1 The article with the individual maintenance kit is to be transported in the packing case by any kind of transport and over any distance.

16.2 Before transportation make sure that the article and individual maintenance kit are fixed properly in the packing case.

All the locks must be in a good condition.

16.3 While being transported the packing case must not be turned over and must be properly fixed. It is forbidden to throw and turnover the packing case containing the article and individual maintenance kit.

16.4 The tripod and the pier are transported together with the complete set of the article.

SUPPLEMENT 1**NORMS
for Consumption of Materials per One Case of Maintenance**

Material	Consumption, gram		
	Routine Maintenance	Maintenance No. 1	Maintenance No. 2
Optical absorbing cotton wool	20	20	60
Grease GOI-54p	60	60	120
Ethyl rectified alcohol	60	60	240
Ether	80	80	240
Adhesive BF-4	-	-	20
Capacitor paper KON-1	-	-	0.8m ²
Vegetable parchment	-	-	0.8m ²
Cigarette paper	-	-	0.8m ²

SUPPLEMENT 2

REGENERATION OF ABSORBING CAPACITY OF SILICA GEL

For regeneration of the absorbing capacity of silica gel it is necessary to unscrew the cap of the dryer, pour silica gel in a clean metal vessel, which is put on a heating source (electric stove, coals of the bonfire and so on).

The direct contact of silica gel with flame is not permitted.

Regeneration is carried out at a temperature of 120°C during 16-20 hours, i.e. until silica gel changes turns into intensively blue color.

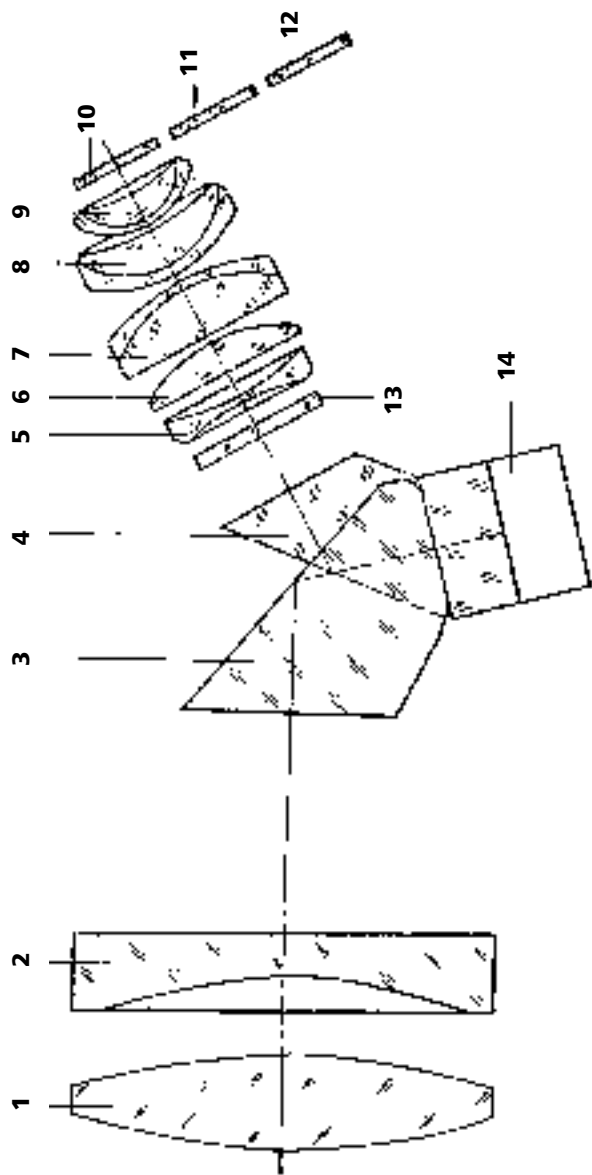
Regenerated silica gel should be cooled in the closed tare and poured in the cartridge of the dryer, then screw up the cap and install the dryer in the container.

It is forbidden to calcinate the dryer. The spare cartridge of the dryer without the protective container and regenerated silica gel must not be exposed to the open air longer than two minutes in order to avoid saturation of silica gel with moisture from the environment.

Regeneration of silica gel may be conducted unlimited number of times. Numerous regeneration of silica gel doesn't influence its absorbing capacity.

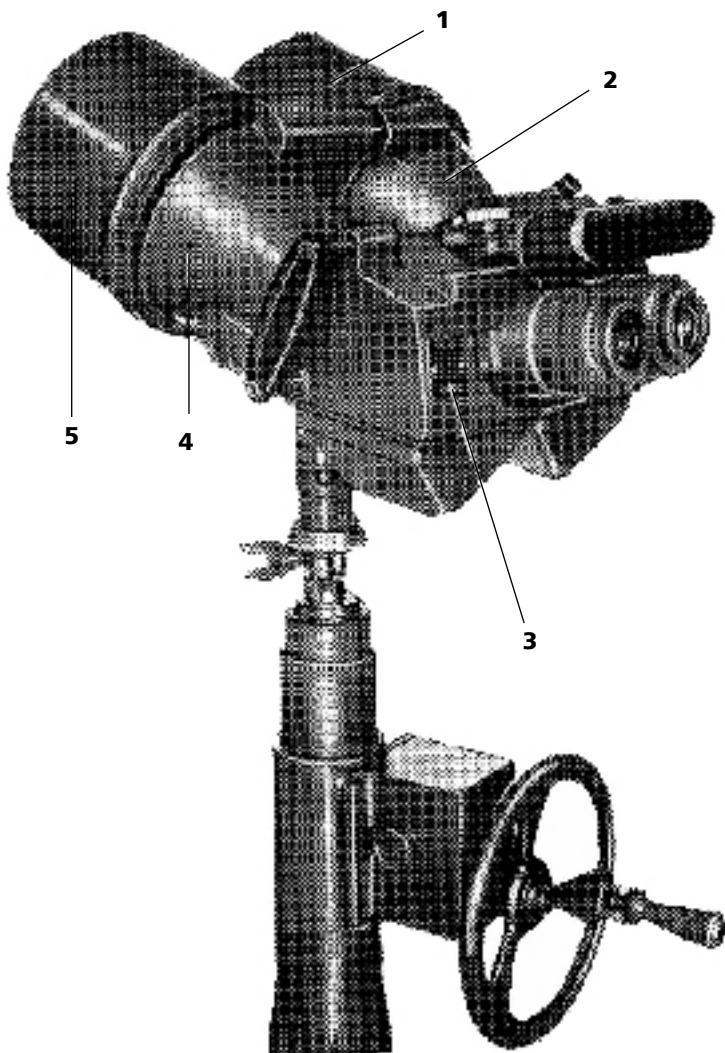
However, the lifetime of silica gel is decreased in case of its pollution. Therefore while assembling and disassembling the dryer and regenerating silica gel avoid touching silica gel directly with hands and conducting calcination in dusty premises.

FIGURES



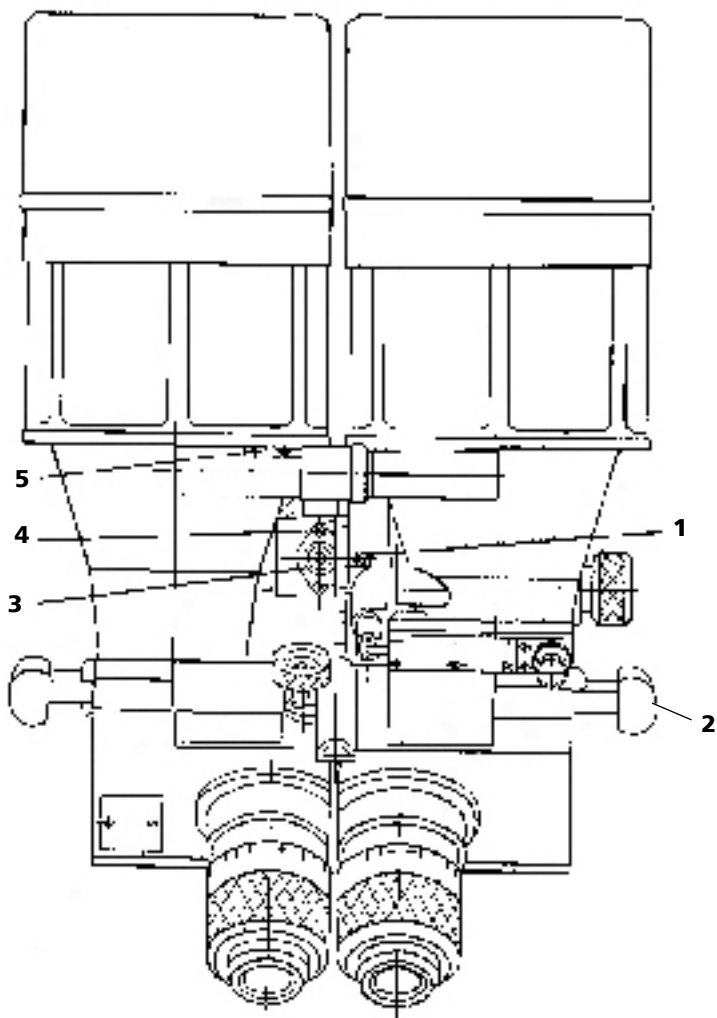
1 - lens; 2 - prism; 3 - prism; 4 - prism; 5 - lens; 6 - lens; 7 - lens; 8 - lens; 9 - lens; 10 - neutral light filter; 11 - orange light filter; 12 - reticle; 13 - light filter; 14 - prism

Fig. 1 Basic optical circuit



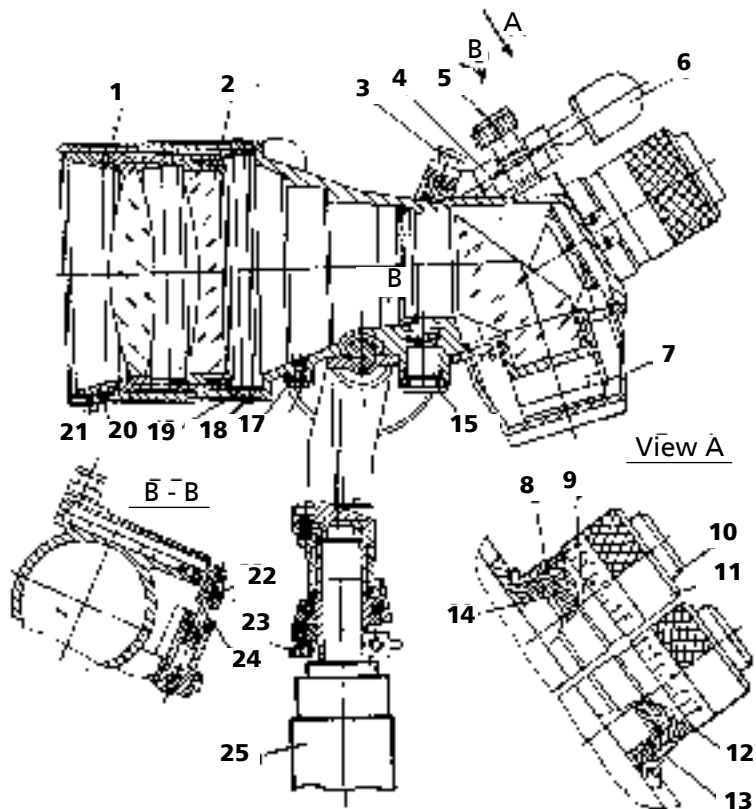
1 - blind; 2 - casing; 3 - nameplate; 4 - casing; 5 - blind

Fig. 2 Article TPB-2. Outer appearance



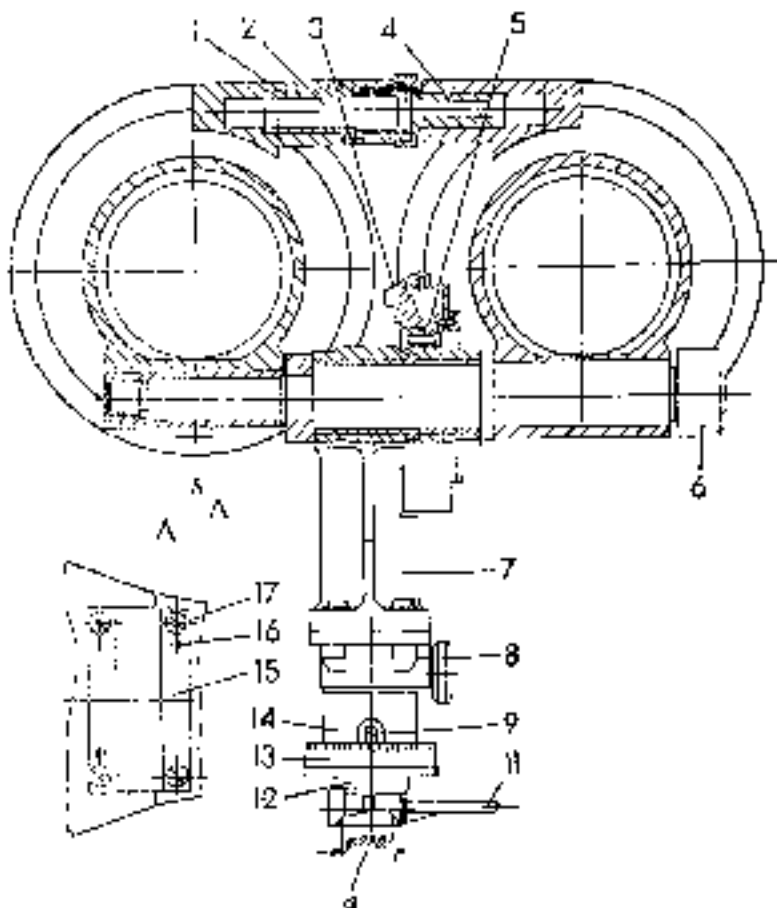
1 - index; 2 - handle; 3 - round level; 4 - screw 2M2.5.6gx8.58.016;
5 - screw A.M4.6gx6.14H.016

Fig. 3 **Article TPB-2. Outer appearance**



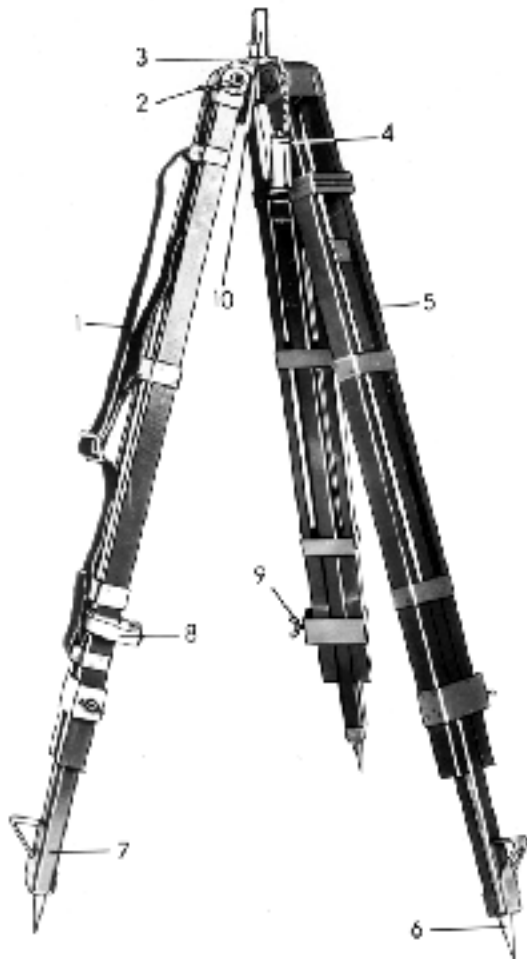
1 - ring; 2 - objective; 3 - button; 4 - head-rest bracket; 5 - knob;
 6 - headrest; 7 - unit of prisms; 8 - mount; 9 - casing; 10 - ring; 11 - scale;
 12 - casing; 13 - diaphragm; 14 - reticle; 15 - desiccator; 16 - cap; 17 - nipple;
 18 - ring; 19 - ring; 20 - screw A.M2,5.6gx4.14H.016; 21 - screw; 22 - screw
 A.M2,5.6gx4.14H.016; 23 - screw; 24 - rod; 25 - pier

Fig. 4 Article TPB-2



1 - bushing; 2 - shaft; 3 - scale; 4 - fork; 5 - mount; 6 - handwheel;
 7 - pier; 8 - hand-wheel; 9 - indicator; 11 - screw; 12 - bushing; 13 - scale;
 14 - casing; 15 - bushing; 16 - pin 3C₃X10.016; 17 - screw M4.6gx10.58.016

Fig. 5 **Article TPB-2**



1 - shoulder strap with buckle; 2 - pedal; 3 - head; 4 - cap with button;
5 - leg; 6 - leg stop; 7 - leg; 8 - strap with buckle; 9 - nut M6xl; 10 - pin

Fig. 6 Tripod

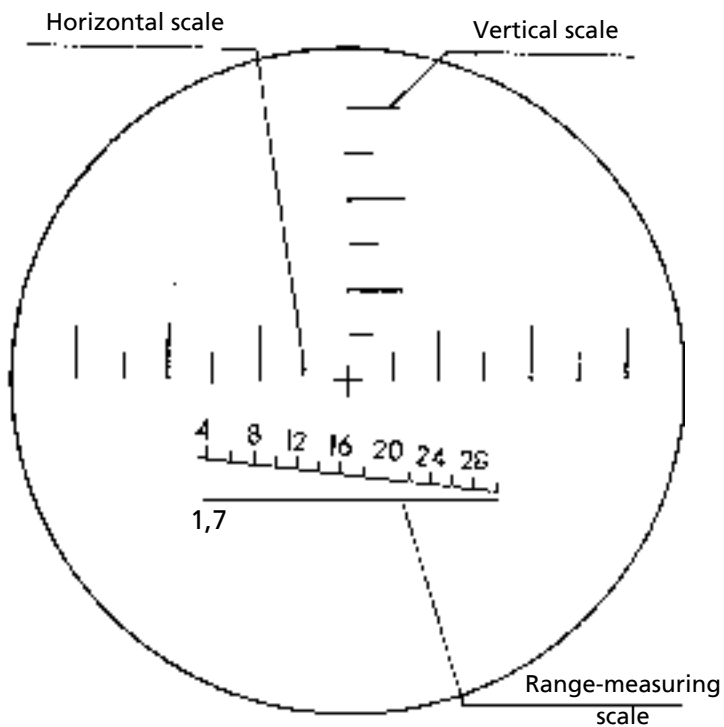
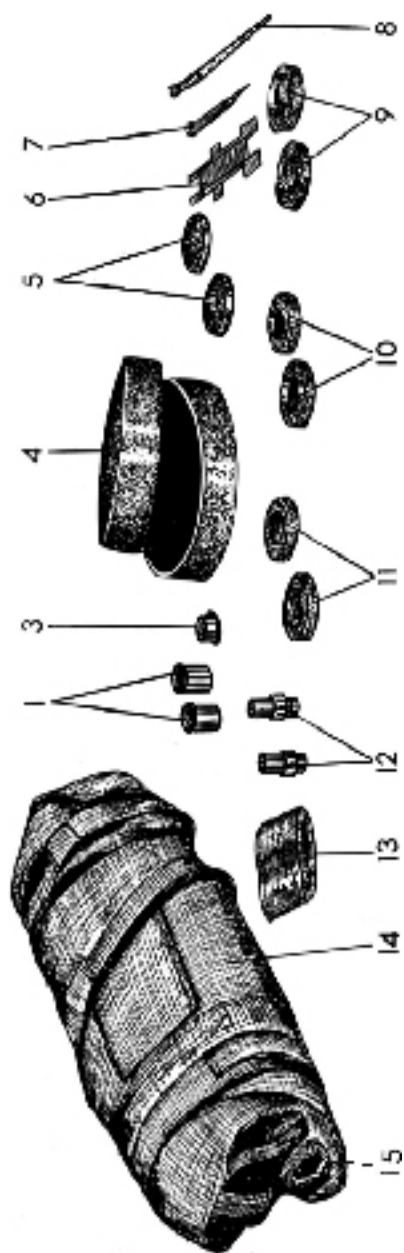
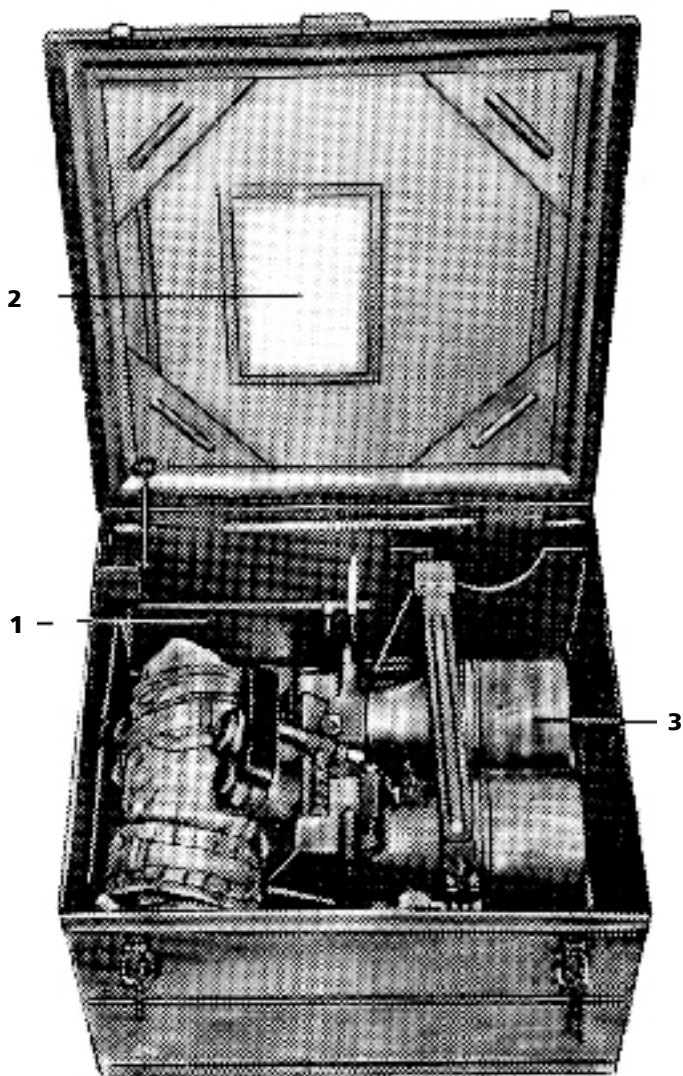


Fig. 7 **Field of view**



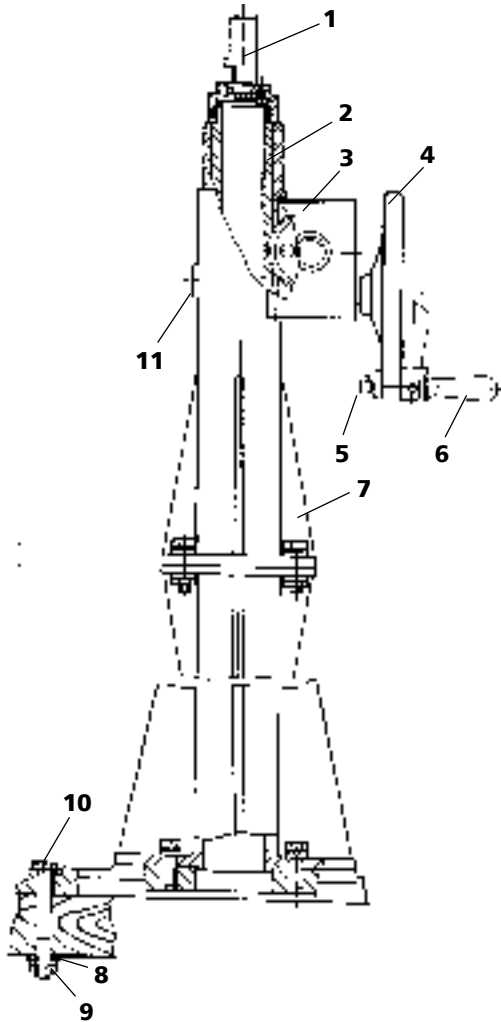
1 - desiccator; 3 - round level; 4 - cap; 5 - cap; 6 - wrench; 7 - screwdriver; 8 - brush;
 9 - light filter; 10 - light filter; 11 - light filter; 12 - pipe connection; 13 - pipe connection; 14 - napkin; 15 - cover

Fig. 8 Individual maintenance kit



1 - packing case; 2 - list of enclosure; 3 - article TPB-2

Fig. 9 Article packing



1 - pin; 2 - rack; 3 - reductor; 4 - handwheel; 5 - button; 6 - handle;
7 - bed; 8 - washer; 9 - nut; 10 - bolt; 11 - key

Fig. 10 **Pier**