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1. One copy of an English-translation of a Soviet manual entitled, Manual for Maintenance of M-46 and M-47 Guns (Rukovodstvo po remontu orudiy M-46 i M-47) 50X1-HUM The Russian-language version of the manual, published by the Military Publishing House of the Ministry of Defense, Moscow, 1958 50X1-HUM Part 3 (appendices), consisting of diagrams and tables, is explained extensively in Parts 1 and 2 of the text, and with the exception of titles and headings, has not been translated. The Russian-language text has been included, however.

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INFORMATION REPORT INFORMATION REPORT

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MANUAL
FOR MAINTENANCE OF
M–46 and M–47
GUNS

(English Translation)

Declassified in Part - Sanitized Copy Approved for Release 2013/09/20 : CIA-RDP80T00246A031200180001-5

Ministry of Defense USSR

Manual

for Maintenance of

M-46 and M-47 Guns

Military Publishing House

Ministry of Defense USSR

Moscow - 1958

Note to the Translation

Part 3 (appendices), consisting of diagrams and tables explained extensively in parts 1 and 2 of the text, has not been translated. However, the complete Russian copy of this material is provided, and appendix titles are supplied in English.

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List of Changes

in GOST [All-Union State Standards] and OST [All-Union Stand50X1-HUM

Specified for the Manual

Indicated in the Manual	In Effect at Present
GOST 380 - 57	GOST 380 - 60
GOST 1050 - 57	GOST 1050 - 60
GOST 1465 - 53	GOST 1465 - 59
GOST 2523 - 51	GOST 9466 - 60 GOST 9467 - 60
GOST 2789 - 51	GOST 2789 - 59
GOST 2967 - 45	GOST 2967 - 52
GOST 4543 - 57	GOST 4543 - 61
GOST 5047 - 49	GOST 9389 - 60
GOST 6402 - 52	GOST 6402 - 61

The text has been deleted and corrections inserted for technical reasons on pages: 11, 25, 29, 52, 53, 62, 83, 85, 94, 100, 110, 116, 119, 122, 135, 137, 139, 182, 197, 198, 199, 213, 217, 268, 272, 273, 274, 281, 282, 284, 289, 295, 298, 301, 305, 306, 352, 354, 355, 359, 361, 362, 363, 364, 365, 375, 376, 379, 380, 381, 382, 386, 388, 389, and 393.

Certified as correct: [unreadable]

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Introduction

[p 3]

This Manual contains basic instructions for inspection and maintenance of the M-46 and M-47 guns. The only constructional differences in these guns are in the loose barrel tubes, the muzzle brakes, and the sight mechanism scale indentations. The remaining parts and members of both guns are identical.

This Manual is intended as a basic maintenance document for mobile maintenance shops.

Maintenance shop designations adopted in this Manual are the same as those used in the General Manual for the Maintenance of Artillery Weapons.

Gun maintenance should be done according to the methods specified for corresponding maintenance shops.

Only the regimental maintenance shop -- PM -- is indicated in the Manual if the methods for defect detection and correction are the same for all maintenance shops.

The volume of operations indicated by this Manual for regimental workshops is calculated for a workshop which has electric welding apparatus and only a turning lathe for machine tool equipment.

The volume of operations intended by this Manual for a DARM /Divisional Artillery Maintenance Shop/ must be done by higher regimental workshops which have skilled and significantly qualified personnel.

If a maintenance shop has facilities which allow it to use machine tools for operations specified as manual operations by this Manual, such a change should certainly be made.

This Manual consists of three sections:

-- The first section contains instructions for inspection and maintenance of gun mechanisms and parts.

-- The second section is composed of flow charts with proper references to the first section of the Manual.

-- The third section consists of appendices of listings, specifications, diagrams, and drawings, illustrating mechanism constructions. Again, references are given to other sections of the Manual.

[p 4]

Procedural instructions for dismantling and assembling the guns are not given in this Manual since they are in the Service Manual for the M-46 and M-47 Guns.

Chapter One

General Maintenance Instructions

The instructions for inspection and maintenance and also the technical characteristics contained in the Manual pertain to M-46 and M-47 guns of initial and subsequent issues.

In those cases where the technical characteristics of the M-46 gun are different from the technical characteristics of the M-47 gun and also in cases where the technical characteristics and instructions for maintenance are different from those for guns of initial issue or, on the other hand, of subsequent issue, the text of the Manual includes the following instructions: "for M-46 gun," "for M-47 gun," "for guns of initial issue," and "for guns of subsequent issue."

Locations where parts are to be reworked are shown by heavy lines in the sketches. Also, only those dimensions necessary to perform required maintenance operations are indicated on the sketches.

On drawings which illustrate mechanism constructions, the numbers 1, 2, 3, etc. denote the ordinal numbers of those defects under consideration in the text of the Manual when the locations of deterioration or damage need to be pointed out. Designations such as 02-29, 08-6, Sb21-4, etc. denote numbers of gun parts and assemblies.

The numbers of parts and assemblies of guns of initial issue which are different from numbers of corresponding parts and assemblies of guns of subsequent issue are given in parentheses in the text and in sketches and figures in the Manual.

The numerical notes (in small circles) in sketches of flow charts denote the ordinal numbers of operations on the diagram.

A catalog of parts for which there are no manufacturing indications in the flow charts, but for which replacements are provided for by this Manual is presented in appendix 1 with instructions indicating what type of maintenance shop must manufacture these parts. Working lines (sketches) of these parts are included at the end of the appendix.

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Shortcomings were discovered during operation of guns of initial [p 6]
issue. Methods for eliminating these shortcomings are given in
appendix 2. These shortcomings must be corrected during maintenance
regardless of the condition of the involved mechanism. Conventional
specifications for cleanliness of part surfaces on which maintenance
is being done or which are remanufactured are given in accordance with
GOST 2789-51.

Grades of materials indicated in the Manual for the manufacture of parts are selected as follows: for steel according to GOST 380-57, GOST 1050-57, GOST 2052-53, GOST 4543-57, GOST 5047-49, and GOST 5192-50; and for non-ferrous metals according to GOST 493-54, GOST 613-50, GOST 859-41, and GOST 1019-47.

Conforming bronze and brass of the grades BrAZhMts10-3-1,5; BrAZh9-4; and LMtsA57-3-1 can be substituted for bronze and brass indicated in the text and sketches of the Manual with the exception of grade BrOTsS6-6-3 bronze.

If the grades of steel indicated in the text or sketches of the Manual are not available, other grades of steel can be used if they provide the indicated category of durability (K or KT) and the conforming amount of impact strength.

Alloyed steels can be replaced with 35KhMA steel.

The grades of the recommended electrodes for arc welding are chosen in accordance with GOST 2523-51. Other electrodes can be used if they provide the required durability or seam hardness.

In maintenance shops which do not have special instruments, heating temperature for quenching is determined by the colors of incandescence and the temperature of annealing by the colors of iridescence as indicated in the General Manual for the Maintenance of Artillery Weapons.

1. Inspection Instructions

Inspection must precede maintenance of every gun in order to establish the technical condition of the gun and its members and to determine the amount of work necessary to put the gun in a condition conforming to combat service requirements.

Enter inspection conclusions in the inspection record (appendix 3).

To prepare the gun for inspection, the following should be done:

-- transfer the barrel from the traveling position to the firing position and check to see if the piston rod is properly connected with

the barrel and the recuperator rod is properly connected with the cradle cut-off gear actuating collar. Check the rod connections by testing the trigger mechanism operation and by opening the breech mechanism. Bolt plunger Sb09-30 (fig.3) should release and be freely movable and the breech mechanism should be opened; 50X1-HUM

-- without removing the trails from the limber, place the barrel at a negative angle of elevation of from 2° to 3° and check the initial compression in the recuperator, which should be within 54 to 58 at. Next, reduce the initial compression to normal in order to avoid an involuntary barrel recoil when moving the tipping parts of the gun to positive angles of elevation; [p 7]

-- transfer the gun from the traveling position to the firing position;

-- check the equilibrator pressure with the tipping parts of the gun at the maximum negative angle of elevation (the pressure must be approximately 44 at.). Return the pressure to normal;

-- clean the dirt from the exterior of the gun and wipe it dry;

-- remove the grease from the bore and breech block housing with soapy water or kerosene and wipe them dry;

-- dismantle the breech mechanism, scrub its parts with kerosene and wipe them dry. Assemble the breech mechanism again and connect it with the breech ring, after having lightly greased the contact surfaces of the parts.

Inspection should begin with an external examination of the gun in firing position in order to check for the absence of any gun components or parts. Then, before dismantling the gun, check the mechanisms in the sequence presented in the compulsory examination schedule which is in the second column of section A of the inspection record (appendix 3). Then, while dismantling, inspect those assemblies, mechanisms, and parts (section B of the record) which are in unsatisfactory condition.

Record the inspection results according to the instructions for filling in the record (appendix 3).

If a mechanism operates with difficulty, dismantle it during the inspection process, clean out any dirt, remove any scratches on the parts, and reassemble it.

If it is not possible to check the operation of a mechanism (individual parts are broken or absent), check it after inserting reserve parts or by measuring the most important members of the mechanism under inspection according to the instructions given in this Manual. 50X1-HUM

Mechanisms which operate satisfactorily during inspection of the assembled gun need only external examination during dismantling to find cracks, mechanical damage, corrosion, changes in color, and defective parts.

Press-fitted inserts in part seats must be tested for movement. Inserts should not move.

To determine the practical dimensions of worn parts, measure the parts in the places of the greatest wear.

Measurement of the thickness of gear and segment teeth and of the thickness of worm threads, which is considered in the first part of the Manual, should only be done in those cases when a check reveals that unsteadiness and play of the mechanisms exceed the limits allowed by this Manual and when wear of teeth and threads is noticed in the gears, segments, and worms upon external examination.

The results of mechanism, component, and part inspections which are determined during dismantling the gun should be entered in section B of the record. [p 8]

If the gun is at a regimental maintenance shop for the correction of one or more predetermined malfunctions, complete dismantling and detailed inspection of the gun is not necessary. In this case, it is necessary only to complete a general examination of the gun and to inspect it only while it is assembly, but it is necessary to dismantle and perform a detailed inspection of the defective mechanisms.

Check the gun after maintenance in a regimental maintenance shop completely according to the instructions of the Manual (See chapter 1, section 4).

In mobile artillery maintenance shops, it is necessary to inspect the recoil mechanism gaskets while the mechanism is assembled in order to find liquid and air (nitrogen) leaks through the gaskets. Find remaining recoil mechanism defects after dismantling.

The recoil mechanism does not have to be dismantled if it is known that it is operating normally and the next overhaul period is not yet due.

If dismantling of the recoil mechanism is not required, it is necessary to cause an artificial barrel recoil of from 450 to 500 mm in order to inspect the recuperator and recoil piston rods at the places where they have gasket sealings and in order to check the character of the liquid. To examine the piston parts of the recuperating cylinder, head 10-114 must be screwed on the operating cylinder.

Check the sighting mechanism illumination system by turning on all of the bulbs. If the bulbs do not light up, check to see whether they have burned out or whether there is a short-circuitin the lighting cuit. 50X1-HUM

Check the lighting power supply circuit of the gun while it is in traveling position in the following manner:

-- connect one end of the wiring to the tow vehicle. After placing the wire plug in the tow vehicle socket, connect the other end of the wire to the plug socket on the gun trail;

-- switch on the tail lamp of the tow vehicle. The lower bulb of the lamp (the tail light) should be illuminated;

-- press the brake pedal on the tow vehicle. This should light the upper bulb of the lamp (the stop signal light).

If the bulbs do not burn, check whether they are in working order and whether there is a short-circuit in the gun electric circuit, having first checked the working order of the tow vehicle lighting circuit.

Replace faulty bulbs with new ones. Correct any short-circuits in the electric circuits.

Note. The rear lights on guns of initial issue have one illuminating bulb (there is no stop signal bulb).

2. Dismantling Instructions [p 9]

The following is necessary to dismantle the gun:

1. Expose the lock screws and unscrew them.

2. Use only official tools and appliances.

3. When removing cotter pins, first bring their parted ends together with pliers.

4. Avoid breaking keys and removing unscrewed or neighboring pieces when unscrewing and screwing parts.

5. Dislodge bolts with a copper knock-out rod.

6. Do not use excessive force in breaking down parts. If a part does not yield, drench it with kerosene and tap around it with a hammer. 50X1-HUM

7. Notice the mutual positions of parts during dismantling in order to reestablish mechanism adjustment during assembly of t[illegible] 50X1-HUM

Notice how far adjusted threaded connections are screwed in. Measure and record existing clearances which, if changed, can influence mechanism adjustment. Mark the mutual arrangement of adjusted parts with lines or shallow scratches. Mark the lines or scratches accurately in order not to damage parts.

8. In separating a mechanism from the gun or a part from a mechanism, notice the position of adjustment lines.

9. During dismantling, lay out parts, which can be confused during assembly, with the parts which they connect with or label them (with paint or scratches).

10. Remove keys which are set tightly in key slots only in those cases when it is necessary during dismantling or to repair or replace them.

11. Place removed members and parts on benches, stands, and tables.

12. Protect polished, burnished, and rubbed parts from nicks, scratches, dirt, and rust.

13. When dismantling mechanisms which have springs, observe the safety measures indicated in the Service Manual.

14. Unscrew lower muzzle brake bolt 01-46 (fig. 1) before removing the barrel from the cradle to prevent damage to the front cradle cap.

3. Maintenance and Assembly Instructions

1. Overhaul the gun in accordance with the results of an inspection executed according to the Inspection Instructions.

2. The scope of the technical characteristics determined in this Manual for releasing a gun from maintenance is calculated to provide a definite reserve for usage of the gun following its release from maintenance. [p 10]

To attain a large usage reserve, it is recommended, if the time and situation permit, that those parts also be repaired which are worn close to the allowable limits authorizing the release of the gun from maintenance.

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3. For correct assembly of tooth and worm meshings, mark them with paint (where necessary) and adjust them.

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4. Insignificant black spots and cavities are permissible at those places where welded metal changes to base metal on the surfaces of parts which have been repaired by welding.

5. Welding or beading can be duplicated if there is no distorted metal at the location of welding or beading.

6. If there is deformation of parts after welding, they can be corrected without heating.

7. If the proper reamer is not available for reaming openings according to the dimensions indicated by the sketches, it is permissable to use reamers which do not differ more than 0.5 mm from the nominal dimensions of shaft alignment in the opening as long as required fitting conditions are preserved.

8. In replacing press-fitted parts (inserts), the manufactured parts (inserts) can be reseated in conformance with the dimensions of the adjoining part as long as the press seating is preserved.

9. If a cotter pin hole in a bolt does not align with a cotter pin hole in a nut, a second hole can be bored in the bolt to coincide with the hole in the nut, but the newly drilled hole in the bolt cannot intersect with the old hole.

10. Cotter pins and lock washers, except for spring washers, should be annealed before reassembly.

11. The threading of cylinders and casings, the inside threading of collars and rods, and the inside threading of the recoil mechanism should be thoroughly wiped and covered with a thin layer of cannon grease before assembly.

Trim off raised metal burrs on external threading with a triangular file or scraper and on internal threading with a hook-shaped scraper which is sharpened according to the thread profile.

12. Undamaged leather collars of wheel brakes (on guns of initial issue); leather rings of the recuperator, leveling screw jack, and equilibrator; and buffer and recuperator gaskets can be reused.

To use leather collars and rings, the following is necessary:

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-- wipe collars and rings with a clean, dry rag and immerse them for 10 to 15 minutes in steol M [type M clear oil?] which is heated to 45° or 50°. After washing, wipe them with a clean rag and dry them at room temperature for 1.5 to 2 hours. Protect them from falling dust and

--soak collars and rings for 10 to 15 minutes in a mixture [p 11] composed of 75% ceresin, 15% vaseline, and 10% AU axle grease heated to 65° or 70°; 50X1-HUM

--after treating collars and rings, dry them. Place collars on collar rings for drying.

Wash gaskets which have been used in water heated to 90° or 100°. After drying, soak them for 15 to 20 minutes in a solution consisting of 75% ceresin, 15% vaseline, and 10% AU axle grease which is heated to 65° to 70°.

13. Before lining recoil mechanism cylinders with steol M which has been used, carefully filter it and check for alkalinity.

14. Press-fitted recoil brake and recuperator mechanism copper gasket rings which have been used can be placed in further service if they provide a proper seal. For best sealing, the rings should be annealed by heating them to 600° to 650° and cooled in water. Then, trim the ring facings.

15. Tubing with soldered heads, valves, and joints should be carefully washed with water, blown through by a jet of compressed air, and dried before assembly.

16. For soldered connections of recoil mechanism parts, the soldering should be done by acid-free soldering in accordance with the instructions in the General Manual for Maintenance of Artillery Weapons.

17. To cover all of the links in winch chain Sb20-6 uniformly (fig. 12), immerse the chain for 5 minutes in cannon grease which is heated to 80° or 100°.

18. Check the throttling rod travel in both directions at the place where the cradle is joined with the rod and double-arm lever 09-105. The force of one hand applied to double-arm lever 09-105 (fig. 3) should be sufficient to move the throttling rod.

Also, check the clearance between the rear facing of lever 08-40A and the front facing of nut 08-27. The clearance should be smaller than 2 mm (fig. 4).

19. To prevent upper lever 09-100A from grazing the cradle aperture wall when giving an angle of elevation of from +15° to +40° to the tipping parts of the gun, trim the cradle aperture to provide a clearance of 1.5 to 2 mm between upper lever 09-100A and the cradle ap 50X1-HUM (fig. 3).

20. Double-arm lever roller 09-107 should set in the groove of cam guide 17-20 at a depth greater than 8 mm. If the roller is not set far enough into the cam guide groove, place a steel washer with a thi
of 4 mm and a diameter equal to that of the roller on roller pin 09-106. There should be at least 0.5 mm of clearance (fig. 3) between the end of roller 09-107 and the surface of cam guide 17-20.

21. When adjusting the tightness of recuperator rod stuffing 10-80 with nut 10-81, leave a reserve of the nut threads at the furthest adjustment during gun operation (the end threads of nut 10-81 should not recess past the face of stuffing box 10-75)(fig. 5). [p

22. When assembling the equilibrator of a gun of an initial issue where bushing 23-6 is locked by washer (23-9), keep a clearance of 0.3 to 0.5 mm between the face of bushing 23-12 and collar 23-74 (fig. 6) to provide normal collar operation.

To attain the indicated clearance, during assembly of the external cylinder (after positioning the bushings 23-10 and 23-13, the adjusting ring 23-11, the collar 23-74, the bushing 23-12, the washer (23-9), and the bushing 23-6 in the cylinder), two plates (dimensions of the plates: 0.5 mm in thickness and 25 to 30 mm in width) should be placed in diametrically contrasting directions between the faces of bushing 23-12 and collar 23-74 and bushing 23-6 should be screwed up to the stay. Then, remove the plates and lock bushing 23-6 with washer (23-9).

23. With the barrel in firing position, there should be at least a 1 mm clearance between the upper surface of plate pivot 09-82 (fig. 3) and the upper surface of the groove on the left wall of the breech ring.

If the clearance is smaller than 1 mm, drop plate Sb09-18 down until a clearance of 1 mm is attained. Cut five oval holes (oval in a vertical direction) in plate bracket 09-84 (for bolts to attach the plate to the cradle) and file the lower surface of the shoulder of bracket 09-84.

24. With the barrel in the firing position, there should be at least 1 mm of clearance between catch 01-35 and the external surface of cradle plate Sb09-18 (fig. 3) and there should be a clearance of at least 2.5 mm between the left surface of the breech ring and the edges of plate Sb09-18.

If the clearances are smaller, straighten out plate Sb09-18.

25. With the barrel in the firing position, stop 09-48 (fig. 3) should be in the groove of the extension of flange nut 10-65 (fig. 3).

If the stop is not in the groove but rests on the rear facing of the nut extension, clear the groove in the extension of nut 10-

26. Checking of the distance conformity between recoil indicator guide 10-28 (fig. 1) and recoil indicator 09-55 (fig. 3) by the reading of indicator 09-55 on guide 09-53 is done in the following sequence:

-- place the trails on the limber;

-- with the barrel in the firing position, make a mark with a marking tool on the upper surface of the cradle guide 900 mm from the rear face of the front barrel ring;

-- haul the barrel up with the winch until there is coincidence of the rear face of the front ring with the mark which was made in the last step;

-- check the reading of indicator 09-55 on indicator guide 09-53. The indicator reading should be within 897 to 903 mm.

If the reading is not within the indicated limits, unscrew the three nuts on the bolts which hold the recoil indicator guide to the cradle for one or two turns and shift guide 09-53 to the place where recoil indicator 09-55 coincides with the number "900" on recoil [p 13] guide 09-53 while indicator 09-55 is brought up to the stay in guide 01-28. There is a tolerance here of ±3 mm.

Fasten the recoil indicator guide to the cradle with the nuts.

27. Check the engagement of recoil indicator guide 01-28 (fig. 1) with recoil indicator 09-55 (fig. 3) with the barrel drawn out. The engagement should be greater than 4 mm in vertical and horizontal positions. If the engagement is smaller than this, build up a layer of metal on guide 01-28 with an E42 electrode and machine if for local conformance.

28. To provide the maximum negative angle of elevation of -2° 30' for the tipping parts of the gun, negative angle of elevation limiter 17-74 can be filed (fig. 8) or a layer of metal can be built up on the limiter with an E42 electrode and then smoothed by filing.

29. To provide the maximum angle of elevation of +46° for the tipping parts of the gun, cradle arc limiter 09-143 can be filed (fig. 3) or a layer of metal can be built up on the limiter with an E42 electrode and then smoothed by filing.

If it is necessary to build up brass limiter 09-143 (on guns of initial issue), build up a layer of brass on the limiter by gas

30. To provide an angle of traverse of ±25° for the rotating part of the gun, lower carriage arc catches 18-3 (fig. 10) can be filed or a layer of metal can be built up on the catches with an E42 electr[illegible] and smoothed by filing. If it is necessary to build up brass stays 18-3 (on guns of initial issue), build up a layer of brass on the stays by gas welding. 50X1-HUM

31. For assembly, place the parts in the same locations in which they were located before maintenance by using the marks and scratches which were made before dismantling.

32. After assembly, adjust the mechanisms in accordance with the instructions in appropriate chapters of this Manual.

33. Before assembly, grease all parts in accordance with the instructions in the Service Manual.

34. After the assembly of any mechanism or part of a mechanism, ascertain the correctness of assembly by checking the operation of the assembled mechanism. Tighten the lock screws.

35. Retouch discolored places according to the instructions in the General Manual for the Maintenance of Artillery Weapons.

36. After maintenance, enter the completion of maintenance in the inspection inventory book and enter all necessary entries concerning maintenance execution in the gun service log.

4. Instructions for Checking the Gun after Maintenance

1. Check the mechanisms of the assembled gun according to the catalog of compulsory checks (appendix 3, section A) and compare the inspection results achieved after maintenance with the inspection results achieved during the preliminary inspection (appendix 3, section A).

Gun mechanisms which were in satisfactory condition and therefore not subjected to maintenance should be in no worse technical condition after assembly of the gun than they were in during the preliminary inspection. The technical condition of repaired mechanisms should comply with the requirements of this Manual. [p 14]

2. Check the position of the graduation lines on the muzzle brake facing (appendix 4).

There can be a 0.5 mm deviation of the cross lines center from the bore axis. 50X1-HUM

If the deviation is greater than 0.5 mm remove the old lines and replace them with new ones.

Then, check the zero sight line.

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3. Test the gun by firing (appendix 5) if the following operations were done during maintenance:

-- overhaul or repair with overhaul of the recuperator;

-- removal of bulges in the bore;

-- sealing of holes in the barrel by the insertion of threaded plugs;

-- replacement of cradle-guides 01-12 of the barrel rings and of the breech ring (fig. 1).

4. Check wheel brake operation in accordance with appendix 5.

5. Instructions for the Correction of General Defects

Corrections of general defects (dents, punctures, cracks, etc.) of parts are done in accordance with the General Manual for the Maintenance of Artillery Weapons while considering the following additional instructions.

In the adjoining parts indicated below, small local damage of threads is permissible if there is not total disruption of pitch in the damaged places. The overall permissible length of thread damage is less than 5% of the length of the screwed connection (the stationary connection of the screw with the nut).

This relates to the following parts connections:

-- jacket 01-2 and breech ring 01-3 (fig. 1);

-- tube 01-1 and muzzle brake 01-51 or 01-45;

-- coupling screw 18-39 and coupling housing 18-42 (fig. 10);

-- link bolt 19-100 and bolt 19-103 (fig. 11);

-- tie bolt 19-122 and clamp nut 19-258;

-- tie bolt 19-513 and bushing 19-519;

-- adapter 17-11 and cap 21-83 (fig. 7);

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-- brake disk 21-85 and nut 21-97;

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-- eye bolt 46-214 (46-213) and nut 46-114 (fig. 19); [p 15]

-- chassis pintle 46-129 and nut 46-77.

If the threads of the enumerated parts are stripped, replace them except for link bolt 19-100, bolt 19-103, brake disk 21-85, and eye bolt 46-214 (46-113) which should be repaired in this case according to the instructions in appendix 6.

In the connections listed below, the length of permiss ble thread stripping is less than 10% of the screwed connection length.

This relates to the following part connections:

-- the muzzle brake and bolt 10-46 (fig. 1);

-- pin 01-8 and nut A51011-7;

-- stuffing box 08-2 and stuffing nut 08-7 (fig. 4);

-- stuffing box 08-2 and nut 08-11;

-- recoil cylinder 08-1 and nut 08-10;

-- recoil cylinder 08-1 and nut 08-46;

-- rod stem 08-13 and rod nut 08-53;

-- pistonhead 08-14 and nut 08-31;

-- moderator stem 08-17 and valve nut 08-20;

-- forecap 08-23 and nut 08-27;

-- forecap 08-23 and nut 08-29;

-- throttling rod 08-28 and nut A51011-40;

-- throttling rod 08-28 and nut 08-42;

-- nut 08-46 and screw 08-47;

-- air cylinder Sb10-2 and nut 10-26 (fig. 5);

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-- air cylinder Sb10-2 and nut 10-29;

-- nut 10-26 and screw 10-27;

-- nut 10-29 and screw 10-27;

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-- stuffing box 10-75 and stuffing nut 10-81;

-- rod 10-32 and flange nut 10-65;

-- cap 10-114 and adjuster bolt 10-120;

-- operating cylinder 10-4 and intermediate cylinder 10-9;

-- operating cylinder 10-4 and head 10-114;

-- axle box 17-22 and nut 17-26 (fig. 8);

-- bolt 17-35 and nut 17-39;

-- pintle cap 17-42 and adjuster bolt 17-43;

-- pin 17-2 for the cap square and nut A51011-8;

-- adapter bushing 17-58 and lock nut 21-2 (fig. 7);

-- axle box casing 17-50 and lock nut 17-53 (fig. 8);

-- the upper carriage and bolt A51000-47;

-- pintle 17-62 and nut 17-63;

-- pin 18.8 and nut 18-11 (fig. 10);

-- yoke 20-51 and eye fitting 20-70 (fig. 12);

-- worm fitting 21-22 and nut 21-84 (fig. 7);

-- external cylinder 23-146 and bushing 23-6 (fig. 6);

-- pin 23-141 and nut A51011-5;

-- bolt 25-10 and nut 25-11 (fig. 14); [p 16]

-- bolt (25-18) and nut 25-11;

-- bolt 46-18 and nuts 46-19 and 46-193 (fig. 19);

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-- king bolt 46-58A and flange screw 46-209;

-- king bolt (46-58) and nut(46-201);

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-- lug 46-8 and nut 46-90.

In the remaining threaded connections, damage of up to 25% of the screwed connection length is permissible.

Follow the instructions in appendix 6 and in the General Manual for the Maintenance of Artillery Weapons to repair part threads.

50X1-HUM

Chapter Two

Maintenance of Barrel

1. Elongation of Breech Chamber

(fig. 1)

The condition of the bore is characterized by the elongation of the breech chamber. As a result of the elongation of the chamber, the ballistic qualities of the gun are lowered; that is, the muzzle velocity of the shell decreases and the dispersion increases.

The fitness category of the barrel is determined by the elongation of the breech chamber in accordance with the existing Instructions for the Categorization of Artillery Armament.

The degrees of elongation of the breech chamber, the decreases in muzzle velocity, and the category of the barrel should be recorded in the gun service log.

DARM. If the barrel is considered to be in the reject category, replace tube 01-1 (appendix 1).

2. Copper Fouling of Bore

(fig. 1)

PM. Copper fouling in the bore should be removed by chemical means (with a solution of RChS) in accordance with the existing Instructions for Chemical Cleaning of Bores of Artillery Barrels.

3. Bent Barrel

(fig. 1)

Check the straightness of the bore with special calipers. Size of calipers: for barrel of gun M-46 -- diameter (Д-- 0.1) -0.08 mm, length 650 mm; for barrel of gun M-47 -- diameter (D--0.08) -0.08 mm length 600 mm.

Note: Дand D signify nominal diameters of the land (caliber) of the bore: Д--for gun M-46; D--for gun M-47.

For convenience in pushing the calipers through the bore, use a regulation pole and cleaning rod.

The calipers should pass through the bore without jamming. 50X1-HUM

DARM. If the calipers do not pass through the bore as a result of bending, and not from the elevation of the edges of the land, the presence of heavy copper fouling, or other reasons, replace tube 01-1 (appendix 1).

4. Expansion of the Bore [p 18]

(fig. 1).

Run a wad through the bore and inspect the bore carefully. If a dark ring is noticed in the bore or if, while running the wad through the bore, the wad passes through certain parts more easily than others, or if the sound of the rod striking against the wad changes, the bore has expanded.

With a star gauge or special device (appendix 7) measure the diameter of the bore between the grooves in the place of expansion, and also check whether the internal expansion has caused external expansion, which is determined by the gap between the surface of the barrel tube and a rule applied to the outer surface of the barrel tube in the place of internal expansion.

If internal expansion has occurred in the section of the barrel tube which fits into the jacket, it is necessary to remove the tube to check the external expansion.

The diameter of the bore between the grooves in the place of expansion should be: for the barrel of gun M-46--no greater than (D+8.1) mm, for the barrel of gun M-47--no greater than (D+4.5) mm.

DARM. If the diameter of the bore is greater than the dimension shown above or if internal expansion has caused external expansion, replace tube 01-1 (appendix 1).

If it is impossible to remove the tube as a result of wedging in the place of expansion, replace the barrel (appendix 1).

The diameter of the bore at the place of permissible expansion, the length of the expanded area and its location in the tube should be recorded in the gun service log.

In the maintenance process it is necessary to periodically i 50X1-HUM the barrel, determine the degree of expansion, and record the findings in the gun service log. If the expansion increases, replace the tube or barrel (appendix 1).

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5. Dents on the Outer Surface of the Barrel

(fig. 1)

Dents on the outer surface of the barrel are allowed in accordance with the data given in the tables (appendices 8 and 9) if there are no cracks in the damaged area.

In barrel sections a and b of the front and rear rings, the permissable depths of dents are given without regard for the thickness of the walls of the clamping pieces.

PM. Remove the raised metal, clean the dented area and the area surrounding it until a metallic luster appears, and polish.

Apply a 10% solution of hydrochloric acid to the surface of each dent. After a certain time dark traces will appear along any cracks in the surface.

The edges of dents on a cannon allowed to remain in service should be rounded off.

Send the gun to a higher maintenance workshop in case of the following defects: [p. 19]

-- the depth of the dents is greater than the dimensions shown in the tables;

-- cracks in the surface of the dents;

-- bulges in the bore formed by dents.

DARM. Remove bulges in the bore formed by dents (chart 1).

AARM [Army Artillery Maintenance Shop]. If the depth of the dents is greater than the dimensions shown in the tables, or if there are cracks resulting from the dents, bore out the dents or cracks and seal the tube and barrel jacket with threaded plugs as indicated below in item 7.

If the length of a crack exceeds the permissible diameter of a plug, replace tube 01-1 or barrel (appendix 1).

6. Cracks on the Surface of the Bore

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(fig. 1)

Cracks in the barrel are not permissible.

When it is suspected that there is a crack on the surface of the bore, test the area in question with a needle fastened to a wooden pole.

The needle will become stuck in a crack but will glide over a smooth surface or a scratch.

AARM. When a crack appears, drill through the wall of the bore in the place of the crack and insert a threaded plug as specified in item 7. If the length of the crack exceeds the permissible diameter of a plug, replace tube 01-1 (appendix 1) [1] [Trans. note: footnote missing]

7. Holes in the Barrel

(fig. 1)

AARM. Holes in the barrel should be sealed with threaded plugs (chart 1).

Depending on the location of the holes in the barrel (sketch 1), the following diameters for plugs are permissible:

For barrel of gun M-46

a) in the barrel tube:

-- in section l_2--no greater than 33 mm;

-- in section l_3--no greater than 39 mm;

-- in section l_4--no greater than 48 mm.

The pitch of the plugs' threads should be: in sections l_2 and l_3--2mm; in section l_4--3mm.

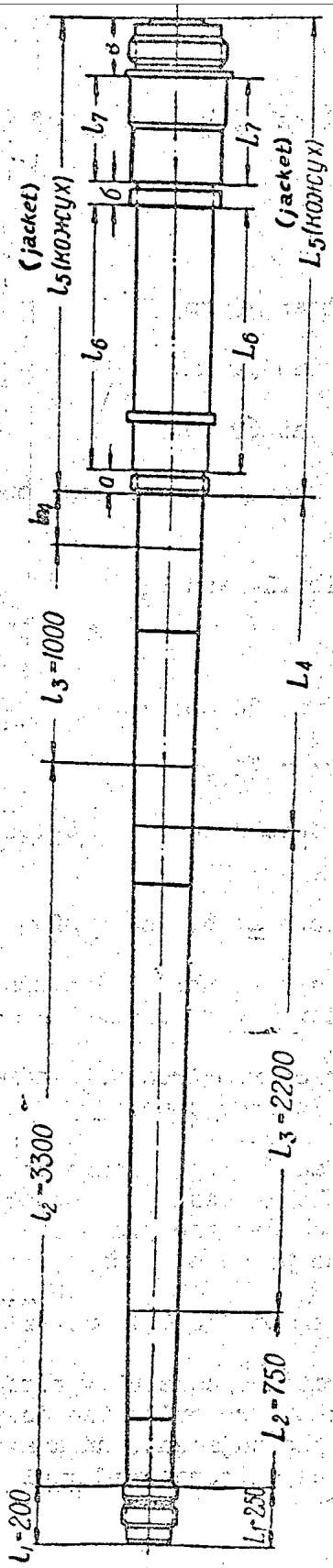
Plugs are not permitted in sections l_1 and l_5. [p 20]

b) in the barrel jacket:

-- in section l_6--no greater than 30 mm;

-- in section l_7--no greater than 42 mm.

The pitch of the plugs' threads should be: in section l_6--0.75 mm, in section l_7--1mm.



Sketch 1

Note: Sections designated by letter l with indexes refer to the barrel of gun M-45, and letter L with indexes to gun M-47.

Plugs are not permitted in sections a, b, and c, of the jacket. 50X1-HUM

For the barrel of gun M-47

a) in the barrel tube:

-- in section L_2 -- no greater than 39 mm;

-- in section L_3 -- no greater than 52 mm;

-- in section L_4 -- no greater than 60 mm.

The pitch of the plugs' threads should be: in sections L_2 and L_3 -- 2 mm; in section L_4 -- 3 mm.

Plugs are not permitted in sections L_1 and L_5.

b) in the barrel jacket

-- in section L_6 -- no greater than 30 mm;

-- in section L_7 -- no greater than 42 mm.

The pitch of the plugs' threads should be: in section L_6 -- 0.75 mm; in section L_7 -- 1 mm.

Plugs are not permitted in sections a, b, and c of the jacket.

If it is impossible to seal holes with threaded plugs of the sizes specified, replace tube 01-1 or the barrel (appendix 1).

Guns having barrels which have been repaired with threaded plugs should be checked by firing five full-charge rounds.

The repair of a barrel with threaded plugs should be noted in the gun service log, thereby indicating the necessity of observing the repaired parts while in use (to see whether the plugs have loosened or whether cracks have appeared in the place of repair).

8. Nicks and Scratches on the Clinometer Plane [p21]

PM. In the case of nicks or scratches, carefully remove the raised metal with a scraper or hand file without removing the dents in the metal or allowing the tool to damage the adjacent, undamaged sect 50X1-HUM The partial or complete scraping of the clinometer plane is forbidden.

9. Rust on the Adjoining Surfaces of the Barrel Jacket and Barrel Tube

PM. Rust on the inner surface of the jacket and the outer surface of the tube should be removed with an abrasive cloth greased with steol M.

Before being assembled, the adjoining surfaces of the jacket and tube should be thoroughly rinsed with gasoline, wiped dry, and then greased with liner grease.

10. Turning of Muzzle Brake 01-51 or 01-45

(fig. 1)

Unscrew bolts 01-46 from the muzzle brake and with the aid of a pinch bar screw the muzzle brake up to the stop in the muzzle face of the barrel tube.

With the muzzle brake screwed up to the top, the reference mark on the end of the muzzle brake should be located between the terminal marks on the barrel tube.

Check whether there are burrs on the shanks of bolts 01-46.

PM. If there are burrs on the shanks of bolts 01-46 remove the raised metal.

DARM. If the reference mark on the muzzle brake goes beyond the limits of the terminal marks on the barrel tube, deepen the undercut in the muzzle brake to a depth of N and insert a spacer between the muzzle face of the barrel tube and the collar of muzzle brake (sketch 2 and 3).

The size of N depends on the thickness of the spacer and should not be greater than 203.5 mm for gun M-46 and 253.5 for gun M-47.

The thickness of the spacer should be determined in the following manner:

-- with a marking tool make a mark on the surface of the barrel opposite the reference mark on the muzzle brake;

-- measure the distance a (along the curve) between the new mark and the extreme right mark on the barrel (looking from the side 50X1-HUM muzzle brake);

-- determine the thickness δ of the spacer by the formula:

$$\delta = 2 + 0.019\ a.$$

Fit the spacer so that when the muzzle brake is screwed up to the stop the reference mark on the muzzle brake is located between [text missing] 50X1-HUM

If a spacer has previously (during maintenance)been placed between the barrel and the muzzle brake, replace it with a new spacer made as indicated in sketch 3. The undercut in the muzzle brake is not deepened. [p 23]

11. Muzzle Brake Will Not Screw Off Barrel Tube

PM. With a star gauge or special device (appendix 7) determine whether the barrel tube has expanded in the section which connects with the muzzle brake (Chapter Two, Item 4).

A barrel from which the muzzle brake will not screw off as a result of expansion, but which is declared fit as a result of bore measurements, may remain in service.

If it is impossible to screw off the muzzle brake even though there has been no expansion, lay a rag soaked with kerosene on the place where the muzzle brake connects to the tube, give the barrel a negative angle of elevation and leave it in that position for a prolonged period of time.

After this, screw off the muzzle brake.

12. Dents and Cracks in Muzzle Brake 01-51 or 01-45

(fig. 1)

PM. Dents with depths up to 5 mm for gun M-46 and 10 mm for gun M-47 are allowed in the muzzle brake.

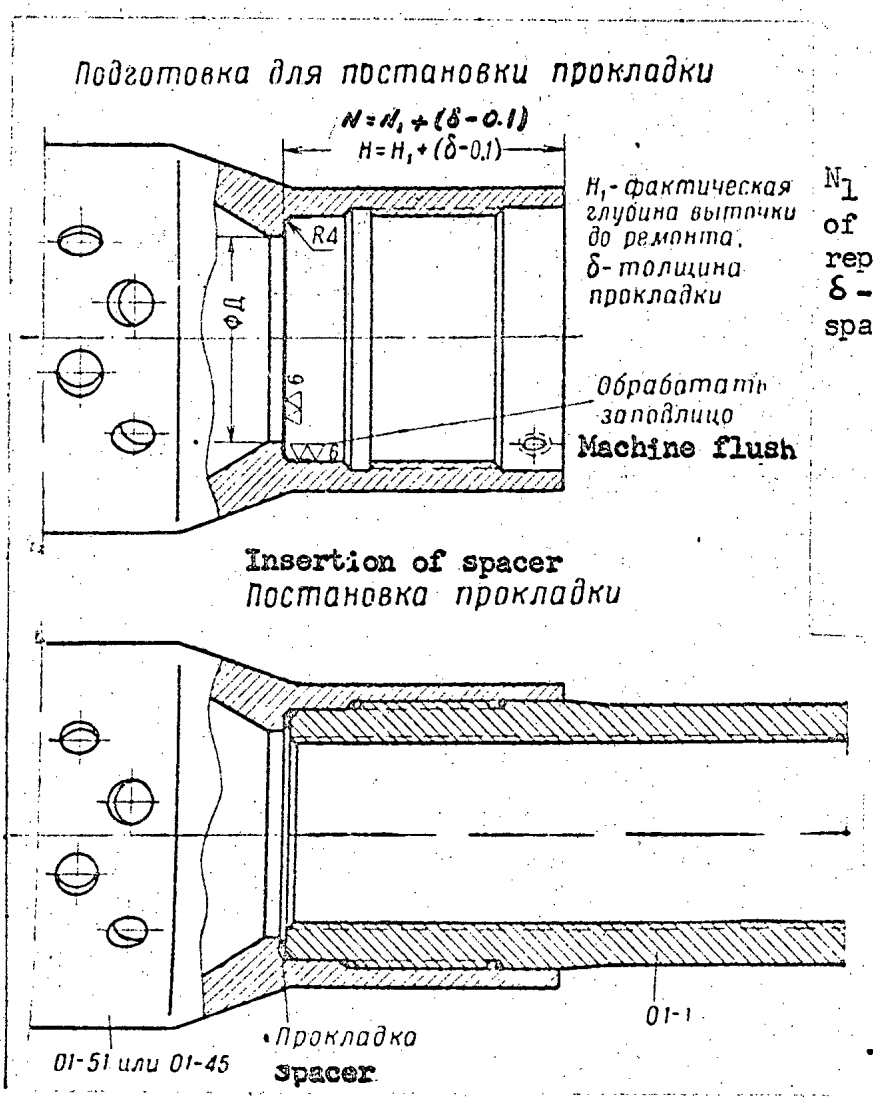
A muzzle brake having cracks and dents of greater depths than those shown above should be replaced.

13. Wear of Guide 01-12 of the Barrel Ring and Guide 01-52 of the Breech Ring

(figs. 1, 3, 4)

With a clearance gauge measure the clearance a between the lower surfaces of the barrel clamping piece and reinforcing plate 09-26 of the cradle (fig. 1), and also clearance b between the lower surfaces of the breech ring and the cradle guide (fig. 1). Clearance a should be no greater than 0.8 mm, and clearance b -- no greater than 0.6 mm. 50X1-HUM

Preparation for insertion of spacer

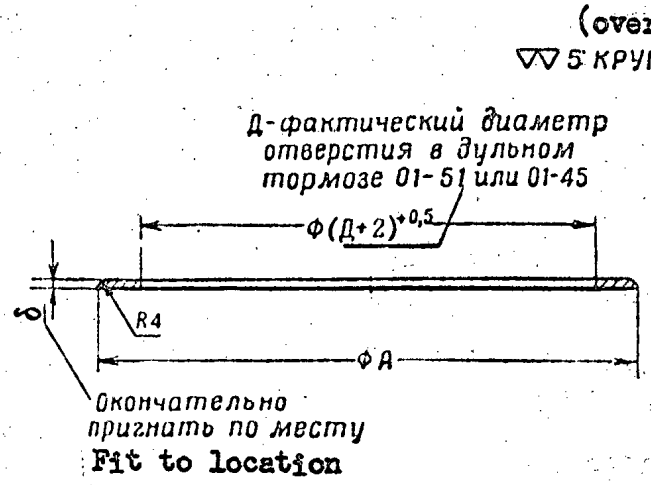


N_1 - actual depth of undercut before repair

δ - thickness of spacer

Sketch 2.

Sb01 - barrel; 01-1 - tube; 01-51 or 01-45 - muzzle brake



A- true diameter of aperture in muzzle brake 01-51 or 01-45

Size	A mm
For M-46 gun	$178_{-0.5}$
For M-47 gun	$198_{-0.5}$

Material: steel 40x
Blunt sharp edges

Sketch 3. Spacer

Next measure the clearances between flange nut 10-65 and bushing 09-42 (fig. 3) and between rod nut 08-53 (fig.4) and the breech lug. To do this:

-- remove the breechblock wedge from the screw box;

-- [text missing]

-- connect the winch to the shield bracket; [p 26]

-- elevate the tipping parts of the cannon up to the cradle stop in the hinged supports of the trails and connect the winch chain to the breech ring;

-- using the winch, move the barrel forward slightly;

-- detach the recoil piston rod from the breech lug, and then, after pushing up wedge detent 01-26, remove wafer-type lock 01-29;

-- place stop Sb09-15 (fig. 3) in the "traveling" position and, using the winch, roll the barrel off 20-30 mm. With a clearance gauge measure the clearance between the protuberance formed by flange nut 10-65 and the groove in bushing 09-42. The clearance should be no less than 0.5 mm;

-- roll the barrel off an additional 30-40 mm and with a clearance gauge measure the clearance between aperture in the breech lug and the wafer protuberances of rod nut 08-53. The clearance should be no less than 0.5 mm.

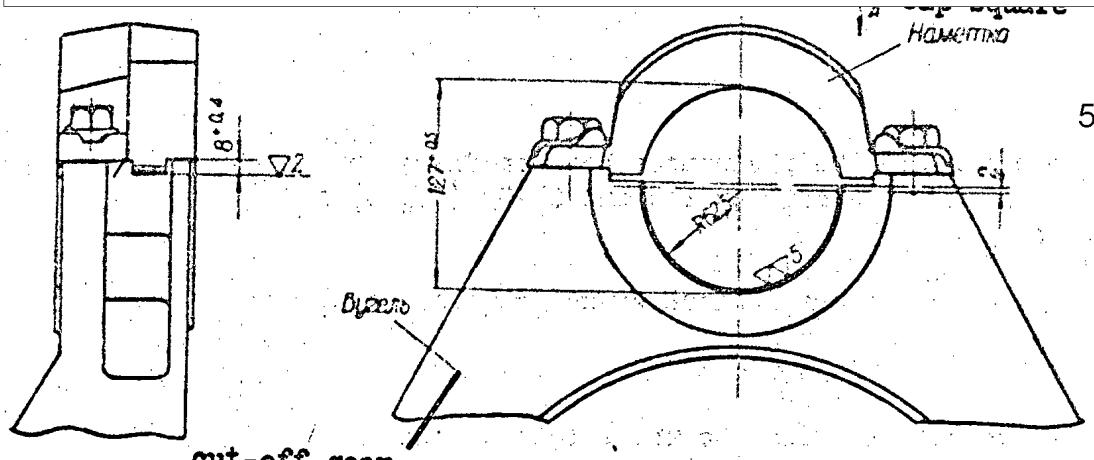
Take off the barrel and measure the thickness of the upper lip of guide 01-12 of the rings. The thickness should be no less than 2 mm.

Check for looseness of the guides; unsteadiness is not allowed.

PM. If the guides are loose, replace the weakened rivets.

AARM. If measuring shows that the thickness of the upper lip of guides 01-12 is greater than 2 mm, clearance a between the lower surface of the barrel rings and reinforcing plate 09-26 of the cradle is greater than 0.6 mm, and the clearances between flange nut 10-65 and bushing 09-42 and between rod nut 08-53 and the breech lug are less than 0.5 mm, it is necessary to:

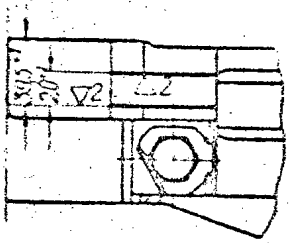
a) if the clearance in the junction of flange nut 10-65 and bushing 09-42 is less than 0.5 mm:



50X1-HUM

View along arrow A

Вид по стрелке А

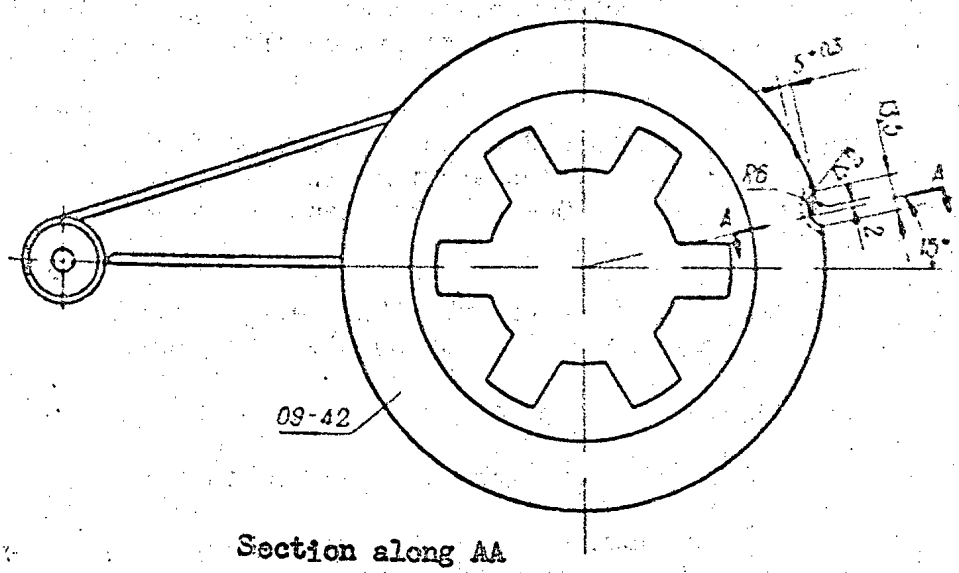


Sketch 4. Cradle

Эскиз 4. Люлька

Острые ребра притупить

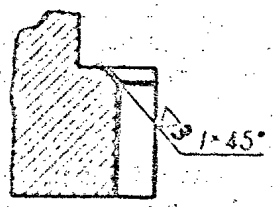
Blunt sharp edges



Section along AA

Разрез по АА

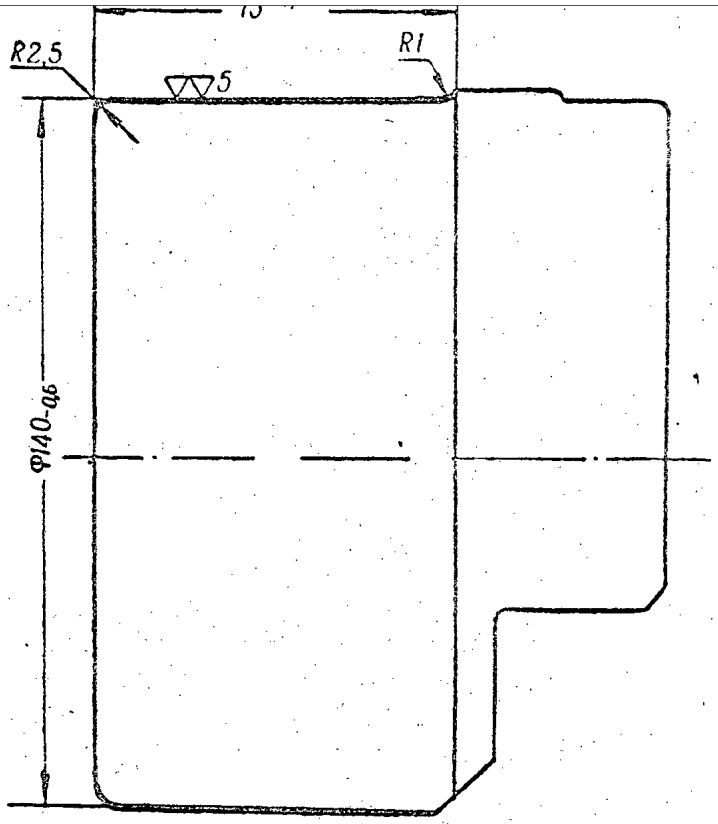
Sketch 5.



50X1-HUM

Blunt sharp edges

Острые ребра притупить

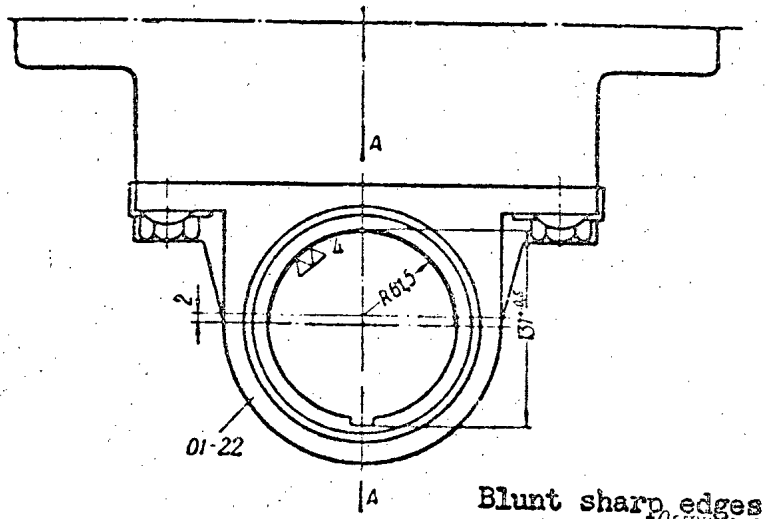


50X1-HUM

Оксидировать Oxidize

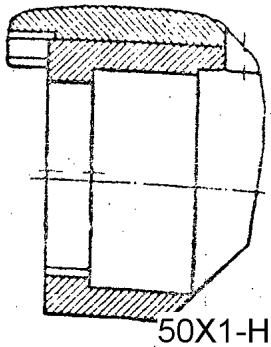
Эскиз 6. 01-29 — замок сухарный

Sketch 6. 01-29 - wafer-type lock



section along AA

Разрез по АА



50X1-HUM

Blunt sharp edges

Острые ребра притупить

Sketch 7.

-- tool the semi-aperture and deepen the groove of the cut-of gear actuating collar (sketch 4):

-- tool the semi-aperture in bushing 09-42 for stop 09-48 (sketch 5);

b) if the clearance in the junction of rod nut 08-53 and the breech lug is less than 0.5 mm:

-- machine the outer surface of wafer lock 01-29 and cut an oval hole in the breech lug (sketches 6 and 7);

-- replace key 08-55 (fig 4) of the rod nut (appendix 1, sketch 214).

After performing the specified work, place the barrel on the cradle and check the connection of the recoil piston rod with the barrel and the recuperator rod with the cut of gear actuating collar of the cradle. With the rods connected to the barrel and the gear actuating collar, try the operation of the elevating mechanism and [text missing]

Also check whether stop 09-48 (fig 3) fits in the semi-aperture of bushing 09-42 when stop Sb09-15 is in the travelling position. [p 27]

If the stop does not fit, adjust the length of forward rod Sb09-16.

FPARM. If measuring shows that the thickness of the upper lip of guides 01-12 is less than 2 mm, or the clearance a is less than 0.8 mm, or clearance b is less than 0.6 mm, replace guides 01-12 and 01-52 (chart 2).

14. Looseness of Stop 01-17 of the Breech Ring, Causing Turning of the Breech Ring in Relation to Jacket 01-12

(fig. 1)

PM. Check for looseness of the stop by tapping lightly with a hammer. If it is loose, screw up screw A51060-57 as far as possible and center it in the slot.

With a clearance gauge measure the lateral clearances between stop 01-17 and the walls of the grooves of the breech ring and jacket.

The sum of the clearance on both sides in the junction of the stop and the breech ring and also the sum of clearances on both sides i the junction of the stop and the jacket should be no greater than 0.15 mm.

If the clearance is larger, the barrel is subject to repair at a st

Chapter Three [p 28]

Maintenance of the Breechblock 50X1-HUM

1. The Breechblock is not Secure in the Closed Position.

(fig. 2)

With the breechblock closed, attempt to pull the breechblock lever Sb02-2A right without pressing down on the lever handle grip 02-9. The breechblock lever should not pull.

Causes for malfunction:

a) A break or spring fatigue of spring 02-8.

With the breechblock closed, press down on the lever handle grip 02-9 and release. The action of the spring should return the grip to the original position. At the same time, the cog of the lever detent 02-7 must engage the lever catch 01-30.

PM. If the grip does not return to the original position, replare the spring with one provided by DARM (chart 3).

b) A jamming of the cog of the lever stop 02-7 with the lever catch 01-30 (1 in figure 2) in the coupling.

DARM. Build up a layer of metal on the lever stop cog and on the lever catch tooth utilizing an electrode, type EN-40, and machine them (sketches 8 and 9).

2. The Breechblock Does not Open.

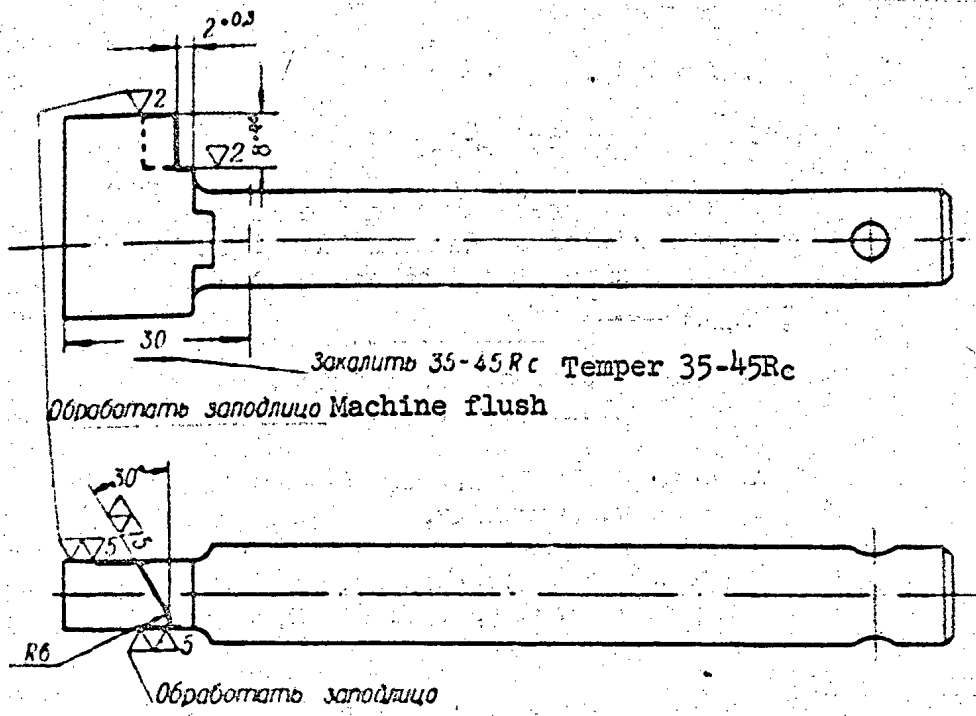
Try to open the breechblock by elevating the barrel at different angles. The breechblock must open smoothly without jerking.

Causes for malfunction:

a) The wedge stop 01-26 won't fully retract from the opening in the breechblock wedge due to a break or spring fatigue of spring 01-27 (figure 1).

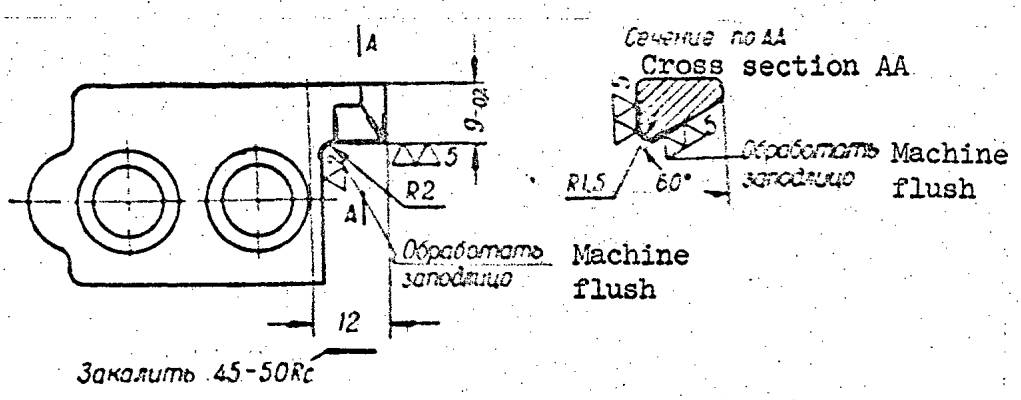
With the wafer-type lock 01-29 fully joined with the control rod, press down with any type of nipple on the catch of the stop 01-26 and attempt to open the breechblock. If the breechblock opens, this indicates spring fatigue of spring 01-27. Measure the height of the uncompressed spring. The height of the spring must be not less tha 50X1-HUM

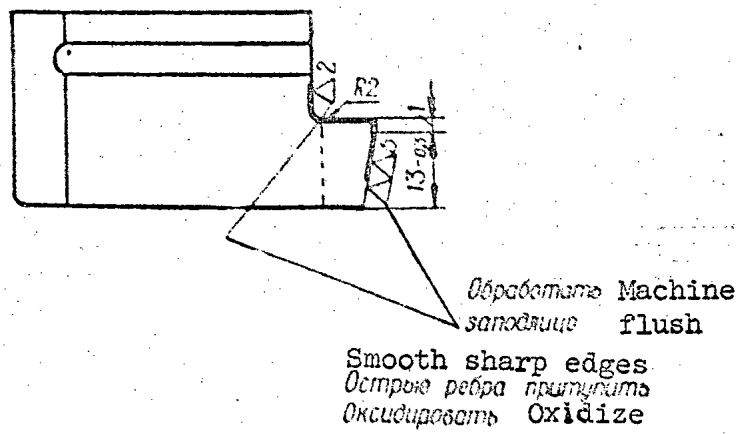
Note: On guns of original issue, a new spring in the uncompressed position conforms to a measurement of 102 ± 5 mm. [p 29]



Эскиз 8. 02-7 — стопор рукоятки

Sketch 8. 02-7 - lever stop





Эскиз 9. 01-30 — крючок рукоятки.

Sketch 9. 01-30 - lever stop

PM. If the wedge stop 01-26 does not fully retract from the opening in the breechblock wedge due to spring fatigue or because it is broken, replace the spring with one provided by DARM (chart 3). 50X1-HUM

b) The wedge stop 01-26 projects over the lower surface of the wedge slot of the breech ring when the breechblock is open (figure 1).

PM. In the absence or after the elimination of the cause of the malfunction indicated in Item "a" (see above), check the amount of stop projection with a rule. While in the projected position, trim the upper end of the stop flush with the lower surface of the breech ring housing and take down the edge 1.5 X 45 degrees on the upper end of the stop.

c) The cocking lever Sb02-4 does not return to the original (forward) position after release due to a break or elongation of spring 02-19 (figure 2).

Check whether the cocking lever Sb02-4 returns to the original (forward) position after release.

PM. If the cocking lever does not return to the original position, replace the spring (appendix 1).

d) Jamming of the breechblock wedge due to shell case expansion (figure 2).

Place the cocking lever Sb02-4 in the forward position, if it is in another position.

Press down on the handle grip 02-9, then turn the breechblock lever Sb02-2A right rearward. At the same time, strike the wooden extension on the tray of the wedge with a hammer and open the breechblock.

Extract the jammed shell case with a hand extractor or force it [out] from the case.

Check the clearance between the breech face of the barrel tube and the facing of the breechblock wedge. To do this, insert a flaw-detection shell case which has a flange with a thickness of $7.2_{-0.05}$mm in the chamber of the tube and close the breechblock. The breechblock must close, but not completely -- the cog of the lever stop 02-7 must not engage the lever catch 01-30.

If a flaw-detection shell case is not available, insert a spent shell case (with a non-protruding bottom) in the chamber, having measured beforehand the thickness of the flange. Close the breechblock. With a clearance gage measure the clearance between the flange of 50X1-HUM case and the facing of the wedge.

The overall thickness of the shell case flange and the clearance measured with the clearance gage must not be more than 7.2 mm.

AARM. If the breechblock closes with the flaw-detection case inserted in the chamber, then the clearance between the breech face of the barrel tube and the facing of the wedge is more than 7.2 mm, and the gun needs to be repaired at the stationary repair organ. 50X1-HUM

3. The Projectile Retainer 02-38A (02-38) Does not go Into the Working (Upper) Position. [p 31]

(fig. 2)

Causes for malfunction:

a) Bending of the retainer pivot 02-41 (on guns of original issue).

Loosen the retainer pivot from the breechblock wedge, and check with a rule whether the pivot is bent.

DARM. If it is bent, replace the retainer pivot (appendix 1, sketch 205).

b) A break or spring fatigue of spring 02-39.

Open the breechblock.

Press down on the projectile retainer and release.

The projectile retainer, under the action of the spring, must immediately return to the upper position.

PM. If the projectile retainer does not return to the upper position, replace it with a spring provided by DARM (chart 3).

4. The Breechblock Does not Close or Closes With Difficulty.

(fig. 2)

Put a regulation shell case in the chamber of the barrel and test close the breechblock with different elevations of the barrel. The breechblock must close without jamming. At the same time, the breeck-block must close completely.

Causes for malfunction:

a) A bending of the retainer pivot 02-41 (on guns of or issue). 50X1-HUM

See Chapter III, Item 3, "a."

b) A bending of the lower extractor 02-33A (02-33) and the upper extractor 02-34A (02-34). 50X1-HUM

PM. When the breechblock closes with difficulty, locate the places where the extractors are sticking and trim the extractors in those places.

If bent extractors impede the full closing of the breechblock, replace the extractors (appendix 1).

5. The Inertial Safety Catch 02-31 Does not Lock the Breechblock in the Closed Position.

(fig. 2)

Close the breechblock and attempt to open it without lowering the inertial safety catch. The breechblock must not open.

Causes for malfunction:

a) A break or spring fatigue of spring 02-12.

Remove the breechblock wedge from the breech ring housing. Push down the inertial safety catch in the wedge slot and release it. The inertial safety catch must immediately return to the original position.

PM. If the inertial safety catch does not return to the original position, replace the spring with one provided by DARM (chart 3).

b) A distortion of the projection of the inertial safety catch 02-31. [p 32]

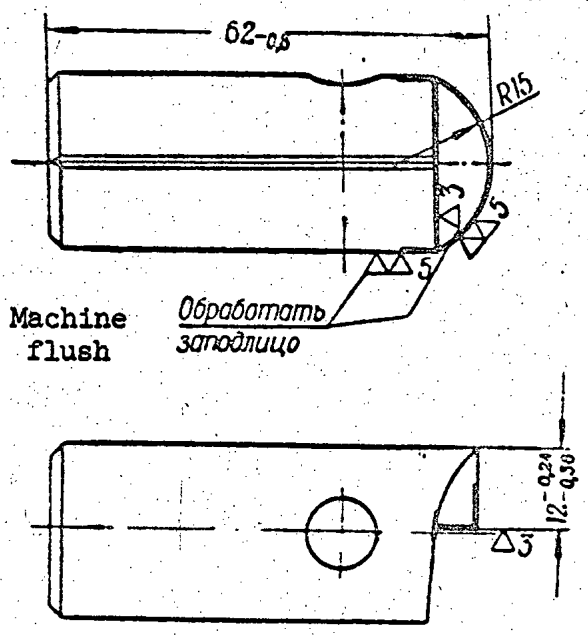
DARM. Build up a layer of metal on the projection of the safety catch. Build up the layer with an electrode, type EN-40, and machine it (sketch 10).

6. The Switch 02-42A (02-42) Does not Return to the Original Position.

(fig. 2)

Causes for malfunction:

a) Burrs on the tip of the set screw (A51064-2) and on the walls of the groove of the switch (02-42), which impede the free movemen 50X1-HUM the switch (02-42) in opening the breech ring (on guns of initial issue).



Smooth sharp edges — *Острые ребра притупить*
Temper 35-45Rc — *Закалить 35-45 Rc*
Oxidize — *Оксидировать*

Эскиз 10. *02-31* — предохранитель инерционный

Sketch 10. 02-31 - inertial safety catch

PM. When there are burrs on the walls of the groove of the switch, clean out the groove, at the same time allowing an increase in the width of the groove up to 8.5 mm.

50X1-HUM

When there are burrs on the tip of the set screw or if the tip is bent, replace the set screw (appendix 1, sketch 206).

b) A break or spring fatigue of spring 02-12.

Open the breechblock. Press firmly on the head of the switch 02-42A (02-42) and release. The switch must return to the original position.

PM. If the switch does not return to the original position, replace the spring with one provided by DARM (chart 3).

7. The Inertial Safety Catch 02-31 Does not Disengage. [p 33]

(fig. 2)

Close the breechblock. By means of switch 02-42A (02-42), disengage the inertial safety catch and check whether the breechblock opens. The breechblock must open.

Causes for malfunction: A break or spring fatigue of spring 02-26.

Remove the breechblock wedge from the breech ring housing.

With one hand press the inertial safety catch 02-31; and, while holding it in the pressed position, with the other hand press firmly on the safety latch 02-32 and release. The safety latch must immediately return to the original position.

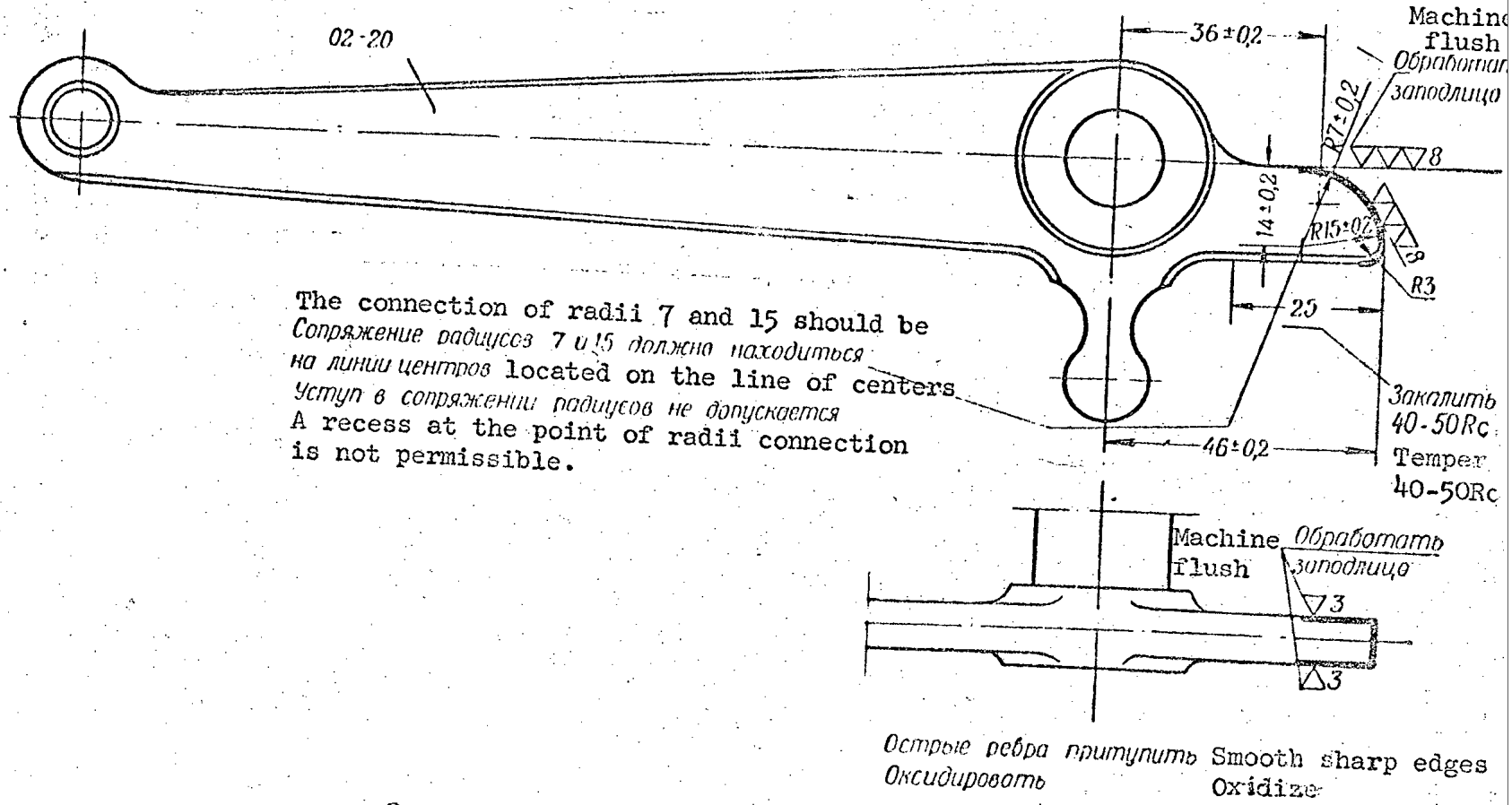
PM. If the latch does not return to the original position, replace the spring with one provided by DARM (chart 3).

8. The Firing Pin Does not Raise and Does not Come Down.

(fig. 2)

With the breechblock closed, pull the cocking lever Sb02-4 out as far as possible, and, keeping the lever in this position, check whether the striker point protrudes beyond the facing of the breechblock wedge. The striker point must protrude beyond the facing of the wedge.

Release the lever Sb02-4 and check with a metal rule whether or not the striker point protrudes beyond the facing of the breechbl50X1-HUM wedge. The striker point must not protrude beyond the facing of the wedge.



Эскиз 11. *Сб02-4* — рычаг взвода: *02-20* — рычаг взвода

Sketch 11. Sb02-4 - cocking lever; 02-20 - cocking lever

50X1-HUM

50X1-HUM

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Repeat the indicated check 4-5 times.

Causes for malfunction:

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a) After release, the cocking lever Sb02-4 does not return to the original (forward) position due to a break or elongation of the spring 02-19.

See Chapter III, Item 2, "c."

b) A break of the firing spring 02-29.

PM. Replace the firing spring (appendix 1).

c) A break or spring fatigue of spring 02-26.

Remove the firing mechanism from the breechblock wedge. Push aside the cocking piece 02-24 so that the side surface "a" of the cocking piece is located approximately flush with the formed cylinderical surface of the firing pin 02-27A (02-23), and release the cocking piece. The action of the spring must immediately return the cocking piece to the original position.

PM. If the cocking piece does not return to the original position, replace the spring with one provided by DARM (chart 3).

d) Wear at the junction of the short arm of the cocking lever 02-20 with the upper projection of the tension [shaft].

DARM. Build up a layer of metal on the short arm of the cocking lever and on the upper projection of the tension shaft. Build up the layer of metal with an electrode, Type EN-50, and machine it (sketches 11 and 12). [p 35]

9. Misfires.

(fig. 2)

Causes for malfunction:

a) A break, bending, or settling of the striker point 02-27A or the striker point (02-27) on guns of original issue.

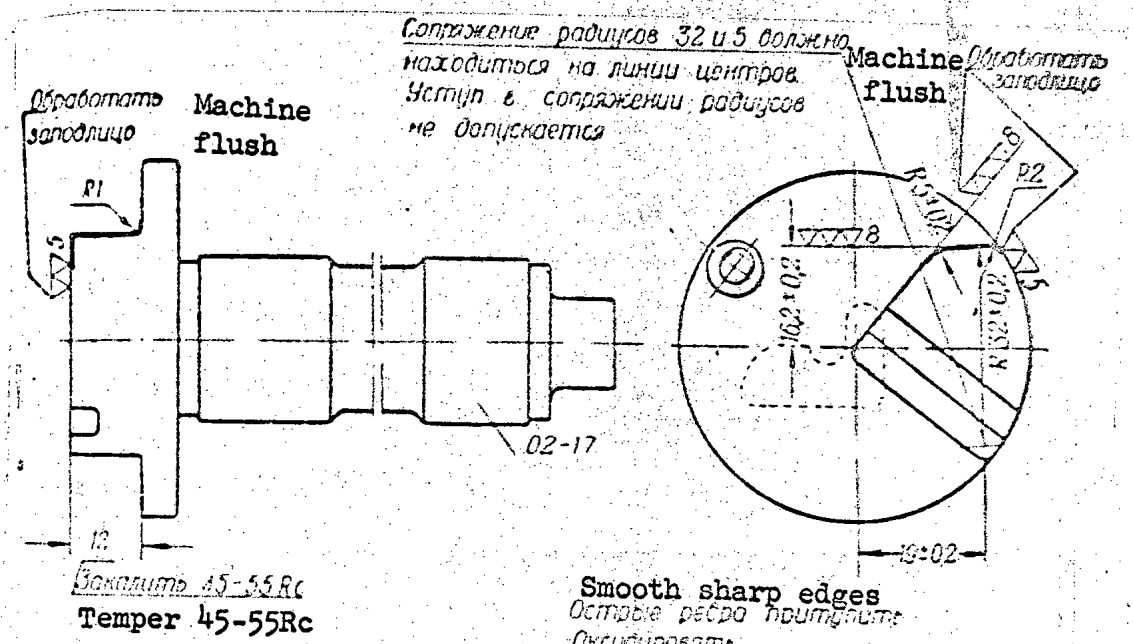
Check the travel of the striker point over the facing of the breechblock wedge. In order to do this:

Remove the breechblock wedge from the breech ring housing;

50X1-HUM

Remove the striker cover 02-30 and the firing spring 02-29 from the wedge slot;

The connection of radii 32 and 5 should be located on the line of centers. A recess at the point of radii connection is not permissable.



Эскиз 12 02-17 — вилка натяжной

Sketch 12. 02-17 - tension shaft

Turn the cocking lever Sb02-4 as far as possible; and without releasing it, push the firing pin forward to the furthest forward position. Check the travel of the striker point with a regulation template (Ab 63).

50X1-HUM

The normal travel of the striker point is from 2.3 to 2.7 mm.

PM. When there is a break, bending, or settling of the striker point (02-27), replace the firing mechanism Sb02-5 with a spare (appendix 1).

DARM. When there is a break, bending, or settling of the striker point (02-27), replace the striker point (02-27) and key 02-28 (appendix 1, sketches 203 and 204).

Arrange the set-up of the point and key in the following order (sketch 13):

-- insert the firing pin (02-23), cocking piece (02-24), pin 02-25, and spring 02-26;

-- screw the [striker] point tightly in the firing pin; [p 37]

-- drill and expand the opening ϕ $5.5^{+0.3}$ mm in the [striker] point and firing pin through the opening in the firing pin;

-- press the key 02-28 as far as possible in the opening of the firing pin;

-- machine the [striker] point and the projecting part of the key flat.

b) A break or spring fatigue of the firing pin spring 02-29. If no break in the spring is found, put in another spring suitable for checking purposes, and ascertain whether the primer is hit. If the primer is hit with the newly installed test spring, this indicates spring fatigue of the spring being checked.

If a suitable spring is not available [for test purposes], determine spring fatigue by the height of the spring.

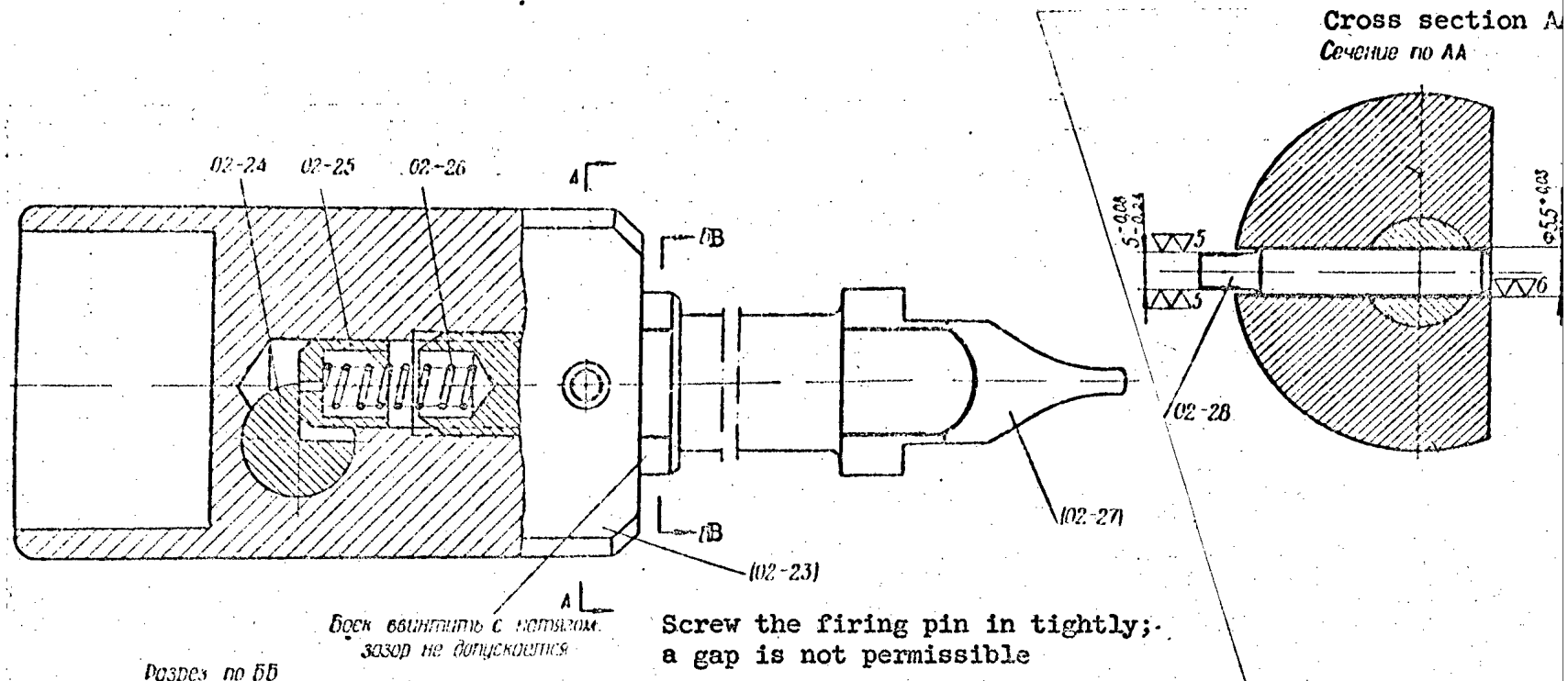
The height of the uncompressed spring must not be less than 50 mm.

PM. Replace the spring if it is broken or there is spring fatigue (appendix 1).

c) Eccentricity of hits of the striker point 02-27A or the striker point (02-27) on guns of original issue.

50X1-HUM

Check the position of the impressions of the striker point on the primer cup. To do this:



Эскиз 13. (02-23) — ударник; 02-24 — курок; 02-25 — боёк; 02-26 — пружина; (02-27) — боек ударника; 02-28 — шпонка

Sketch 13. (02-23) - firing pin; 02-24 - cocking piece; 02-25 - catch; 02-26 - spring; (02-27) - striker pin; 02-28 - key

50X1-HUM

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-- screw a spent primer cup from a shell case;

-- screw the anvil and cuplet from the primer cup; 50X1-HUM

-- check the impression on the primer cup with regard to the spacing of the hits in the primer cup cavity. After that, trim the end of the cup;

-- screw the primer cup in the eye of the shell case;

Note: When a primer cup is not available, it is permissible to seal the eye in the shell case for the primer cup with wax.

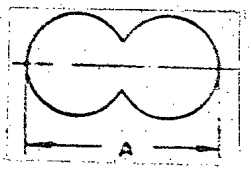
-- put the shell case in the chamber of the barrel and close the breechblock;

-- with hand pressure applied to the tray of the breechblock wedge, move the wedge to the right as far as possible and release the firing pin;

-- open the breechblock, turn the shell case 180 degrees and close the breechblock;

-- once again, with hand pressure applied to the tray of the breechblock wedge, move the wedge as far right as possible and release the firing pin;

-- remove the shell case and measure the distance A between the contact impressions of the striker point (sketch 14).

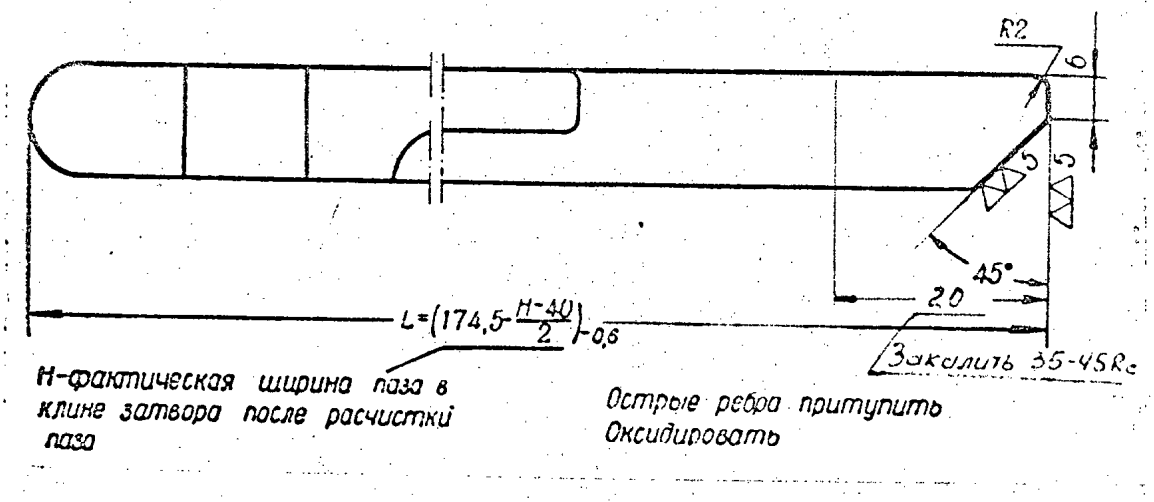


The distance A must not be more than 6.5 mm.

AARM. When the distance A is more than 6.5 mm, reduce the ovalness of the pin of the breechblock lever arm 02-1A by removing a thin layer of metal. Replace the slide 02-5A (02-5) and the slide catch 02-36 and clean out the groove for the slide in the wedge (chart 4).

An increase in the width of the groove up to 45 mm is permissible.

When replacing the slide 02-5A (02-5), machine the end part [w 50X1-HUM missing].



H-the actual width of the groove in the breechblock wedge after clearing the groove.

Smooth sharp edges
Oxidize

Sketch 15. 02-18 - intermediate safety catch

10. The Cartridge Case Does Not Eject [p 38]

The malfunction appears during firing.

When there is an unfired calibrated cartridge, check the ejection of the cartridge with the breechblock opened. The cartridge case should eject energetically.

Reasons for the malfunction:

a) Dilated cartridge case (during firing).

PM. Extract the cartridge case from the chamber using a hand extractor or push it out from the muzzle end.

b) Claws on lower extractor 02-33a (03-33) and upper extractor 02-34A (02-34) are broken (3 in fig. 2).

PM. Replace the extractors (appendix 1).

50X1-HUM

Maintenance of the Cradle

1. Stop Sb09-15 Does Not Hold in Traveling and Combat Positions

(figure 3)

Stop Sb09-15 should hold the lever arm mechanism in traveling and combat positions.

Reason for the malfunction: A break or fatigue in spring 19-437.

Set stop Sb09-15 in traveling or combat position.

Pull back stop 09-68 by cap 09-65 and release. The stop should quickly return to initial position.

PM. If the stop does not return to initial position, replace the spring with one made at DARM (chart 3).

2. Bushing with Bracket Sb09-10 is not Checked by Stop 09-48 When Stop Sb09-15 is Set in Traveling Position.

(figure 3)

The malfunction can be exposed by setting the barrel in traveling position or by detaching the barrel from the cradle.

Recess stop 09-48 and switch stop Sb09-15 from traveling position to combat position. Then switch stop Sb09-15 into traveling position. By doing this, stop 09-48 should enter the semi-aperture of bushing with bracket Sb09-10 and check it.

Reasons for the malfunction:

a) The length of forward rod Sb09-16 is not adjusted.

When stop Sb09-15 is in traveling position, the semi-aperture in bushing with bracket Sb09-10 should be aligned with stop 09-48.

PM. If the semi-aperture does not align with the stop, turn lock nuts 09-72 and 09-137 several turns. Align the semi-aperture with the stop by rotating adjusting screw 09-73 in either direction. After adjusting, fasten the adjusting screw with lock nuts.

50X1-HUM

b) A break or fatigue in spring 09-47. [p 40]

With stop Sb09-15 in traveling position, press down stop hand and release. The stop should quickly return to initial position. 50X1-HUM

PM. If the stop does not return to initial position, replace the spring with one made at DARM (chart 3).

3. When Stop Sb09-15 is Set in Traveling Position, Rod Sb09-30 is not Checked by Stop 09-93.

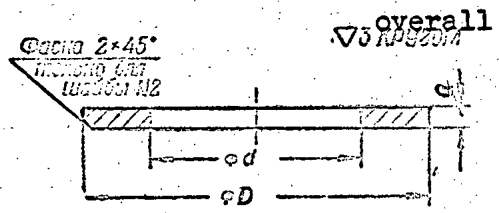
(figure 3)

With stop Sb09-15 in traveling position, try to pull the tappet back. The tappet should not move.

Reasons for the malfuction:

a) The length of rear rod Sb09-17 is not adjusted.

Bevel 2x45° only for N2 washers



Material: steel S3
Smooth sharp edges

Wash.	Measurements in mm. D	d	a
1	39-0.5	21.5+0.6	3+6
2	38-0.7	21.5+0.6	3+5
3	40-0.7	25+0.9	According to location
4	60-0.8	45+0.7	According to location
5	136-1.5	75H(100+1)	8

Sketch 16. Washer

50X1-HUM

PM. Regulate the rear rod with stop Sb09-15 in traveling position and rod Sb09-30 in extreme forward position.

50X1-HUM

Unscrew lock nuts 09-72 and 09-137 several turns. By rotating adjusting screw 09-73, adjust the length of the rear rod so that stop 09-93 enters the rod aperture and checks it but does not interfere with the free movement of the rod when stop Sb09-15 is in combat position. After adjusting, fasten the adjusting screw with lock nuts. [p 41]

b) A break or fatigue in springs 09-85.

With stop Sb09-15 in combat position, pull rod Sb09-30 into an extreme rear position and release it. The rod should quickly return to the initial position.

PM. If the rod does not return to its initial position, replace the springs with ones made at DARM (chart 3).

When there is fatigue in the springs, washer No. 1 (sketch 16) can be placed between the spring and pivot 09-82.

c) A break or fatigue in stop spring 09-95.

With stop Sb09-15 in traveling position, pull stop 09-93 down and release it. The stop should quickly return to its initial position.

PM. If the stop does not return to its initial position, replace the spring with one made at DARM (chart 3).

4. When Stop Sb09-15 is set in Combat Position, Stop 09-93 Hinders the Free Movement of Rod Sb09-30.

(figure 3)

Reason for the malfunction: The length of rear rod Sb09-17 is not adjusted. See Chapter 4, item 3, a.

5. Difficulty is Switching Stop Sb09-15 from Traveling Position to Combat Position when the Recuperator is Detached from the Cradle.

Return the barrel to an extreme forward position by means of the winch.

Switch stop Sb09-15 from traveling position to combat positio50X1-HUM conversely. One man should be able to switch the stop.

Reasons for malfunction:

a) A break in the welded joint connecting handle 09-208 t50X1-HUM 09-64. (fig. 3)

PM. Detach stop Sb09-15 and rear rod Sb09-17 from lever 09-64. Sever the welded joint from the surface of the lever and handle and weld the handle to the lever with electrode E42 (sketch 17).

b) The clearance between the bearing surfaces of the protuberances of bushing with bracket Sb09-10 and flange nut 10-65 (fig. 3) is not adjusted.

Remove cover 09-146.

Place the arm on the limber and connect the winch chain to the breech ring.

With the barrel in an extreme forward position, pull the barrel forward, turning the winch handle with a force of 20 - 55 kilograms. [text missing]

PM. If the clearance does not fall within these limits, take cap Sb10-20 (10-125) (fig. 5) and, either loosening or tightening [p 43] regulating bolt 10-120, adjust the clearance so that it falls within the limits of 1 - 2 mm.

After adjusting, mount cover 09-146 and cap Sb10-20 (10-125) in place.

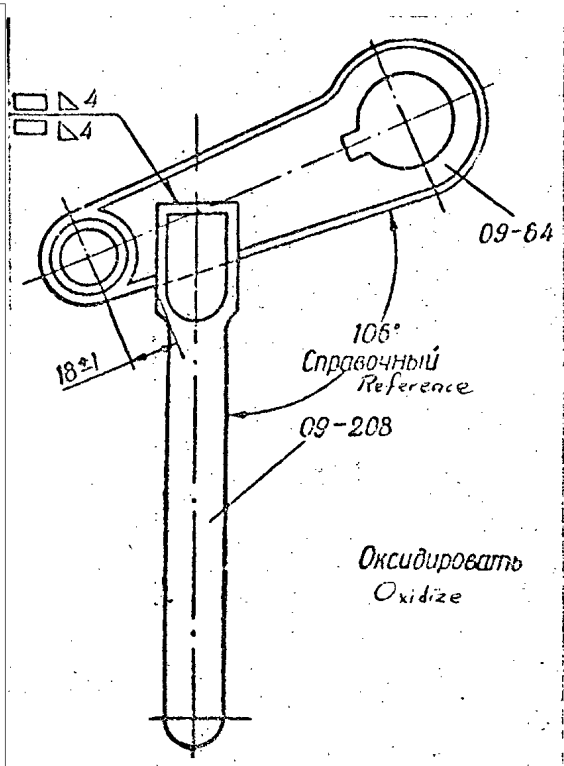
6. A Bend or Break in Rod Stop (09-27) in Guns of Initial Issue.[1] [Trans. note: footnote missing]
(figure 3)

PM. Straighten bend in stop by heating.

DARM. When there is a break, replace the stop (appendix 1, sketch 216). To mount a new stop on cylinder Sb09-5, it is necessary to:

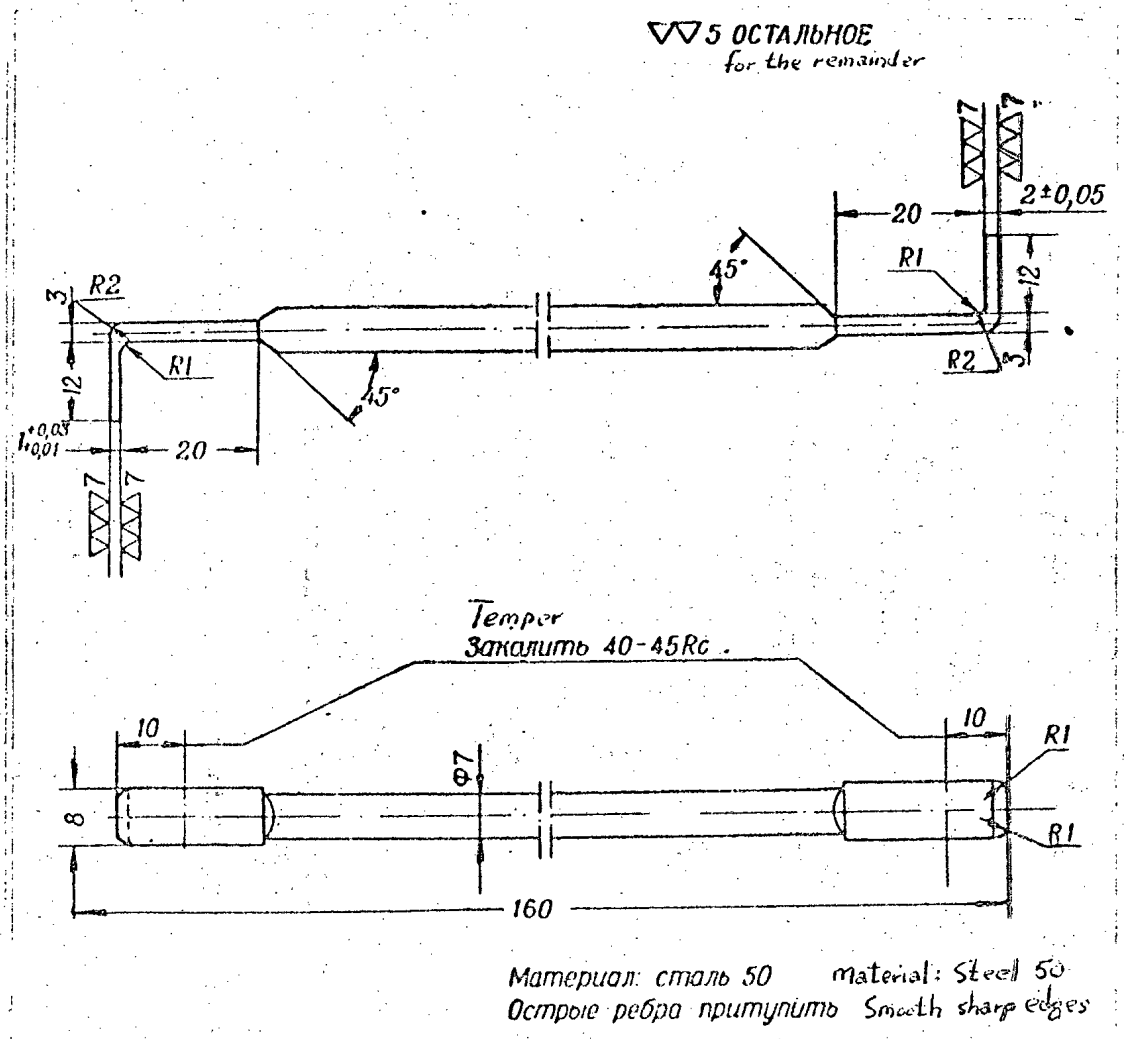
--set up a releasing block mechanism and adjust it;
--place stop Sb09-15 in combat position;
--mount stop (09-27) on cylinder Sb09-5 and set it so that there is a gap of 3 mm between the stop and buffer disk (08-49) (fig. 4). With the stop in this position, mark out an opening in the stop (for cotter pin A51043-9), corresponding to the opening in the cylinder, then drill and ream an opening in the stop and cylinder (sketch 19).

50X1-HUM



Эскиз 17. *Сб09-38* — рычаг с рукояткой; *09-64* — рычаг; *09-208* — рукоятка

Sketch 17. Sb09-38 - lever arm mechanism; 09-64 - lever; 09-208 - handle.



Материал: сталь 50 material: Steel 50
Острые ребра притупить Smooth sharp edges

Эскиз 18. Шаблон

Sketch 18. Pattern

50X1-HUM

50X1-HUM

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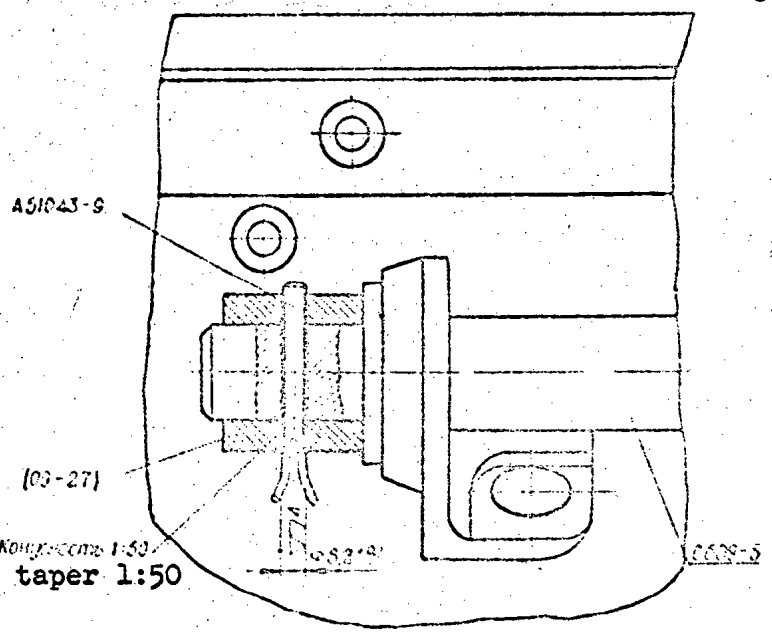
50X1-HUM



Sketch 19. (09-27) - rod stop; Sb09-5 - cylinder; A51043-9 - cotter pin

--insert cotter pin A51043-9; it should not protrude more than 3 mm. If the protrudance is longer, cut off the end of the pin. [p 44]

7. Dents, Holes and Cracks in the Cradle

Dents in the cradle are permissible if they do not hinder the free movement of recoiling parts, the normal operation of mechanisms, or disassembly and assembly.

Cracks in the trunnion yoke in the areas between the trunnion and the yoke are not permissible.

AARM. Weld cracks in the cradle frame with a length of no more than one tenth of a perimeter of a cross section of the frame with electrode E50-A, having first drilled openings with diameters of 3- 6 mm around the ends of the cracks.

When there are longer cracks, after welding them, weld on reinforced steel plates of any quality with a thickness of not less than 6 mm to provide the necessary strength.

Close up all holes in the cradle by welding on plates. 50X1-HUM

Sizes and configurations of reinforced plates welded on by the repair shop depend on the places where the cracks and holes are 50X1-HUM

50X1-HUM

Maintenance of the Recoil System

50X1-HUM

(figure 4)

1. Oil Leakage From the Recoil Brake and Recuperator

Remove forward cradle cap.

Artificially recoil the barrel 450-500 mm and check whether oil is present on the recoil piston rod and recuperator rod. Also, check whether oil is leaking through the sealing rings, valves, or stuffing of the throttling rod.

After checking, put the cradle cap back in place.

Reasons for the malfunction:

In the recoil brake:

a) The recoil piston rod stuffing is insufficiently tightened by stuffing nut 08-7 (fig. 4).

PM. Tighten the stuffing. If the leak does not stop, add more stuffing or replace the stuffing (appendix 1).

If the leak does not stop even after replacing the stuffing, then the reason for the leak may be wear of the apertures for nut bushing 08-8, ring 08-5, or babbitt lining of washer Sb08-13.

In this case, send the cannon to a higher maintenance shop.

AARM. Measure the diameters of the apertures for the bushing, ring, and babbitt lining and the outer diameter of recoil-piston rod 08-12. The difference of the diameters in each junction should be no more than 1 mm.

If there is wear of bushing 08-8 (the difference of the diameters is more than 1 mm), remove the bushing, make a new bushing (appendix 1, sketch 208), and press fit it into stuffing nut 08-7. In order to eliminate the possibility of jamming the rod in the bushing (after pressing), it is permissible to scrape the inner surface of the bushing.

[text missing]

50X1-HUM

If there is wear of the babbitt lining (difference of diameters [p 46]
in the junction is more than 1 mm), line the washer with a new b50X1-HUM
brand BN, and work it around the rod (sketch 20).

After extracting the old babbitt lining, solder the inner surface of the washer with POS-30 solder.

b) Compressed or insufficiently tightened sealing rings 08-45 by screws 08-47, 08-73 by screw 08-72, and 08-9 by nut 08-11 (Fig 4).

Check whether oil is leaking from under forward cap 08-23, screw 08-72, or stuffing box 08-2.

PM. If there is oil leakage, tighten the sealing rings. Tighten sealing ring 08-45 by gradually screwing in diametrically positioned screws 08-47 (in pairs).

When it is necessary to tighten sealing ring 08-9, the following steps should be taken:

--place the pattern (sketch 21) in the groove of nut 08-11, in which buffer disk key 08-50 is located, and mark two lines by the pattern on the outer surface of the recoil cylinder;

--screw on nut 08-11 and tighten sealing ring 08-9. With this, bring one of the grooves of nut 08-11 in line with the graduation lines marked on the recoil cylinder which is controlled by the pattern.

To accomplish alignment of the groove of the nut with the graduation lines, it is permissible to tamper the forward end of nut 08-11.

If the leak does not stop after tightening, replace the sealing rings with ones made at DARM or AARM (appendix 1, sketch 209).

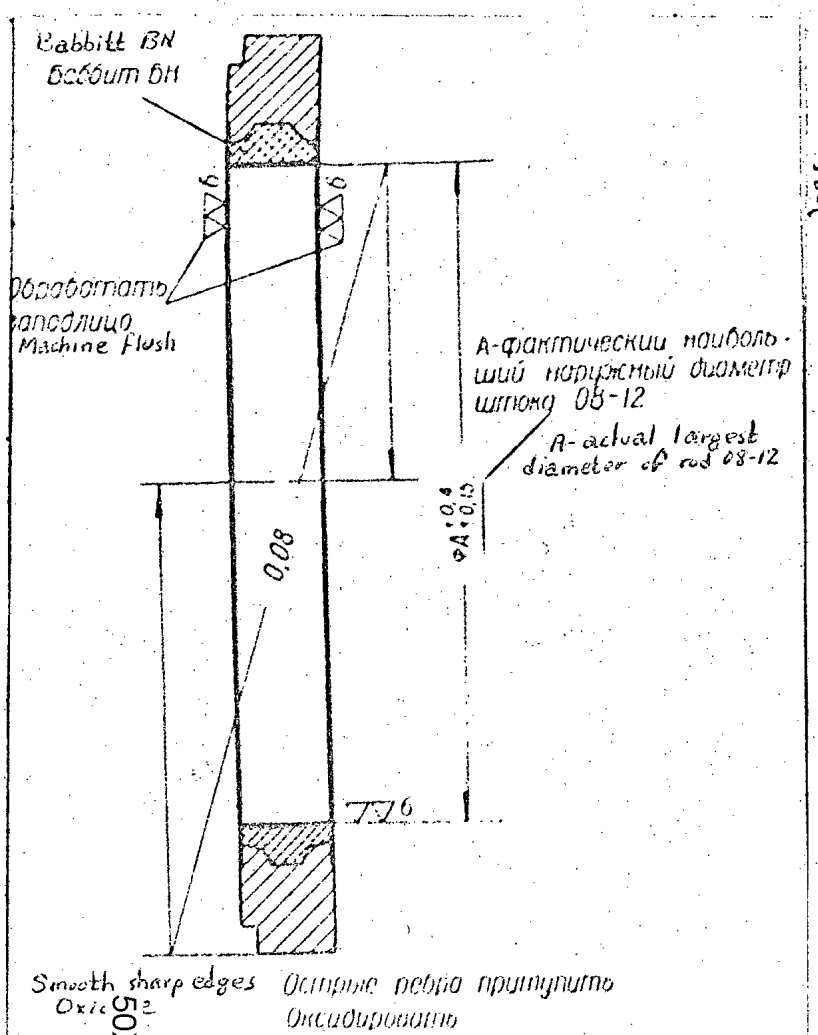
c) Valve cone 08-48 does not fit tightly in seat in forward cap 08-23 (4 in fig 4).

Check whether oil leaks in the junction of valve cone and seat in forward cap.

PM. When there is oil leakage, correct the valve cone by abrading or replace the valve (appendix 1, sketch 213).

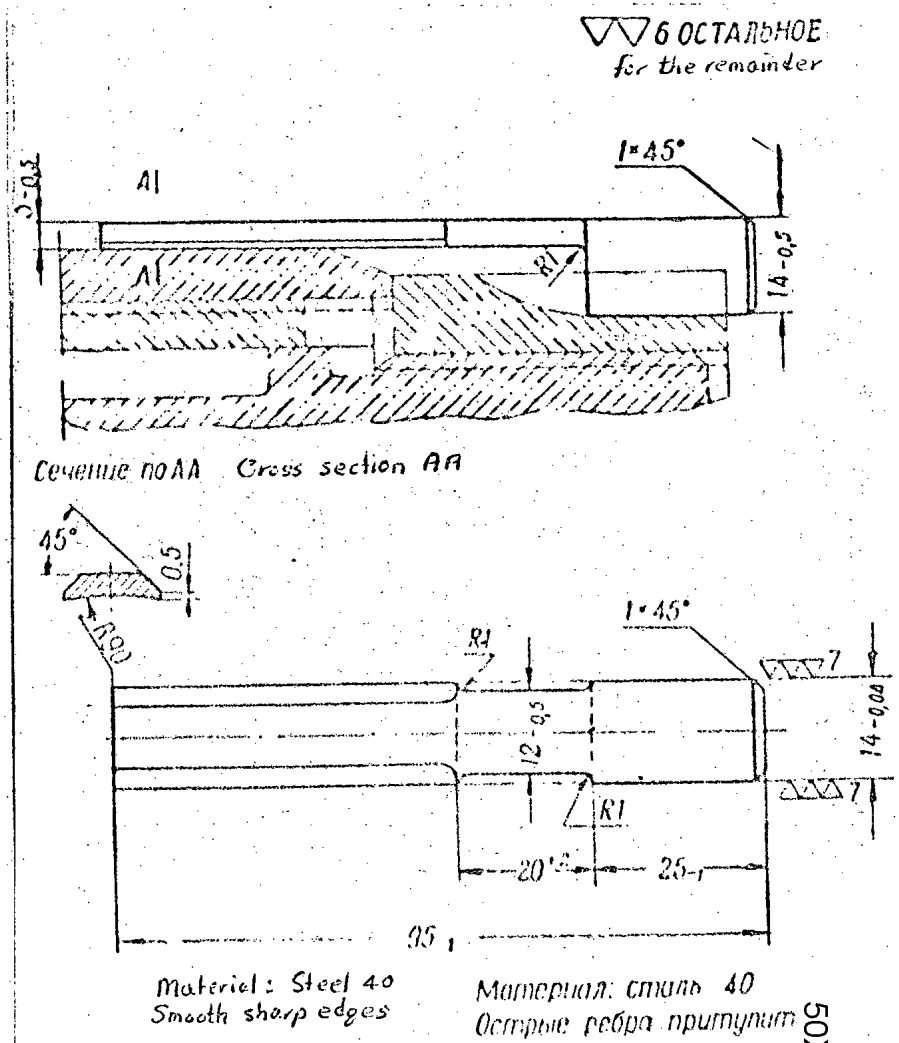
DARM. When there is oil leakage, trim the bottom of the seat in the forward cap by countersinking and correct the valve cone by abrading.
50X1-HUM

If there is oil leakage even after this, replace the valve (appendix 1, sketch 213).



Эскиз 20. С508-13 -- шайба

Sketch 20. Sb08-13 - washer



Эскиз 21. Шаблон

Sketch 21. Pattern

d) Damage (tears, cracks) to collars 08-4 and 08-104, leather rings 08-103, rubber ring 08-102, or wear of collars 08-4 and 08-104 (f 50X1-HUM

PM. / Replace faulty collars and rings (appendix 1).

In the Recoil Mechanism

e) Stuffing 10-80 is insufficiently tightened by stuffing nut 10-81 (fig 5).

[text missing]

If the leak does not stop even after replacing the stuffing, then the reason for the leak might be wear of the apertures of nut bushing 10-22, ring 10-79, or babbitt lining of washer Sb10-8. [p 48]

Measure the diameters of the apertures of the bushing, ring, and babbitt lining and the outer diameter of recuperator rod 10-32. The difference of the diameters in each junction should be no more than 1.2 mm.

If there is wear of bushing 10-22 (the difference of diameters in the junction is more than 1.2 mm), extract the bushing, make a new bushing (appendix 1, sketch 223) and press fit it into nut 10-81.

After press fitting, force the bushing aperture around the rod (sketch 22).

When there is wear of ring 10-79 (difference of diameters in the junction is more than 1.2 mm), replace the ring (appendix 1, sketch 225).

If there is wear of the babbitt lining (difference of diameters in the junction is more than 1.2 mm), line the washer with a new babbitt, brand BN, and force onto the rod (sketch 23). After extracting the old babbitt lining, solder the inner surface of the washer with solder POS-30.

f) Sealing rings 10-25 and 10-53 are compressed or insufficiently tightened by screws 10-27 (fig 5).

Check whether oil leaks from under stuffing box 10-75 and operating cylinder 10-4.

PM. When there is oil leakage, tighten the sealing rings by gradually screwing up the diametrically positioned screws 10- 27 (in pairs).

50X1-HUM

If the leak does not stop even after tightening, replace the sealing rings with ones made at DARM or AARM (appendix 1, s[illegible]). 50X1-HUM

g) /Sealing rings 10-107 are insufficiently tightened by nut 10-109 (fig 5).

Unscrew plug 10-110 and check whether oil leaks from under the sighting glass 10-106.

PM. When there is oil leakage, tighten the sealing rings. Clearance b (fig 5) of no less than 0.5 mm should be left between the outer end of the sighting glass and gasket 10-105.

If the leak does not stop even after tightening, add one more sealing ring or replace all sealing rings (appendix 1).

When adding the additional ring or replacing all the rings and after tightening the end with a nut, clearance b should be within the limits of 0.5 - 1.5 mm.

h) Valve 10-57 does not fit tightly in the seat in rear cap 10-2 (5 in fig 5).

Check whether oil leaks in the junction of the valve and seat in the rear cap.

PM. When there is oil leakage, correct the valve cone by abrading or replace the valve (appendix 1, sketch 224).

DARM. When there is oil leakage, trim the bottom of the seating in the rear cap by countersinking or boring with a flat pointed end [text missing]

If the leak does not stop even after this, replace the valve (appendix 1, sketch 224). [p 50]

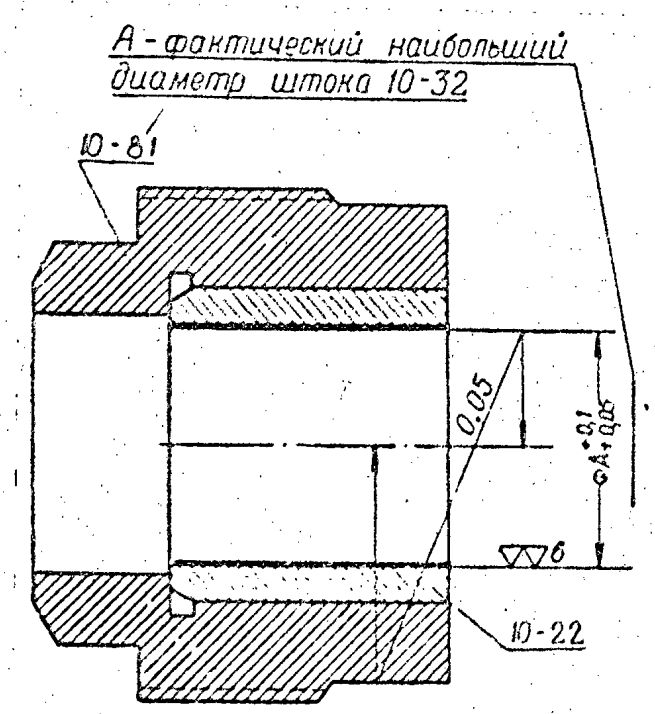
i) Damage (tears, cracks) or wear of collars 10-77 (fig 5).

PM. Examine collars 10-77.

When there is damage or wear, replace the collars (appendix 1).

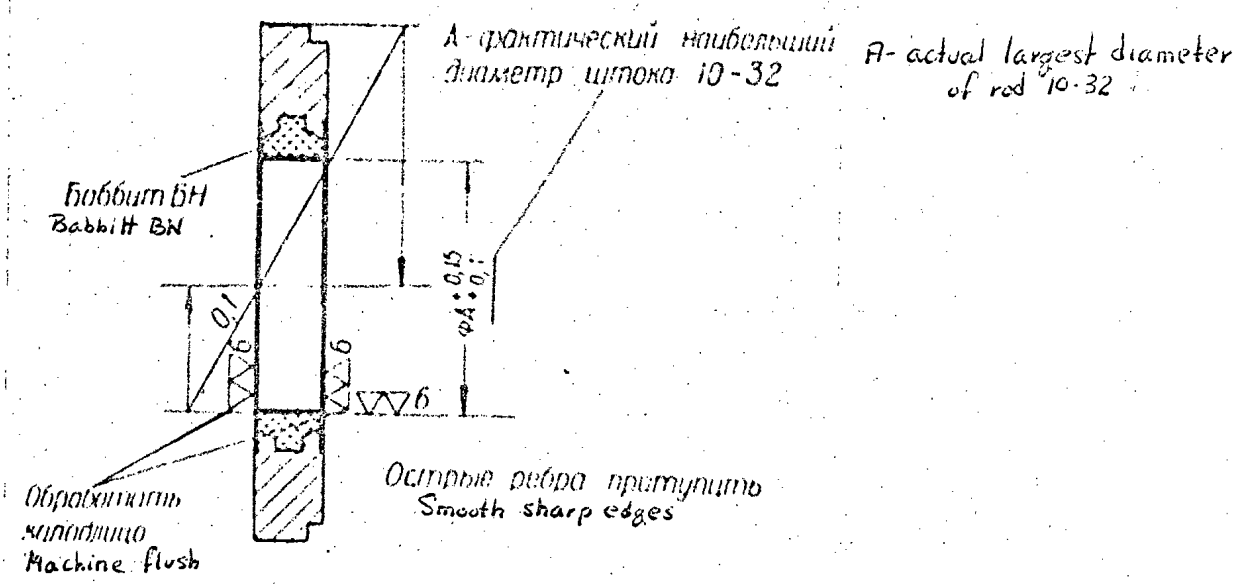
Also examine collars 10-83 of the recuperator piston rod. When there is damage or wear of the collars, replace them (appendix 1).

50X1-HUM



Эскиз 22. *10-22* — втулка гайки; *10-81* — гайка сальника

Sketch 22. 10-22 - nut bushing; 10-81 - stuffing nut



Эскиз 23. *С610-8* — шайба

Sketch 23. Sb10-8 - washer

2. Oil Leakage Through Valve 10-57 with the Required Quantity of Oil in the Recuperator (figure 5) 50X1-HUM

Reason for the malfunction: leather rings 10-54 are insufficiently tightened by nut 10-55.

PM. Loosen lock nut 10-56 and tighten the rings with nut 10-55. If the leak does not stop, replace leather rings 10-54 (appendix 1).

3. Oil Leakage From Recuperator Through Packing, Sealing Ring 10-115 and Ring 10-127 When the Barrel is Artificially Recoiled

(figure 5)

Reasons for the malfunction:

a) Packing 10-117 is insufficiently tightened by nut 10-119.

PM. Tighten packing. If the leak does not stop, add packing or replace packing (appendix 1).

b) Damage (tears, cracks) to sealing ring 10-115 and ring 10-127.

PM. Replace faulty rings (appendix 1).

4. Air Leakage (Nitrogen) From Recuperator

(figure 5)

Give a maximum angle of inclination to the tipping parts of the gun and wet valve nut 10-55, plug 10-58, and sighting hole plug 10-110 with soapy water.

The appearance of bubbles indicates leakage of air (nitrogen) from the recuperator.

Reasons for the malfunction:

a) Sealing ring 10-107 is insufficiently tightened by nut 10-109.

PM. If there is air (nitrogen) leakage through the sighting hole, screw out plug 10-110 and tighten sealing rings. Clearance b (fig 5) of no less than 0.5 mm should be left between outer end [text missing] and sealing ring 10-105.

50X1-HUM

If the leak does not stop even after tightening, add one more sealing ring or replace all sealing rings (appendix 1). [p 51]

50X1-HUM

After adding an additional ring or replacing all the rings and after tightening the rings with the nut, clearance b should be within the limits of 0.5 to 1.5 mm.

b) Tube 10-63 is not filled with oil.

PM. When there is a leakage of air (nitrogen) through valve 10-57, screw out plug 10-58, give the tipping part of the gun an angle of elevation of 6 - 10 degrees and unscrew valve 10-54 a quarter of a turn. When oil appears in the aperture for plug 10-58, quickly close the valve. A hydraulic sealing of air (nitrogen) in the recuperator is achieved as a result of this.

5. Extended Recoil

(When the angle of elevation is from -2°30' to + 20°, the length of recoil is more than 1320 mm; from plus 34° to plus 45°, the length of recoil is more than 815 mm).

The length of recoil is determined during firing or is established by records accompanying the gun from the military unit which sent the gun for repair.

The normal length of recoil during firing with a full charge should be as follows: when the angle of elevation is from -2°30' to + 20°, between 1150 and 1320 mm. When the angle of elevation is from + 34° to + 45°, between 735 and 815 mm.

The maximum length of recoil is 1350 mm.

To avoid receiving an incorrect reading from recoil indicator 09-55 (fig. 3), check its working order: To do this, try moving the recoil indicator along recoil indicator guide 09-53.

The recoil indicator should be movable by hand and should be held in a specified position by flat spring 09-56 (fig. 3).

PM. If the recoil indicator is not held in the specified position, replace flat spring 09-56 with one made at DARM (appendix 1, sketch 217).

Rivet the spring to recoil indicator 09-55 with 2 rivets 4 X 16 GOST 1187-41.

50X1-HUM

Reasons for the malfunction:

In the Recoil Brake 50X1-HUM

a) Insufficient quantity of oil.

PM. Screw out plug 09-116 and open cap Sb-09-31 (fig. 3) which is located on forward cap 09-155 of the cradle.

Give the tipping parts of the gun an angle of elevation of 6°, open valve 08-48, and unscrew screw 08-72 from the recuperator rod and check [text missing].

If oil does not appear in the opening, then through the opening [p 52] in the recuperator rod add steol M by means of a funnel until oil appears at the edge of the recuperator rod opening.

After checking, tighten the valve and screw down as far as possible. Also close the cap and screw on the plug.

b) Wear of recoil-piston rod casing 08-16 (fig. 4).

Measure the outer diameter of the rod casing and compare it with the average inner diameter of recoil cylinder 08-11 as indicated in the gun book.

The difference of the diameters should be no more than 0.4 mm.

AARM. If the difference of diameters is more than 0.4 mm, make a casing (appendix 1, sketch 210), place it on rod head 08-14 and work the casing around the recoil cylinder (sketch 24). Move the three apertures for screws 08-59 30° off-center in relation to the old apertures in rod head 08-14.

c) Wear of insert 08-34 (fig. 4).

Measure the diameter of the insert aperture and the outer diameter of recuperator rod 08-28.

The difference of the diameters should be no more than 0.5 mm.

AARM. If the difference of diameters is more than 0.5 mm, replace the insert (appendix 1, sketch 211).

50X1-HUM

In The Recuperator

d) Insufficient pressure. 50X1-HUM

Check initial pressure in the recuperator with a manometer. With a normal quantity of oil, the pressure should be between 54 and 58 atm.

PM. If the initial pressure is lower than prescribed, add air (nitrogen) until the pressure reaches a normal level.

e) Insufficient quantity of oil.

Determine the quantity of oil in the recuperator with a gage. It should be 20.6 - 22.6 liters.

PM. If the quantity of oil in the recuperator is below normal, fill the recuperator with steol M until it reaches the normal level. Check it with a gage a second time.

In the Mechanism for Changing the Length of Recoil

f) The regulating device for changing the length of recoil is broken.

Measure the distance between the marks on upper level 09-100A and double-arm lever 09-105. The distance should be 140 mm.

---

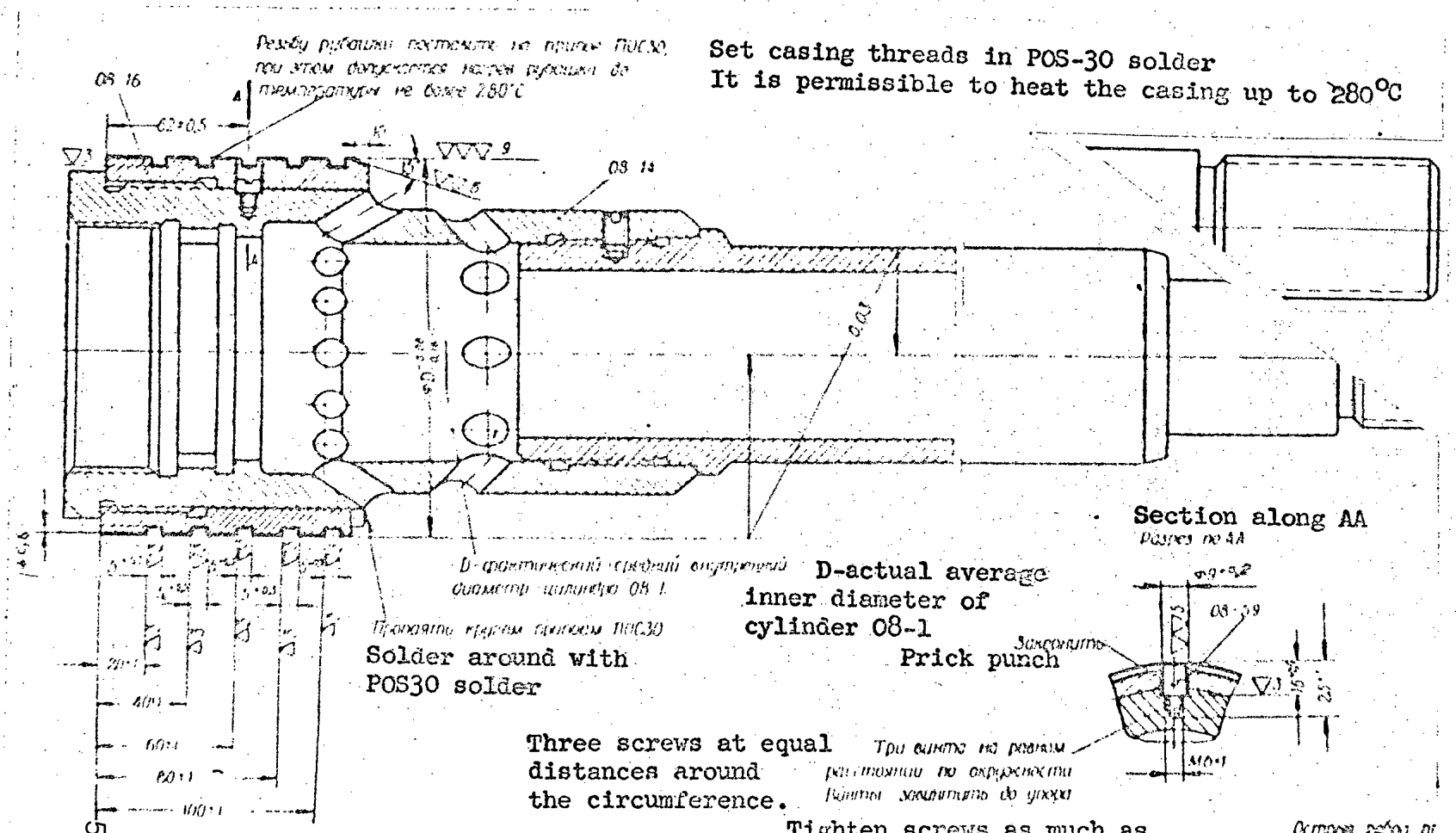
1. [Footnote - see paragraph b) above]

The average inner diameter can also be determined in the following manner:

Measure the interior of the cylinder with a star gage along 2 mutually perpendicular diameters 1,900 mm in length (from the front end of the cylinder)

[text missing]

50X1-HUM



Эскиз 24. *С608-4* — шток; *08-14* — головка штока; *08-16* — рубашка штока; *08-59* — вин

Sketch 24. Sb08-4 - rod; 08-14 - rod head; 08-16 - rod casing; 08-59 - screw

50X1-HUM

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PM. If the distance is not 140 mm, loosen lock nuts 09-72 [p. 54] and 09-137 and, turning adjusting nut 09-73, establish a distance of 140 mm between the marks. After this, tighten the lock nuts. 50X1-HUM

g) Insufficient traverse of **throttling** rod 08-28 (less than 33°) due to increased play of the mechanism for changing length of recoil. (fig. 3 and 4).

Set gun in combat position on level ground.

Determinate the angle of traverse of the **throttling** rod in the following manner:

--give the barrel an angle of elevation of approximately 0° by turning the elevating hand wheel in proper direction;

--open cap Sb09-31 which is located on the forward cradle cap;

--place pattern No 1. (appendix 11, sketch 385) on the front cylindrical part of the **throttling** rod. Fasten a plumb line to the lower part of the pattern;

--mark a graduation line through slots in pattern No 1 on forward cradle cap 09-155;

--place pattern No 2 (appendix 11, sketch 392) in the slots on the front end of the **throttling** rod and shift the slide bar along pattern No 1 groove up to the stop in pattern No 2. Take off pattern No 2 and mark the angle on the pattern No 1 scale;

--give the barrel an angle of elevation by turning the elevating hand wheel in same direction;

--align the slot in pattern No 1 with the graduation line marked on forward cap 09-155;

--place pattern No 2 in the slot of the **throttling** rod and shift the bar along pattern No 1 groove up to the stop on pattern No 2;

--take off pattern No 2 and mark the angle on the pattern No 1 scale.

The difference of the two angles indicates the actual angle of recuperator traverse.

In determining the **throttling** rod angle of traverse, the measurements described above should be done three times. Find the arithmetic average of measurements taken and round off to the nearest degree. 50X1-HUM

The throttling rod angle of traverse should be no less than 33° 50X1-HUM

Reasons for insufficient throttling rod angle of traverse.

1) Wear in the junction of upper rod 09-101 and lower rod 09-106 with upper lever 09-100A, double-arm lever 09-105 and spherical pivot 09-102 (fig. 3).

Check the size of axial vacillation of the rods in relation to the levers. An axial vacillation of no more than 1.2 mm of each rod is permissible.

PM. When there is vacillation of more than 1.2 mm, unscrew screws A51063-40 and eliminate rod vacillation by tightening spherical pivots 09-102.

Allow for free movement of the rods. After adjusting, drill openings 4.5 mm in diameter and 13 + 0.5 mm in depth (measure depth from end of protrudance on lever) in spherical pivots along the threads in the [p 55] aperatures of the levers. Plug up the spherical pivots with screws A51063-40 and center the screws.

If tightening the spherical pivots does not eliminate rod vacillation, file the inner end of the pivot and then adjust as indicated above.

2) Wear in the junction of the opening in double-arm lever 09-105 with lever pin 09-111 (fig. 3).

Measure the diameter of the opening in the double-arm lever and the outer diameter of the lever pin. The difference of the diameters should be no more than 1 mm.

PM. When the difference of diameters is more than 1 mm, cut out the oval shape in the lever opening, removing a minimum layer of metal. Replace lever pin 09-111 (appendix 1, sketch 220). An increase in diameter of the lever opening up to 24 mm is permissible.

After setting the lever in the cradle, drill an opening with a diameter of 22 $^{+1}$mm (measure the depth from lug 09-194) in the lever pin according to the existing threaded opening in lug 09-194. Stop the lever pin with screw A51064-3 and file off the screw.

3) Wear in junction of opening in roller 09-107 and roller pin 09-108 (fig. 3).

Measure the diameter of the roller opening and the outer diameter 50X1-HUM of the roller pin. The difference of diameters should be no more than 1 mm.

PM. When the difference of diameters is more than 1 mm, replace roller 09-107 and roller pin 09-108 (appendix 1, sketches 218 an50X1-HUM

Assemble double-arm lever 09-105 with roller. Allow for free turning of the roller and stop the roller pin with screw A 51063-40 in a new position (sketch 25). Weld in the old threaded aperture with electrode E42.

4) Wear in junction of cam-guide 17-20 groove and roller 97-107 (fig. 3 and 8).

Measure the width of the cam-guide groove and the outer diameter of the roller. The difference should be no more than 1.5 mm.

PM. When the difference is more than 1.5 mm, clean the cam-guide groove and replace roller 09-107 (appendix 1, sketch 218).

5) Wear of openings of bushings 09-11 and 09-114 in the junction with variable recoil roller 09-140A (fig. 3).

Measure the diameters of the bushing openings and the diameters of the rollers necks. The difference of diameters in each junction should be no more than 1.5 mm.

PM. When the difference of diameters is more than 1.5 mm, replace the bushings (appendix 1, sketches 215 and 221).

6) Wear in junction of lever pin 09-112A with lever 09-40A (fig. 3 and 4).

Measure the width of the lever groove and the diameter of lever pin 09-112A. The difference of measurements should be no more than 1.2 mm.

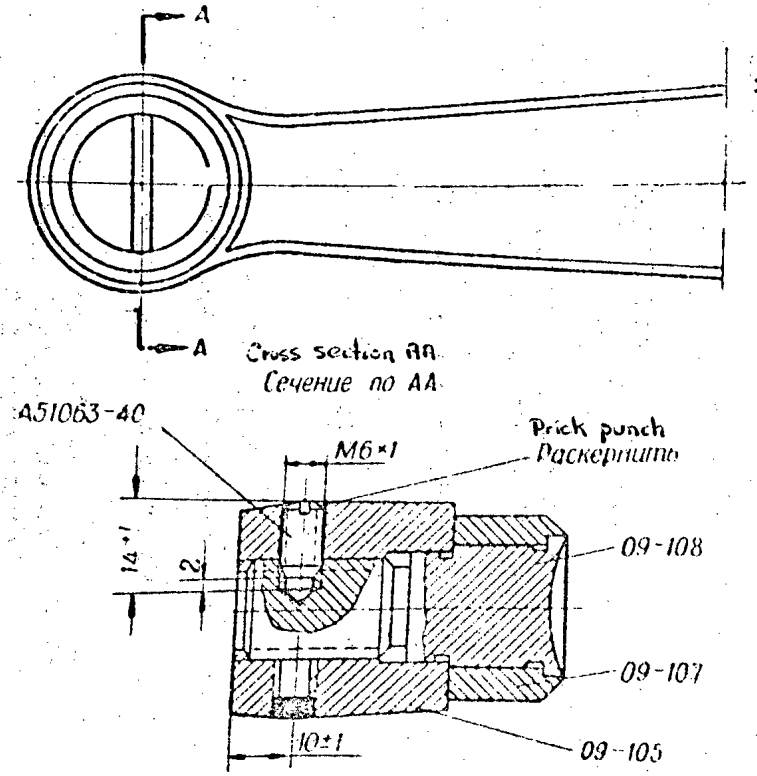
DARM. When the difference of measurements is more than 1.2 mm, weld a layer of metal onto the side of lever 08-40A groove with electrode E50A and work [text missing]

6. Contracted Recoil [p 57]

(When the angle of elevation is from -2°30' to + 20°, the length of recoil is less than 1150 mm; from + 34° to +45°, the length of recoil is less than 735 mm).

Length of recoil is determined during firing or is established by records accompanying the gun from the military unit which sent the gun for repair. 50X1-HUM

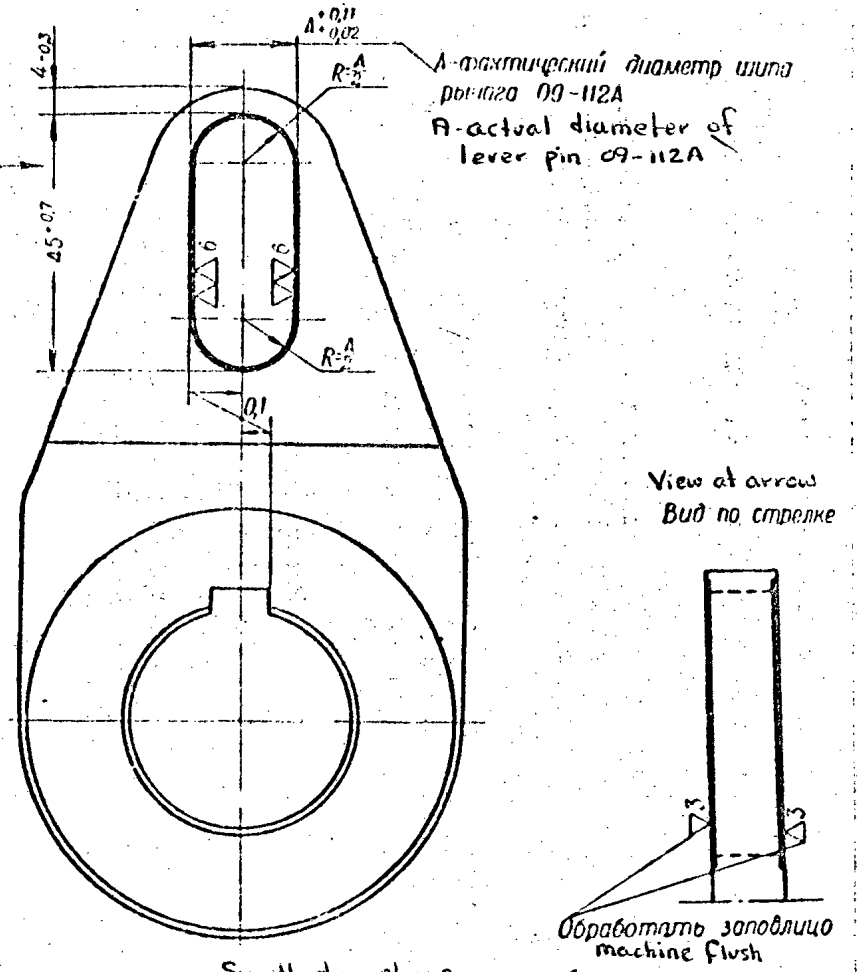
Reasons for the malfunction:



Эскиз 25. 09-105 — рычаг двуплечий; 09-107 — ролик; 09-108 — ось ролика; A51063-40 — винт

Sketch 25. 09-105 - double-arm lever; 09-10[illegible] - roller; 09-108 - roller pin; A510[illegible]40 - screw

50X1-HUM



Эскиз 26. 08-40А — рычаг

Sketch 26. 08-40A - lever

50X1-HUM

In The Recoil Brake

50X1-HUM

a) Recoil-piston rod stuffing 08-6 is overly tightened by stuffing nut 08-7 (fig 4).

PM. With normal pressure in the recuperator rod, artificially recoil barrel 450 - 500 mm with a hydraulic air pump. With a discharge of oil from the sealed area of the recuperator operating cylinder, the barrel should recover smoothly, without jerking.

If the movement of the barrel is jerky, loosen the stuffing. After doing this, make sure there will be no oil leakage through stuffing. Check the tightness of the stuffing a second time by the method indicated above.

In the Recuperator

b) Excessive pressure

Check initial pressure in recuperator with a pressure gage. With a normal quantity of oil, pressure should be within the limits of 54 - 58 atm.

PM. If the initial pressure is more than prescribed, discharge excess air (nitrogen) and bring the pressure down to normal.

c) Excessive oil.

Determine the quantity of oil in the recuperator with a gage. It should be 20.6 - 22.6 liters.

PM. If there is more oil in the recuperator than required, let out excess oil and check it with a gage a second time.

d) Stuffing 10-80 is overly tightened by nut 10-81 and stuffing 10-98 by piston rod nut 10-100.

PM. Check the tightness of the stuffing by the method indicated above.

If barrel run out is jerky, decrease the tightness of stuffing 10-80 so that afterwards there is no oil leakage through the stuffing.

Check the tightness of the stuffing a second time.

50X1-HUM

If barrel run out is jerky, decrease the tightness of piston stuffing 10-98 so that afterwards there is no oil leakage through the stuffings. After tightening, check nut 10-100 with stop 10-91.

In the Mechanism for Changing the Length of Recoil [p 58]

50X1-HUM

e) The mechanism for changing length of recoil is broken (fig. 3).

See chapter 5, item 5, e.

f) Insufficient traverse of throttling rod 08-28 (less than 33°) due to increased play in the mechanism for changing the length of recoil.

See chapter 5, item 5, g.

In the Junction of the Cradle and Barrel

g) Increased friction in the junction of the cradle and barrel guides.

Inspect the open sections of the cradle guide operating surfaces. Then move the barrel into traveling position and inspect the remaining sections of the guide operating surfaces.

PM. When there are scratches, trim off any raised metal. If there are brass protrudances, eliminate them by scraping.

7. Failure to Run Out or Run Out with Jerks

The nature of the run out is determined during firing or is established by records accompanying the gun from the military unit which sent the gun for repair.

Failure to run out or run out with jerks is not permissible.

In order to avoid failure to run out due to clogging of the air exhausts in plug grid 10-122 (fig. 5) of the recuperator regulating bolt, check the condition of the apertures.

In the Recoil Brake

a) Excessive oil (fig. 3 and 4).

PM. Screw out plug 09-116 and open cap Sb09-31 which is located in forward cradle cap.

50X1-HUM

Give the tipping parts of the gun an angle of elevation of 6° and open valve 08-48. Screw out screw 08-72 from the throttling rod and let out excess oil. After this, screw in the valve and screw as far as possible. Also, close the cap and screw in the plug.

b) Air cushion in recoil cylinder. (Fig. 3 and 4)

PM. Screw out plug 09-116 which is located in the forward cradle cap.

Give the tipping parts of the cannon an angle of elevation of 6° and open valve 08-48.

After letting out air, screw in the valve as far as possible and close the opening in the forward cradle cap.

c) Recoil-piston rod stuffing 08-6 is excessively tightened by stuffing nut 08-7 (fig. 4).

See chapter 5, problem 6a.

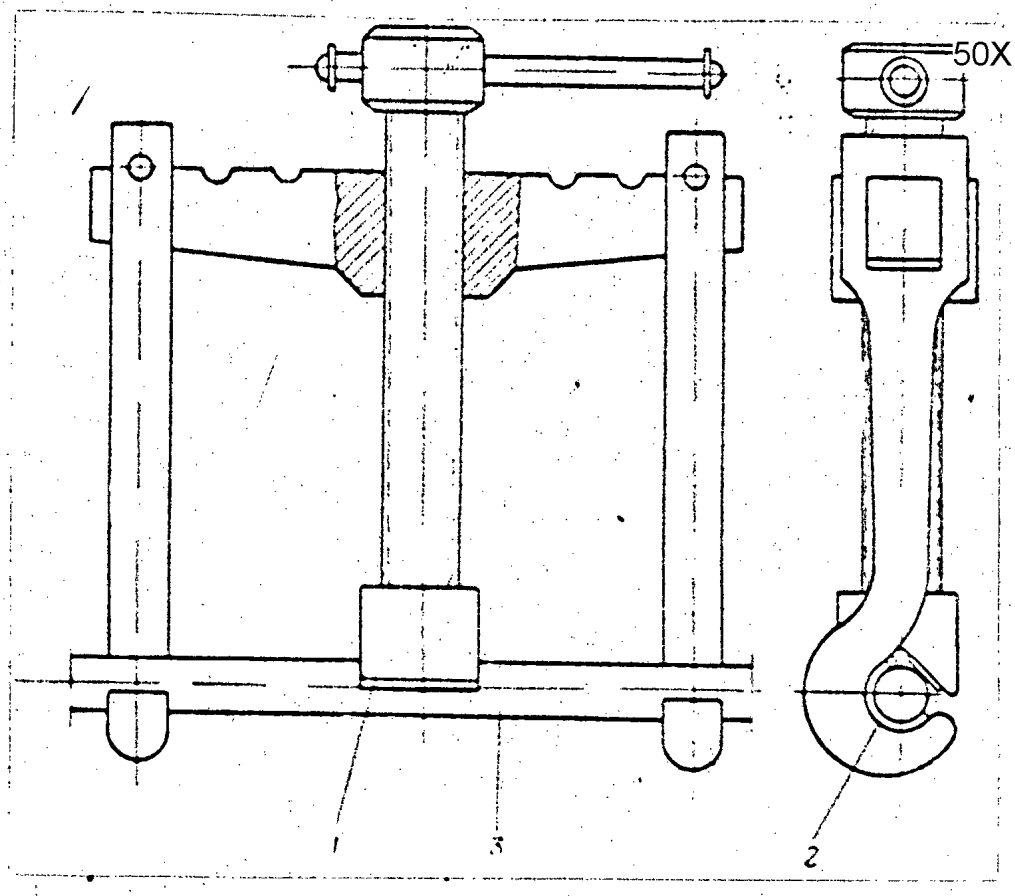
d) Nicks and scratches on rod casing 08-16 and throttling rod casing 08-35 (fig. 4). [p 59]

Inspect the rod casing and buffer casing.

PM. Trim off raised metal. When there are deep scratches, send the cannon to a higher repair shop.

DARM. Replace throttling rod casing 08-35 (appendix 1, sketch 212).

When assembling the throttling rod and casing, allow for free turning of the casing on the rod. To do this, screw on nut A51011-40 as far as possible; then unscrew it 1/6 of a turn and insert cotter pin. In case of non-alignment of the openings for the cotter pin, it is permissible to trim off the front end of the nut.



Sketch 27. Clamp press. 1 - copper pad attached to head of screw; 2 - copper pad attached to jaw of hook; 3 - rod

AARM. Make a new casing 08-16 (appendix 1, sketch 270), place on recoil-piston rod head 08-14, and work casing around brake cylinder (see sketch 24).

Move the three openings for screws 08-59 off-center 30° to 35° in relation to old openings in rod head 08-14.

e) Bend in recoil-piston rod 08-12 and rod 08-28 (fig. 4).

Place the recoil-piston rod and throttling rod on a prizmatic device and check their degree of bend by the indicator or by means of a surface gage and clearance gage.

A bend of no more than 0.8 mm is permissible in the recoil piston rod and throttling rod.

AARM. When the bend is more than 0.8 mm, straighten the piston rod and throttling rod, [text missing]

50X1-HUM

In the Recuperator [p 60]

f) Insufficient pressure.

See chapter 5, item 5 d.

g) Insufficient oil.

See chapter 5, item 5 e.

h) Stuffing 10-80 is excessively tightened by nut 10-81 and piston rod stuffing 10-98 is excessively tightened by nut 10-100 (fig. 5).

See chapter 5, item 6 d.

i) Bend in rod 10-32 (fig. 5).

Place the rod on prisms and check the degree of bend by the indicator or by means of a surface gage and clearance gage.

A bend in the rod of no more than 1.4 mm is permissible.

AARM. When the bend is more than 1.4 mm, straighten the rod in a clamp press (see sketch 27) without heating.

In the Junction of the Cradle and Barrel

j) Increased friction in the junction of the cradle and barrel guides.

See chapter 5, item 6 g.

8. Abrupt Run Out (Run Out with a Knock)

The type of run out is determined during firing or is established by records accompanying the gun from the military unit which sent the gun for repair .

Run out should be smooth and without knock.

50X1-HUM

Reasons for the malfunction:

In the Recoil Brake

50X1-HUM

a) Insufficient oil. See chapter 5, item 5 a.

b) Sticking of run out control valve 08-18 as a result of which the valve does not reach the slot of the moderator rod (fig. 4).

Screw out the moderator stem from inner tube 08-22, then screw off nut 08-20 and take out spring 08-19.

Try to move the valve along the moderator stem. The valve should move freely without sticking along the stem.

PM. When the valve sticks, trim the raised metal on the moderator stem and in the valve opening but do not remove all traces of scratches.

c) Improper seating of moderator valve 08-18 in the slot of moderator stem 08-17 (fig. 4).

Check the seating of the valve in the slot of the moderator stem by the paint marks. At least 70 per cent of the surfaces should contact each other. [p 61]

PM. When less than 70% of the surfaces contact each other, grind the valve in the slot of the moderator stem. To accomplish grinding, place a layer of abrasive micro-powder M7-M14, thinned with kerosene, on the valve. After grinding, check the fitting of the surfaces according to the paint a second time.

d) Breakdown or fatigue in spring 08-19 (fig. 4).

The normal height of the spring in a free state is 45.5 $\pm$ 2.3 mm.

DARM. When there is break or fatigue in the spring, replace it (chart 3).

e) Wear of throttling rod casing 08-35 (fig. 4).

Measure the outer diameter of the throttling rod casing and compare it with the minimum diameter of the cavity for inner tube 08-22[1], which is written in the gun service log..

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1. The minimum diameter of the cavity can also be determined in this manner: Measure the cavity of the inner tube with a star gage along two mutually perpendicular diameters at a length of 1625 mm (from the front end of the tube), after each 100 mm [te:50X1-HUM]

The difference of diameters should be no more than 0.2 mm

50X1-HUM

DARM. When the difference of diameters is more than 0.2 mm, replace throttling rod casing 08-35 (appendix 1, sketch 212).

When assembling the rod and casing, allow for free turning of the casing on the rod. To do this, screw on nut A51011-40 as far as possible; then unscrew it one sixth of a turn and insert a cotter pin. In case of non-alignment of the openings for the cotter pin, it is permiss ble to trim off the front end of the nut.

f) Rod 08-52 is damaged or has lost resiliency.

PM. Replace the faulty rod (appendix 1).

In the Recuperator

g) Excessive pressure.

See chapter 5, item 6 b.

h) Excessive oil

See chapter 5, item 6 c.

i) Breakdown or fatigue in valve spring 10-24 (fig. 5).

Normal height of spring in free state is 153 ± 5 mm.

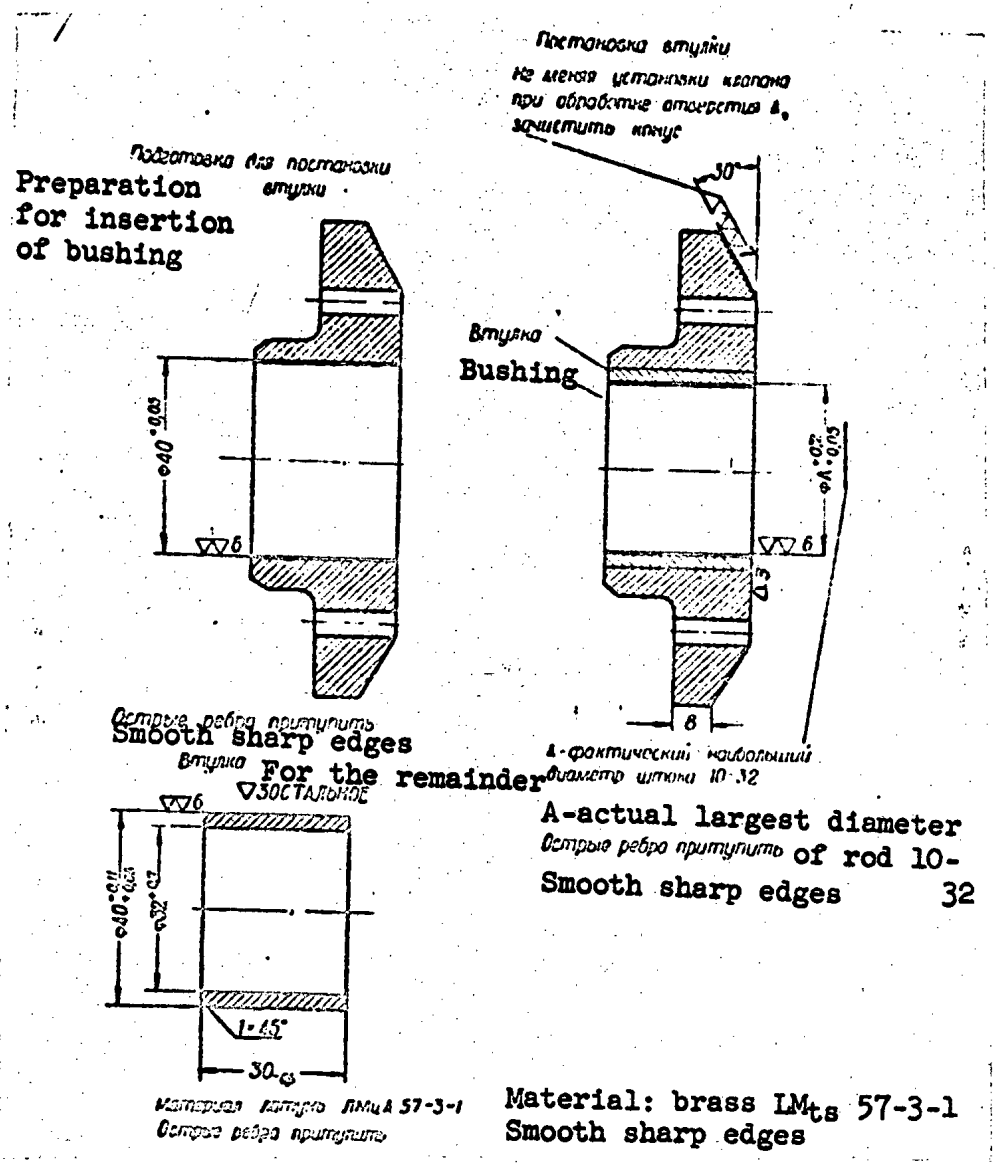
PM. When there is break or fatigue in the spring, replace it (appendix 1).

j) Wear of valve 10-23 opening (fig. 5).

Measure the diameter of the valve openings and the outer diameter of recoil piston rod 10-32. The difference of diameters should be no more than 0.8 mm.

PM. When the difference of diameters is more than 0.8 mm, prepare the valve for inserting a bushing. Make the bushing and force it into the valve (sketch 28). [p 62]

50X1-HUM



Sketch 28. 10-23 -- valve

9. Extended Roll Out of the Gun During Firing

Roll out of the gun is determined during firing with the tipping parts of the gun at an angle of elevation of 0 to 5 . When firing, the gun should be placed on a level concrete foundation (or hard ground) [text missing] (or in the ground), with the trails completely separa the wheels braked by the hand brake. [p 63]

Roll out of the gun can also be established by records accompanying the gun from the military unit which sent the gun for repair.

A roll out of gun of no more than 300 mm is permissable. 50X1-HUM

Reasons for the malfunction:

a) See chapter 5, item 8.

In the Recoil Brake

b) Sticking of moderator valve 08-18-- the valve does not reach the slot in moderator stem 08-17 (fig. 4).

Screw the moderator stem out of inner tube 08-22. Then screw off nut 08-20 and remove spring 08-19.

Try moving the valve along the moderator stem. The valve should move freely, without sticking, along the stem.

PM. If the valve sticks, trim off the raised metal on the moderator stem and the opening in the moderator valve, but do not remove all traces of scratches.

c) Presence of hard particles (chips, sand, etc.) in steol M.

PM. Take the buffer apart and wash all parts. Before refilling the buffer with oil, carefully filter it or replace it with new steol M oil.

10. Rust on Outer and Inner Surfaces of Recoil Piston Rod 08-12, on Outer Surface of Recuperator Rod 10-32 and Rod 08-28, and on Inner Surface of Brake Cylinder 08-1, Inner Tube 08-22, Recuperator Operating Cylinder 10-4, Stuffing Box 08-2, Forward Cap 08-23, and Stuffing Box 10-77 (fig. 4 and 5)

PM. Remove rust from the non-chrome surfaces of parts by wiping the affected areas with a clean cloth or polishing by hand with a hemp cord.

It is permissible to use fine charcoal powder mixed with steol M.

The small flaws which remain are permissible if they are cleaned to a metallic shine.

When there is deep rust on the non-chrome surfaces of parts, send 50X1-HUM the gun to a higher maintenance shop.

When the chrome layer on the recoil rod, throttling rod, recuperator operating cylinder, and buffer is damaged (blistered), replace the buffer and recuperator mechanism[1] (appendix 1). 50X1-HUM

When there are no spare buffer and recuperator mechanisms, it [p 64] is permissible to temporarily use those which have damaged chrome so long as there is not oil leakage through the sealing devices in the rods, buffers and piston rods.

When spare buffers and recuperator mechanisms are received, the old ones (with chrome) should be replaced.

AARM. Remove deep rust on the inner surfaces of recoil cylinder 08-1, stuffing box 08-2, inner tube 08-22, forward cap 08-23, stuffing box 10-75, and on outer surfaces of the buffer, taking a minimum layer of metal from all surfaces (chart 5).

Remove deep rust on the inner surface of rod 08-12 and intermediate cylinder 10-9 by cleaning locally (chart 5).

11. Wear of Recuperator Piston Rod Rings 10-97 and 10-99 (figure 5)

Measure the inner diameter of the recuperator operating cylinder 10.4 and the outer diameter of the rings. The difference of diameters in each junction should be no more than 1.5 mm.

DARM. When the difference of diameters is more than 1.5 mm, replace the rings (appendix 1, sketches 226 and 227).

12. Damaged grid 10-122 of regulating bolt plug (figure 5)

PM. Replace the damaged grid (appendix 1).

To replace the grid, the following steps are necessary:

--take out bushing 10-126 from plug 10-121 by boring the bushing. The size of the bores in the plug should be no more than 21 + 0.05 mm in diameter and 8 + 0.4 mm in depth;

---

1. Do not permanently reject buffers and recuperator mechanisms which have damaged chrome layers on the surfaces of rods, operating cylinders, and buffers. Send them to stationary bases for electrochemical removal of layer [text missing].

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--make bushing 10-126 (appendix 1, sketch 228);
--solder grid 10-122 to end of bushing 10-126 with solder POS-30;
--press bushing 10-126 into the bores of plug 10-121 and center the bushing at three points.

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13. Dents and Holes in Brake Cylinder 08-1
(figure 4)

AARM. Remove bulges on the inner surface of the cylinder which are caused by dents on the outer surface (chart 6).

AARM. If there are holes in the cylinder, replace the buffer[1] (appendix 1). [footnote missing]

14. Dents and Holes in Air Cylinder 10-3, Intermediate Cylinder 10-9 and Operating Cylinder 10-4 [p 65]
(figure 5)

DARM. Straighten the dents in the cylinder.

Small dents in the air cylinder are permissible so long as there are no cracks.

If straightening dents in the operating cylinder will cause damage to the chrome layer on the inner surface of the cylinder, replace the recuperator. (appendix 1).

Weld holes in the air and intermediate cylinders of up to 15 mm in size. Weld plates onto holes of more than 15 mm but not more than 100 by 150 mm in the air cylinder and 80 by 120 mm in the intermediate cylinder (chart 6).

If there are holes in the air cylinder of more than 100 by 150 mm, holes in the intermediate cylinder of more than 80 by 120 mm, or if there are holes in the operating cylinder, replace the recuperator (appendix 1).

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Chapter Six

Elevating Mechanism and Equilibrator Maintenance

50X1-HUM

1. Air Leakage from the Equilibrator

(fig. 6)

Check the hermetic seal of the equilibrator air system by doing the following:

-- place a manometer in the upper socket of manifold 23-33;

-- place the tipping parts of the cannon at the maximum negative angle of elevation;

-- with soapy water moisten the shank of nozzle 23-16, the manifold head and lock nut 23-27, nuts 23-55, valves 10-57, and lock nuts 10-56; the places where connecting tubes Sb23-21 and Sb23-22 connect with the piston heads and with manifold 21-33, the connections of tube Sb23-16 with the manifold and cylinder; and brazed places on the equilibrator air system tubing;

-- open valves 10-57 on the right and left pistons and check whether there is air leakage through the connections indicated above and, by using the manometer, whether or not the air pressure falls in the equilibrator air system. There should not be a drop in pressure;

-- close valves 10-57 on the right and left pistons and check whether there is air leakage from underneath the valves through the connections of connecting tubes Sb23-21 with the pistonhead and with the manifold and through the connections of connecting tube Sb23-16 with the manifold and with the cylinder. Also, by using the manometer, check whether or not there is a drop in pressure in the air system. There should not be a drop in pressure.

Causes of malfunctions:

a) There is insufficient or no liquid in the equilibrator.

Place the tipping parts at an angle of elevation of from 30° to 35°.

Open plugs 23-23 on the external cylinders and check whether liquid comes out of the openings in plugs 23-23.

[text missing]

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b) The cones of valves 10-57 fit loosely in their seats in the pistonheads (b in fig. 6). [p 67]

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PM. With leakage of air from underneath the valves (when the valves are closed), smooth the cones by grinding or replace the valves (appendix 1, sketch 224).

DARM. With leakage of air, cut the bottom of the seats in the pistonheads with a countersink or a bore on a plane with the surface which is being ground and smooth the cones of the valves by grinding them.

If air leakage is not stopped after this, replace the valves (appendix 1, sketch 224).

c) There is leakage of liquid from the equilibrator external cylinders because the cones of plugs 23-23 fit loosely to their seats in the external cylinders (7 on fig. 6).

Check whether or not liquid is leaking from underneath the plugs.

PM. If there is leakage of liquid, smooth the plug cones by grinding or replace the plugs (appendix 1, sketch 260).

DARM. If there is leakage of liquid, cut the bottom of the seat in the external cylinder with a countersink or a bore on a plane with the surface which is being ground and smooth the plug cones by grinding them.

If leakage is not stopped after this, replace the plugs (appendix 1, sketch 260).

d) The chrome layer is damaged (bulging) and rust is formed on the external surface of cylinder 23-3.

Raise the barrel to the maximum angle of elevation and examine the external surface of the cylinders. Bulging of the chrome layer or of individual cylinder sections indicates that there is rust under the chrome layer.

PM. If the chrome layer is damaged (bulging), replace the equilibrator[1] [Trans. note: footnote missing] (appendix 1).

If no spare equilibrator is available, the equilibrator with the damaged chrome layer can be used temporarily if there is no leakage from underneath the piston cylinder.

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When a spare equilibrator is received, replace the old equilibrator (with the damaged chrome layer).

e) There is leakage of liquid out of the equilibrator external cylinders because collars 23-74 are damaged (ruptures, cracks).

Give the barrel the maximum angle of elevation. Then, by decreasing the angle of elevation to the maximum negative angle of elevation, check whether or not there is leakage of liquid from under piston cylinders 23-3. 50X1-HUM

PM. Replace the collars if there is leakage of liquid and no damage to the chrome layer on the piston cylinders (appendix 1). [p 68]

f) There is rust on the internal surface of external cylinder 23-146.

PM. Remove the rust by wiping the affected portions with a clean rag. A fine charcoal powder mixed with steol M can be used. Send the gun to a higher maintenance shop if the rust is deep.

AARM. Remove deep rust by removing a minimal layer of metal. The internal diameter can be increased to 151 mm (chart 6).

Bore the opening of bushing 23-6 to a diameter of 127^{+1} mm if the internal diameter of the external cylinder is 150.5 mm or larger.

g) The cone of nozzle 23-161 fits loosely in its seat in manifold 23-33 (8 in fig. 6).

PM. Smooth the cone of the nozzle by grinding or replace the nozzle (appendix 1, sketch 261) if there is air leakage.

DARM. If there is air leakage, cut the bottom of the seat in the manifold with a counter sink or a bore on a plane with the surface which is being ground and smooth the nozzle cone by grinding it.

If the air leakage is not stopped after this, replace the nozzle (appendix 1, sketch 261).

h) Leather rings 10-54 are not sufficiently tightened by nut 23-55.

PM. With air leakage from underneath nuts 23-55 and valves 10-57 (with the valves open), tighten the leather rings. If the air leakage is not stopped, replace the leather rings (appendix 1).

i) Lock nuts 23-27, 23-37, and 23-159 of the connecting tubing are not tightened sufficiently.

PM. If there is air leakage through the connections of the connecting tubing with the pistonheads, manifold 23-33, and the cylinder, tighten the lock nuts so that there is no air leakage. 50X1-HUM

j) There are cracks in tubes 23-176 and 23-177, and the brazing at the connections of connecting tubes 23-176 and 23-177 with clamping sleeves 23-26 and of tubing 23-157 with nozzles 23-38 and 23-158 is damaged. 50X1-HUM

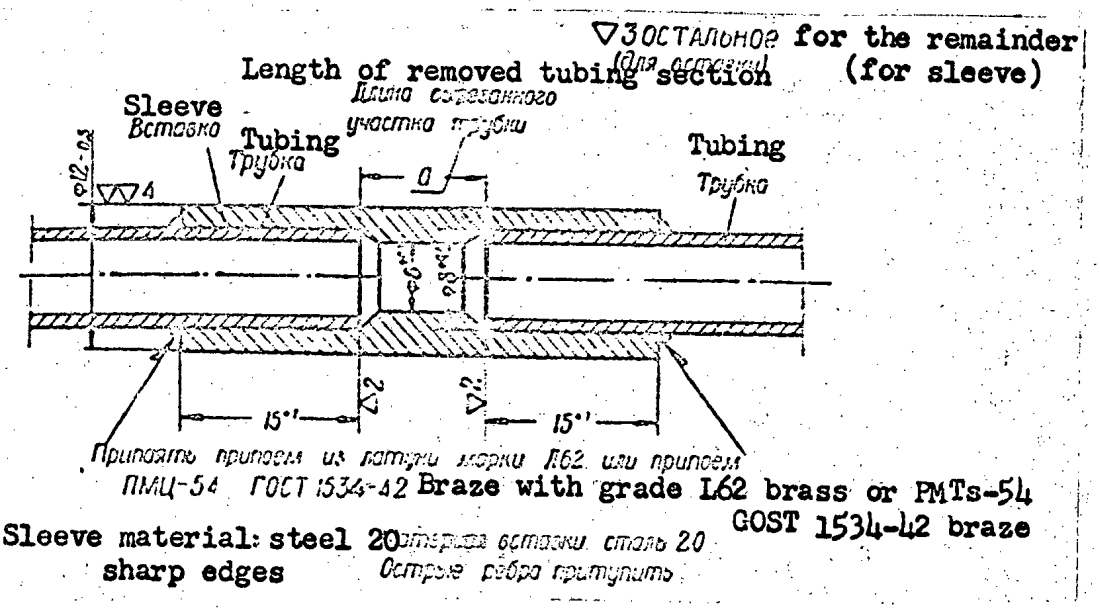
DARM. If there is air leakage at brazing locations, separate the tubing from the nozzle or from the clamping sleeve, then connect the tubing again to the nozzle or clamping sleeve with POS30 braze and braze the tubing with braze from L62 grade brass or PMTs 54 GOST 1534-42 grade copper-zinc braze.

If there are cracks in the tubing, cut out the damaged portion and connect both ends of the tubing with a sleeve with POS30 braze, after ... [text missing]

After the tubing is repaired, test it for hermetic sealing with air pressure by: [p 69]

-- connecting the tube Sb23-21 and the tube Sb23-16 and using a pressure of 140 atm. for 5 minutes;

-- connecting the tube Sb23-22 and using a pressure of 60 atm. for 5 minutes.



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Sketch 29. Tubing Repair

2. Difficult Travel of the Elevating Mechanism

Check the operation of the elevating mechanism by movin50X1-HUM tipping parts of the gun through angles of elevation from -2° 30' to +46°, and then from +46° to -2° 30'.

The mechanism should operate smoothly. The force necessary to start movement on the handle of the elevating wheel should be no more than 8 kg[1]. [Trans. note: footnote missing]

Causes of malfunctioning:

In the Equilibrator

a) Air pressure in the equilibrator is too small or too great.

PM. If more force is needed on the elevating wheel handle of the elevating mechanism to increase angles of elevation than to decrease them, air should be added to the equilibrator.

If less force is needed on the elevating wheel handle to increase angles of elevation than to decrease them, the air pressure in the equilibrator should be decreased. [p 70]

When the air pressure in the equilibrator is adjusted, there should be about 44 atm. with a maximum negative angle of elevation and about 25 atm. with a maximum angle of elevation. These values are approximate. The force needed to turn the elevating mechanism wheel is the basic indicator of correct pressure adjustment in the equilibrator.

b) Springs 23-143 (fig. 6) are fatigued or broken.

If more force on the elevating mechanism wheel handle is necessary to increase angles of elevation (at small angles of elevation) than to decrease them after the pressure in the equilibrator has been adjusted, the cause of this can be spring fatigue.

PM. Prepare two No. 2 washers (see sketch 16) and place one washer between each spring and spring housing Sb23-20 (23-140). If the force on the wheel handle (at small angles of elevation) for increasing angles of elevation is still greater than for decreasing them or if the springs have broken, replace them (appendix 1).

c) Bearings 1308 have failed (fig. 6).

PM. Replace the faulty bearing (appendix 1).

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In the Worm Gear and Axle Brake

d) The tension of dished-disk springs 21-30 and the axle brake (fig. 7) is not adjusted.

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PM. Adjust the tension of the dished-disk springs and the axle brake as follows:

-- remove the cotter pin and screw up nut 21-97 one to one and a half turns;

-- remove catch 21-91;

-- while rotating the elevating mechanism wheel, simultaneously unscrew cap 21-83 far enough so that the force on the handle is noticeably increased. Then tighten cap 21-83 one twelfth turn and check the wheel rotation;

-- put catch 21-97 in place;

-- unscrew nut 21-97 far enough so that worm fitting 21-22 is stopped. Then it is no longer possible to rotate the wheel;

-- screw up nut 21-97 one sixth turn and again check the wheel rotation. Then fasten the nut with a cotter pin.

e) The meshing of the teeth of worm wheel Sb21-4 with the threading of worm fitting 21-22 is jammed (fig. 7).

PM. Take off catch 21-91 which holds cap 21-83 and free bearings 8211 by turning the cap.

[text missing]

...while doing this see that the end of the catch goes into the groove of the adjusting insert when setting catch 21-91. After the adjustment is completed, paint the adjusting insert groove, which is located opposite the catch, with red lead and position the catch. Then adjust the tightness of dished-disk springs 21-30 and the axle brake as instructed above in problem 2, "d". [p 71]

f) Bearings 54810 and 8211 (fig. 7) have failed.

PM. Replace the faulty bearings (appendix 1).

In the Bevel Gear

g) There is jamming in the gear meshing of pinions 21-40 and 21-100 (fig. 7). 50X1-HUM

PM. Disconnect ball-and-socket joint socket 21-61 from shaft 21-38.

Test the wheel rotation. If rotation is difficult, adjust the gear meshing by placing additional spacing rings 21-62 and 21-65 (appendix 1, sketches 252 and 253) under the flanges of split 50X1-HUM 21-32 and cap 21-44.

h) Bearings 204 and 206 (fig. 7) have failed.

PM. Replace the faulty bearings (appendix 1).

In the Crankshaft Mechanism

i) Bearings 7216 (fig. 7) are tightened excessively.

PM. Loosen the tight adjustment of the bearings by placing an additional spacing ring 21-6 (appendix 1, sketch 250) under the flanges of hub 21-7.

There should be no axial movement inside adjuster bushing 21-2 after adjustment of crankshaft 21-1.

j) Bearings 7216 and 218 (fig. 7) have failed.

PM. Replace the faulty bearings (appendix 1).

In the Round Gear

k) There is jamming in the gear meshing of pinions 21-70 and 21-160 (fig. 7).

PM. Check the meshing of the gears after adjusting the meshing of pinions 21-40 and 21-100 (see above item 2, "g") and with the crankshaft removed.

Test the wheel rotation. If rotation is difficult, adjust the gear meshing by placing an additional spacer 21-88 (appendix 1, sketch 254) under housing 21-67.

l) Bearings 204 (fig. 7) have failed.

PM. Replace the faulty bearings (appendix 1).

In the Junction of the Cradle and the Crankshaft

m) There are dents, seizing, and kneading in gear segments 09-50 and in the toothed gears of crankshaft 21-1 ... [text missing]

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n) There is catching of ball 21-58 of the ball-and-socket joi50X1-HUM and of ring 21-59 in socket 21-61 of the ball-and-socket joint (fig. 7).

PM. Remove the ball-and-socket joint and dismantle it. Remove rust from ball-and-socket joint parts and clean the parts where they are jammed.

In the Cradle

o) Roller bearings 2218 (fig. 3) have failed.

PM. Replace the faulty roller bearings (appendix 1).

3. Increased Gross Vertical Play of Gun Tipping Parts

In the firing position, place the gun in a perfectly level position and manually apply the gun wheel brakes.

By operating the gun elevating and traverse mechanisms, position the barrel horizontally approximately in the middle position between the trails.

Push upward on the muzzle end of the barrel with a force of about 125 kg and, while holding the barrel in this position, measure the angle of barrel elevation with a quadrant on the check seat of the barrel. Then apply the same force downward on the muzzle and, while holding the barrel in this position, measure the angle of barrel elevation again.

The difference between the angle measurements indicates the amount of gross vertical play in thousandths.

Measure the gross vertical play as indicated above three times. Take an arithmetical average of the measured results and round off the average to the nearest thousandth.

The gross vertical play should be no more than 12 thousandths.

Causes of malfunctioning:

a) There is axial movement of worm fitting 21-22 due to breakdown or fatigue of dished-disk springs 21-30 (fig. 7).

Remove cap 21-69.

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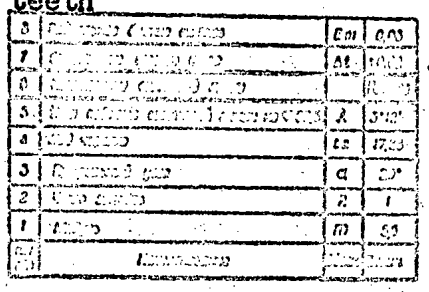
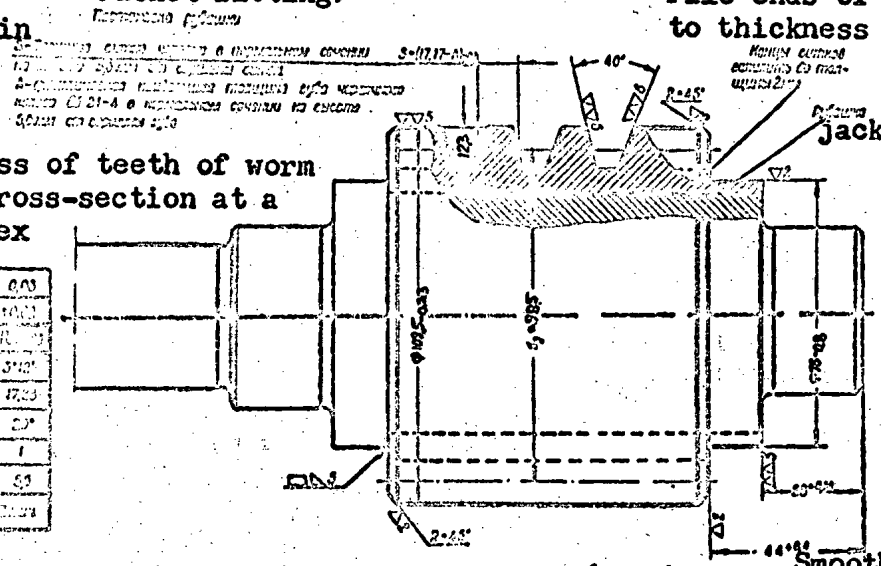
S-
Thickness of worm teeth in normal cross-section at height of 3.3 mm from apex of teeth

A-actual maximum thickness of teeth of worm wheel Sb21-4 in normal cross-section at a height of 5.6 mm from apex of teeth



Jacket fitting:



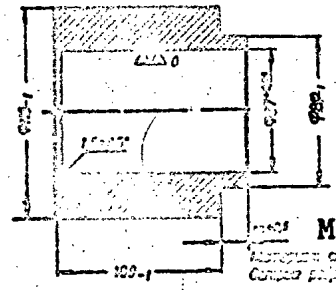
File ends of threading to thickness of 2 mm.

Jacket

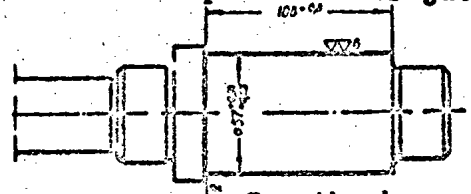
Smooth sharp edges
Oxidize

Jacket

for the remainder



Preparation for jacket placement



Smooth sharp edges

Material: KT75-0KhN1M steel
Smooth sharp edges

Sketch 30. 21-22 -- Worm Fitting

Turn the elevating mechanism wheel, first in one direction, then in the other. Check whether or not there is axial movement of the worm fitting.

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PM./ If there is axial movement, remove the worm fitting and the parts assembled with it and examine the dished-disk springs.

If the springs are broken, replace them (appendix 1).

If the springs are not broken, the following is necessary:

-- remove retainer 21-33;

[text missing]

-- put retainer 21-33 in place and position the worm fitting with its parts and the axle brake on the cannon; [p 73]

-- adjust the tension of dished-disk springs 21-30 and the axle brake (see chapter VI, item 2 "g") and check again whether or not there is axial movement of the worm fitting.

If there is axial movement, make a spacing ring from grade 40 steel (spacing ring dimensions: external diameter of 103_{-1} mm; thickness of 2 to 3 mm, and diameter of the opening of $46^{+0.7}$ mm) and place it between stop washer 21-29 and the dished-disk springs. Then adjust the tension of the dished-disk springs in such a way that the height of the springs is equal to 48 mm.

If the axial movement is not stopped by inserting the spacing ring, replace the springs (appendix 1).

b) The junction of cradle toothed segment 09-50 with the gear teeth of crankshaft 21-1 is worn (figs. 3 and 7).

Measure the clearance between the segment teeth and the crankshaft gear at several angles of elevation by the following:

-- insert a 2 by 10 mm lead plate with a length of 120 mm between the segment teeth and the gears (along the line of the teeth).

-- flatten the plate by turning the elevating mechanism wheel and then take it out;

-- measure the smallest thickness of the plate from both ends. The thickness of the plate indicates the amount of clearance between the teeth.

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The clearance between the teeth should be less than 1.6 mm.

DARM. If the clearance is more than 1.6 mm, shift the cradle segment (chart 7).

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c) The junction of the teeth of worm wheel Sb21-4 with the threading of worm fitting 21-22 is worn (fig. 7).

Measure the thickness of the worm wheel teeth at a distance of 5.6 mm from the apex of the teeth and the thickness of the worm fitting threading at a distance of 5.5 mm from the apex of the threading.

The thickness of the worm wheel teeth should be no less than 6.9 mm. The difference between the threading pitch of 17.28 mm and the sum of the worm wheel teeth thickness and the worm fitting threading thickness should be no more than 1.7 mm.

DARM. If the thickness of the worm wheel teeth is less than 6.9 mm, replace the worm wheel and the worm fitting (appendix 1).

AARM. If the difference between the threading pitch and the total teeth and threading thickness is greater than 1.7 mm, place a jacket on the fitting and machine it (sketch 30).

While pressing the jacket on the fitting, heat the jacket to 400° to 450° C.

d) The bearing surface of upper carriage pivot 17-62 is worn (9 in fig. 8).

[text missing]

... with the gun mechanism put the tipping parts of the gun at the maximum negative angle of elevation. [p 75

Push downward on the muzzle with a force of approximately 125 kg and, holding the barrel in this position, measure the clearance between the bearing surfaces of the upper and lower carriages from the breech mechanism.

The clearance should be less than 4 mm.

DARM. If the clearance is greater than 4 mm, build up a layer of metal on the bearing surface of the pivot crimp with an E50A electrode and machine it (sketch 31).

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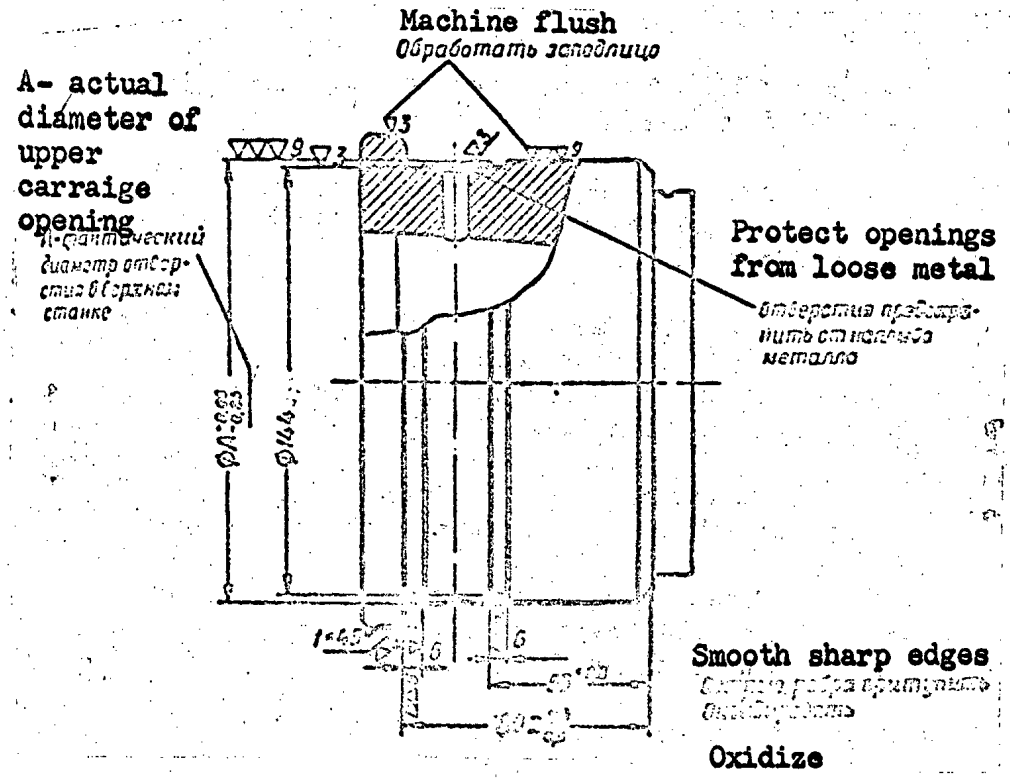

Sketch 31. 17-62 -- Pivot

4. Increased Play of the Elevating Mechanism

(More than 5/8 of a Turn of the Wheel)

(fig. 7)

Place the gun in the firing position.

Fasten a wire indicator (pointer) on housing 21-37 of the bevel gears in such a way that its end is located at the elevating mechanism wheel rim.

Place the barrel approximately in an horizontal position by moving the gun elevating mechanism. Find where the play of the elevating mechanism stops by turning the wheel .... [text missing]

Place a quadrant on the barrel check seat along the longitudinal line and set the quadrant bubble in the middle. [p 76]

Slowly turn the wheel the other way. Stop it the moment the bubble moves from the quadrant level position and again make a line to indicate the second position of the wheel. 50X1-HUM

The angular displacement of the marks on the wheel rim indicates the amount of mechanism play.

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Carry out similar checks with angles of elevation of 12°, 36°, and 45° and with that angle at which the gun is locked in the travelling position.

The play of the mechanism should not exceed 5/8 of a turn of the wheel.

Causes of malfunctioning:

a) See chapter 6, item 3, "a", "b", and "c".

In the Bevel Gear

b) The meshing of pinions 21-40 and 21-100 is not adjusted.

PM. Disconnect socket 21-61 of the ball-and-socket joint from shaft 21-38. Adjust the toothed meshing by decreasing the thickness of spacing rings 21-62 and 21-65 or by replacing the spacing rings with thinner ones (appendix 1, sketches 252 and 253). Then, wheel rotation should be easy without catching.

c) The teeth of pinions 21-40 and 21-100 are worn.

Measure the thickness of the teeth of pinion 21-40 at a distance of 1.87 mm from the teeth apex and the thickness of the teeth of pinion 21-100 at a distance of 2.61 mm from the teeth apex. The thickness of the teeth is measured on a large auxiliary cone.

The thickness of the teeth of pinion 21-40 should be no less than 2.4 mm and of pinion 21-100 no less than 3 mm.

DARM. If the thickness of the teeth is less than the indicated value, replace the gears (appendix 1).

In the Ball-and-Socket Joint

d) The junction of ball-and-socket joint pin 21-60 with the openings of ball-and-socket joint ring 21-59 is worn.

Measure the diameters of the ball-and-socket joint ring openings and the diameters of the terminal parts of the pin. The difference in the diameters of each junction should be no more than 0.7 mm.

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DARM. If the difference is greater than 0.7 mm, make the ring opening round by removing a minimal layer of metal, replace the ball-and-socket joint pin, and machine the opening in ball-and-socket joint ball 21-58 to conform to the true diameter of the ball-and-socket joint pin (chart 8). 50X1-HUM

The diameter of the ring openings can be increased up to 12 mm.

If the diameter of the opening is greater than 12 mm, replace the ball-and-socket joint ring, ... [text missing]

Measure the width of the socket groove and the thickenss of the ball-and-socket joint ring. The difference of the measurements should be less than 0.7 mm. [p 77]

DARM. If the difference is greater than 0.7 mm, take out the irregularity in the walls of the socket groove by removing a minimal layer of metal and replace the ball-and-socket joint ring (chart 8). The width of the groove can be increased up to 20 mm.

In the Round Gear

f) The meshing of pinions 21-70 and 21-160 is not adjusted.

PM. Make this adjustment after adjusting the meshing of pinions 21-40 and 21-100 (see above item 4, "b") and with the crankshaft removed.

Adjust the teeth meshing by decreasing the thickness of spacer 21-88 or by replacing the spacer with a thinner one (appendix 1, sketch 254).

Wheel rotation should then be easy without catching.

g) The teeth of pinions 21-70 and 21-160 are worn.

Measure the thickness of the gear teeth at a distance of 2.24 mm from the teeth apex. The thickness of the teeth should be no less than 2.7 mm.

DARM. If the thickness of the teeth is less than 2.7 mm, replace the gears (appendix 1).

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5. Broken Gear Teeth of Crankshaft 21-1 and Broken Teeth of Arc 09-50

50X1-HUM

(figs. 3 and 7)

DARM. If a crankshaft gear tooth or an arc tooth is broken for any length and to a height of less than 5 mm from the apex or if one of them is broken at any height and for a length of 25 mm, restore the tooth by welding (chart 9).

If the crankshaft gear teeth are broken or if one arc tooth is broken for more than 25 mm in length and more than 5 mm from the apex in height, insert dowels, weld them, and machine them (chart 9).

If two or three teeth of the arc are broken, imbed an insert (chart 9).

6. Holes and Dents in External Cylinder 23-146 and in Cylinder 23-3 of the Equilibrator

(fig. 6).

PM. Dents in external cylinder 23-146 are permissible if they do not hinder normal piston operation or interfere with dismantling and assembling the equilibrator.

If dents in the external cylinder hinder piston operation or dismantling and assembling and if there are holes in the external cylinder or dents and holes in the piston cylinder, replace the equilibrator (appendix 1).

[text missing]

Weld holes (Footnote: An external cylinder with a hole may be repaired only ... [text missing]) in the external cylinder up to 15 mm in size; larger than 15 mm, but smaller than 90 by 135 mm, seal with inserts if the holes are located on part of the hydraulic lock (from the lower face of the cylinder to the internal rib); seal with cover plates (chart 6) if the holes, measuring smaller than 90 by 135 mm, are located on other areas of the cylinder. [p 78]

If the dimensions of a hole in the external cylinder are greater than 90 by 135 mm, replace the equilibrator (appendix 1).

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7. Weakening of Rivets 21-21 which Connect Tread 21-19 to Nave 21-20 of the Worm Wheel

50X1-HUM

(fig. 7)

Check whether or not the rivets have weakened. Carry out the check by tapping the rivet heads with a check hammer. Put a finger on the opposite end of the rivet while tapping; if the rivet has weakened, a movement will be felt.

PM. Remove the weakened rivets. Measure the diameters of the openings for the rivets in the tread and in the nave and determine how oval the openings are. If the openings are 0.5 mm out of round, drill and ream the openings. The opening diameters can be increased up to 15 mm.

Replace weakened rivets with new rivets 21-21 (appendix 1, sketch 251). If fewer than eight rivets have weakened, replace only the weakened rivets.

If eight or more rivets have weakened, replace all of the rivets. Replace the rivets alternately in the order of their diametrical position without separating the tread from the nave.

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50X1-HUM

Maintenance of Traversing Mechanism and Upper Carriage

1. Stiff Operation of Traversing Mechanism

Place the gun on a level surface in combat position.

Check the operation of the traversing mechanism, giving the rotating parts of the gun various angles of laying.

The mechanism should operate smoothly. The force on the handle of the handwheel required to operate the mechanism should be no greater than 6 kg.[1] [Footnote missing]

Causes of Malfunctions:

In the Junction of the Upper Carriage and Lower Carriage

a) The upper carriage is not suspended in relation to the lower carriage (fig 8).

Elevate the tipping parts of the gun to 46° and with a clearance gauge measure the clearance between the bearing surfaces of the upper and lower carriages from the side of the breech parts; lower the tipping parts of the gun to a negative angle of elevation of -2°30' and measure the clearance between the bearing surfaces from the side of the chase.

There should be no contact between the surfaces.

The clearance between the bearing surfaces should be no less than 0.05 mm (a clearance gauge of 0.05 mm should pass freely) and no greater than 0.5 mm.

PM. If the clearance is less than 0.05 mm, remove locking gibs 17-72 and 17-67 and screw up regulating bolt 17-43 of the pivot (if the clearance is less than 0.05 mm from the side of the breech parts) or lock nuts 17-53 of the rollers (if the clearance is less than 0.05 mm from the side of the chase) so that a clearance gauge of 0.05 mm passes freely between the bearing surfaces.

If screwing up the regulating bolt or lock nuts does not increase the clearance (the clearance is less than 0.05 mm), it is necessary to screw off pivot cover 17-42 and lock nuts 17-53 and remove and inspect [p 80] dished-disk springs 17-36 and 17-24 and bearings 8211 of the pivot and 205 of the rollers.

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If the springs and bearings are broken, replace them (appendix 1)

50X1-HUM

If the springs and bearings are not broken, the reason why the clearances cannot be increased is fatigue of the dished-disk springs. In this case, replace the dished-disk springs (appendix 1).

After replacing the faulty springs and bearings, and also when the clearances between the bearing surfaces are greater than 0.5 mm , suspend the upper carriage in relation to the lower by regulating bolt 17-43 and lock nuts 17-53 so that the clearances between the bearing surfaces are within the limits specified above.

After making the adjustments, secure the regulating bolt and lock nuts with locking gibs 17-67 and 17-72.

In the Bevel Gear

b) Jamming in the meshing of gears 22-34 (fig 9).

PM. Remove screw A51063-8 which fastens guide sleeve 22-65 on shaft 22-31 and disconnect the guide sleeve from cross piece 22-66.

Test the rotation of the hand wheel. If rotation is stiff, adjust the meshing by placing an additional spacer 21-62 (appendix 1, sketch 252) under the flange of bushing 21-32.

After making the adjustment, connect the guide sleeve with the cross piece and check the force on the traversing handwheel.

c) Broken bearings 204 and 206 (fig. 9).

PM. Replace faulty bearings (appendix 1).

In the Junction of the Arc of the Lower Carriage and the Gear Shaft.

d) Nicks, scratches and burrs on the teeth of arc 18-47 and on the gear teeth of shaft 22-1 (figs. 9 and 10).

PM. Clean the surface of the teeth, removing only the raised metal.

In the Worm Gear

The detection and elimination of malfunctions in the worm gear should take place after the elimination of causes of malfunctions a, b, c, and d.

50X1-HUM

e) Excessively tight bearings 7606 and 7207 (fig. 9).

PM. Try the rotation of the handwheel. If the rotation is stiff, loosen the bearing adjustment by placing additional spacers 50X1-HUM missing]

After adjustment, worm 22-4 and gear shaft 22-1 should not have [p 81] axial movement.

f) Jamming in the meshing of the teeth of worm wheel 22-3 with the threads of worm 22-4 (fig 9).

DARM. Try the rotation of the handwheel. If the rotation is stiff, adjust the worm meshing by changing the thickness of spacers 22-6 by inserting additional spacers 22-6 (appendix 1, sketch 256) or by decreasing the number of spacers.

g) Broken bearings 7207, 7606, and 210 (fig 9).

PM. Replace the faulty bearings (appendix 1).

In the Joint

h) Jamming of ball 21-58 and ring 21-59 of the joint in socket 21-61 (fig 9).

PM. Remove the joint and take it apart. Remove rust from the parts and trim the parts in the places of jamming.

2. Increased Gross Horizontal Unsteadiness of Rotating Parts

Place the gun in combat position on a level surface and apply the wheel brakes.

By operating the elevating and traversing mechanism, set the barrel in a horizontal position approximately midway between the trails.

Push the muzzle to the left with a force of approximately 50 kg and, keeping the barrel in this position and rotating the micrometer head and reflecting mirror, sight the crosshairs of the panoramic sight (the top of the center ^ of the sight) on any aiming point and note the reading of the azimuth scale. Then push the muzzle to the right with the same force and, keeping the barrel in this position and rotating the micrometer head, again sight the crosshairs (the top of the center ^ of the sight) on the same aiming point and note the reading of the azimuth scale.

50X1-HUM

The difference between the readings of the azimuth scale will be the amount of gross horizontal play in thousandths. 50X1-HUM

Measure the gross horizontal play three times as indicated above and take the arithmetic average of the measurements rounded off to the nearest thousandth.

The gross horizontal play should not be greater than 12 thousandths.

Causes of malfunctions:

a) Axial movement of worm 22-4.

Rotate the traversing handwheel in one direction, and then, changing the direction of rotation, check [text missing]

PM. In the case of axial movement, decrease the thickness of spacer 22-19 or replace it with a thinner spacer (appendix 1, sketch 257). The rotation of the handwheel should be light, without catching. [p 82]

b) Wear in the meshing of the teeth of arc 18-47 with the teeth of gear shaft 22-1 (figs. 9 and 10).

Measure the thickness of the teeth of the arc 3.5 mm from the top of the teeth and the thickness of the gear teeth 7.65 mm from the top of the teeth.

The thickness of the teeth of the arc should be no less than 8 mm, and the thickness of the gear teeth, no less than 10.6 mm.

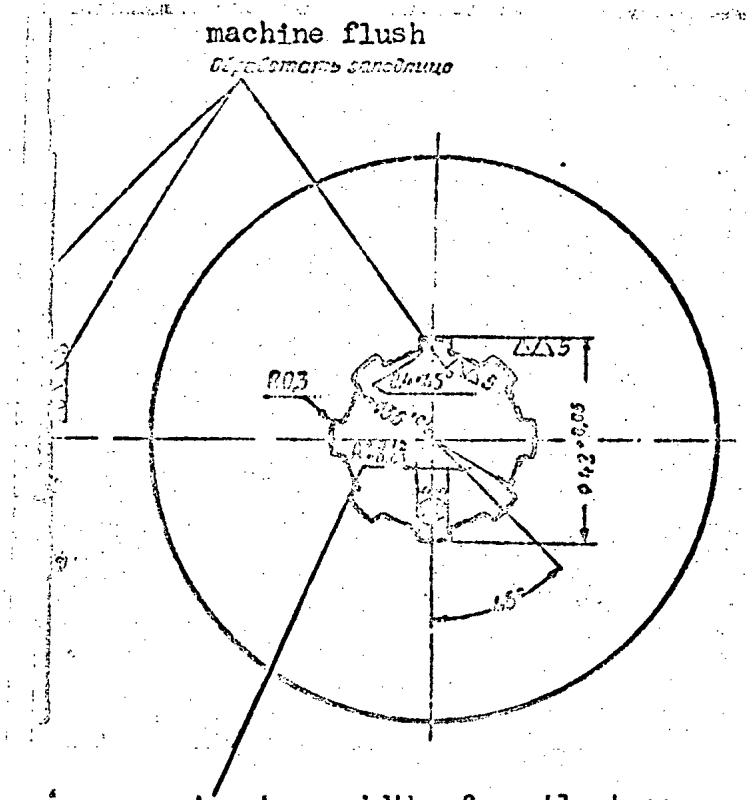
AARM. If the thickness of the teeth of the arc and gear are less than the specified dimensions, shift arc 18-47 (chart 10).

c) Wear in the meshing of the teeth of worm wheel 22-3 with the threads of worm 22-4 (fig 9).

Measure the thickness of the teeth of the worm wheel 4.09 mm from the top of the teeth and the thickness of the threads of the worm 4 mm from the top of the threads.

The thickness of a tooth of the worm wheel should be no less than 4.8 mm. The difference between the pitch of the threads (12.56 mm) and the sum of the thickness of a tooth of the worm wheel and the thickness of a thread of the worm wheel should be no greater than 1.7 mm.

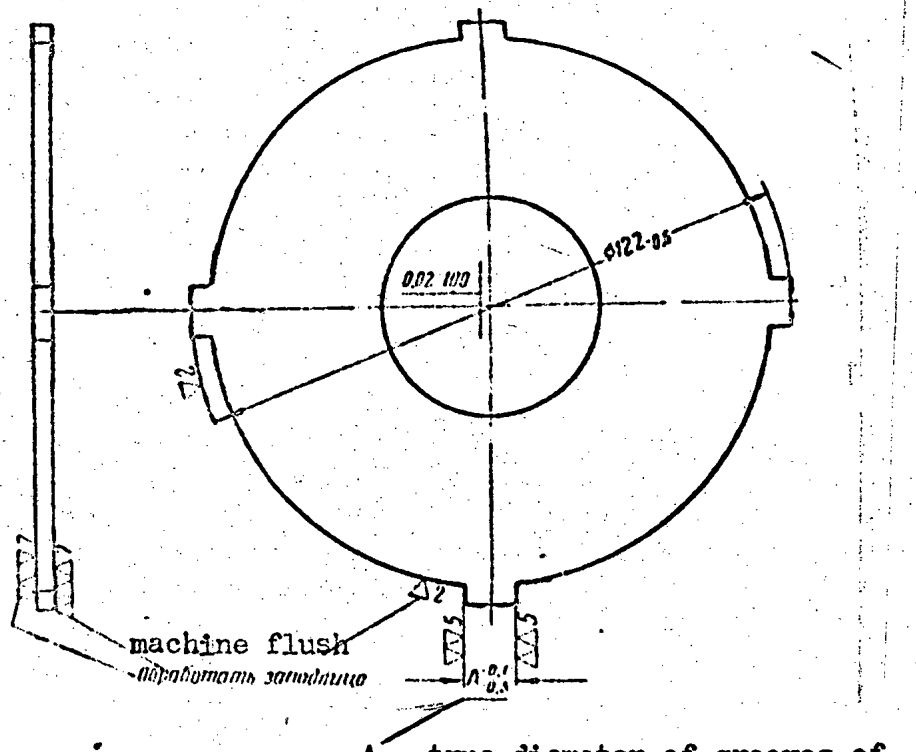
50X1-HUM



A - true width of castle-type projection of gear shaft 22-1

Blunt sharp edges. Distortion of more than 0.15 mm not permissable. Oxidize.

Sketch 32. 22-8 - upper clutch plate;
22-9 - intermediate clutch plate



A - true diameter of grooves of worm wheel 22-3

Blunt sharp edges. Distortion of more than 0.15 mm not permissable.

Sketch 33. 22-10 - clutch plate

50X1-HUM

50X1-HUM

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DARM. If the thickness of a tooth of the worm wheel is less than 4.8 mm, replace the worm wheel and worm (appendix 1). 50X1-HUM

AARM. If the difference between the pitch of the threads and the sum of the thickness of a tooth and the thickness of a thread is greater than 1.7 mm, replace the worm with one having thicker threads. (appendix 1, sketch 255).

d) Wear in the junction of the castle-type projections of gear shaft 22-1 with the grooves of the upper (22-8) and intermediate (22-9) clutch plates (fig 9).

Measure the width of the grooves of the clutch plates and the thickness of the castle-type projections of the gear shaft. The difference between the dimensions in each junction should be no greater than 1.2 mm.

DARM. If the difference is greater than 1.2 mm, remove the burrs on the castle-type projections, build up the sides of the grooves of the clutch plates with a layer of metal, using an ENKh-30 electrode, and machine grooves for the projections of the shaft (sketch 32).

e) Wear in the junction of the projections of clutch plates 22-10 with the grooves of worm wheel 22-3 (fig 9).

Measure the width of the grooves of the worm wheel and the width of the projections of the clutch plates. The difference between the dimensions in each junction should be no greater than 1.2 mm.

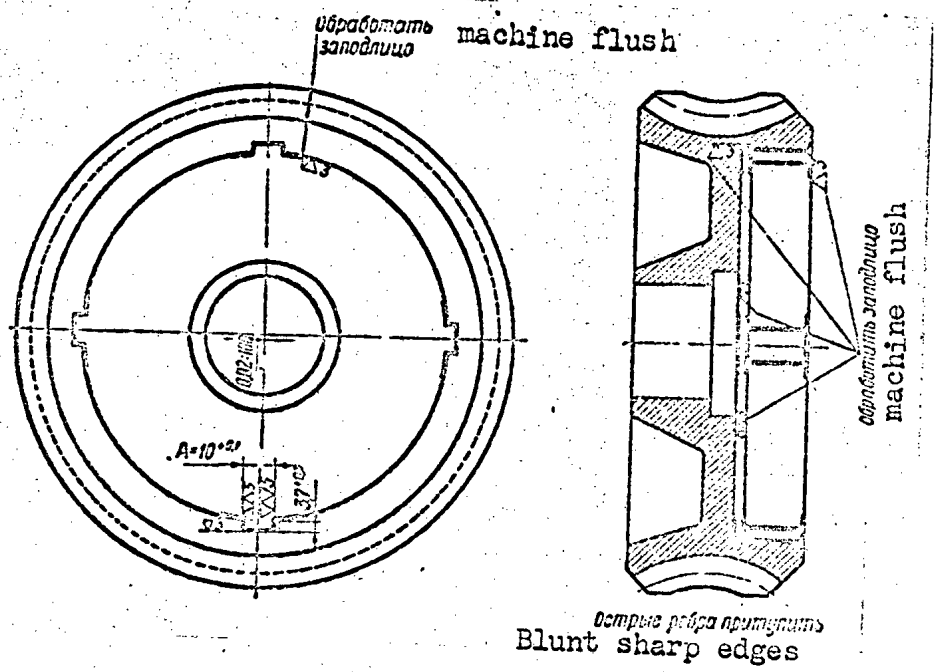
AARM. If the difference is greater than 1.2 mm, remove burrs in the grooves of the worm wheel by taking off a minimum layer of metal, [text missing]

The width of the grooves may be increased up to 12 mm. If the [p 84] width is greater than 12 mm, build up the grooves by gas welding using LAZhMts 66-6-3-2 brass and machine new grooves (sketch 34).

f) Wear in the junction of pivot 17-62 and the aperture of the upper carriage (fig 8).

Measure the diameter of the aperture of the upper carriage and the external diameter of the upper pivot journal. The difference between the diameters should be no greater than 1.4 mm.

DARM. If the difference is greater than 1.4 mm, build up the upper pivot journal with a layer of metal, using an E50A electrode and machine (see sketch 31). 50X1-HUM



Sketch 34. 22-3 - worm wheel

3. Increased Play in the Traversing Mechanism (greater than 7/8 of a turn of the handwheel)

Place the gun in combat position.

Fasten a wire indicator (pointer) on housing 21-37 (fig 7) so that the end is located near the rim of the traversing handwheel.

Insert extension Sb41-37 (fig 18) in the panoramic sight socket and tighten it; then insert the panoramic sight in the socket of the extension and tighten it.

Operating the elevating and traversing mechanisms of the gun, [text missing]

Turn the traversing handwheel in either direction until it takes [p 85] hold and sight the crosshairs of the panoramic sight (the top of t 50X1-HUM center ∧ of the sight) on an aiming point.

Note the position of the hand wheel with a mark on the outer surface of the rim at the indicator.

Slowly turn the handwheel in the opposite direction until the moment the crosshairs (the top of the center ∧) of the sight shift from the aiming point and note the second position of the handwheel with a mark at the indicator. The angular displacement of the mark on the rim of the handwheel will give the amount of play in the mechanism.

Conduct the same check for angles of horizontal laying 300 thousandths left and right of the center position of the barrel.

The play of the mechanism should be no greater than 7/8 of a turn of the handwheel.

Causes of malfunctions:

a) See Chapter 7, item 2, a, b, c, d, f.

In the Junction of the Guide Sleeve and Connecting Piece.

b) Wear in the junction of the projections of guide sleeve 22-65 with the grooves of connecting piece 22-6 (fig 9).

Measure the width of the grooves of the connecting piece and the thickness of the projections of the guide sleeve. The difference between the dimensions in each junction should be no greater than 0.5 mm.

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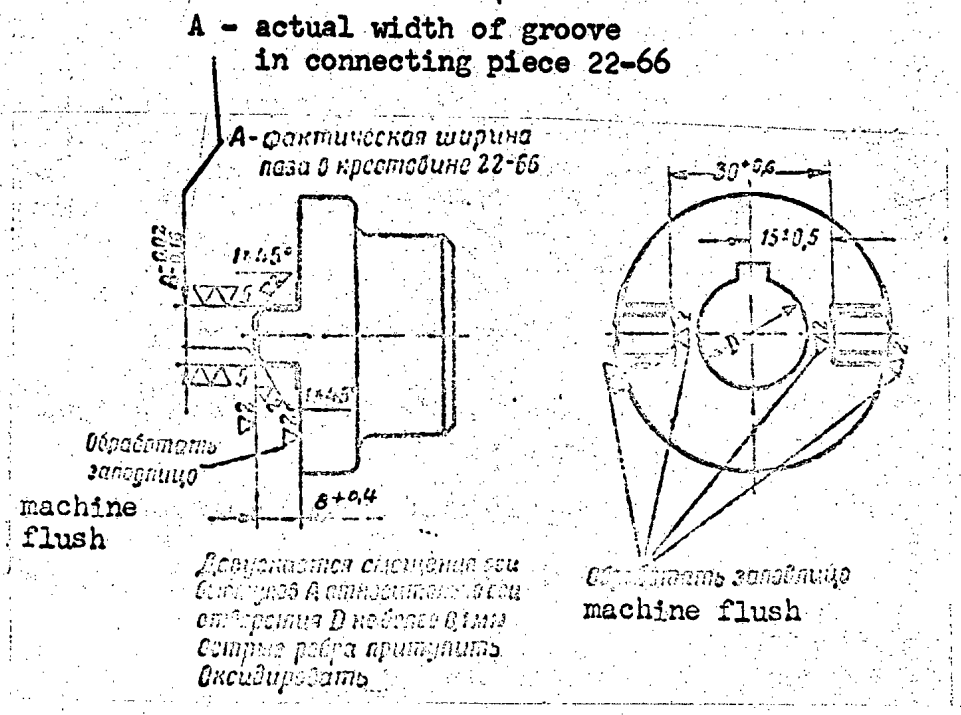

The deviation of the axis of projection A in relation to the axis of aperture D should be no greater than 0.1 mm.
Blunt sharp edges.
Oxidize.

Sketch 35. 22-65 - guide sleeve

DARM. If the difference is greater than 0.5 mm, remove the burrs in the grooves of the connecting piece by taking off a minimum layer 50X1-HUM metal [text missing]

The width of the grooves of the connecting piece may be increased [p 86] up to 12 mm. If the width is greater than 12 mm, replace the connecting piece (appendix 1, sketch 259).

In the Bevel Gear

c) Meshing of gear 22-34 is out of adjustment (fig 9).

PM. Remove screw A51063-8 which fastens guide sleeve 22-65 on shaft 22-31 and disconnect the guide sleeve from connecting piece 22-66. Next, disconnect socket 21-61 of the joint from shaft 22-48 and adjust the meshing by decreasing the thickness of spacer 21-62 or by replacing the spacer with a thinner one (appendix 1, sketch 252). The rotation of the handwheel should be light, without catching. After making the adjustment, connect the socket of the joint with the shaft and the guide sleeve with the connecting piece.

d) Wear of the teeth of gear 22-34 (fig 9).

Measure the thickness of the teeth 2.24 mm from the top on a large auxiliary cone.

The thickness of the teeth should be no less than 2.6 mm.

DARM. If the thickness of the teeth is less than 2.6 mm, replace the gear (appendix 1).

In the Joint

e) Wear in the junction of pin 21-60 with the holes in ring 21-59 of the joint.

See Chapter 6, item 4, d.

4. Increased Disturbance of Horizontal Laying During Firing Resulting From Slippage in the Clutch of the Traversing Mechanism

This is determined during firing or established from the records accompanying the gun from the military unit which sent the cannon in for repair.

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Disturbance of horizontal laying resulting from clutch slippage during the firing of a round is allowed for up to two revolutions of the handwheel.[1] [Trans. note: Footnote missing]

Cause of malfunction: friction disks 22-8, 22-9, and 22-10 are inadequately tightened by nut 22-13 (fig 9).

50X1-HUM

PM. / Check the position of the horizontal line on the face of nut 22-13, which should follow the axis of the hole from the cotter pin in gear shaft 22-1.

Lock the upper carriage in traveling position with travel lock Sb17-2 (fig 8). [p 87]

Using a dynamometer, measure the force required to move the traversing handwheel. The force required to move the handwheel should be from 30 to 50 kg (under which slippage of the clutch plates should occur). Make this check after each half-revolution of the handwheel for five revolutions.

If the force required to move the handwheel is less than 30 kg, remove the cotter pin and tighten the clutch plates by tightening nut 22-13. A change of no more than 1 mm (1/2 turn of the nut) is allowed in the position of the horizontal line and nut 22-13 in relation to the axis of the hole for the cotter pin.

After tightening the plates, check the force required to move the handwheel as specified above. If the force is less than 30 kg, take apart the worm gear case and inspect the clutch plates and dished-disk springs 22-7.

If the clutch plates are covered with grease, wipe them dry. If the dished-disk springs are broken, replace them (appendix 1). Next, reassemble the worm gear case and tighten the clutch plates until the horizontal line on nut 22-13 coincides with the axis of the hole for the cotter pin.

Install the case on the gun and check the force required to turn the handwheel. If that force is less than 30 kg, tighten nut 22-13 no more than a half turn and check again the force required to turn the handwheel. That force should be from 30 to 50 kg. Remove the old line on the face of the nut and make a new line 0.5 mm in width and depth along the axis of the hole for the cotter pin.

If, after tightening the clutch plates (in the absence of broken disk springs 22-7), the force required to move the handwheel is less than 30 kg, replace the dished-disk springs (appendix 1) and adjust the tightness of the clutch plates.

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5. Increased Total Clearance Between From Clamp 17-70 and the Lower Surface of the Edge of the Lower Carriage and Between the Bearing Surfaces of the Upper and Lower Carriages

50X1-HUM

/ (figure 8)

Place the gun on a level surface in combat position. Operating the traversing mechanism, place the barrel in a position approximately midway between the trails.

Measure the clearance between the bearing surfaces (in the front parts) of the upper and lower carriages and between the front clamp 17-70 and the lower surface of the edge of the lower carriage.

The total clearance should be no greater than 2.5 mm.

AARM. If the total clearance is greater than 2.5 mm:

-- remove the front clamp from the upper carriage;

-- remove any roughness on the lower bearing surface of the front [text missing]

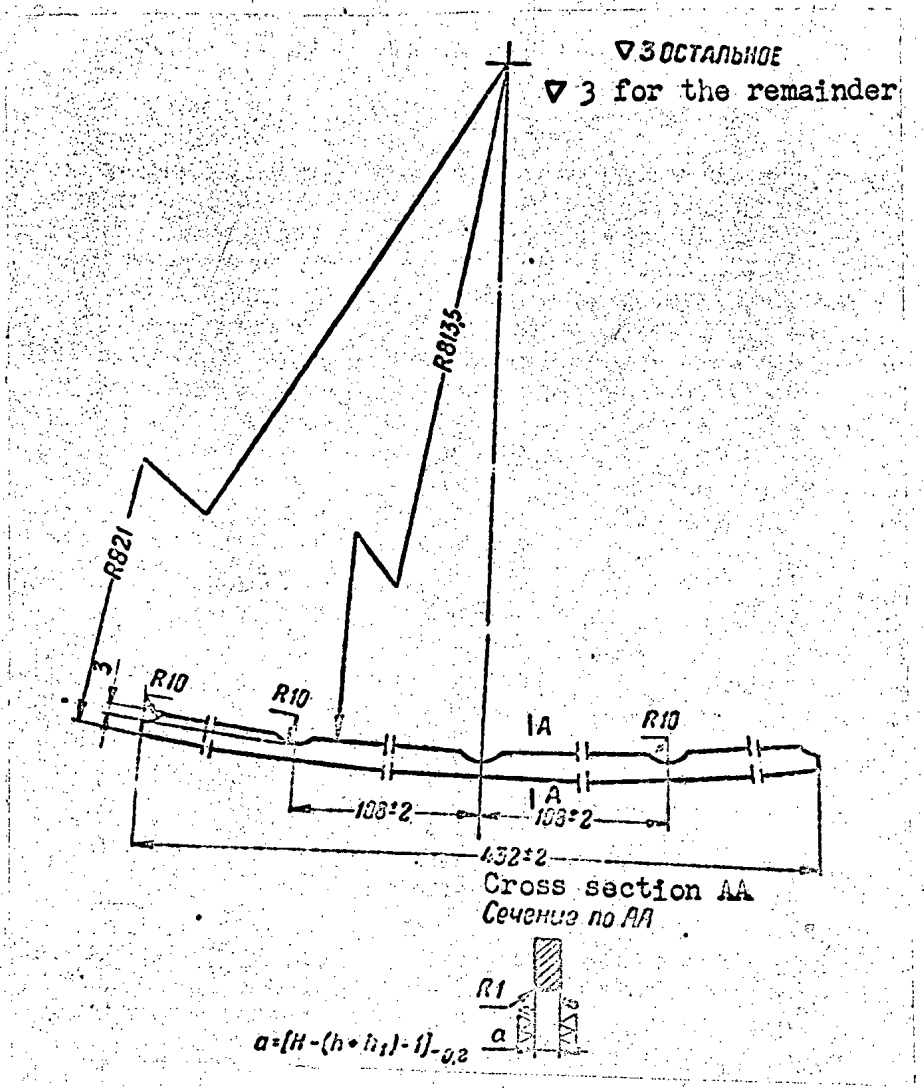
-- make a spacer (sketch 36), weld it to the upper bearing surface of the clamp with an E42 electrode, and trim the weld seam flush with the spacer; [p 88]

-- place the front clamp on the upper carriage and determine the degree of non-coincidence of the holes in the clamp with the threaded holes in the upper carriage for bolts A51000-56. Next cut three oval holes in the clamp; [text missing]

-- fasten the clamp on the upper carriage with three A51000-56 bolts and enlarge the four holes in the clamp and upper carriage for adjusting pins 17-73. The diameter of the holes may be increased to 23 mm; [p 89]

-- make four adjusting pins 17-73 of the actual diameter of the holes in the clamp (appendix 1, sketch 232) and insert them in the holes.

50X1-HUM



H - width of groove of front clamp 17-70
h - thickness of edge of lower carriage
h_1 - thickness of edge of upper carriage.

Material: steel K30-40
Blunt sharp edges.

Sketch 36. Spacer

6. Stop 17-9 Does Not Securely Lock the Upper Carriage to the Lower in the Traveling Position 50X1-HUM

(fig 8)

Cause of Malfunction: spring 17-8 is broken or fatigued.

By operating the traversing mechanism, place the upper carriage in center position and switch stop 17-9 from combat position to traveling position.

The spring should immediately thrust stop 17-9 downward and lock the upper carriage.

PM. If the action of the stop is sluggish or if it does not enter the conical opening in the lower carriage, replace the spring with one made by DARM (chart 3).

7. Wear in the Junction of Stop 17-9 With the Openings in Cylinder 17-7 and the Lower Carriage

(fig 8)

Lock the upper carriage to the lower carriage in traveling position with stop 17-9 and with a clearance gauge measure the clearance between the lower surface of lever pin 17-10 and the bearing surface of the slot of cylinder 17-7 (10 in fig 8). The clearance should be no less than 1 mm.

Detach the upper carriage from the lower and take apart the stop.

Measure the large diameter of the conical opening in the lower carriage, the diameter of the opening in the cylinder, and the diameter of the stop.

The difference between the diameters in each junction should be no greater than 0.7 mm.

PM. If the difference in the diameters is less than 0.7 mm and the clearance between the surface of pin 17-10 and cylinder 17-7 is less than 1 mm, file the bearing surface of the slot in the cylinder so that when the upper carriage is locked in traveling position the clearance is between 2 and 2.5 mm.

AARM. If the difference in the diameters is greater than 0.7 mm correct the oval shape of the openings in the cylinder and lower carriage by removing a minimum layer of metal. The diameter of the opening in the cylinder and the large diameter of the conical opening in the lower carriage should be the same. 50X1-HUM

The diameters may be increased up to 37 mm.

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Make/stop 17-9 with the true diameter of [text missing]

Assemble the stop, place the upper carriage on the lower, and lock the upper carriage in the traveling position with stop 17-9. [p 90]

With a clearance gage measure the clearance between the lower surface of lever pin 17-10 and the bearing surface of the slot in cylinder 17-7. The clearance should be no less than 3.5 mm. If the clearance is less, file the bearing surface of the slot in cylinder 17-7.

8. Broken Teeth on Gear Shaft 22-1 and Arc 18-47

(fig. 9 and 10)

DARM. If a tooth of the gear shaft or a tooth of the arc is broken for any length and at a height of 5 mm from the top or for a length of up to 15 mm and at any height, restore the tooth by welding on layers of metal (chart 9).

If the teeth of the gear shaft are broken for a length greater than 15 mm and a height greater than 5 mm from the top, insert a dowel, weld it in place, and machine it (chart 9).

If two or three teeth of the arc are broken, install an insert (chart 9).

50X1-HUM

Chapter Eight

Maintenance of the Lower Carriage and Trails

1. The Gun Suspension System Does Not Function

(fig. 10)

PM. Place the gun on a perfectly level surface.

With the trails locked in traveling position, check whether the upper surfaces of balance beams Sb18-10 and Sb18-11 and buffers 18-50 contact. The balance beams should not contact the buffers.

Check for disconnection of the suspension system with the trails extended in combat position. With the trails spread apart, pintles 18-18 should freely enter the apertures in the balance beams.

If the balance beams contact the buffers, take out the torsion bars and inspect them. If the torsion bars are broken or twisted, replace them (appendix 1).

If pintles 18-18 do not enter the apertures in the balance beams when the trails are extended in combat position, adjust the position of the balance beams (with trails locked in the traveling position) by either tightening or loosening coupling screw 18-39. Length b, the emergence of the threaded part of the coupling screw from the coupling housing, should be no more than 55 mm.

If it is not possible to achieve disconnection of the suspension system with the trails spread in combat position by the adjustment indicated, move appropriate torsion bar 18-32 to another slot and adjust the position of the balance beam as indicated above.

Note: A turn of the torsion bar one slot corresponds to a displacement of the apertures in the balance beams (for pintles 18-18) in relation to the apertures in the combat locking lever of 32 mm.

After adjusting the suspension system, roll the gun on the ground (rearwards or forwards 5-7 m) and check for disconnection of the spring suspension system with the trails extended.

2. The Suspension System Does Not Disconnect

(fig 10)

Spread the trails until latched in the lower carriage. Pintles 18-18 should freely enter the balance beam apertures.

[text missing]

3. The Suspension System Does Not Connect [p 92]
50X1-HUM

(fig. 10)

Bring the trails together into traveling position. Pintles 18-18 should freely exit the balance beams and should not project beyond the front end of either the right or left combat locking levers. The presence of a pintle projection from the levers is determined by passing a clearance gage between the end of the combat locking lever and the balance beams.

The reason for pintle projections and the means of eliminating them are indicated below (see Chapter VIII, item 3, a, b, c).

PM. If the clearances in the junctions (see Chapter VIII, item 3, a, b, c) do not exceed tolerable limits, place the pivots with rods in place and, with the trails locked in traveling position, mark a line on pintles 18-18 near the end of the combat locking levers. Remove the pivots with rods from the trails, measure distance A from the end of the pivot to the line (sketch 27) and width E (fig. 10) of the combat locking lever, and determine the difference of the measurements a = A - E.

Cut off the front end of pintles (a + 2) mm according to sketch 37.

Causes of the malfunction:

a) Wear in the junction of ball bearing 18-21 with pintle 18-18 and nut 18-20.

PM. Take off casing Sb45-6 and remove pintle 18-18 with rod 18-74 from the trail.

When there is looseness in the coupling indicated above, tighten nut 18-20 to eliminate instability but make sure the ball bearing retains free movement.

Prick punch the nut at two points after tightening.

If tightening the nut does not eliminate instability completely, cut off the end of the nut (sketch 38).

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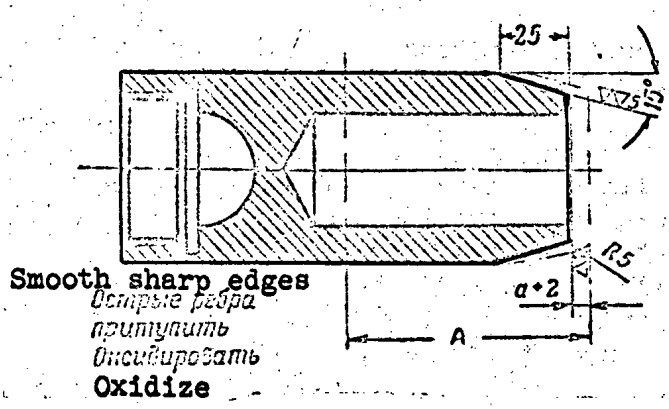
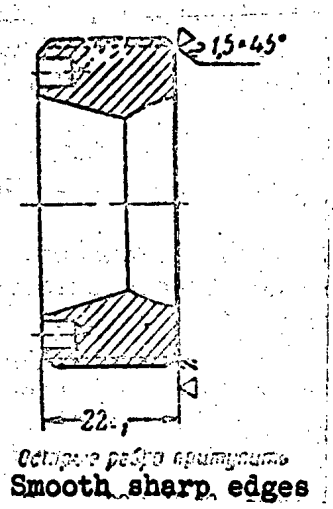


Sketch 37. 18-18 -- pintle



Sketch 38. 18-20 -- washer

A decrease in the length of the nut up to 21 mm is permissible. [p 93]

b) Wear in the junction of pin 18-77 with rod 18-74 and pin 18-76.

Measure the diameters of pin 18-77 and the apertures in rod 18-74 and pin 18-76. The difference of the diameters should be no more than 2 mm.

PM. When the difference of diameters is more than 2 mm, eliminate the oval shape in the apertures of rod 18-74 and pin 18-76 by removing a minimum layer of metal, and replace pin 18-77 (appendix 1, sketch 240). An increase in the diameter of the apertures up to 23 mm is permissible.

If the diameter of the aperture is more than 23 mm, weld the aperture rod 18-74 with electrode E50A and machine it. Replace pin 18-76 and 18-77 (appendix 1, sketches 239 and 240).

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c) Wear in the junction of pin 18-76 and bracket 18-75 or 18-79

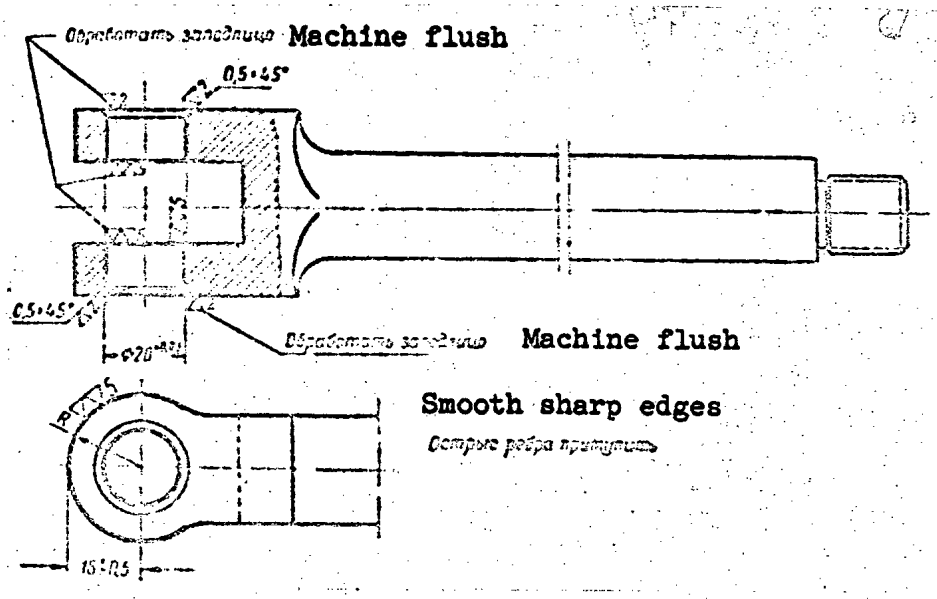
50X1-HUM

Measure the diameters of the apertures in the bracket and the pin.

The difference of the diameters in each junction should be no more than 2 mm.

PM. When the difference of the diameters is more than 2 mm, eliminate the oval shape in the bracket apertures by removing a minimum layer of metal and replace pin 18-76 (appendix 1, sketch 239). An increase in the diameter of the larger aperture up to 43 mm and an increase in the diameter of the smaller aperture up to 23 mm is permissible.

In the event that rod 18-74 sticks to pin 18-76 in the eye, file the eye to a radius of R = 17 mm (see sketch 39).



Sketch 39. 18-74-rod

50X1-HUM

4. Wear in the Junction of Pintle 18-18 and the Aperture in Combat Locking Lever 18-16 or 18-17 and the Aperture in Rocker Arm Sb18-10 or Sb18-11

[illegible] 50X1-HUM

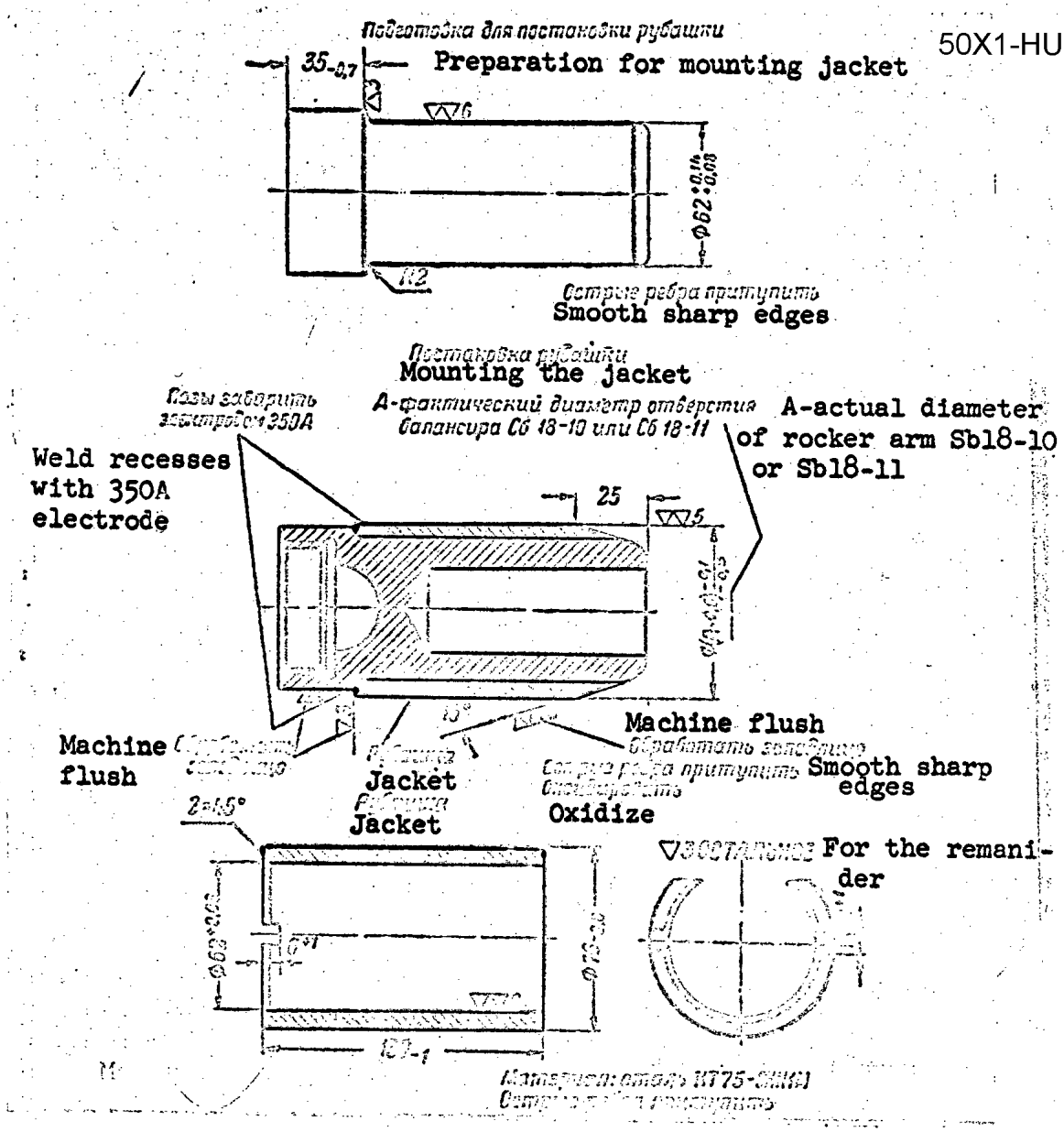
(fig. 10)

Measure the diameter of pintle and the diameter of the aperture in the rocker arm.

The difference of the diameters should be no more than 2.5 mm.

DARM. If the difference of the diameters is more than 2.5 mm, eliminate the oval shape in the balance beam apertures by removing a minimum layer of metal and insert a bushing on the pintle (sketch 40) or replace the pintle (appendix 1, sketch 236).

50X1-HUM



Material: steel KT75-OKhNIM
Smooth sharp edges

Sketch 40

Cut a slot in the combat locking arm to provide a clearance of 0.1 - 0.36 mm in the junction with the pintle after inserting the bushing 50X1-HUM the pintle or after re-making the pintle.

An increase in the diameters of balance beam apertures up to 73.6 mm and in the diameter of the aperture in the combat locking lever up to 73 mm is permissible.

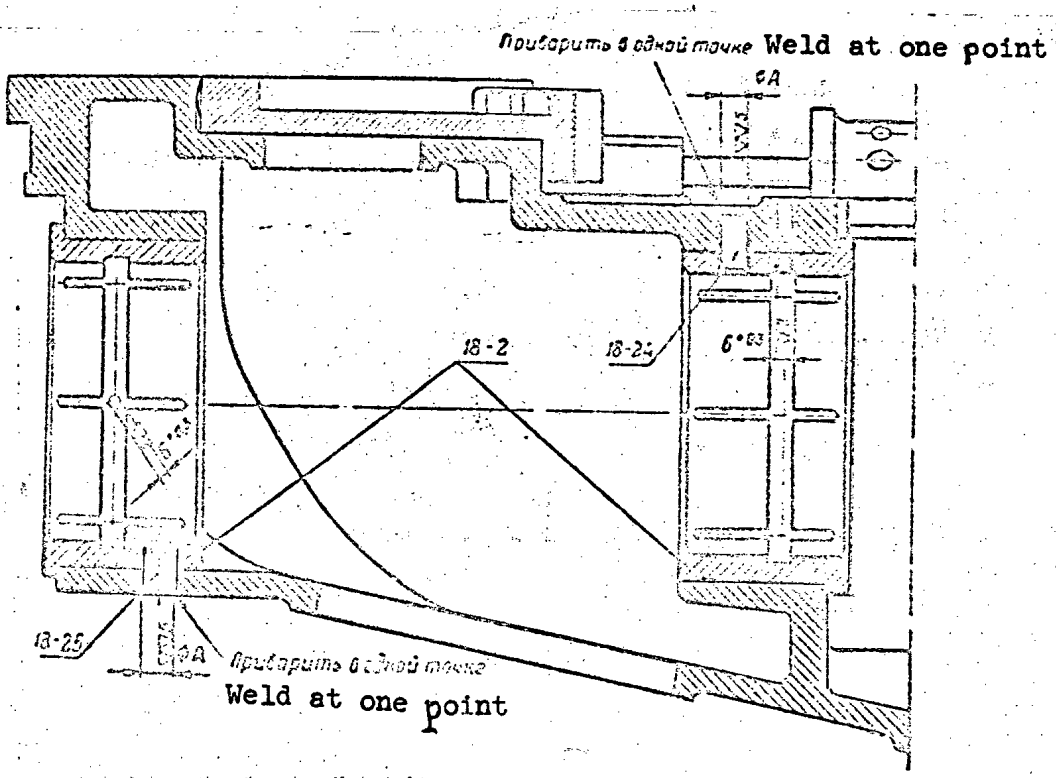
5. Defects Causing Malfunctions in the Suspension System

(fig. 10)

Causes of malfunctions:

a) Wear or breakdown of buffer 18-50.

Inspect the buffers and measure the height h of buffer protrusion over the surface of the lower carriage bracket.



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Sketch 41. Lower carriage: 18-2 -- bushing; 18-24 -- pin; 18-25 -- pin

Height h of buffer protrusion should be no less than 6 mm.

PM. If height h of buffer protrusion is less than 6 mm, or if the buffer is broken, replace it (appendix 1). 50X1-HUM

b) Wear in the junction of bushings 18-2 and forward sleeve 18-101.

Measure the diameter of the aperture in bushing 18-2 and the diameter of the neck...
[text missing]

The difference of the diameters shpuld be no more than 2 mm. [p 96]

DARM. If the difference of the diameters is more than 2 mm, replace bushings 18-2 (appendix 1, sketch 234). To determine the height of the bushing collar, measure the distances A and B (fig 10).

The height of the collar:

bushing I -- $h_1 = (A-170)_{-0.26}$ mm;

bushing II -- $h_2 = [357.74-(h_1+B)]_{-1}$ mm.

After press fitting bushings 18-2 into the lower carriage, machine apertures A (for pins 18-24 and 18-25) and the apertures (for grease) with diameters of $6^{+0.3}$ mm in the bushings conforming to the existing apertures in the lower carriage (sketch 41).

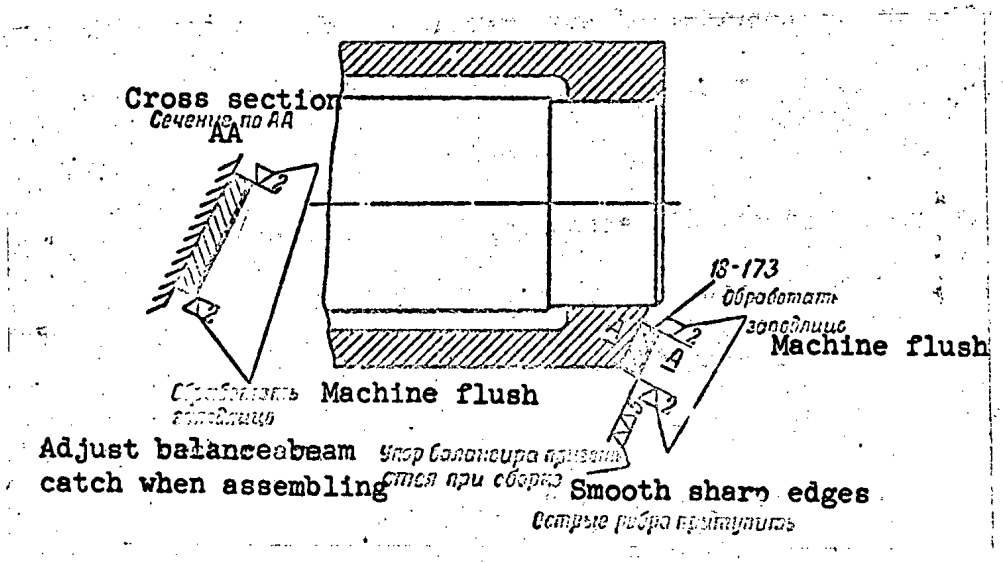
Make pins 18-24 and 18-25 (appendix 1, sketch 237) and press fit the pins into apertures A.

To eliminate jamming of forward sleeve 18-101 in bushings 18-2 (after press fittings), it is permissible to scrape the inner surface of the bushing.

c) Wear of bushing collars 18-2. The height of the collar should be no less than 4 mm.

DARM. When the height of the bushing collar is less than 4 mm, replace the bushings (appendix 1, sketch 234). Determine the height of the bushing collar and placement of bushings according to instructions in item 5, b, chapter VII.

50X1-HUM



Sketch 42. Left Balance Beam With Lug: 18-173-balance beam catch

d) Wear of balance beam catch 18-173.

With the gun suspended on trestles placed under the lower carriage and buffers 18-50, with wheels and torsion bar removed, turn balance beam Sb18-10 or Sb18-11 up on forward sleeve 18-101 to the stop in the lower carriage. Measure the gap between the upper surface of the balance beam and area S. The gap... [text missing]

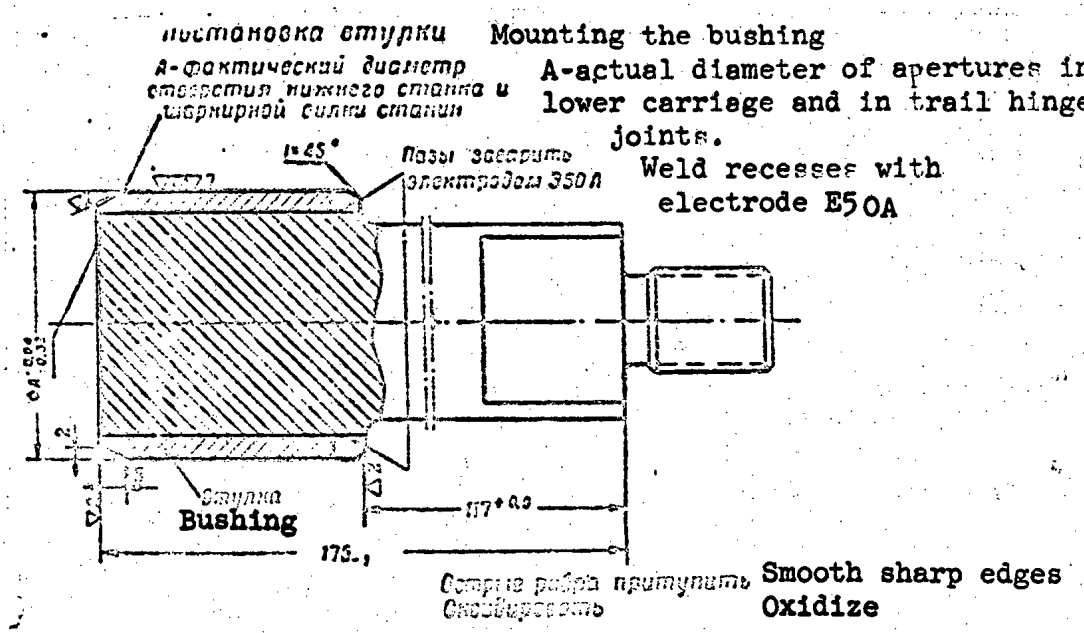
DARM. If the gap is less than 0.5 mm, weld on a layer of metal [p 97] with E50A electrode to the balance beam catch so that the gap between the upper surface of the balance beam and area S will be within the limits of 1 - 3 mm (sketch 42).

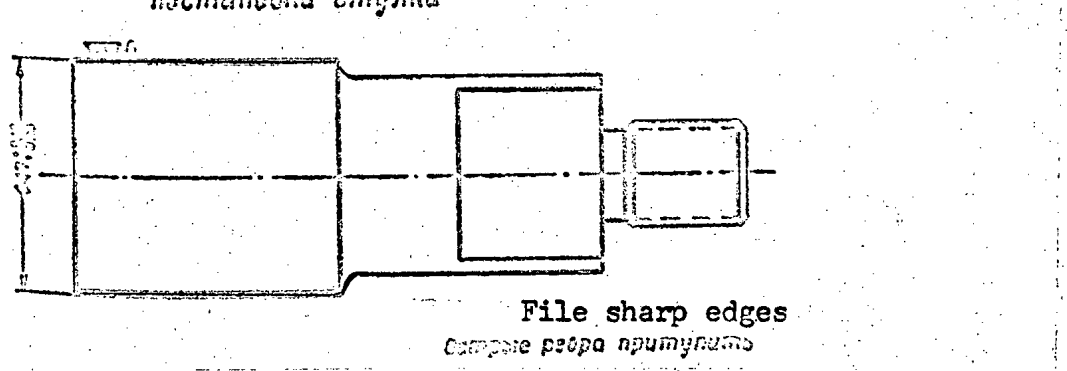
6. Trails Do Not Lock in Combat Position

(fig. 10)

With the trails spread in combat position, stops 18-162 should freely enter the apertures in the hinged parts of the trails under the action of their springs.

Conduct a check at various angles of barrel elevation and with the cannon inclined in a lateral direction. Incline the cannon by placing blocks 170-200 mm high in turn under the left and right wheels.





Sketch 43

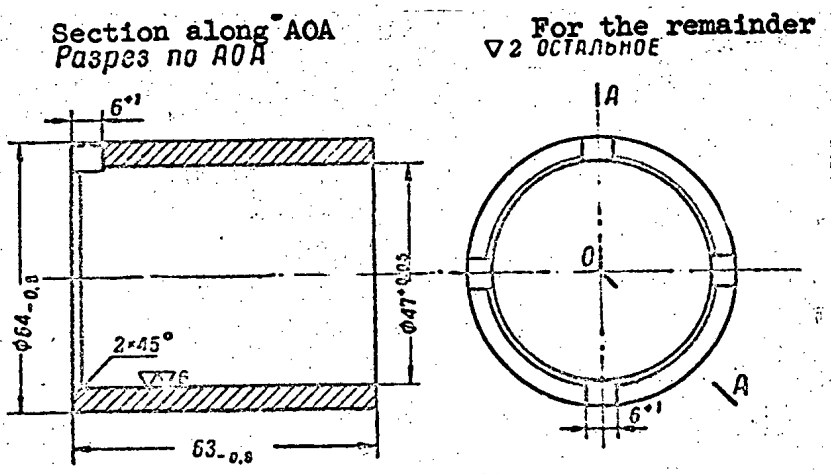
Reasons for the malfunction: [p 98]

a) A break or fatigue in spring 18-163.

With the trails in combat position, press down in turn on the left and right levers of stops 18-162. Connect the stops, then release the levers. Stops 18-162, under the action of their springs, should quickly return to latch the trails.

PM. If the stops do not return to their initial positions, replace the springs (appendix 1).

b) A bend in stop 18-162 and wear in the junction of the stop and apertures in the hinged trails brackets and lower carriage casing.



Material: steel KT 75 OKhM Материал: сталь КТ 75-ОХМ
Smooth sharp edges Острые ребра притупить

Sketch 44. Bushing

Check whether the stop is bent. Then measure the diameters of the apertures in the hinged trail brackets and in the lower carriage casing and the diameter of the stop. 50X1-HUM

The difference of diameters in each junction should be no more than 0.8 mm.

DARM. When the stop is bent and also when the difference of diameters is more than 0.8 mm, eliminate the oval shape in the apertures in the hinged trail bracket and in the lower carriage casing by removing a minimum layer of metal. Machine the aperture in the casing (for the stop shaft) to a diameter of $43^{-0.17}$ mm and replace the stop (appendix 1, sketch 241).

If the stop is not bent and the difference of diameters is more than 0.8 mm, machine the apertures in the hinged trail bracket and in the casing as indicated above and place a bushing on the stop (sketches 43 and 44). When press fitting, heat the bushing no more than 400°C. [text missing]

After installing a new or repaired stop, check latching of the trails in combat position as indicated above. If the stop does not enter the aperture in the hinged trail bracket, it is permissible to grind the stop, increasing the gap in the junction to 0.5 mm. [p 99]

7. Trail Supports (Gibs 19-454) do not Adjoin Supports in Lower Carriage When Trails are in Combat Position

(fig. 11)

Check for adjoining of the trail supports after eliminating the malfunction: "Bend in Stop 18-162 and Wear in Junction of Stop and Apertures in Hinged Trail Bracket and in Lower Carriage Casing." (See chapter 8, item 6, b).

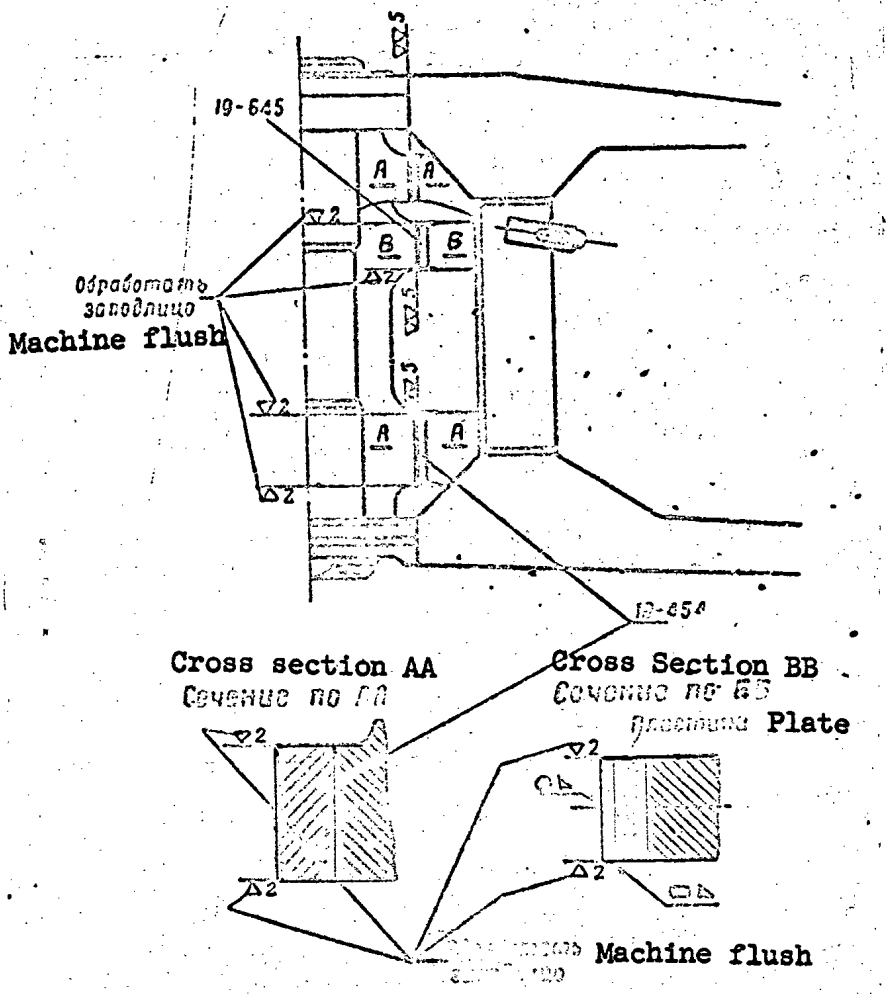
Extend the trails into combat position until latched and fasten them with stops 18-162.

Give the barrel an angle of elevation of 15-20° and check the adjoining of the trail supports of the lower carriage. Adjoining of supports should be no less than 40% of the area of the bearing surfaces. Check this with a 0.5 mm clearance gage. The clearance gage should not pass. The remaining areas of the supports may have partial clearances up to 0.05 mm. [p 100]

50X1-HUM

AARM. If a 0.05 mm clearance gage passes, clean off the burrs on the lower carriage supports, weld a layer of metal 3-4 mm thick ont trail supports with welding electrode EN-40.

50X1-HUM



Sketch 45

50X1-HUM

Work the trail supports along the lower carriage supports so that when the trails are extended as far as possible, at least 4[illegible] of the areas of the bearing surfaces of the supports adjoin and the [illegible] freely enter the apertures of the hinged trail bracket. Clearances up to 0.5 mm are permissible on the remaining area of the bearing surfaces (sketch 45).

Check the adjoining of the supports by checking the painted surfaces for wear.

8. Wear of Trail Supports (Gibs 19-645) in Junction With the Lower Carriage Supports.

(fig. 11)

Bring the trails together until they come into contact with the lower carriage supports.

Measure distance X_1 (fig. 11) between the ends of right bracket Sb19-94 and left bracket Sb19-91.

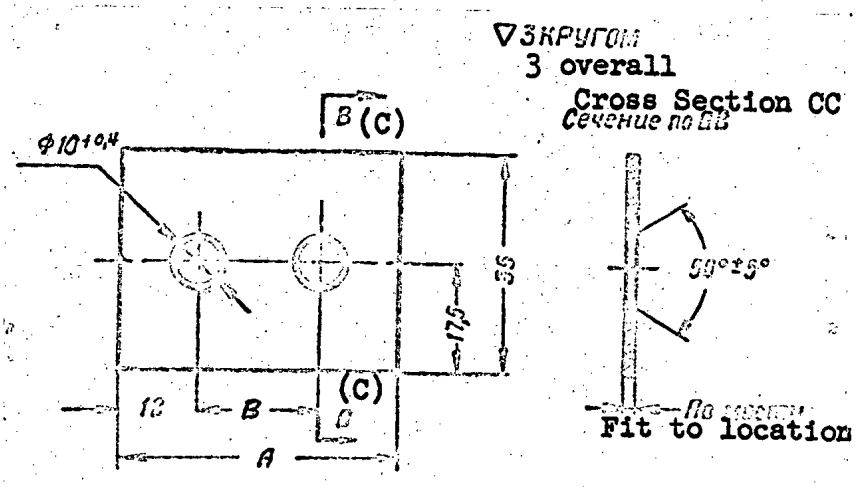


Plate	Size in MM A	B
1	45	21
2	55	31

Sketch 46

Draw in the trails with coupling bolt Sb19-92 as far as possible [p 101] and measure distance X_2 (fig. 11) between the ends of the right bracket and left bracket. 50X1-HUM

The difference of measurements ($X_1 - X_2$) is less than 5 mm.

AARM. If the difference of measurements ($X_1 - X_2$) is less than 5 mm, clean off burrs on the lower carriage supports, make plates (sketch 46), and weld the plates to the trail supports with electrode E50A. Work them along the lower carriage supports so that the difference of measurements ($X_1 - X_2$) is within the limits of 15-30 mm (see sketch 45).

Adjoining of trail supports to the lower carriage supports with trails drawn together in traveling position should be no less than 40% of the bearing surface areas. Partial clearances up to 0.5 mm are permissible on the remaining bearing surface areas. Check the adjoining of supports by checking the painted surfaces for wear.

Note: Place plate No 1 on gib 19-645 with measurements of 50 by 35 mm (on guns of initial issue) and place plate No 2 on gib with measurements of 60 by 35 mm (on cannons of subsequent issue).

9. Wear in the Junction of Parallel Motion Bar 18-38 and Rear Bushing 18-26 or 18-27 with Coupling Screw 18-39 or with Parallel Motion Bar 18-37.

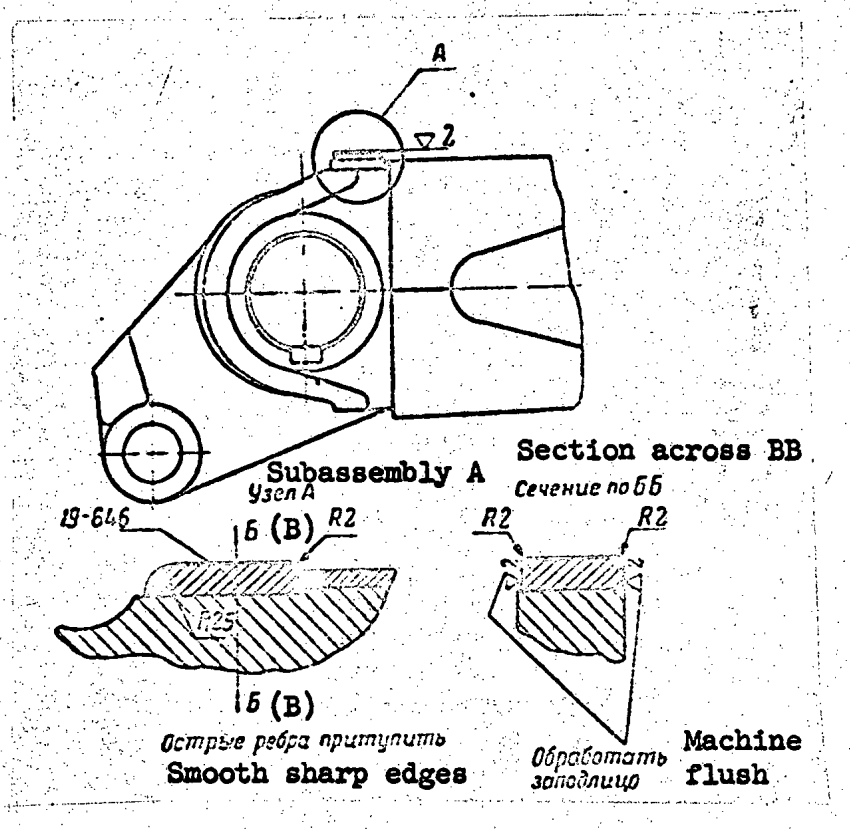
[illegible] (fig. 10)

Measure the diameters of the apertures and pins. The difference of diameters in each junction should be no more than 1 mm.

PM. When the difference of diameters is more than 1 mm, eliminate the oval shape in the apertures by removing a minimum layer of metal. The diameter of all apertures should be identical. An increase in the diameters of apertures up to 40 mm is permissible.

Replace pin 18-38 (appendix 1, sketch 238).

50X1-HUM



Sketch 47. Left trail: 19-646 -- support

10. Wear of Trail Supports 19-645 (fig. 10, 11)

Check adjoining of the supports after eliminating the malfunction: "Wear of Trail Supports" (Gibs 19-645) in Junction With Lower Carria 50X1-HUM Supports (see Chapter 8, item 8).

Set the gun on level ground and, with the trails locked in traveling position, measure gaps "a" (fig. 10) from right and left between the trail supports and surfaces of the rear bushings with levers 18-26 and 18-27.

The overall clearance should be no more than 1.5 mm.

DARM. When the overall clearance is more than 1.5 mm, weld... [text missing]

11. Increased Sagging of One Trail in Relation to the Other [p 102]

(fig. 11)

With the trails brought together and locked in traveling position, mark a horizontal line on front surface S of right bracket Sb19-94 and left bracket Sb19-91.

Extend the trails so that guide pin 19-517 completely comes out of the housing of right bracket Sb19-94.

By means of the left jack, raise the trails and place a block under the spade of the left trail so that after freeing the jack the right trail is freely suspended. With the trail in this position, determine the amount of sagging of the right trail in relation to the left trail according to the displacement of marks on the right and left brackets. In the same manner, determine the amount of sagging of the left trail in relation to the right trail by raising the trails with the right jack and placing a block under the spade of the right trail.

A sagging of no more than 60 mm of one trail in relation to the other is permissible.
[text missing]

After mounting a new (spare) link bolt, check sagging of the trails again as instructed above. If the sagging of the trails is still more than 60 mm or if there is no spare link bolt, send the cannon to a stationary repair organ. [p 103]

50X1-HUM

12. Summer Spades Sb19-51 are not Held by Latches Sb19-64 or Sb19-63 in Traveling Position 50X1-HUM

(fig. 11)

Reason for the malfunction: A break or fatigue in spring 19-133.

Pull back the stop and release it. The stop should quickly return to the initial position under the action of its spring.

PM. If the spring does not work, replace it with one made at DARM (chart 3).

13. Clamp 19-193 is Not Held in Combat Position by Stop Sb19-119

(fig. 11)

Reason for the malfunction: A break or fatigue in spring 19-437.

Pull back the stop and release it. The stop should quickly return to the initial position under the action of its spring.

PM. If the spring does not work, replace it with one made at DARM (chart 3).

14. Barrel is Not Locked or is Insecurely Locked in the Traveling Position

(fig. 11)

Reason for the malfunction:

a) Break or fatigue in spring 19-459.

Pull back the stop and release it. The stop should quickly return to the initial position under the action of its spring.

PM. If the spring does not work, replace it with one made at DARM (chart 3).

b) Wear in the junction of pin 19-179 and the aperture in clamp 19-193 and in bracket 19-340.

Measure the diameters of the aperture in the clamp and bracket and the diameter of the pin. The difference of diameters in eac50X1-HUMh should be no more than 0.6 mm.
[text missing]

The diameters of all apertures should be identical. An [p 104]
increase up to 30 mm in the diameter of the apertures is permissibl 50X1-HUM

Replace pin 19-179 (appendix 1, sketch 243). After replacing the pin, check the alignment of the raised surface of clamp 19-193 with the trail.

c) Wear in the junction of hinged clamps 19-193 and cradle latches 09-32 and 09-33 (fig. 3).

Lower the breech part of the cradle until latches 09-32 and 09-33 completely adjoin the hinged clamps. Pull back the barrel with a winch into traveling position and lock by stop Sb19-76 but do not tighten tightening device Sb19-35.

Measure the gap between the cradle guides and bearing surfaces of the guides of the rear barrel clamping piece. It should be no more than 1 mm. If there is no gap, check the alignment of the breech ring to the bearing surfaces of right support 19-438 and left support 19-439. Partial gaps up to 0.5 mm are permissible on half the length of the bearing surfaces of the trail supports.

DARM. When there is a gap between the cradle guides and bearing surfaces of the guides of the rear clamping piece of more than 1 mm and when there is insufficient alignment of the breech ring with the trail supports, repair hinged clamps 19-193 according to chart 11.

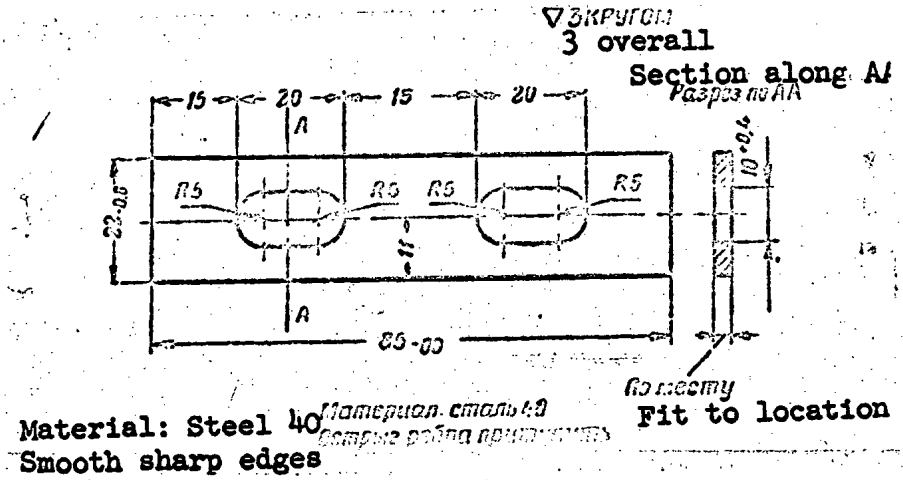
15. An Increased Overall Lateral Gap in the Junction of the Breech Ring and Supports 19-438 and 19-439 on the Trails

(fig. 11)

Measure the lateral gap between the breech ring and supports on the trails with the barrel in traveling position. The total gap should not exceed 1.5 mm with tightening devices 19-35 untightened. When the tightening devices are tightened, this gap should be taken up. Partial gaps of no more than 0.5 mm for half the length of the support are permissible.

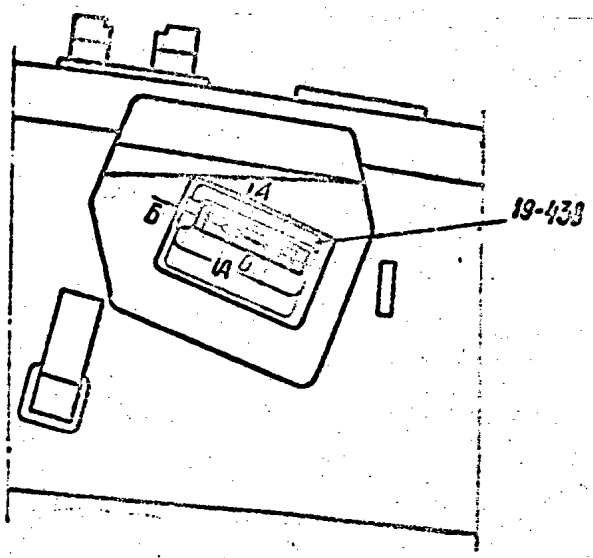
DARM. When the overall lateral gap between the breech ring and supports on the trails is more than 1.5 mm, weld plates (sketch 48) to the lateral surfaces of supports on the trails and machine. Partial [p 105]
gaps no more than 0.5 mm for half the length of the support are permissible (sketch 49).

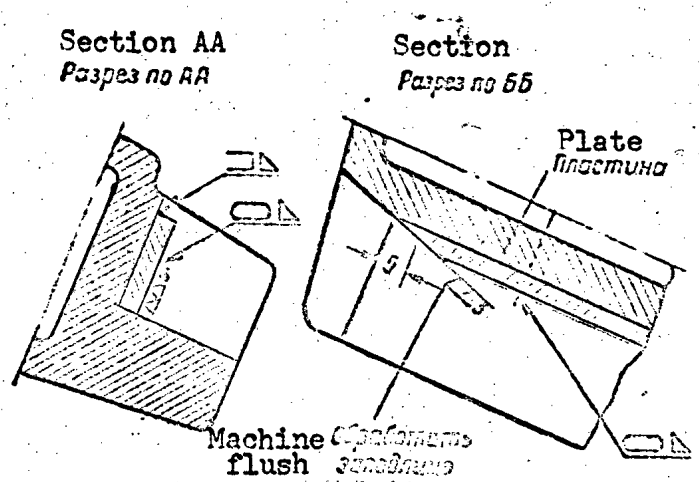
50X1-HUM



Material: Steel 40 Материал: сталь 40
Smooth sharp edges Острые ребра притупить

Sketch 48.





50X1-HUM

Sketch 49. Right trail: 19-438 -- right support

16. Handle Sb24-16 is Not Held to Trails by Stop Sb19-116

50X1-HUM

(fig. 11)

Reason for the malfunction: A break or fatigue in spring 19-38.

Pull the stop back and release it. The stop should quickly return to initial position under the action of its spring.

PM. Replace the spring with one made at DARM (chart 3) if the spring does not return the stop to initial position

17. Cleaning Rod Storage Box Sb19-12 is Not Secured to Trails by Stop 19-134 (19-53) [p 106]

(fig. 11)

Reasons for the Malfunction:

a) Spring 19-133 (19-52) is broken or fatigued.

Pull the stop back and release it. The stop should quickly return to its initial position under the action of its spring.

PM. Replace the spring with one made at DARM (chart 3) if the stop does not return to its initial position.

b) A break in stop (19-53) on guns of initial issue.

PM. Replace the stop with one made at AARM and...
[text missing]

18. Clamp Ring Sb19-70 is Not Secured by Stop Sb19-118 [p 107]

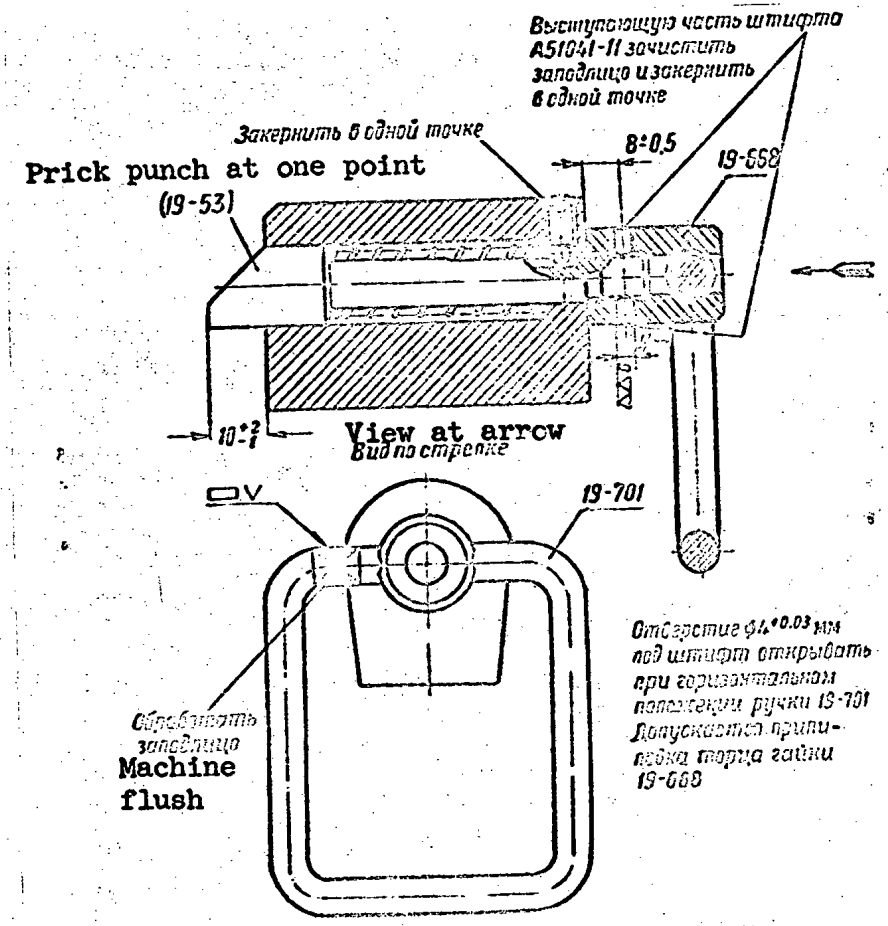
(fig. 11)

Reason for malfunction: A break or fatigue in spring 19-38.

Pull back the stop and release it. The stop should quickly return to its initial position under the action of its spring.

PM. Replace the spring with one made at DARM (chart 3) if the stop does not return to its initial position.

50X1-HUM



Эскиз 50. *C619-29* — стопор с корпусом: *(19-53)* — стопор; *19-668* — гайка; *19-701* — ручка; *A51041-11* — штифт цилиндрический

Trim off protruding part of pin flush and prick punch at one point

Aperture $\phi 4^{+0.03}$ mm beneath pin is accessible when handle 19-701 is in horizontal position. Filing end of nut 19-668 is permissible.

Sketch 50. Sb19-29. Stop and housing: 19-53 -- stop; 19-668 -- nut; 19-701 -- handle; A51041-11 -- cylindrical pin

50X1-HUM

50X1-HUM

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19. Dents, Holes, and Cracks in Trails and Spades

50X1-HUM

Dents are permissible if they do not interfere with the normal operation of mechanisms or with the attachment of associated instruments and fixtures.

DARM. Weld cracks in trails and spades with electrode E50A, having first drilled holes in the ends of the cracks with radii of 3-6 mm. After welding, weld reinforcing steel plates of any quality with a thickness of no less than 6 mm to the cracked sections.

Seal holes in trail boxes by welding on reinforcing plates.

Sizes and configurations of plates are determined by the repair shop depending on the location of cracks and holes.

Cracks in hinged trail brackets are not permitted. In this case, send the gun to a stationary repair organ for repair.

20. Cracks in Lower Carriage and Balance Beams

Cracks are not permissible. If there are cracks, send the gun to a stationary repair organ for repair.

21. Nicks in Slots and Cracks in Torsion Bar; Damage to Protective Coat of Paint and Rust on Bar 18-32

(fig. 10)

Remove grease from the torsion bar and examine it. Check whether the protective coat of paint is damaged. Check whether there are places damaged by rust. Check whether there are cracks or small nicks in the slots.

PM. [text missing]

File nicks in the torsion bar slots with a smooth-cut file, taking off the raised metal. [p 108]

When the protective coat of paint is damaged or blistered, remove paint from the torsion bar with a wire brush. After removing the paint, wipe the torsion bar with a rag dampened in white spirit. Then wipe with a clean dry rag and inspect it.

When there is rust, gashes, or flaws on torsion bar, polish the area to a metallic shine. It is permissible to clean off the rusted areas by hand in a vice or on a bench with emery dust and oil or with a scratch brush. After cleaning, scour the torsion bar with white spirit and wipe with a dry rag.

50X1-HUM

Note: If there is a sand blasting machine present, use it to clean the torsion bar./ This is the best method of removing rust. 50X1-HUM

To protect the torsion bar from rust, it is necessary to:

Wipe the bar with a rag dampened with R-4 solvent (or another solvent) and dry it thoroughly.

Paint the entire operating surface of the torsion bar (except for the ends of the slots) with 4 coats of primer paint PKhVG-3 with a time lapse between each coat for the first three coats of no less than 6 hours at a temperature of 15 - 20 °C. Dry the last coat of primer at a temperature of 15-20°C for 24 hours until the paint is completely dry.

Before putting it in place, grease the entire torsion bar (including the painted surfaces) with hot gun grease.

50X1-HUM

Chapter Nine

Winch Maintenance

1. Handle Sb20-5 Is Not Held by Stop 20-55 on the Axle of Left Carrier 20-25

(fig. 12)

Cause of malfunctioning: Spring 20-53 is fatigued or broken.

Press stop 20-55 as far as it will go and release it. The stop should spring back to its original position.

PM. If the stop does not return to its original position, replace the spring (chart 3) and stop 20-55 (appendix 1, sketch 247) and assemble the handle.

2. Insecure or Difficult Fastening and Setting of Suspension Shackle Sb20-2 in the Traveling (Operating) and Firing Positions

(fig. 12)

When setting the suspension shackle in the traveling (operating) and firing positions, stop 27-130 (figs. 11 and 17) should freely enter the groove of eye fitting 20-70 and securely fasten the suspension shackle in the indicated positions.

Causes of malfunctioning:

a) Stop 27-130 (figs. 11 and 17) is bent.

PM. Straighten the stop.

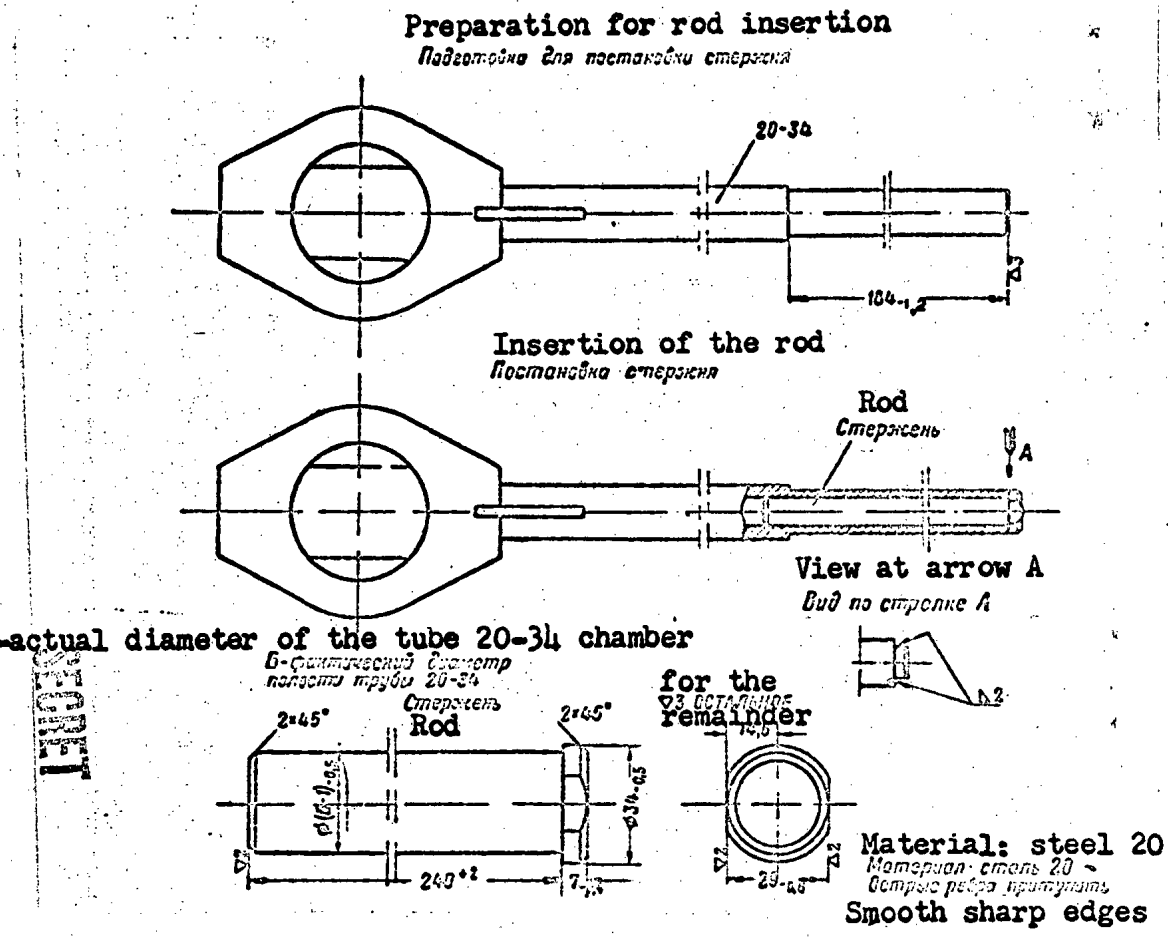
b) Spring 27-127 (figs. 11 and 17) is fatigued or broken.

Draw out stop 27-130 past cap 27-127 and release it. The stop should spring back to its original position.

PM. If the stop does not return to its original position, replace the spring with one manufactured at DARM (chart 3).

c) Tube 20-34 is bent.

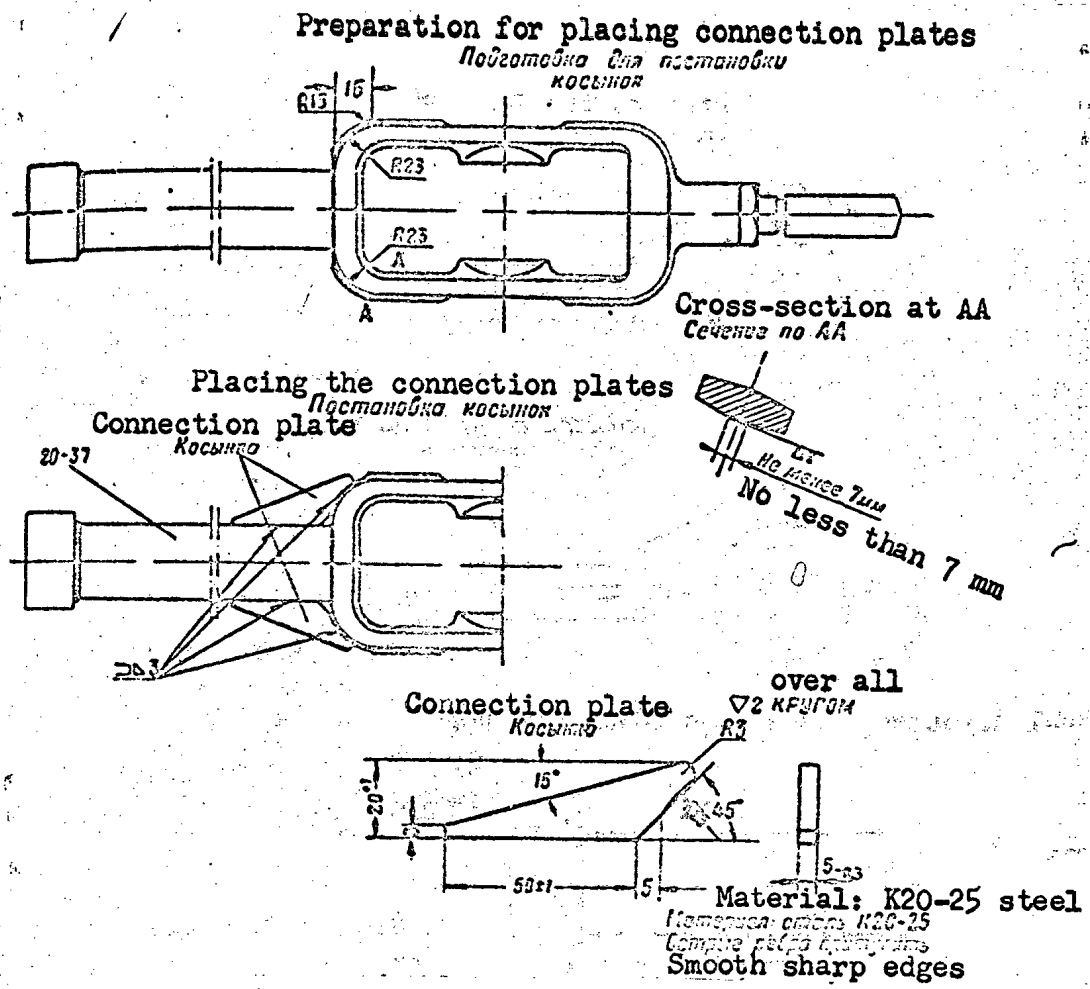
PM. If the tube is bent, straighten it and insert a rod in the tube, ... [text missing]



Sketch 51. Sb20-1 -- beam; 20-34 -- tube

d) Tube 20-37 with an external diameter of 40 mm is bent.

PM. If the tube is bent, straighten it and weld on two connection plates with an E42 electrode (sketch 52).



Sketch 52. Sb20-2 -- suspension shackle: 20-37 -- tube

e) The linkage connection of pintle 20-47 with plates 20-68 and 20-46 is worn.

Place the suspension shackle in the traveling (operating) position and check wether stop 27-130 (fig. 17) freely enters into the groove of eye fitting 20-70. If the stop does not go into the eye fitting groove but butts against the eye fitting to the left of the groove, this indicates that the linkage connection of the pintles with the plates is worn.

PM. Unscrew safety nut 20-71. Then screw eye fitting 20-70 i[illegible] yoke 20-51 far enough so that stop 27-130 (fig. 17) freely enters into the eye fitting groove when the suspension shackle is in the traveling (operating) position. Tighten the eye fitting with the safety nut and measure distance a between the safety nut and the eye fitting. This dis[illegible]

After the adjustment, if the stop does not go into the groove of the eye fitting or it goes into ... [text missing]
...with the end link) depending upon to what extent the stop do 50X1-HUM
not coincide with the eye fitting groove.

The removal of one chain link increases distance a by approximately 17.5 mm.

The removal of one link and reassembly of the chain is done in the following manner:

--put pin 20-44 into the breech socket and push the winch shaft forward as far as possible;

--remove the cotter pin fastenings of one pin 20-57 and of the four pintles 20-47 which are connected to the pin (along one side of stirrup 20-39);

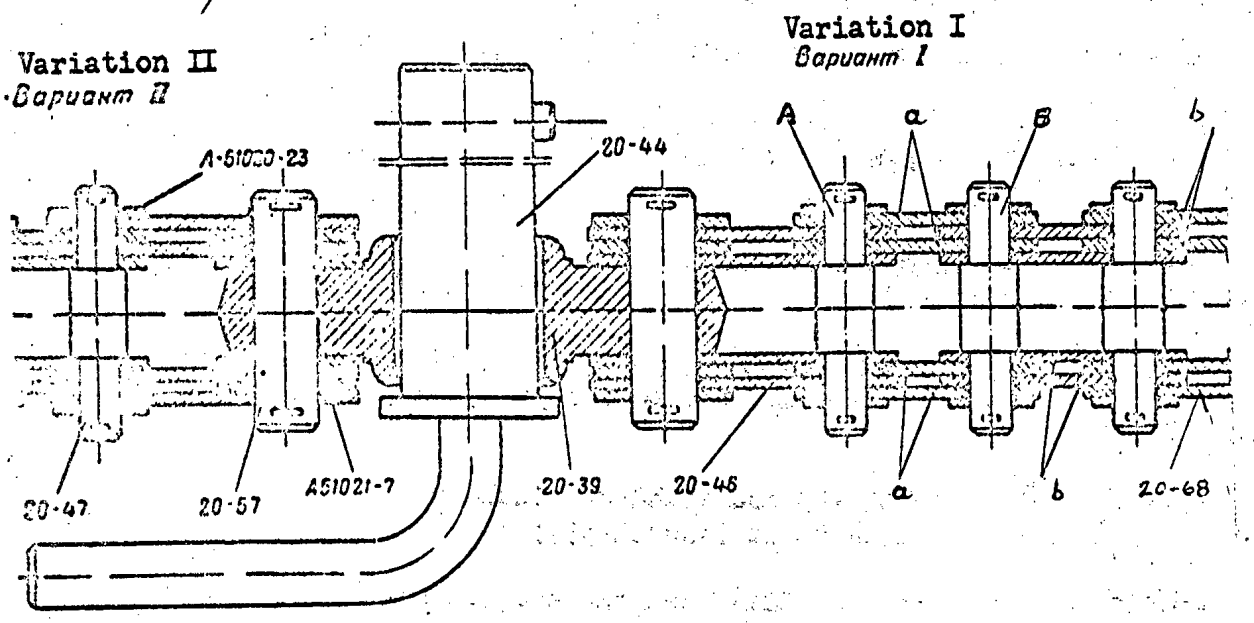
--remove washers A51020-23 and withdraw pintle A and the four plates a which are connected to it (sketch 53);

--position the washers A51021-7 and the end plate 20-46 as indicated in Sketch 53, variation II when assembling the chain.

If it is necessary to remove two links, remove the cotter pin fastenings of two pintles 20-47 (six pintles in all) and remove... [text missing]

50X1-HUM

50X1-HUM



Sketch 53. Sb20-3 -- chain; 20-39 -- stirrup; 20-44 -- pin; 20-46 -- end plate; 20-47 -- pintle; 20-57 -- pin; 20-68 -- plate; A51020-23 -- washer; A-51021-7 -- washer

...plate b (see sketch 53). During chain assembly, position the washers A51021-7 on the end plates (see sketch 53, variation I). [p 113]

f) Spring A51230-11 is fatigued or broken.

When placing the suspension shackle in the traveling (operating) position, if stop 27-130 (fig. 17) butts against eye fitting 20-70 to the right of the groove, this indicates fatigue of spring A51230-11.

PM. Unscrew the safety nut 20-71. Then unscrew eye fitting 20-70 out of yoke 20-51 far enough so that stop 27-130 (fig. 17) freely goes into the groove of the eye fitting when the suspension shackle is in the traveling (operating) position. Tighten the eye fitting with the safety nut and measure distance a between the safety nut and the eye fitting. This distance should be no greater than 50 mm.

If distance a is greater than 50 mm after the adjustment, place a steel washer (of any grade steel, dimensions of the washer: diameter 31 mm; thickness from 8 to 10 mm) in tube 20-37 between the spring and yoke 20-51 and check whether the stop freely enters the eye fitting groove.

50X1-HUM

After installing the washer, if the stop does not go into the eye fitting or it goes in, but distance a is greater than 50 mm, replace the spring (appendix 1). 50X1-HUM

g) The junction of bushings A51901-302 with spindle 20-41 is worn.

Measure the bushing diameters and the spindle diameter. The difference between the diameters at each junction should be no less than 2 mm.

PM. If the difference of the diameters is greater than 2 mm, replace the bushings (appendix 1, sketch 248).

3. Difficult Winch Travel

(fig. 12)

Place the trails on the limber. Connect the winch suspension shackle to the upper carriage and check the winch operation by turning handle Sb20-5. Then insert pin 20-44 in the breech socket and check the winch operation by moving the barrel into the firing position.

The winch mechanism should operate smoothly without catching.

The force on winch handle Sb20-5 with the winch unloaded (pin 20-44 not in the breech socket) should be no more than 5 kg, and when moving the barrel into firing position, it should be no more than 25 kg.

Causes of malfunctioning;

a) Round nut A51970-9 is too tight on gear shaft 20-3.

PM. By unscrewing round ut A51970-9, give the gear shaft an axial movement of 0.3 to 0.5 mm.

b) Pintles 20-47 catch against nut 20-17 and the internal surface of yoke 20-51 during winch operation because the ribs of bushings A51910-344 and A51910-302 are worn.

By turning the winch handle, see whether or not the facings of pintles 20-47 catch on the nut and the yoke.

[text missing]

...with the edges of the pintles. Adjust the washer thickness [illegible] sprocket 20-33 is easily rotated. 50X1-HUM [p 114]

If the pintles catch on nut 20-17, prepare a No. 4 washer (see sketch 16) and place it between sprocket 20-19 and the bushing ring. Adjust the washer thickness in such a way that pintles 20-47 do not catch on nut 20-17 and the internal surface of bracket 20-32. 50X1-HUM

c) The connections of bushings A51910-344 with gear shaft 20-3 are worn.

Measure the diameter of the bushing openings and the diameter of the shaft journal. The difference of the diameters at each connection should be no more than 1.5 mm.

DARM. If the difference of the diameters is more than 1.5 mm, replace the bushings (appendix 1, sketch 249).

d) Bearings 207, 211, and 305 have failed.

PM. Replace the bearings (appendix 1).

e) The junction of bushings A51910-302 with the left carrier 20-25 is worn.

Measure the diameters of the openings of bushings A51910-302 and the diameter of the journal of left carrier 20-25. The difference between the diameters at each junction should be no more than 1 mm.

PM. If the difference between the diameters is more than 1 mm, replace bushings A51910-302 (appendix 1, sketch 248).

4. Involuntary Turning of Handle Sb20-5 Due to Winch Chain Tightness

(fig. 12)

Place the trials on the limber. Connect the suspension shackle with the upper carriage and insert pin 20-44 in the breech socket.

By turning winch handle Sb20-5 intermittently (up to 5 turns) in the direction for rolling up the barrel, check whether or not there is involuntary turning of the handle. There should not be involuntary turning of the handle.

Causes of malfunctioning:

a) Spring 20-29 is fatigued or broken.

50X1-HUM

The normal height of the untensioned spring should be no less than 28 mm.

PM. If the springs are fatigued or broken, replace them with some provided by DARM (chart 3).

50X1-HUM

b) / Roller 20-24 is worn and the junction of left carrier 20-2 with cap 20-2 is worn.

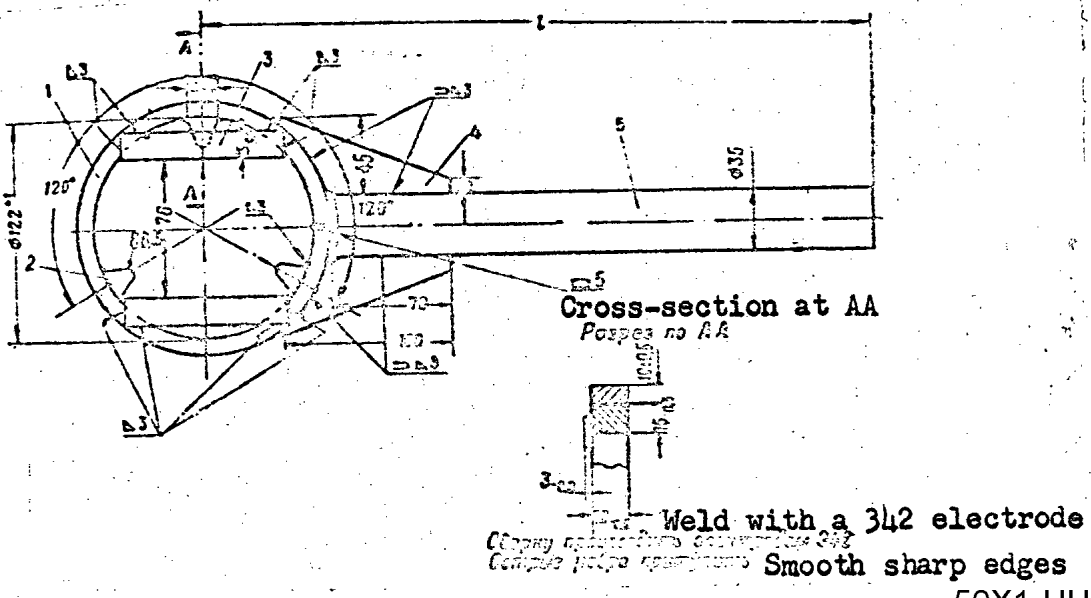
If there is involuntary turning of handle Sb20-5 but no fatigue or breakdown of springs 20-29 (or after the springs have been replaced), the cause of the malfunctioning is wear in the connections which are pointed out above.

AARM. Overhaul the roller brake is accordance with chart 12.

Footnote: Rollers 20-24 with a diameter of $19.9_{-0.014}$ mm are used in the winch roller brakes of guns of initial issues, and on guns of subsequent...[text missing]

After maintenance of the roller brake, test the assembled winch [p 115] (without beam Sb20-1, suspension shackle Sb20-2, and chain Sb20-3) by applying a moment of 10,000 kgcm to sprocket 20-19 in the following manner:

--bolt the winch housing on a stable platform. The winch housing can be fastened to a base where the winch housing is turned 180° with respect to its normal position. When testing the winch on a stand, place the trails on the limber;



50X1-HUM

Sketch 54. Special Wrench: 1-ring; 2 - tooth; 3 - strip; 4 - gusset plate; 5 - handle

--place the special wrench (sketch 54) on sprocket 20-29 in such a way that the lever of the wrench is in a horizontal position and apply a load to the lever to produce a moment of 10,000 kgcm. The weight of the load depends upon where the load is applied to the lever arm 1 (see sketch 54); 50X1-HUM

--turn handle Sb20-5 intermittently one full turn in any one direction and note any involuntary turning of the handle.

Repeat this check 3 or 4 times, placing the wrench lever in a horizontal position each time. Then, carry out the indicated checks in the same way, but turning handle Sb20-5 intermittently in the opposite direction.

There should not be involuntary turning of the handle.

c) The junction of bushings A51910-302 with left carrier 20-25 is worn.

See chapter 9, item 3, "e".

50X1-HUM

Chapter Ten

[p 116]
50X1-HUM

Jack Maintenance

1. The Jack is not Secured to the Trail by Stop Sb19-115

Cause of malfunction:

a) Disengagement of the handle (24-69) from the rod at the weld for cannons of initial issue (fig. 13).

PM. When disengaging the handle from the rod, remove the weld on the handle, fashion a handle 24-114 (appendix 1, sketch 265), and weld it to the rod with electrode E42 on the mounted jack in such a manner as to ensure that the measurement of A is within 601 - 602 mm. In this manner, the handle should touch the end of the collar of the bushing 24-13. During maintenance also ... [text missing]

b) Insufficient holding of stop 19-620 in the aperture of the [p 117] pivot 24-64 (figs. 11 and 13).

Push rod Sb2-15 into the jack cylinder until the handle lug 24-114 (24-69) is in the collar of bushing 24-13. Measure distance A (fig. 13) between the center of the apertures of jack frame 24-3 and the end of pivot 24-64. Distance A should be no less than 599 mm.

PM. When distance A is less than 599 mm, weld a layer of metal to the end of handle 24-114 (24-69), which is joined to the end of bushing 24-13, with electrode E42 and adjust the end of the bushing so that the above distance A is within 601 - 602 mm.

c) Breaking or sagging of spring (19-52) (fig. 11).

Draw out stop 19-620 by handle 19-62 and release it. Through spring action, the stop should quickly return to the original position.

PM. If the stop does not return to the original position, replace the spring with one prepared at DARM (chart 3).

2. Leakage of Fluid From the Jack
(fig. 13)

When the right trail jack is in the horizontal position check for leakage from sealing ring 24-95, valve 24-46, ring 24-85, and through openings in plug 24-94.

50X1-HUM

To check for leakage of fluid from the left trail jack it is necessary to remove the jack from the trail and turn it so that valve Sb24-11 is at the bottom.

Leakage of fluid is not permissible.

Place the jack in working position and, lowering the trail with t 50X1-HUM
jack, check for leakage of fluid from piston Sb24-15 and plunger Sb24-13.

Loss of fluid through the plunger is permitted because of partial dripping.

Causes of malfunction:

a) Worn or insufficiently tightened sealing ring 24-95 with cup 24-89 and ring 24-85 with plug 24-86.

PM. When fluid is leaking from the ring, tighten the cup and plug rings.

If the leak does not stop, replace the ring (appendix 1, sketch 264).

b) The valve jaw 24-46 does not fit tightly to cup housing 24-89.

Check whether there is a leakage of fluid in the coupling of the valve jaw with the cup housing.

PM. [text missing]

If the leak has not stopped after this, change the valve (appendix 1, sketch 262). [p 118]

Cut off the old valve and drill arm 24-47 out of the valve. Then, countersink a hole in the arm at a 90-degree angle and to a depth of 3 mm.

Weld the valve to the arm with electrode E-42 and take down the seam flush with the arm.

After welding the valve to the arm, temper the valve for a length of 12 mm.

c) Breaking of sagging of conical spring 24-80 of safety valve 11 (in figure 13).

Check whether there is a leakage of fluid from piston rod Sb24-15 and plunger Sb24-13.

PM. When fluid is leaking through the opening in plug 24-94, replace the spring (chart 3). 50X1-HUM

d) Rust on the internal surface of the exterior cylinder Sb24-1 and on the surface of the plunger Sb24-13 channel in jack frame 24-3.

Note. Non-chrome plated jacks having internal rust on the surface of the exterior cylinder and the surface of the plunger may 50X1-HUM the repair shop.

PM. Remove the rust from the surface (of the unchromed jack) by rubbing the rusty section with a clean piece of cloth. Employment of a soft charcoal powder mixed with steol M is permissible.

Soft blisters with smooth edges are permitted to remain provided they are dressed to a metallic luster.

When there is deep rust present on the unchromed surfaces, send the cannon to a higher maintenance shop.

When there is damage (bulging) to the chrome laminate of a chrome-plated jack, replace the jack[1] [text missing] (appendix 1).

In the absence of a reserve jack, temporary use of a jack having a damaged chrome surface is permitted, provided there is an absence of fluid leakage through the piston rod and plunger gasket. Upon receiving a reserve jack, the old jack (with the damaged chrome) must be replaced.

AARM. Remove deep rust on the unchromed surface, removing a minimum layer of metal. An increase in the internal diameter of the exterior cylinder is permitted up to 51 mm, and the diameter of the jack trail channel (for the plunger) -- up to 22.4 mm. (chart 5).

When the increase in the interior diameter of the exterior cylinder is more than 50.5 mm, replace the regular rubber collar with collar [p 119] 07-15 / 52-P-354U (sketch 57).

In so doing, bore out a groove in collar ring 24-109 (sketch 58). When assembling the collar ring, screw it in until it catches and is stopped by screw A51065-5 (see sketch 57).

3. Leakage of Fluid Through Valve 24-62 When Lowering the Trail

(fig. 13)

Cause of malfunction: insufficient tightening of ring 24-40 with flange nut 24-60.

PM. Tighten the ring. If the leak does not stop, replace the ring (appendix 1). 50X1-HUM

4. Insufficient Travel of Piston Rod for Raising Trails When Removing Trails From Limber or Placing Them on Limber

(fig. 13)

50X1-HUM

Causes of malfunction:

a) Insufficient fluid in the jack.

PM. Place the jack in a vertical position, unscrew plug 24-86, and check whether there is leakage from the plug opening. [text missing]

b) Breaking or sagging of conical spring 24-80 of valves (12 in figure 13). [p 120]

If, with a normal amount of fluid in the jack and an absence of fluid leakage from under piston rod Sb24-15 and plunger Sb24-13, piston travel when working the jack is insufficient, the reason for this may be breaking or sagging of the conical spring of the valves.

PM. Replace unfit plugs (chart 3).

5. Trails are Not Kept in Raised Position by Jacks

(fig. 13)

Cause of malfunction: valve cone 24-62 does not fit closely to the cup housing in jack frame 24-3.

PM. Cut the cup with a countersink or bore with a flatly sharpened tip and straighten the valve cone by grinding it.

If, after this, the malfunction has not been eliminated, replace the valve (appendix 3, sketch 263).

Cut off and drill out the old valve from handle 24-63. Extend the opening in the handle; then countersink it at an angle of 90° at a depth of 4 mm. Weld the valve to the handle with electrode E42 and trim the seam flush with the handle.

An increase in the diameter of the opening in the handle up to 13 mm is permitted.

6. Wear or Damage of Ring 24-14 and Gasket 24-27

(fig. 13)

50X1-HUM

PM. Replace the unfit ring and gasket (appendix 1).

7. Dents and Holes[1] [footnote missing] in Exterior Cylinder Sb24-1

50X1-HUM

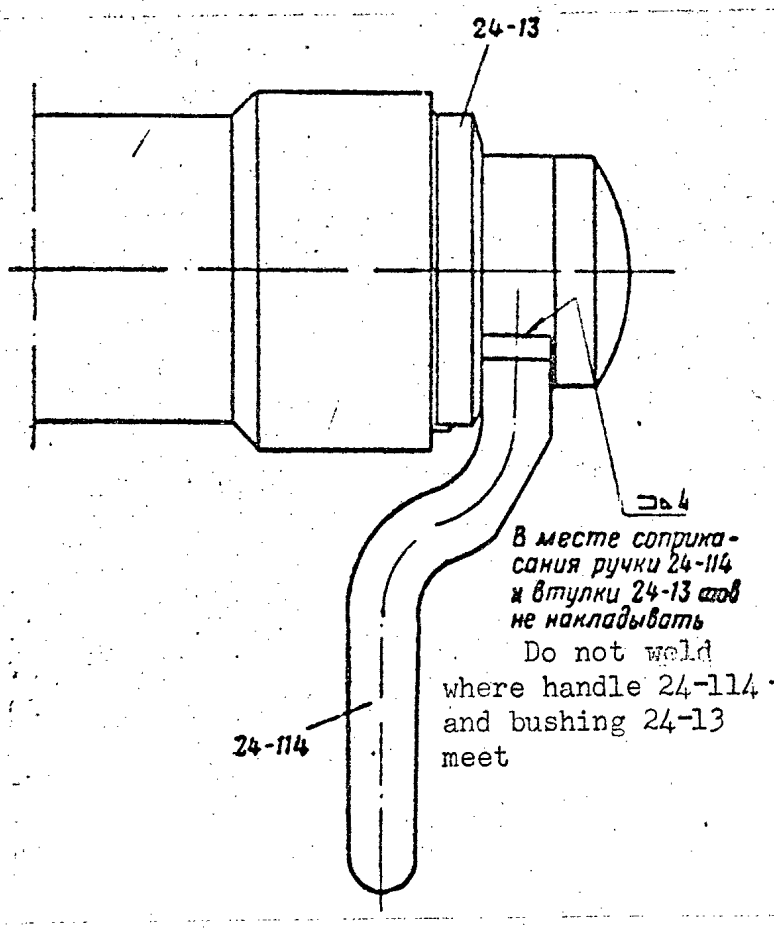
(fig. 13)

AARM. Remove the bulge on the interior surface of the cylinder which has formed from dents on the exterior surface (chart 6). Weld holes of up to 15 mm. Those of more than 15 mm but no more than 35x50 mm, close with inserts by welding (chart 6).

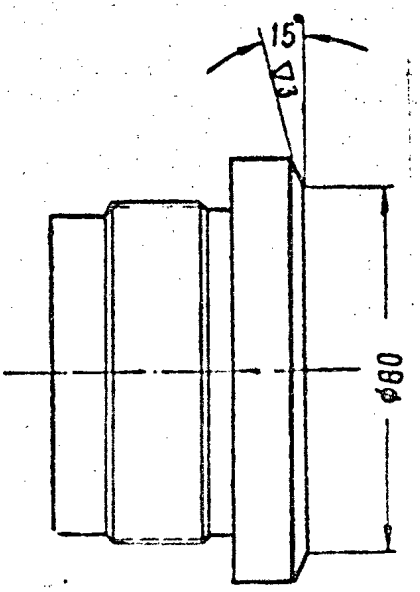
If it is impossible to remove bulges on the interior surface of the cylinder, cut out the damaged places and close up the cylinder by welding.

When holes in the cylinder are more than 35x50 mm, replace the jack (appendix 1).

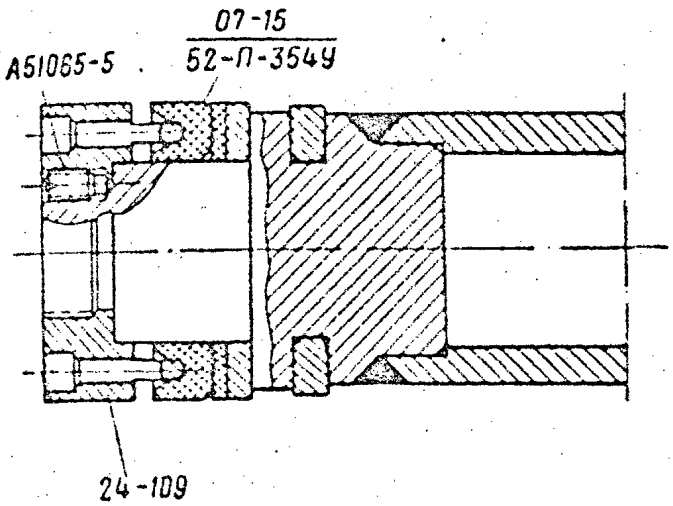
50X1-HUM



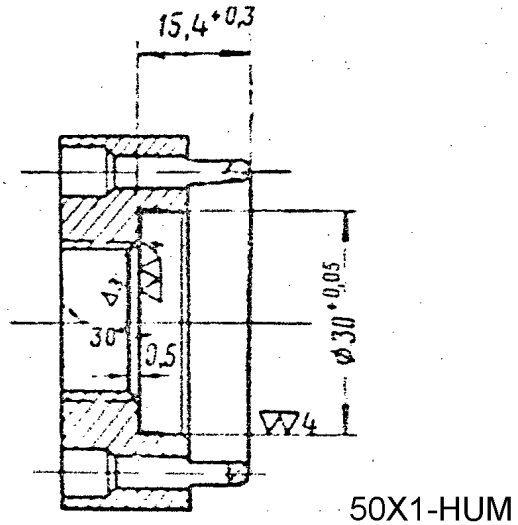
Sketch 55. Jack: 24-13 -- bushing; 24-114 -- handle



Sketch 56. 24-13 -- bushing



Sketch 57. Sb24-15 -- Rod with piston; 24-109 -- collar ring; A51065-5 -- screw; $\frac{07\text{-}15}{52\text{-}P\text{-}354U}$ -- collar



Sketch 58. 24-109 -- collar ring

Chapter Eleven [p 121]

Wheel Maintenance 50X1-HUM

1. Stiff Movement of Wheels

(fig. 14)

With the aid of jacks placed under the lower carriage, raise the front part of the cannon so that the wheels do not touch the ground.

Disengage the wheel brake and check the ease with which the wheel turns by giving the wheel a turn by hand. After several turns, stop the wheel. Under the influence of inbalance the wheel should, upon stopping, change its direction of rotation and finally stop with the weighted part at the bottom.

Reason for malfunction:

a) Excessively tightened bearings 7714 and 7518 with nut 18-11.

PM. Remove hub cap 25-8 and adjust the wheel movement by screwing down nut 18-11 as far as it will go, then unscrewing it 1/6th of a turn and securing it with a cotter pin.

b) Breakage of bearings 7714 and 7518.

PM. Replace the bearings (appendix 1).

c) When disengaging the wheel brake the wheel is not released.

See Chapter 12, item 2, b, d, e, f, g; item 3, b.

2. Axial Looseness of Wheels as a Result of Worn Bearings 7714, 7518

(fig. 14)

With the aid of jacks placed under the lower carriage, raise the front part of the cannon so that the wheels do not touch the ground.

Remove hub cap 25-8 and tighten nut 18-11 as far as possible; then unscrew it from pin 18-8. [text missing]

The end of the washer must protrude beyond the end b of the collar [p 122]
of pin 18-8.

PM. If the end of the washer does not protrude beyond the [illegible] 50X1-HUM
the pin collar, replace washer 18-10 (appendix 1, sketch 235).

3. Leakage of Lubricant From Nave Sb25-2

(fig. 14)

50X1-HUM

Reasons for malfunction:

a) Deterioration of gasket 25-5.

PM. Replace worn gasket (appendix 1).

b) Damaged gasket ring 25-7.

PM. Replace damaged gasket ring (appendix 1).

c) Compressed or insufficiently tightened ring 24-85 of plug 25-19.

PM. When there is leakage of lubricant from under the plug, tighten ring 24-85 with the plug.

If the leak does not stop, replace the ring (appendix 1, sketch 264).

4. Dents, Cracks, and Holes in the Nave of the Wheel

(fig. 14)

PM. Dents in the nave of the wheel are permissible if they do not impede normal dismantling and assembly of the wheel or disrupt the stability of the wheel.

Weld holes in the nave of the wheel measuring up to 30 mm and cracks up to 50 mm in length with electrode E42, having first drilled holes with a diameter of 3-6 mm at the ends of the cracks.

When there are holes and cracks larger than indicated above, weld a steel plate of any type according to GOST 380-57 with electrode E42.

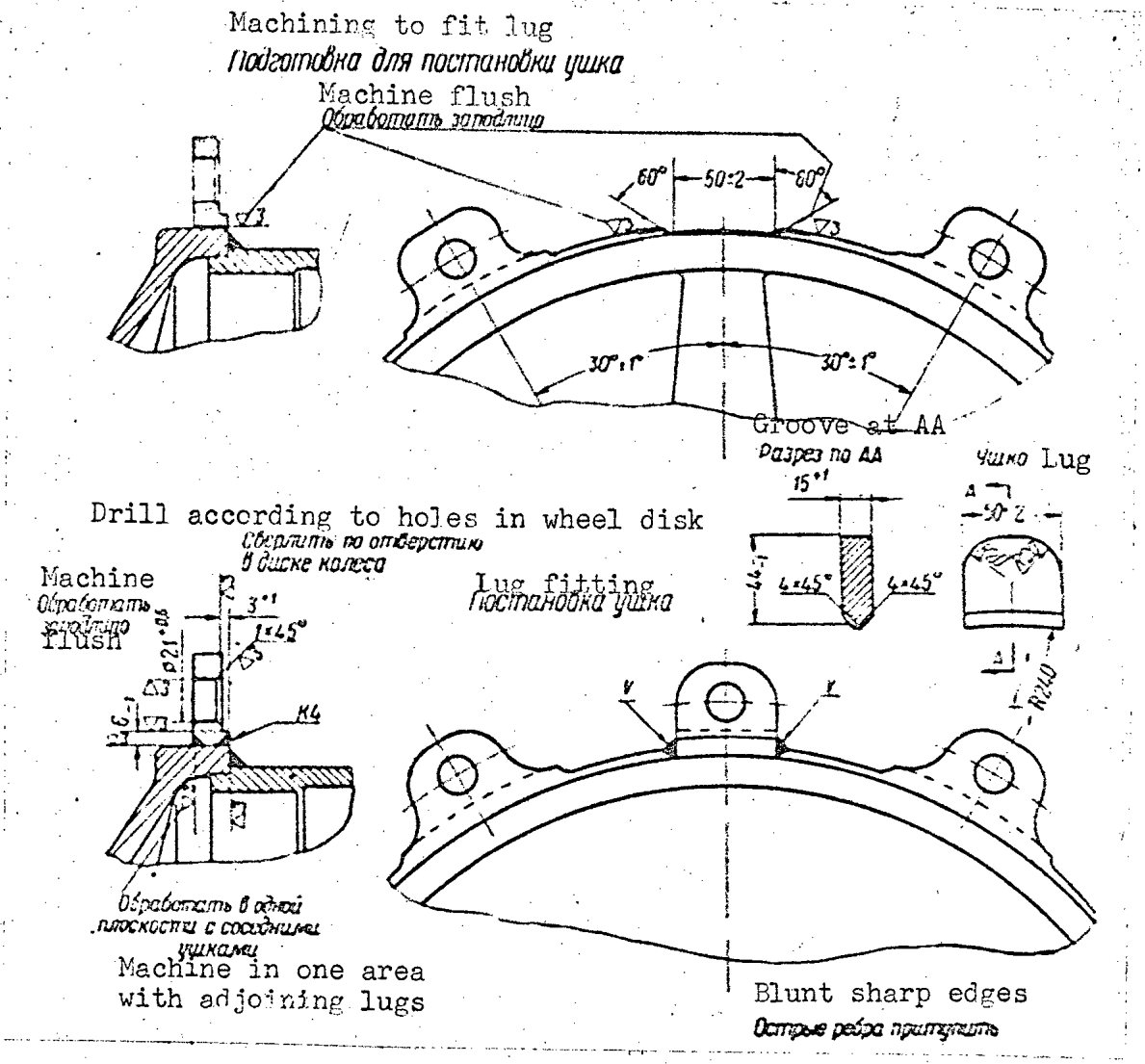
5. Breakage of Lug of Nave Sb25-2

(fig. 14)

PM. If the nave lug is broken, remove the lug and weld the wheel disk with electrode E50A along the entire line of the break.

DARM. [text missing]

In those cases where breakage of the lug does not permit preparation [p 123] of the nave for fitting of the lug as shown in sketch 59, weld a sheet 50X1-HUM of metal (at the place of the break) on the nave with electrode E50A and machine according to sketch 59 to fit the lug.



Sketch 59. Sb25-2 -- nave with brake drum

Chapter Twelve [p 124]

Wheel Brake Maintenance

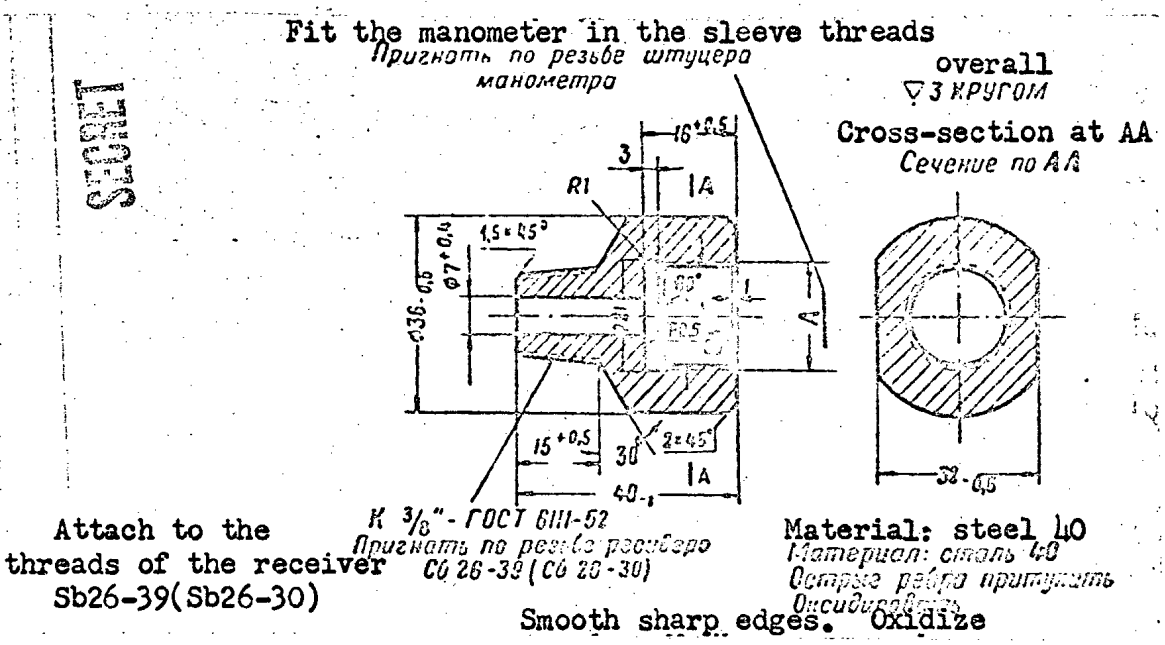
50X1-HUM

/1. Air Leakage out of the Wheel Brake Supply System

(figs. 15 and 16)

Check the hermetic seal of the supply system before braking in the following manner:

-- unscrew plug A52151-28 out of receiver Sb26-39 (Sb26-30) and screw the connecting fitting (sketch 60) in its place;



Sketch 60. Connecting Fitting

-- screw a manometer with a scale reading from 0 to 25 atm. into the connecting fitting;

-- connect the air brake hose lock to the hose lock on the trail. Connect the other air brake hose lock to the lock of the hose which is connected by a stopcock and lock to a compressed air cylinder;

-- moisten the following connections with a soapy solution: the trail hose with control valve Sb26-23; connecting tube Sb26-38 or tube (Sb26-31) with the control valve and receiver; valve Sb26-24 with valve housing Sb26-22; the fiber-rubber hose with nipple A52264-36; and the hoses with air filter Sb26-43 (fig. 11) (the air filter is used only on guns of subsequent issue); [p 125]

50X1-HUM

-- open the cylinder stopcock and, by observing the manometer readings, bring up the pressure in the receiver to 5 or 6 atm. Then close the cylinder stopcock and check the following:

50X1-HUM

1) the hermetic seal of the air brake hose lock connections;

2) whether there is air leakage through the connections indicated above; and, with the manometer, whether the pressure falls in the receiver.

There should be no air leakage in the connections indicated above. The pressure should fall no more than 1 atm. in 5 minutes.

Then check the hermetic seal of the air supply system with the brakes applied by the following:

--moisten the connections of the hoses with control valve Sb26-37 and with left cylinder Sb26-36 (Sb26-4) and right cylinder Sb26-37 (Sb26-5) with a soapy solution;

--open the cylinder stopcock and, by observing the manometer readings, bring up the pressure in the receiver to 8 atm.;

--disconnect the cylinder hose from the air brake hose lock (apply the brakes). The pressure in the receiver should be 5 or 6 atm.;

--check whether there is air leakage in the hose connections and also check with the manometer whether or not the pressure falls in the receiver.

There should not be air leakage in the indicated connections. The pressure should not fall more than 1 atm in 5 minutes.

When checking for air leakage from the wheel brake supply system, the connections of the manometer to the receiver should be air tight.

If the maintenance shop does not have a compressed air cylinder and a manometer which reads from 0 to 25 atm., check the hermetic seal of the wheel brake supply system from the air line of the tow vehicle as instructed below.

Check the hermetic seal of the wheel brake supply system before braking by the following:

--check the hermetic seal of the stopcock on the tow vehicle with the stopcock closed;

--connect one end of the air brake hose to the tow vehicle and the other end to the cannon;

50X1-HUM

-- if it is not closed, close valve Sb26-24 of control valve Sb26-23;

50X1-HUM

-- moisten the following connections with a soapy solution: the trail hose with ... [text missing]

... of valve Sb26-24 with valve housing Sb26-22; the fiber-rubber hose with nipple A52264-36; and the hose with air filter Sb26-43; [p 126]

-- open the tow vehicle brake stopcock and bring up the pressure in the wheel brake air system to 5 or 6 atm. Then close the brake stopcock and check:

1) the hermetic seal of the air brake hose lock connections;

2) whether there is air leakage through the connections indicated above; and also determine the time required for braking to begin (the exit of the rods of pistons Sb26-34 (Sb26-2) out of the brake cylinders from the moment the brake stopcock on the tow vehicle is closed).

There should be no air leakage through the indicated connections. The beginning of the braking action (the exit of the piston rods out of the brake cylinders) should occur no earlier than 2 minutes from the moment when the tow vehicle brake stopcock is stopped.

Check the hermetic seal of the wheel brake supply system with the brakes applied by the following:

-- moisten the hose connections with the control valve and with left cylinder Sb26-36 (Sb26-4) and right cylinder Sb26-37 (Sb26-5) with a soapy solution;

-- open the tow vehicle brake stopcock and bring up the pressure in the wheel brake supply system to 5 or 6 atm.;

-- disconnect the air brake hose from the tow vehicle (apply the brakes) and check whether there is air leakage through the connections indicated above, and also check the time for the termination of the braking action (the beginning of the withdrawal of the rods of pistons Sb26-34 (Sb26-2) into the brake cylinders from the moment that the air is released from the supply system -- the disconnection of the hose from the tow vehicle).

There should be no air leakage through the indicated connections. The termination of the braking action (the withdrawal of the pistons into the brake cylinders) should occur no earlier than 5 minutes from the moment when the air is released from the supply system.

50X1-HUM

Causes of malfunctioning:

a) Clamp A71312-9 of the nipple connection (13 in fig. 16) is not tightened sufficiently. 50X1-HUM

PM. If there is air leakage in the connection of nipple A52264-36 with the hose, tighten the clamp so that there is no leakage in the given connection.

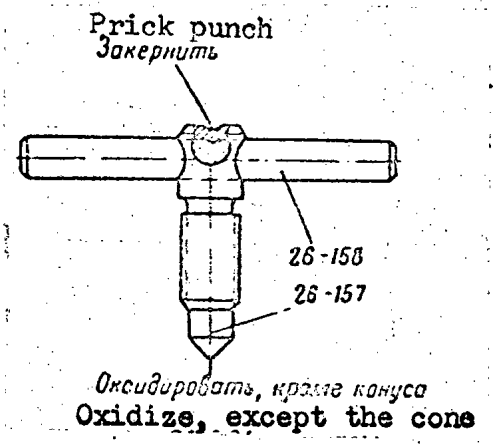
b) Flange nut (A52253-52) on guns of initial issue or sleeve 26-176 on guns of subsequent issue is not sufficiently tightened, and also sealing ring 26-165 is not properly seated with connecting fitting 26-164 (fig. 15).

PM. If there is air leakage in the connection of the tubing with end nipple 26-175 (26-95), and also in the connection of the tubing with the receiver, tighten the proper sleeve, flange nut, or connecting fitting.

If the air leakage in the connection of the tubing with the receiver is not stopped after the connecting fitting is tightened, replace the sealing ... [text missing]

c) The cone of valve 26-157 is loosely seated in the seat of valve housing Sb26-22 (14 in fig. 15). [p 127]

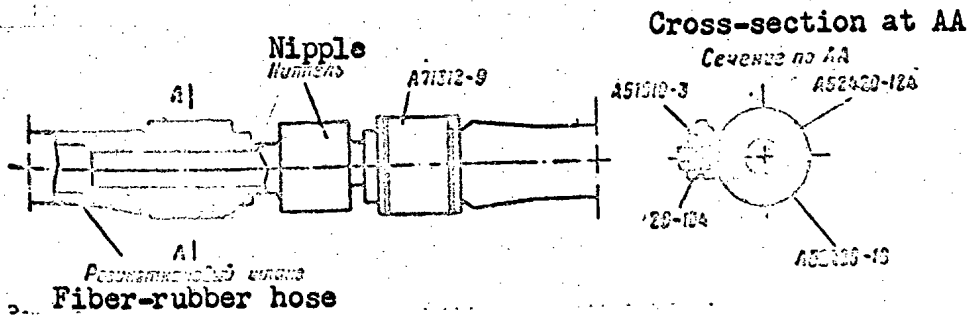
PM. If there is air leakage between the valve and valve housing seat, smooth the valve cone by grinding or replace the valve (appendix 1, sketch 267). Assemble the valve with tap wrench 26-158 (sketch 61).



Sketch 61. Sb26-24 -- valve: 26-157 -- valve; 26-158 -- 50X1-HUM

DARM. If there is air leakage, ream the bottom of the seat in the valve housing with a countersink or bore on a plane with the end being ground and smooth the cone by grinding. 50X1-HUM

If the air leakage is not stopped after this, replace the valve (appendix 1, sketch 267). Assemble the valve with tap wrench 26-158 (see sketch 61).



Sketch 62. Fiber-rubber hose: 26-194 -- screw; A51010-3 -- nut; A52420-124 -- lining; A52426-16 -- clip; A71312-9 -- clamp

d) Nipples A52264-36 in valve housing Sb26-22 and in left cylinder Sb26-36 (Sb26-4) and right cylinder Sb26-37 (Sb26-5), and end nipple 26-175 (26-95) in the valve housing are not tightened sufficiently (figs. 15 and 16).

PM. If there is air leakage through the indicated connections, tighten nipples A52264-36 and end nipple 26-175 (26-95).

e) The soldered connections of the copper tubing (on guns of initial issue) with clamping sleeve 26-163 and of tubing 26-178 (on guns of subsequent issue) with clamping sleeve 26-163 and with insert 26-177 (15 in fig. 15) are damaged.

PM. If there is air leakage in the soldered connections, solder the tubing again with L62 grade brass solder or PMTs-54 GOST 1534-42 grade copper-zinc solder.

f) Damage (rupture, tearing, bulging ... [text missing]

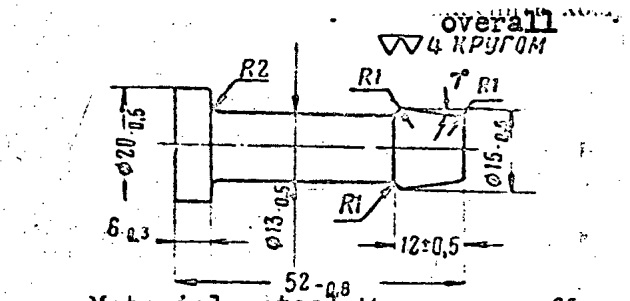
Check the air pressure hose as follows: [p 128]

-- remove the hose from the gun;

-- connect one end of the hose through a manometer to a compressed air cylinder and stop the other end of the hose with a plug (sketch 50X1-HUM Tighten the plug with clamp A71312-9.

Open the cylinder stop cock and take two minutes to bring up the pressure in the hose to 10 atm. Then close the cylinder stopcock and maintain the pressure in the hose for 10 minutes. There should be no drop in pressure.

Check the hermetic seal of the hose connections by moistening them with a soapy solution.

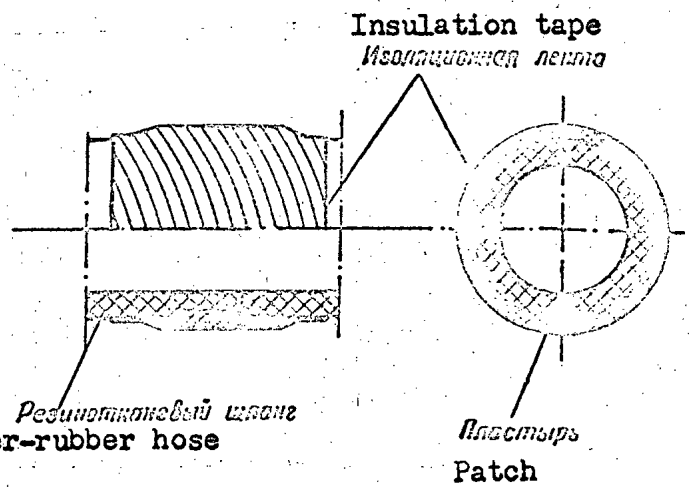


Material: steel Материал сталь 25
Smooth sharp edges Острые ребра притупить
Oxidize Оксидировать

Sketch 63. Plug

If the hose does not hold the pressure, test it with an air pressure of 6 atm. in a water bath to find where it is damaged.

PM. If there are punctures and tears no greater in depth than 2 mm, put a rubber patch on the hose with GOST 2199-43 adhesive. The patch should overlap the hose and should cover the contours of the damaged area by 5 to 8 mm. Put three or four layers of GOST 2162-55 rubberized insulation tape over the patch (sketch 64).

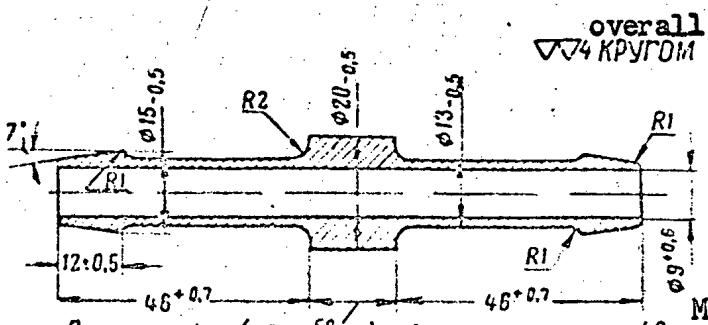


Sketch 64

If the punctures are deeper than 2 mm or there are bulges and tears in the hose, manufacture two sets of parts as instructed in sketch 62 (appendix 1, sketches 268 and 271), remove the damaged portions ... [text missing] 50X1-HUM

After placing a patch or nipple on the hose, check the air pressure [p 129] as instructed above.

If there is still air leakage, replace the hose (appendix 1).



Sketch 65. Nipple

g) There is rust on the internal surface of cylinder (Sb26-3) (on guns of initial issue) (fig. 16).

PM. Remove the rust from the cylinder surface where it is not chrome plated by wiping the affected portions with a rag. A fine charcoal powder mixed with steol M can be used.

If the rust is deep, send the cannon to a higher maintenance shop.

AARM. Remove the deep rust by removing a minimal layer of metal from the whole surface (chart 5).

The internal surface of the cylinder can be increased to 100.3 mm.

h) The chrome layer is damaged (bulging) and rust has formed on the internal surface of cylinder Sb26-35 (on guns of subsequent issue) (fig. 16).

50X1-HUM

Examine the internal surface of the cylinder. Bulging of the chrome layer at individual places on the cylinder indicates that there is rust under the chrome layer.

50X1-HUM

If the chrome layer is damaged (bulging), replace the cylinder (appendix 1). If there is no spare cylinder, the cylinder with the damaged chrome layer can be used if there is not air leakage past the piston.

When a spare cylinder is received, replace the old cylinder (with the damaged chrome layer).

Cylinders with damaged chrome layers should definitely not be condemned. They should be sent to a fixed base for electrochemical ... [text missing]

i) Collars 10-83 (26-10) of pistons Sb26-34 (Sb26-2) are damaged [p 130] (ruptures, cracks) (fig. 16).

PM. Examine the collars and if they are damaged, replace them (appendix 1).

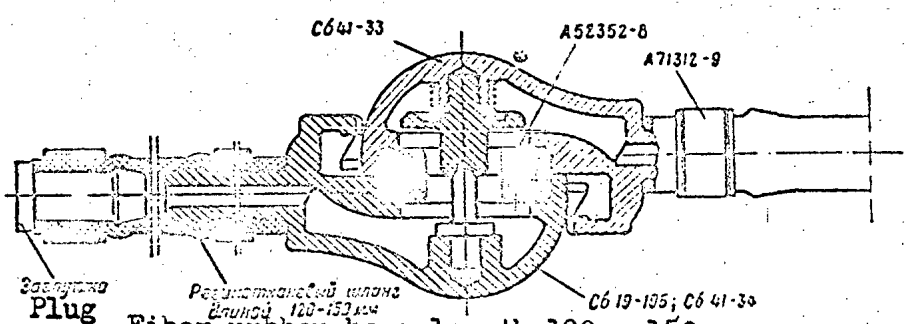
j) Gaskets 26-191 of air filter Sb26-43 are damaged (ruptures, cracks) (fig. 11).

PM. Examine the gaskets and if they are damaged, replace them (appendix 1).

k) Valve washer 26-121 is damaged (fig. 15).

PM. Examine the washer and if it is damaged, replace it (appendix 1, sketch 266).

l) Cup A52352-8 of locks Sb19-105, Sb41-33, and Sb41-34 is damaged (ruptures, cracks) (sketch 66).



Sketch 66. Sb19-105 -- lock; Sb41-33 -- lock; Sb41-34 50X1-HUM
A52352-8 -- cup; A71312-9 -- clamp

PM. Remove lock Sb19-105 from the trail and check the hermetic seal of the coupling locks with an air pressure of 10 atm. while soaking them in a bath of anticorrosive liquid for 10 minutes.

There should not be more than a 1 atm. drop in pressure during the entire check period.

To check the coupling lock connections, connect one end of the coupling lock to a compressed air cylinder through a manometer and plug up the other end with a plug. Fasten the ends of the hoses on the plug and the lock with clamps A71312-9 (see sketch 66).

If the pressure drops more than 1 atm. during the entire check period, replace cup A52352-8 (appendix 1).

After replacing the cup, check the hermetic seal of the coupling locks with air pressure as instructed above.

m) There is rust on the internal surface of valve housing Sb26-22 (on guns of initial issue) (fig. 15).

PM. Examine the internal surface of the control valve housing ... [text missing]

...to use a fine charcoal powder mixed with steol M. [p. 131]

DARM. Remove deep rust by removing a minimal layer of metal over the whole surface. The internal diameter of the valve housing can be increased to 50.2 mm.

n) Rings 26-130 and 26-131, washer 26-132, cup 26-182 (26-133), ring 26-129, and gasket 26-145 are damaged (punctures, cracks) and springs 26-122 and 26-123A are fatigued or broken (fig. 15).

After defects "a" to "m" have been corrected (see chapter 12, item 1), if the following occur:

-- there is a drop in pressure which is greater than 1 atm. in 5 minutes when checking the hermetic seal before braking;

-- there is a drop in pressure which is greater than 1 atm. in 5 minutes when checking the hermetic seal with the brakes applied;

-- piston rods Sb26-34 (Sb26-2) advance out of the brake cylin
sooner than 2 minutes from the moment of closing the brake stopcock on the tow vehicle (when checking the hermetic seal before braking);

-- the piston rods withdraw into the braking cylinders sooner than 5 minutes from the moment of releasing the air from the supply system (when checking the hermetic seal with brakes applied). The cause of air leakage or of the increased drop in pressure can be: 50X1-HUM

1) When checking the hermetic seal of the supply system before braking --

-- Rings 26-130, 26-131, and gasket 26-145 are damaged and spring 26-122 is fatigued or broken.

PM. Examine ring 26-130, ring 26-131, slide valve Sb26-40, and the gasket. Replace ring 26-130, slide valve Sb26-40 (or ring 26-131) and gasket 26-145 (appendix 1) if they are damaged.

The length of replaced slide valve Sb26-40 should correspond to the length of the faulty slide valve.

The slide valves of the control valves of guns of initial issue have a length of 34 mm, and of guns of subsequent issue, a length of 29 mm. If the necessary slide valve Sb26-40 is not available in the maintenance shop, replace only the damaged ring 26-131 (appendix 1).

After seating the new ring 26-131, compress external rib a (fig. 15) of slide valve 26-124A (26-124) and centerpunch internal rib b (fig. 15) of the slide valve in six places. Then check the openings of the slide valve by reaming for a diameter of $8^{+0.03}$ mm. After replacing the damaged parts, if the drop in pressure while checking the hermetic seal of the supply system before braking is more than 1 atm. in 5 minutes or the piston rods begin to move out of the brake cylinders sooner than 2 minutes from the moment of stopping the tow vehicle stopcock, replace spring 26-122 with one manufactured at a DARM (chart 3).

2) When checking the hermetic seal of the supply system during the braking action ... [text missing]

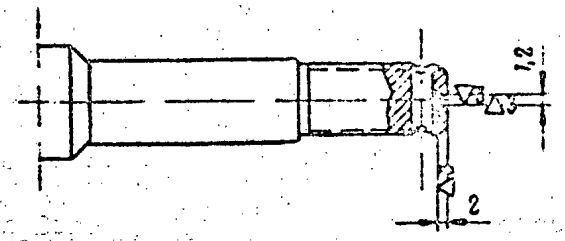
PM. Examine the washer, the cup, and the ring. If the parts are damaged, replace them (appendix 1). [p 132]

After replacing the damaged parts, if the drop in pressure when checking the hermetic seal of the supply system when braking is greater than 1 atm. in 5 minutes or the piston rods begin to draw into the brake cylinders sooner than 5 minutes from the moment of releasing the air from the supply system, replace spring 26-123A (26-123) with a spring 26-123A which has been manufactured at a DARM (chart 3). Spring 26-123A has an external diameter of 37 mm and the diameter of the wire is 2.5 mm.

50X1-HUM

Before assembling the control valve, machine the groove on pin 26-125 (the given groove is used on the valve pistons of cannons of subsequent issue) according to sketch 67.

50X1-HUM



Sketch 67. 26-125 -- pin

Also grease the working and sealing surfaces with Af-70, GOST 2967-45 instrument grease.

2. Inoperative Hand Brake

(fig. 16)

Jack up the front part of the gun so that the wheels do not touch the ground. Then place fixed jacks under the lower carriage.

Rotate the wheels manually and test the braking of the wheels by moving lever Sb26-11 along the notched segment 26-75. It should not be possible for two men (at each wheel) to move the braked wheels.

When the wheels are braked, lever pawl 26-53 should be located no closer to the lower end of the notched segment than the fifth notch.

Release the brakes by moving lever Sb26-11 upward. Check whether the brakes have released by rotating the wheels manually. The wheels should rotate freely. Check the actions of braking and release of brakes at least three times.

Causes of malfunctioning:

a) Cable Sb26-16 is broken.

b) The brake is not adjusted. [p 133]

When braking the wheels (with the hand brake), if lever pawl 26-53 is located closer to the lower end of notched segment 26-75 than the fifth notch, adjust the length of cable Sb26-16.

50X1-HUM

Loosen the cable fastening by unscrewing nuts A51011-3 for 2 or 3 turns, and place lever Sb26-11 at the uppermost position. Tighten

the cable and fasten it with the nuts. Rods 26-169 (26-8) of pistons Sb26-34 (Sb26-2) should go all the way into the brake cylinder.

If the wheel brakes do not release after the length of the cable is adjusted:

1) On guns of initial issue which do not have a mechanism for adjusting the exit of the piston and the position of the brake shoes, move arms (Sb26-19) to the next slot by the following:

-- loosen the cable by screwing out nuts A51011-3 for 2 or 3 turns;

-- remove the cotter pin fastenings and take out pin A51620-65;

-- remove arm (Sb26-19) from its engagement with pistonhead 26-17;

-- shift arm (Sb26-19) 15 to 20 mm in relation to right spindle (26-64) or left spindle (26-63);

-- mark a pintle slot with paint and mark the position of this slot in relation to the arm slots with a groove on the lever facing;

-- remove the arm from the pintle;

-- mark the second facing of the earlier marked pintle slot;

-- move arm Sb26-19 one slot by rotating it in a clockwise direction for left disk Sb26-26 of the wheel brake and counterclockwise for right disk Sb26-25 of the wheel brake[1] [footnote missing] (fig. 15);

-- insert the arm shoulder in the groove of the pistonhead;

-- set nut A51021-11;

-- screw on nut A51011-8 and tighten it in such a way as to provide free rotation of right spindle (26-64) or left spindle (26-63) and fasten the nut with a cotter pin;

-- insert pin A51620-65 and fasten it with a cotter pin;

-- tighten the cable with lever Sb26-11 in the uppermost position. The pistons should enter the brake cylinders completely.

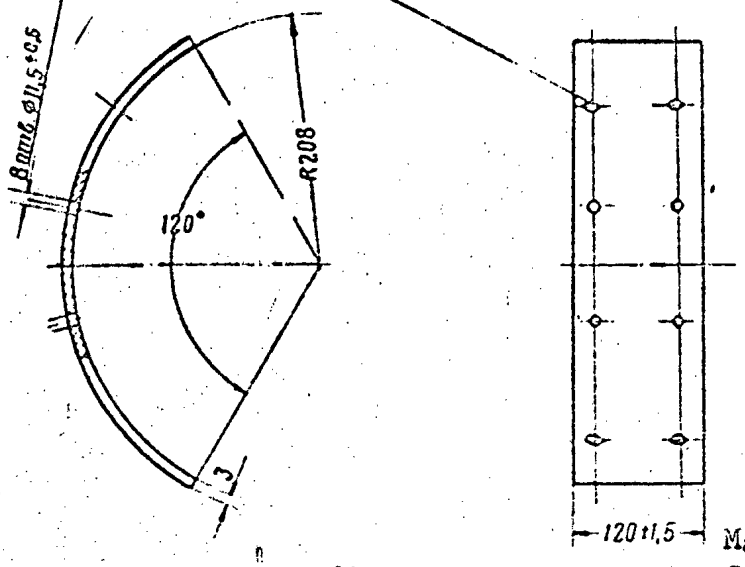
2) On guns of subsequent issue which have a mechanism for adjusting the exit of the pistons and the brake shoe positions, adjust exit of rods 26-169 of pistons Sb26-34 out of the brake cylinders and position brake shoes Sb26-1.

Drill openings in brake shoe 26-1

Сверлить по отверстиям в колодке тормозной 26-1

overall

▽3 КРУГОМ



50X1-HUM

Material: any grade steel

Материал сталь любой марки

Smooth sharp edges

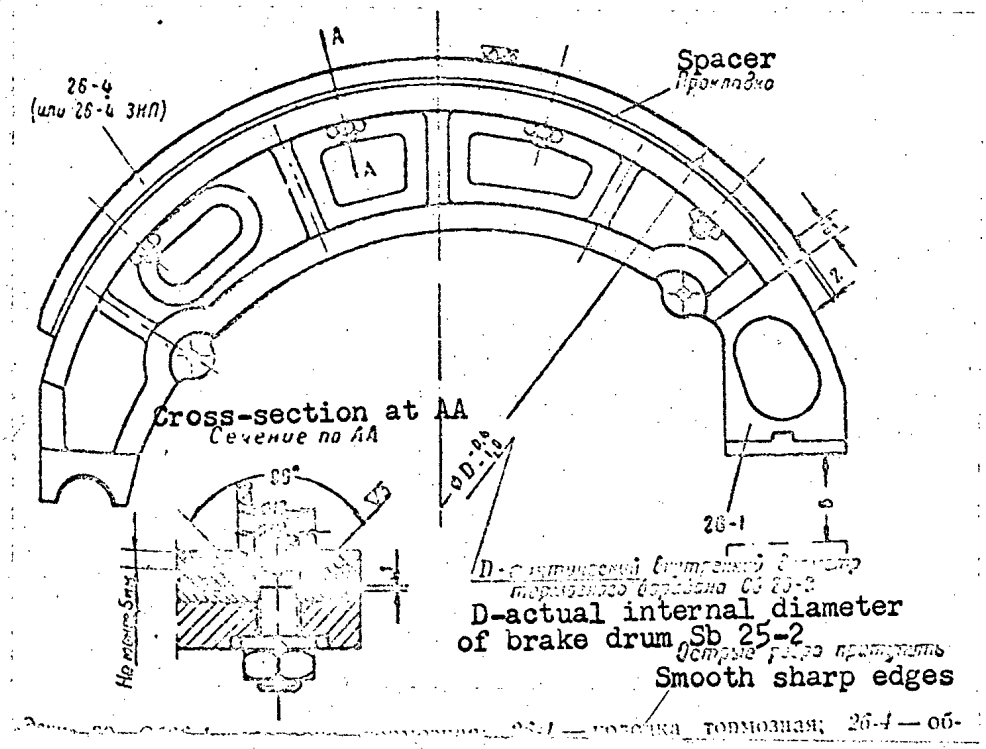
Острые ребра притупить

Uncoiled length of strip

Развернутая длина полос $l = 438$ мм

$l = 438$ mm

Sketch 68. Spacer



50X1-HUM

Sketch 69. 26-1 -- brake shoe; 26-4 -- lining

Make the adjustment by rotating worm 26-212. Then, when the hand [illegible] brake is applied, pawl 26-53 of lever Sb26-11 should be no closer than the fifth notch to the lower end of notched segment 26-75 and the rods should come out of the cylinders for 20 to 25 mm. When lever [illegible] in the uppermost position, the wheels should rotate freely.

c) There is a phosphate layer on the internal surface of the brake drums (on guns of initial issue) or there is grease on brake shoe linings 26-4.

PM. Remove the wheels and brake linings. Scrub the brake shoe linings with gasoline and dry them. Examine the internal surface of the brake drum. If there is a phosphate layer on the internal surface, remove it with an emery cloth.

d) Collars (26-10) of pistons (Sb26-2) are too tightly fastened by nuts (A51010-9) and (A51013-8) on guns of initial issue.

PM. Loosen the collars by unscrewing the nuts.

e) The grease has thickened (in cold weather) or it has clogged left cylinder Sb26-36 (Sb26-4) or right cylinder Sb26-37 (Sb26-5) (figs. 15 and 16).

PM. Wash out the cylinders. Grease them with winter grease or with cannon grease diluted with axle grease.

f) Springs 26-69 and 26-70 are fatigued or broken.

To determine if there is spring fatigue, put on the brake with lever Sb26-11 (with the wheels clear of the ground) and quickly release it. The brake shoes should be drawn back quickly by the springs.

PM. If the shoes are not drawn back, replace the springs (appendix 1).

g) Brake shoe linings 26-4 are worn.

Measure the internal diameter of brake drum Sb26-2 (fig. 14), distance A (fig. 16), and the thickness of lining 26-4.

The internal diameter of the brake drum should be no greater than 446 mm, distance A no longer than 56 mm, and the thickness of the lining no smaller than 7 mm. Measure distance A with the brake applied (for measurement of distance A, lever Sb26-11 should be in the lowermost position).

AARM. If distance A is greater than 56 mm and the thickness of the linings is more than 7 mm, place a spacer (sketch 68) under the worn linings of the brake shoes and machine the linings (sketch 69). Machine the linings with the shoes connected together and positioned so that distance B is equal to 44 mm. 50X1-HUM

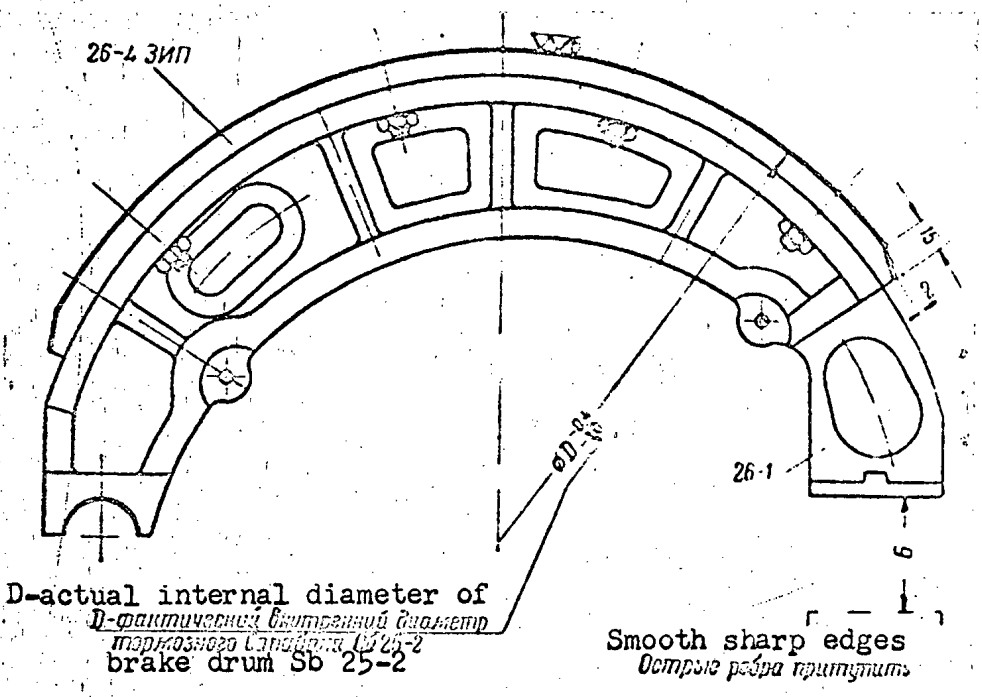
Place the shoes on the wheel brake disk and with the position of cam 26-65 adjusted (by turning shafts 26-63A (26-63), and ... [text missing]

If a distance A is greater than 56 mm with spacers under the brake shoe linings and the thickness of the lining is less than 7 mm, replace the linings (appendix 1). [p 136]

Two cases can be encountered when replacing the linings:

-- replacement using 26-4ZIP (furnished as ZIP [spare parts] which are machined with a thickness of 11.5 mm), and

-- replacement using linings 26-4 (not machined and having a thickness of 18 mm).



Sketch 70. Sb26-1 -- brake shoe: 26-1 -- brake shoe; 26-4 -- brake shoe lining

First case. To set the linings 26-4ZIP, the following is necessary: 50X1-HUM

1) If the internal diameter of the brake drum is no larger than 443 mm:

-- remove the worn linings and spacers from the brake shoes;

-- place 26-4ZIP linings on the brake shoes (two linings on one shoe and two on the other; use linings of one series and of the same number 26-4/1 or 26-4/2 on each shoe) and machine the linings (sketch 69).

50X1-HUM

2) If the internal diameter of the brake drum is more than 443 mm, but no larger than 446 mm:

-- remove the worn linings from the brake shoes;

-- put spacers and 26-4ZIP linings on the shoes ... [text missing]

... shoe place linings of one series and of the same number 26-4/1 or 26-4/2) and machine the linings (see sketch 69). [p 137]

Machine 26-4ZIP linings to the diameter $D^{+0.4}_{-1}$ over the whole surface of the linings with the shoes connected together. Keep distance B equal to 44 mm when putting the shoes together.

If it is not possible to machine the linings at the necessary diameter over the whole surface with distance B equal to 44 mm, dimension B can be increased to 50 mm.

Place the shoes on the wheel brake disk and hold the positional adjustment of cam 26-65 (by turning spindles 26-63 A (26-63) and 26-64A (26-64) keep dimension A equal to 38 to 50 mm between the shoes) with lever Sb26-11 in the uppermost position.

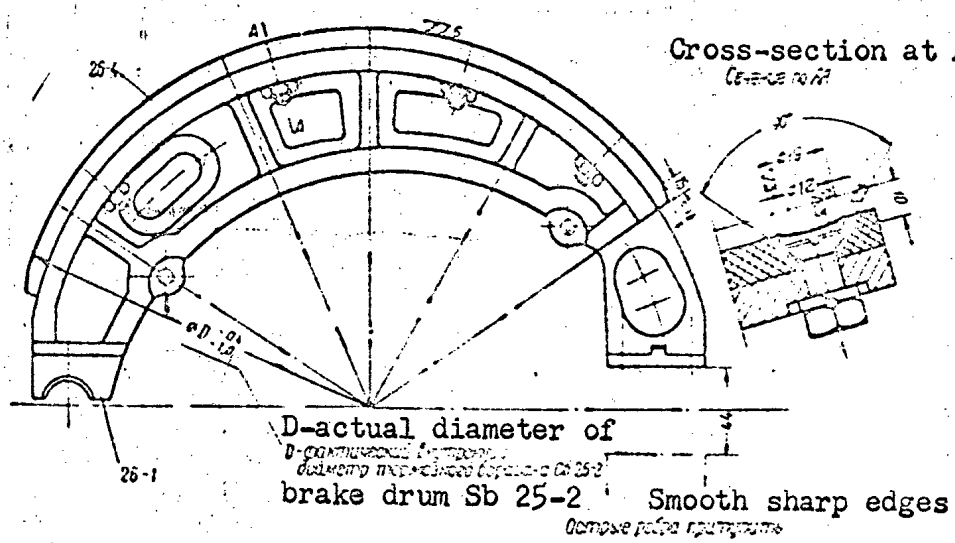
Second case. To set linings 26-4, the following is necessary:

-- remove the worn linings and spacers from the brake shoes;

-- place linings 26-4 on the shoes (without spacers) and machine them (sketch 71).

50X1-HUM

50X1-HUM



Sketch 71. Sb26-1 -- brake shoe: 26-1 -- brake shoe; 26-4 -- brake shoe lining

place the shoes on the wheel brake disk and, by adjusting, keep dimension A between the shoes equal to 38 to 44 mm (see first case above) (fig. 16).

After replacing the linings on the brake drums, adjust the wheel brake (see chapter 12 , item 2, "b").

On guns of subsequent issue, in the disks of the wheel brake ... [text missing]

... of the wheel brake, adjust the position of the brake shoes with the [p 138] wheels on the gun by the following:

-- raise the front part of the cannon with a jack so that the wheels do not touch the ground and place fixed jacks under the lower carriage;

-- loosen upper eccentric shaft 26-202 by unscrewing nut 25-11 for 1 or 2 turns, having first cut off the welded seam which fastens nut 25-11;

-- turn shaft 26-202 until the wheel is braked (the greatest eccentricity of the shaft is indicated by the arrow on the face of the shaft);

50X1-HUM

-- turn the eccentric shaft the other way (ideally for 1/12 of a turn) until the wheel rotates freely.

While holding the shaft 26-202 in position with a wrench, tighten nut 25-11 as far as it will go, weld it in two places to the disk with an E42 electrode, and fasten it with a 4 x 45 cotter pin. 50X1-HUM

In the same way, adjust the position of the lower brake shoe with the lower eccentric shaft 26-202.

h) The clearance between shafts 26-63A (26-63) or 26-64A (26-64) and slide blocks 26-2 with the wheels braked is less than 0.4 mm.

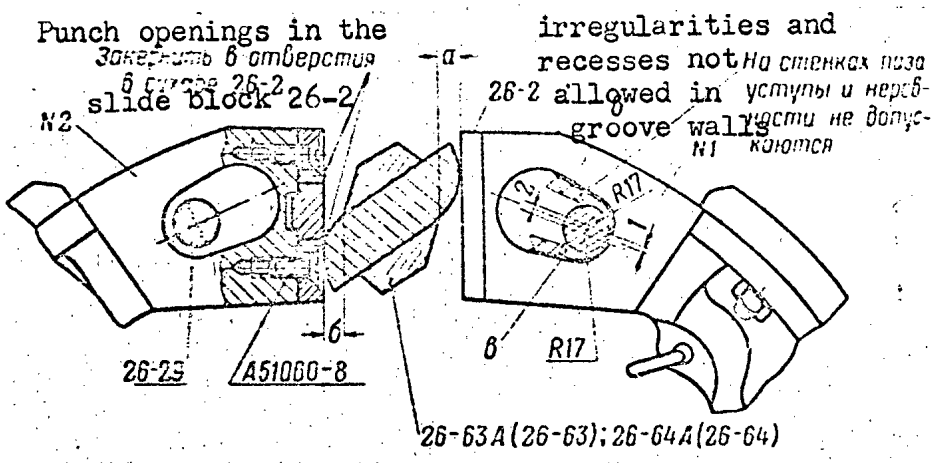
Remove the wheels, then remove lap 26-67.

Measure the clearances a and b between right shaft 26-64A (26-64) of left shaft 26-63A (26-63) and the contact surface of slide block 26-2 (sketch 72) as follows:

-- shift lever Sb26-11 to the extreme lower position;

-- have one man compress the brake shoes toward the center of the wheel brake disk and shift the brake shoes in the direction of wheel rotation (for forward movement of the gun) until they are stopped on the wall of the oval groove of shoe No. 1 in pin 26-29 ... [text missing?]

-- shift the brake shoes in the opposite direction until they [p 139] are stopped by the wall of the oval groove of shoe No 2 in pin 26-29 and measure clearance b.



Sketch 72. 26-2 -- slide block; 26-29 -- shoe pin; 26-63A (26-63) -- left shaft; 26-64A (26-64) -- right shaft; A51060 -- screw

50X1-HUM

Clearances a and b should be no less than 0.4 mm.

PM. If clearances a or b are smaller than 0.4 mm, remove the corresponding slide block 26-2, machine the given bearing surface of the slide block, and drill two holes with the diameter of $3^{+0.3}$ mm in the slide block, if the openings are not already there (sketch 73). 50X1-HUM

Note: There are no holes with a diameter of 3 mm in slide blocks 26-2 on guns of initial issue.

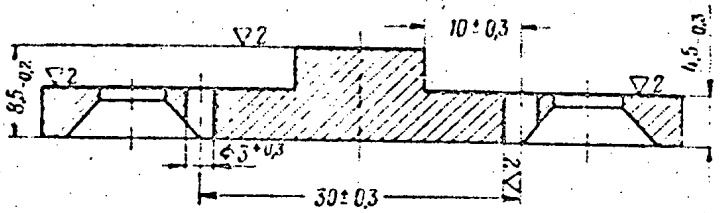
After the slide block is placed on the shoe, screws A5160-8 are screwed into the holes in the slide block (see sketch 72).

i) Brake shoes 26-1 catch on pins 26-29 during braking.

Remove the brake shoes and check whether or not there are recesses on the side walls in the oval grooves with which pins 26-29 are connected.

PM. If there are recesses in the side walls of the grooves, remove them by filing.

After correction of all of these defects, if the malfunctioning continues (the brakes do not work), machine the oval groove according to sketch 72.



Sketch 73. 26-2 -- slide block

3. Inoperative Air Wheel Brake

(figs. 15 and 16)

Check wheel brake operation as follows:

-- jack up the lower carriage so that the wheels do not touch the ground, then place fixed jacks under the lower carriage;

-- attach a manometer which reads from 0 to 25 atm. to the receiver;

-- connect a hose from a stopcock and lock on a compressed air cylinder to the hose lock on the trail; 50X1-HUM

-- open the cylinder stopcock and bring up the pressure in the receiver to 5 or 6 atm., then close the cylinder stopcock; [text missing]

... to be braked and leave the brakes on for at least 3 minutes. Two men should not be able to turn the wheel while it is braked; [p 140]

-- connect the cylinder hose to the lock on the trail and again bring up the pressure in the receiver to 5 or 6 atm. 50X1-HUM

When air is supplied to the wheel supply system, the brakes should release. This is checked by rotating the wheels manually. The wheels should rotate freely.

When checking wheel brake operation, check the movements of the pistons in the brake cylinders. When the pressure is reduced in the supply system (braking) the pistons should quickly come out of the brake cylinders, and when the pressure is increased (brakes released) the pistons should quickly return to their original positions.

Check the application and the release of the brakes at least three times.

If there are no manometers reading from 0 to 25 atm. or compressed air cylinders in the maintenance shop, check the brakes from the air line of the tow vehicle as instructed below:

-- jack up the lower carriage so that the wheels do not touch the ground. Then place fixed jacks under the lower carriage;

-- connect the hose on the trail to the air line of the tow vehicle through the air brake hose;

-- open the brake stopcock of the tow vehicle and bring up the pressure in the supply system of the brakes to 5 or 6 atm;

-- turn the wheels by hand. Then disconnect the air brake hose from the tow vehicle. The wheels should be braked and remain braked for at least three minutes. Two men should not be able to rotate the braked wheels;

-- connect the air brake hose to the tow vehicle and again bring up the pressure in the supply system of the wheel brake to 5 or 6 atm. The brakes should be released. Check this by rotating the wheels manually. The wheels should rotate freely.

While checking the operation of the brakes, trace the movement of the pistons in the brake cylinders. When the brakes are applied, the pistons should quickly leave the brake cylinders and when the brakes are released, the pistons should quickly return to their original positions.

Check the application and release of the brakes at least three times. 50X1-HUM

Causes of malfunctioning:

a) See chapter 12 , item 2, "b", "c", "d", "e", "f", "g", "h", "i". 50X1-HUM

b) Spring 26-171 (26-21) is fatigued or broken. With the wheel braked, pistons Sb26-34 (Sb26-2) should ... [text missing]

Normal height of the springs when they are not compressed is: springs 26-171 -- $200\pm\frac{10}{5}$ mm; springs (26-21) -- 188±9 mm. [p 141]

Note: Springs 26-171 are used on guns of subsequent issue; the dimensions of these springs are: external diameter 50 mm, wire diameter 4.5 mm.

Springs (26-21) are used on guns of initial issue; the dimensions of these springs are: external diameter 49 mm, wire diameter 4 mm.

PM. If the springs are fatigued or broken, replace them (appendix 1).

c) The fiber-rubber hose is broken or damaged (tears, punctures, bulging).

See chapter 12 , item 1, "f".

d) Control valve Sb26-23 is stopped up.

PM. Clean out the dust and dirt from the control valve.

Before assembling the control valve, grease the working and sealing surfaces with AF-70 GOST 2967-45 instrument grease.

e) Air filter Sb26-43 on guns of subsequent issue is stopped up (fig. 11).

PM. Clean the dust and dirt from the air filter.

Examine filter 26-190. If it is damaged or very soiled, replace the filter (appendix 1).

4. The Brake Drum Heats Up When the Gun Is Being Moved

Determine whether the drum is heated by pulling the gun with a tow vehicle or by checking the gun records which accompanied the gun from the military unit which sent it in for maintenance.

50X1-HUM

Causes of malfunctioning: See chapter 12 , item 2, "b", "d", "e", "f", "i", and item 3, "b", "c", "d", "e".

5. Lever Sb26-11 Is Not Locked by Pawl 26-53 on Notched Segment 26-75 (fig. 16)

50X1-HUM

By moving the lever, check whether it locks at each notch of the notched segment. The pawl should not come out of its engagement with the notches of the segment when the lever is pressed in the direction to release the brakes (upward).

Causes of malfunctioning:

a) Spring 26-54 is fatigued or broken.

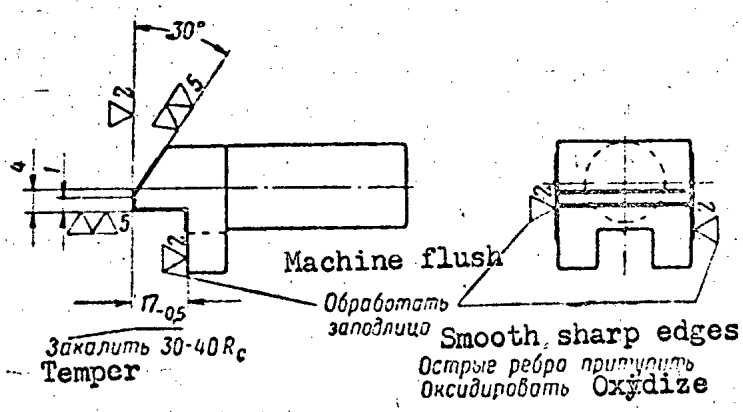
Depress trigger 26-60 and release it. Under the influence of the spring, pawl 26-53 should quickly return to its original position and lock the lever on notched segment 26-75.

PM. If the pawl does not return to its original position, replace the spring with one provided by a DARM (chart 3).

b) There are burrs on the tooth of pawl 26-53 and on the teeth of notched segment 26-75.

[text missing]

[p 142]



Sketch 74. 26-53 -- pawl

DARM. If the pawl slides out of the teeth of the notched segment, trim off local burrs from the teeth by removing a minimal layer of metal. If the burrs are rather large, build up a layer of metal on the pawl tooth with an ENKh-30 electrode and on the segment teeth with an E42 electrode and then machine the layers of metal (sketch 74).

Machine the teeth of the notched segment by using a template prepared according to the profile of unworn teeth.

50X1-HUM

6. Arm 26-46 of Notched Segment 26-75 Is Bent
(fig. 16)

50X1-HUM

Measure the clearance between the right wheel (according to usual forward travel) and bolt A51000-20 of notched segment 26-75 with the gun assembled. This clearance should be no smaller than 20 mm.

Apply the hand wheel brake with the gun in firing position. Rotate the gun rotating part to the left as far as it will go with the traversing mechanism. Then put the gun tipping parts at the maximum negative angle of elevation. Hand brake lever Sb26-11 should not be bent more than 20 mm in this position of the gun.

PM. If the clearance between the right wheel and the notched segment bolt is less than 20 mm or if the lever is bent farther than 20 mm, straighten notched segment arm 26-46.

7. The Wheel Brake Locks or Releases Involuntarily When the Gun Is Being Transported by a Tow Vehicle
(fig. 15)

Causes of malfunctioning:

a) The fiber-rubber hose is broken or damaged (tears, punctures, bulging).

See chapter 12 , item 1, "f".
[text missing]

... of the connected tube with clamping sleeve 26-163 (on guns of initial [p 143] issue) or with clamping sleeve 26-163 and insert 26-177.

PM. If the tube is broken, replace it (appendix 1).

If the solder is damaged, solder the tube with L62 grade brass or PMTs 54 GOST 1534-42 grade lead-zinc solder.

8. Punctures and Dents in Receiver Sb26-39 (Sb26-30)
(fig. 15)

PM. Dents in the receiver are permissible if they do not hinder normal assembly and disassembly.

Weld punctures if they are smaller than 15 mm. If they are larger than 15 mm but no larger than 50 x 80 mm, seal them with a cover plate in a manner similar to the sealing of punctures in the equilibrator external cylinder (see chart 6, item "D").

50X1-HUM

After welding punctures in the receiver or after sealing punctures with cover plates, wash out the receiver and dry it.

Check the receiver for air tightness with a pressure 50X1-HUM while immersing it for 10 minutes in an anticorrosive liquid.

50X1-HUM

Chapter Thirteen [p 144]

Maintenance of Shield Assembly 50X1-HUM

1. Cracks in the Shield

Remove the paint along the suspected crack and cover the area with dry chalk; place a rag soaked in kerosene on the opposite side of the shield.

If there is a crack in the shield a dark trace visible to the naked eye will soon appear on the surface covered with chalk.

DARM. If a crack is discovered in the shield, drill holes 3-6 mm in diameter at the ends of the crack.

If the crack is longer than 50 mm, place a plate made from a discarded shield on the front of the shield. Rivet the plate in place.[1] [footnote missing]

Use a bit with hard alloy inserts to bore holes for the rivets. The length of the plate must exceed that of the crack by at least 20 mm.

If a crack no longer than 10 mm is located near the edge of the shield, remove it by cutting a notch in the edge of the shield with an emery wheel.

2. Holes in the Shield

AARM. Heat the edges of the hole with a torch or gas burner, being careful to heat as little of the area beyond the limits of the hole as possible, and straighten the edges of the hole which have been bent back.

Smooth the contours of the hole as much as possible, grinding off the flaws with an emery wheel. Bore holes at the ends of radial cracks and place a plate over the holes on the front of the shield. The plate should overlap the edges of the crack by at least 20 mm (see Chapter 13, item 1).

Use rivets with semicircular heads to seal up bullet holes in the shield.

3. Damaged Shield Assembly Mounts (fig. 17) [p 145]

Causes of malfunction:

a) Broken or bent tubes (27-17) of the shield brackets and 27-168 and 27-18 of the shield braces. 50X1-HUM

PM. Disconnect the shield bracket or brace having the damaged tube from the gun and straighten the bent tube.

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If the tube is broken or bent beyond repair, send the cannon to a higher maintenance shop.

DARM. Cut off the rough ends of the parts of the broken tube and join the parts together with an insert (sketch 75).

If tube 27-168 is broken at the place where it connects to ear 27-28 or if tube 27-17 is broken at the place where it connects to ear 27-19 or to brackets 27-13 and 27-14 on a gun of initial issue, remove the piece of tube remaining in the ear and join the ear or the bracket with the tube by installing an insert (sketch 76).

If part of a tube is bent beyond repair, remove that part and join the two halves of the tube with an insert.

Weld on the insert with an E42 electrode while mounting the shield on the cannon, ensuring normal bracing of the shield. In doing this the tubes may be bent.

b) Weakened attachment of right bracket 27-13 to the upper carriage by bolts 27-122 resulting from bending of bolt 17-89 (on a gun of initial issue).

PM. If bolt 17-89 is bent, cut it off, make a new bolt (appendix 1, sketch 233), and weld it to the upper carriage with an E50A electrode (sketch 77).

Weld the bolt to the right bracket (Sb27-7) while mounting the shield assembly.

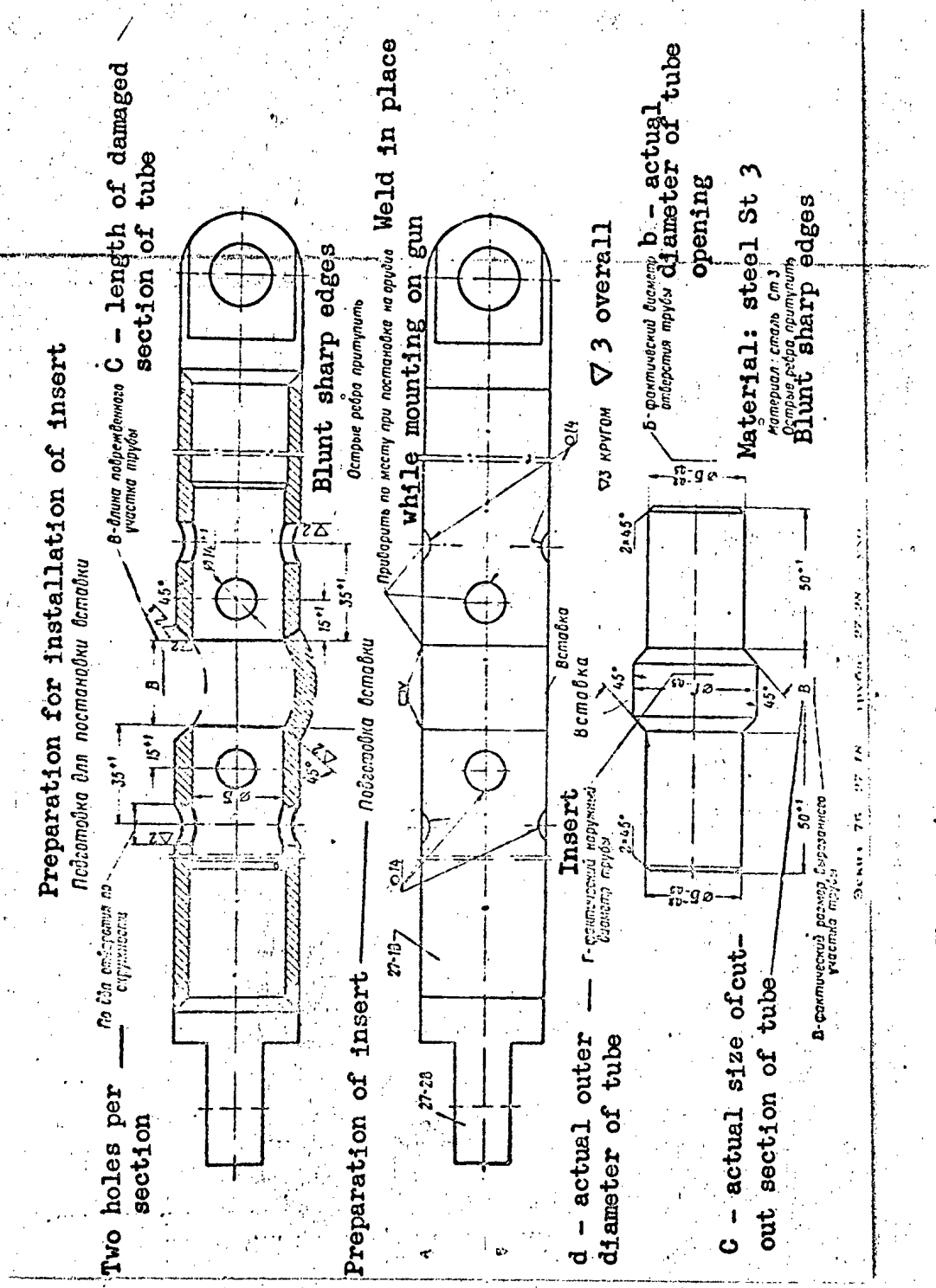
c) Wear of the holes in bases 27-131, 27-135, and 17-84, in the ear (27-19) of the bracket, in the right and left brackets (27-180 and 27-181), and in ear 27-28 of the brace at the junction with pin 27-124.

Measure the diameters of the holes in the base and ear and the diameter of the pin. The difference between the diameters in each junction should be no greater than 1 mm.

DARM. If the difference between the diameters is greater than 1 mm, eliminate the oval shape of the holes in the base and ear by removing a minimum layer of metal and replace the pin (appendix 1, sketch 273).

The diameter of the holes in the base and ear may be increased up to 23 mm.

50X1-HUM



Sketch 75. 27-18 -- tube; 27-28 -- ear

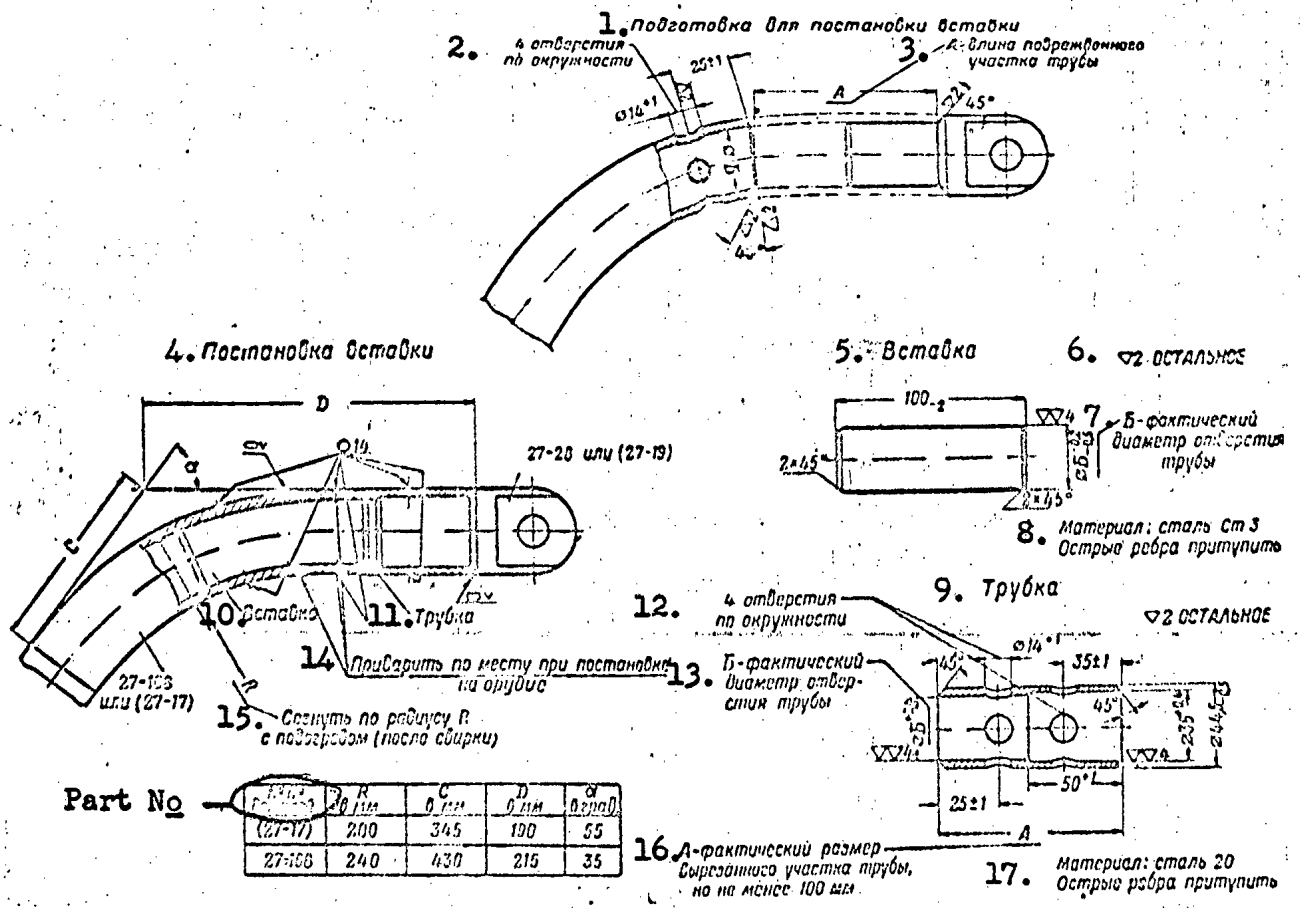
4. Aperture Covers Sb27-3 and Sb27-41 of the Shield Are Not Held in a Fixed Position by Latch 27-4

(fig. 17) 50X1-HUM

When closed, the latch should hold the aperture cover in a fixed position. There should be no looseness in the cover.

Causes of malfunction: [text missing]

[p 147]



Part No	R, не менее	C, не менее	D, не менее	α, град
(27-17)	200	345	190	55
27-168	240	430	215	35

Sketch 76. (27-17)--tube; (27-19)--ear; 27-168--tube

1. Preparation for installation of insert
2. 4 holes per section
3. A - length of damaged section of tube
4. Installation of insert
5. Insert
6. ▽ 2 for the remainder

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(continued)

7. B - actual diameter of tube opening

8. Material: steel St.3
Blunt sharp edges

9. Tube

10. Insert

11. Tube

12. 4 holes per section

13. B - actual diameter of tube opening

14. Weld in place while mounting on gun

50X1-HUM

15. Heat and bend along radius R (after welding)

16. A - actual size of cut-out section of tube, but no less than 100 mm.

17. Material: steel 20
Blunt sharp edges

DARM Remove pin 27-6 and take off the latch. Build up the bearing surface of the latch [text missing]

Make latch pin 27-6 (appendix 1, sketch 272), insert it in the aperture cover, clinch it, and trim it flush with the surface of the aperture cover. Put the latch and washer on the pin and clinch the other end of the pin so that the latch turns freely. [p 149]

Fit the bearing surface of the latch so that there is no looseness in the aperture cover.

Latches on guns of initial issue have a shorter stem -- B = 31 - 33 mm (see sketch 79). In this case, lengthen the stem of the latch by fusing on metal (see Chapter 13, item 4, b).

b) Unreliable locking of aperture covers of the shield by latch 27-4 (on guns of initial issue).

PM. Remove latch pin 27-6 and take off the latch.

Measure the length of B (sketch 79). If length B is 31-33 mm, lengthen the stem by fusing on metal with an E42 electrode and machine (see sketch 79).

Make latch pin 27-6 (appendix 1, sketch 272), insert it in the aperture cover, clinch it, and trim it flush with the surface of the cover. Put the latch and washer on the pin and clinch the other end of the pin so that the latch turns freely.

Fit the bearing surface of the latch so that there is no looseness in the aperture cover.

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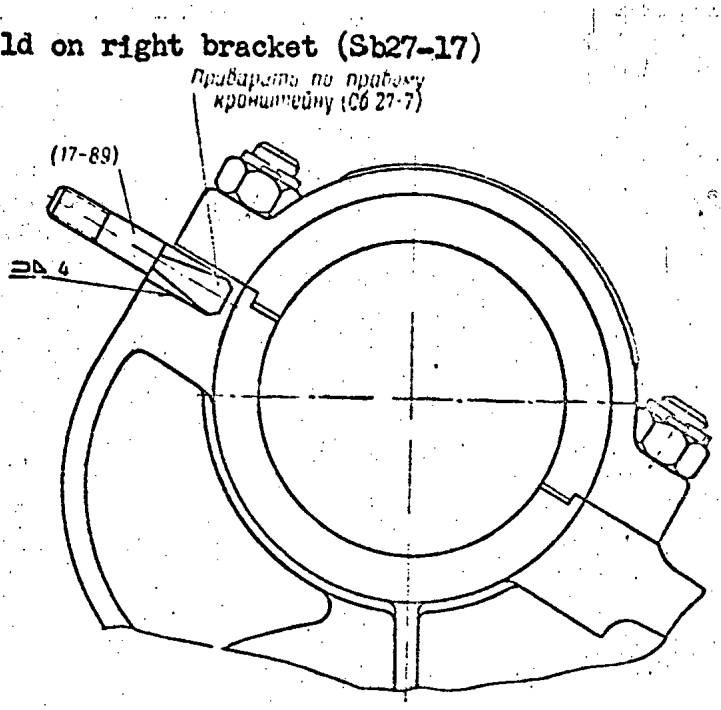
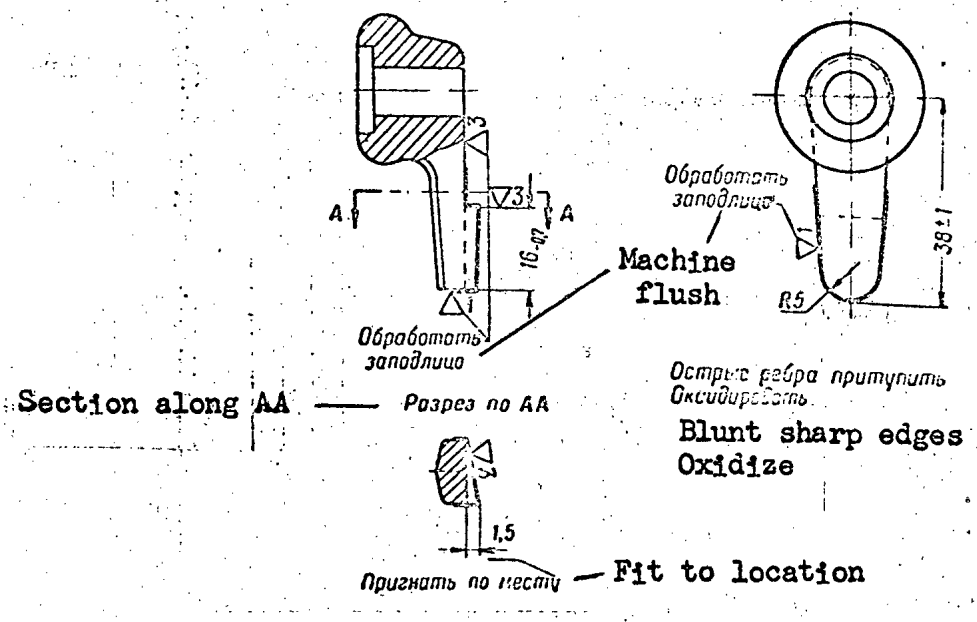


Sketch 77. Upper Carriage: (17-89) -- bolt



Sketch 78. 27-4 -- latch

Chapter Fourteen [p 150]

Maintenance of Sighting Devices

50X1-HUM

1. Preparing the Gun for Testing Sighting Devices

Place the gun in combat position (with trails spread and winter spades sunk into the ground) on a perfectly level surface.

Note: If it is not possible to sink winter spades into the ground, place wooden blocks 170 mm high under the wheels.

The aiming mechanisms (elevating and traversing) should be tested. When they are in operation there should be no jerking, jamming, or stiff movement.

The clinometer plane should be free of scratches and carefully rubbed down.

2. Instructions on Leveling the Barrel

Level the barrel in the following manner:

-- place the gunner's quadrant on the clinometer plane parallel to the axis of the bore and level the bubble by operating the gun elevating mechanism;

-- place the gunner's quadrant on the clinometer plane in a lateral direction (along the lateral lines) and level the bubble by raising the appropriate trail on its jack and by operating the gun traversing mechanism.

After leveling, the rear parts of the trails should rest on the ground. When necessary, place a wooden wedge under the spade of one of the trails.

A. Panoramic Sight S-71

(fig. 18)

After repairing the sight, check the operation of mechanisms and malfunctions marked with an asterisk (*)... [text missing]

1. Checking the Sight Fastening and Mounting on the Gun [p 151]

PM. Check the stability of fastening of yoke with trunnion Sb12-1 or trunnion (12-1) in cradle trunnion by bolts 12-8. Instability of the yoke with the trunnion or sight trunnion in the cradle trunnion is not permissible. 50X1-HUM

Check mounting of the sight on the cannon in the following manner:

-- place the gunner's quadrant on the clinometer plane of yoke Sb12-1 or fork (12-7) and level the bubble by operating the gun elevating mechanism;

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-- place the quadrant on the clinometer plane along the longitudinal lines and determine the angle of elevation or declination, which will also be the angle of inclination of the sight yoke. An angle of inclination of the yoke of no more than 10 mils is permissible.

When the yoke angle of inclination is more than 10 mils, loosen the four bolts 12-8. By turning the yoke with trunnion Sb12-1 or sight trunnion (12-1) on its axis, set the fork horizontally with an accuracy of ± 2 mils (when the barrel is in a horizontal position). Then fasten the yoke with trunnion Sb12-1 or trunnion (12-1) with bolts 12-8.

2. Vertical Play of Extension Sb41-37 or of Panoramic Sight in the Panoramic Sight Socket*

Set the extension (panoramic sight) in the panoramic sight socket but do not clamp the extension (panoramic sight) with clamping screw A52152-2.

Holding the sight by the panoramic sight socket with one hand and with the other hand pushing the extension socket (panoramic sight) up and down, check whether there is play of the extension (panoramic sight) in the socket. Play is not permissible.

Cause of the malfunction: spring 12-66 is broken or fatigued.

Turn the wing knob in a clockwise direction and release it. The spring should quickly return the wing knob to its initial position and tightly hold the extension (panoramic sight) in the socket cone.

PM. If the spring does not return the wing knob to its initial position, replace it with one made at DARM (chart 3).

3. Horizontal Play of Extension Sb41-37 or of Panoramic Sight in the Panoramic Sight Socket*

Set the extension (panoramic sight) in the socket and tighten clamping screw A52152-2 as far as possible.

Holding the sight with one hand and with the other hand turning the extension socket, check whether there is play of the ext50X1-HUM (panoramic sight) in the socket.

Play is not permissible.

Cause of the malfunction: burrs on the end of clamping screw A52152-2. [text missing] 50X1-HUM

4. Vertical Play of Panoramic Sight in Extension Sb41-37 Socket* [p 152]

Set the extension in the panoramic sight socket and tighten clamping screw A52152-2 as far as possible. Then set the panoramic sight in the extension socket but do not tighten clamping screw 41-109.

Holding the extension socket with one hand and with the other hand pushing the panoramic sight up and down, check whether there is play of the panoramic sight in the socket. Play is not permissible.

Cause of the malfunction:

a) Friction of screw 41-108 shank in the groove in panoramic sight clamp 41-103.

PM. By turning the clamp in a clockwise direction and by simultaneously turning screw 41-108 in either direction, check whether the clamp will freely return to its initial position.

Adjust the screw so that the clamp will return to its initial position.

b) Spring 41-104 is broken or fatigued.

Turn panoramic sight clamp 41-103 in a clockwise direction as far as possible and release it. The spring should quickly return the clamp to its initial position and tightly clamp the panoramic sight in the cone of the extension socket.

PM. If the spring does not return the clamp to its initial position, replace it with one made at DARM (chart 3).

5. Horizontal Play of Panoramic Sight in Extension Socket Sb41-37*

Set the extension in the panoramic sight socket and tighten clamping screw A52152-2 as far as possible.

Then set the panoramic sight in the extension socket and tighten clamping screw 41-109 as far as possible. Holding the extension socket in one hand and turning the panoramic sight to the right and to the left with the other hand, check whether there is play of the panoramic sight in the socket. Play is not permissible. 50X1-HUM

Cause of malfunction: clamping screw 41-109 and screw A51063-11 have not been adjusted.

PM. Adjust the screws so that there is no play of the par 50X1-HUM sight in the socket.

6. Range Drum Index 12-128 Does Not Hold in a Fixed Position on Guide 12-125*

By moving the index along the guide, check whether it is held by clamp 12-126 in the guide stops. The index should hold.

Cause of the malfunction: spring 12-127 is broken or fatigued.

PM. If the index 12-128 is not held by the clamp in the guide stops, replace the spring (chart 3).

7. Stiff Operation of Quadrant Angle of Site Mechanism* [p 153]

Check the mechanism in operation. The mechanism should work smoothly, without jamming.

Causes of the malfunction:

a) Bolt 12-44 is excessively tightened.

PM. Unscrew screw A51063-3 two or three turns and by unscrewing bolt 12-44, adjust the operation of the mechanism. Make sure there is no axial movement of gear segment Sb12-7. After adjusting, lock the bolt with screw A51063-3.

b) Jamming in the junction of worm 12-57 and segment Sb12-7 as a result of a break in the worm.

Try moving the mechanism. There will be jamming where the worm is broken.

PM. Replace the faulty worm.

8. Stiff Operation of the Cross-Leveling Mechanism*

Check the mechanism in operation. The mechanism should work smoothly, without jamming.

Causes of the malfunction:

a) Bushings 12-10 in fork 12-5 lugs or fork with bracket (12-7) and bushings in the lugs of sight box Sb12-1 are excessively t 50X1-HUM

PM. Unscrew nuts A51010-3 one or two turns. Regulate the operation of the mechanism by loosening bolts 12-11. Make sure that horizontal or vertical play in the sight does not return (see chapter 14, section A, item 11, 12). 50X1-HUM

After adjusting, tighten nuts A51010-3 as tight as possible.

b) Bar with lug 12-20 is bent.

Dismantle the cross-leveling mechanism and check with a straightedge whether the bar with lug is bent.

PM. When there is a bend, straighten the bar with lug without heating.

c) Scratches on threads of adjusting screw Sb12-3.

PM. Remove the scratches on the threads, taking off only the raised metal.

9. Difficulty Using Levels*

Cause of the malfunction: insufficient sensitivity of the level bubbles.

Watch the movement of the bubbles while slowly turning knob 12-49 of the quadrant angle of site mechanism and handle 12-15 of the cross-leveling mechanism.

The bubbles should move smoothly, without hesitating.

PM. If the bubbles do not move smoothly, replace the vial and cover...[text missing]

10. Checking the Value of Graduation on the Longitudinal and Transverse Levels* [p 154]

The value of graduation on regulation levels is usually 3 minutes. The value of graduation on the level is the size of the angle to which it is necessary to incline the vial so that the leveling bubble moves 2 mm; the 2 mm correspondends to one small graduation on the vial, that is, the distance between adjacent long and short lines.

Check the value of graduation of the level in the following manner:

1. The longitudinal level.

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-- level the bubble by turning the sight elevating knob in the direction of increasing angles (to the right) and note the setting on

mil scale 12-110;

-- by turning the sight elevating knob in the same direction, move the bubble up to a short line (middle line) on the vial (move the bubble one small graduation) and note the setting on mil scale 12-110. The difference between the first and second scale settings will be the value of graduation of the level.

PM. If the value of graduation is more than 1 mil (3.6'), replace the vial and cover Sb12-10 (appendix 1).

2. The transverse level.

-- level the bubble by operating the cross-leveling mechanism;

-- set the quadrant in the socket groove in a lateral direction and by turning the quadrant knob, level the quadrant bubble and note the setting;

-- by operating the cross-leveling mechanism, move the transverse bubble to a short (middle) line on the vial (to one small graduation mark);

-- level the quadrant level by turning the quadrant knob and note the setting.

The difference between the first and second settings on the quadrant will be the value of graduation of the level.

PM. If the value of graduation is more than 1 mil (3.6'), replace vial and cover (Sb12-10) (appendix 1).

11. Excessive Non-Recoverable Longitudinal Play in the Sight*

Determine non-recoverable longitudinal play in the sight in the following manner:

-- level the longitudinal level (by means of the sight mechanisms);

-- push the panoramic sight socket with one hand away from yourself (forward) with a force of 7 - 8 kg. After doing this, release the socket and note the position of the longitudinal bubble in relation to the lines on the vial;

-- pull the panoramic sight socket towards yourself (rearwards) with a force of 7 - 8 kg. After doing this, release the socket and note the position of the longitudinal bubble in relation to the lines on the vial.

Total non-recoverable play in either direction should not exceed 1 mil. [p. 155]

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Read the amount of play in the sight according to the lines on the level vial.

Causes of the malfunction:

a) Bushings 12-10 in lugs of fork 12-5 or fork with bracket (12-7) and bushings in the lugs of sight box Sb12-1 are loosely tightened.

PM. Unscrew nuts A51010-3 one or two turns. Having tightened bolts 12-11, adjust bushings 12-10 so that there is no stiff operation in the cross-leveling mechanism.

After adjusting, tighten nuts A51010-3 as far as possible.

b) Spring 12-38 has not been inserted.

PM. Insert the spring.

c) A break or fatigue in spring 12-38 or spring 12-94.

PM. If the springs are broken, replace them with ones made at DARM (chart 3).

If the springs are not broken, measure the height of spring 12-94 in a free state. If the height of the spring is less than 57 mm, replace it. After replacing, check the non-recoverable longitudinal play in the sight again.

If after replacing spring 12-94 the amount of play in the sight is more than 1 mil, replace spring 12-38.

12. Excessive Non-Recoverable Lateral Play in the Sight*

Determine the non-recoverable lateral play in the sight in the following manner:

-- by turning handle 12-15 of the cross-leveling mechanism, level the transverse bubble;

-- push the panoramic sight socket to the right with one hand with a force of 7 - 8 kg. After this, release the panoramic sight socket and note the position of the transverse level bubble in relation to the lines on the vial;

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-- push the panoramic sight socket to the left with one hand with a force of 7 - 8 kg. After this, release the socket and again note the position of the transverse level bubble in relation to the lines on the vial.

50X1-HUM

Total non-recoverable play to either aide should not exceed 2 mils.

Read the amount of play in the sight according to the lines on the level vial.

Causes of the malfuction:

a) Bolt 12-82 is weakly tightened.

PM. Take out the retaining pin and tighten nut 12-83 two or three turns. Screw bolt 12-82 as tight as possible in the end of eccentric pin 12-4 and check the rotation of the rotatable part of the sight. The rotation should be smooth. A gap of no more than 0.05 mm between the inner end of bolt head 12-82 and the end of the worm wheel is permissible.

Screw the nut onto the bolt as far as possible and lock it with a retaining pin. If the aperture in the bolt for the retaining pin does not coincide with the hole in the nut, cut off the end of the nut. [p 156]

If the gap between the end of bolt 12-82, which has been screwed on as far as possible, and the end of the worm wheel is more than 0.05 mm, file the end of eccentric pin 12-4.

b) Bushings 12-10 in the lugs of fork 12-5 or the fork with bracket (12-7) and bushings in the lugs of sight box Sb12-1 are loosely tightened.

See chapter 14, section A, item 11, "a".

PM. When the spring is broken or when the height of the spring in a free state is less than 30.7 mm, replace the spring with one made at DARM (chart 3).

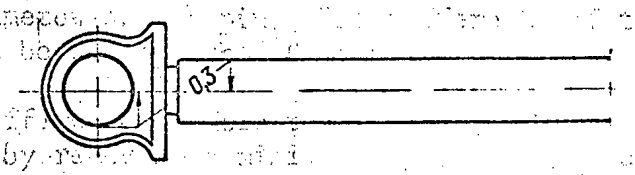
d) Wear in the junction of pin 12-25 and the apertures in bar 12-20 and fork bracket 12-7 or arm (12-8).

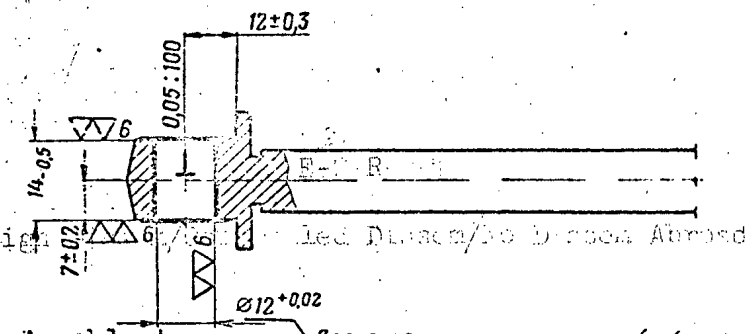
Measure the diameter of the bar lug and the eye of the fork bracket, or the arm, and the diameter of the pin. The difference of the diameters in each junction should be no more than 0.1 mm.

DARM. When the difference is more than 0.1 mm, eliminate the oval shape in the apertures by removing a minimum layer of metal and the pin (appendix 1, sketch 229).

50X1-HUM

If the diameter of the aperatures in the bar lug and the eye of the fork bracket or arm is more than 13 mm, weld the apertures with an E50A electrode and machine them (sketches 80, 81, and 82). [p 157] 50X1-HUM





It is permissable to machine finish the aperture together with fork with trunnion Sb12-1 or arm (12-8)

Допускается окончательная обработка отверстия совместно с вилкой с цапфой Сб 12-1 или с рычагом (12-8)

Острые ребра притупить
Smooth sharp edges

Sketch 80. 12-20--bar with lug.

13. Increased Non-Recoverable Play in the Angle of Site Mechanism

To determine non-recoverable play in the angle of site mechanism it is necessary to:

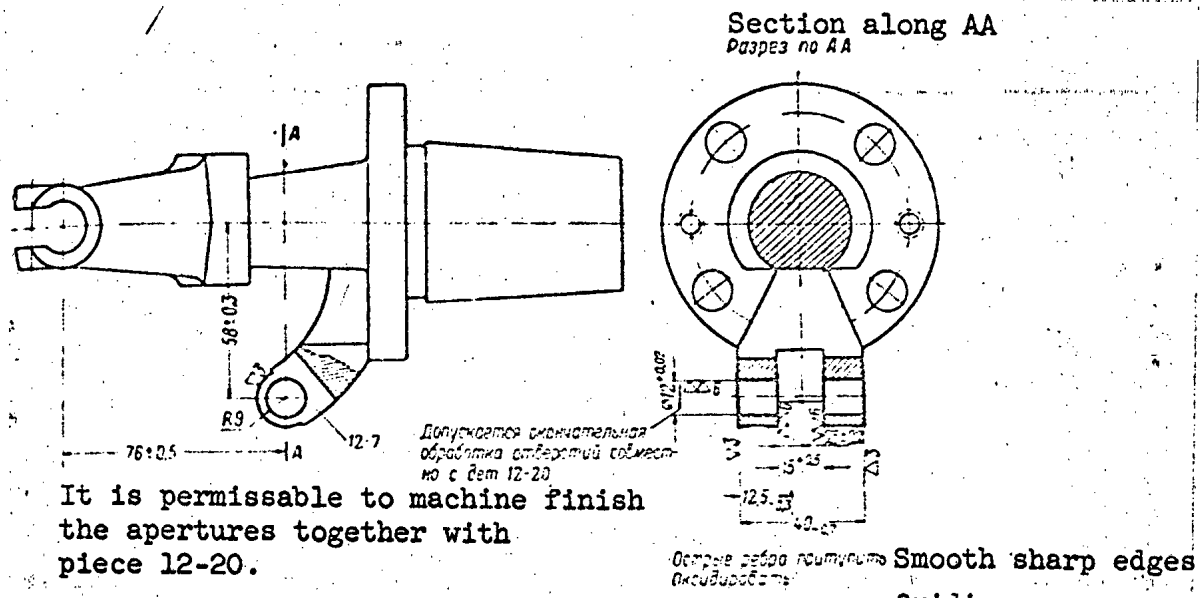
-- level the bubble in the longitudinal level... [text missing]

-- by exerting hand pressure on the lugs of segment base 12-39 of the longitudinal level, turn it in either direction as far as possible. Then release the segment base and note the position of the bubble in the longitudinal level in relation to the lines on the vial; [p 158]

-- apply the same amount of pressure and turn segment base 12-39 in the opposite direction as far as possible. Then release the segment base and note the position of the bubble in the longitudinal level in relation to the lines on the vial.

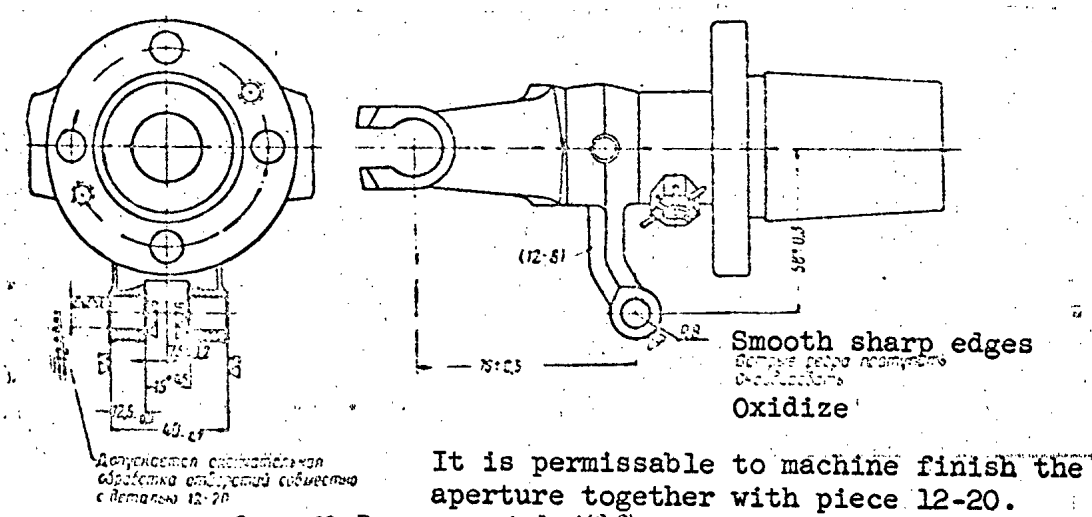
Total non-recoverable play to either side should not exceed 1 mil.

Read the amount of play in the angle of site mechanism according to the lines on the level vial. 50X1-HUM



Эскиз 81. *Сб12-1* — вилка с цапфой; *12-7* — кронштейн

Sketch 81. Sb12-1 -- fork with trunnion; 12-7 -- bracket



Эскиз 82. Вилка с цапфой: *(12-8)* — рычаг

Sketch 82. Fork with trunnion; (12-8) -- arm

Causes of the malfunction:

a) Spring 12-43 has not been inserted.

50X1-HUM

PM. /Insert the spring.

b) A break or fatigue in spring 12-55 or spring 12-43.

PM. If the springs are broken, replace them with ones made at DARM (chart 3).

If the springs are not broken, measure the height of spring 12-55 in a free state. If the height of the spring is less than 13 mm, replace it. Then check for non-recoverable play in the angle of site mechanism.

If the non-recoverable play exceeds 1 mil, replace spring 12-43.

14. Checking and Correcting Zero Settings of the Sight

PM. Check the zero settings of the sight in the following order:

-- bring the barrel into a horizontal position in the longitudinal and transverse directions; (see chapter 13, item 2)

-- place the gunner's quadrant on the panoramic socket plane parallel to the transverse level, and by turning cross-leveling handle 12-15, level the bubble in the gunner's quadrant;

-- turn the gunner's quadrant 90° on the panoramic socket plane and, by turning the sight elevating knob, level the bubble in the gunner's quadrant;

-- level the bubble in the longitudinal level by turning the angle of site elevating knob 12-49.

With the sight set as instructed:

-- the cross-leveling bubble should be centered;

-- there should be a zero setting on the mil scales of the sight elevating mechanism and on the range drum scale;

-- on the angle of site mil scales there should be... [text missing]

If the cross-leveling bubble does not center, adjust the position [p 159]
of vial housing Sb12-10 in the eyes of level bracket 12-70 by adjustin50X1-HUM
screws 12-76 so that the bubble levels.

For access to the adjusting screws, unscrew left plug 12-77 (when looking at the sight in the direction of firing). After adjusting, put the plug back in place.

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If the zero graduation on the coarse angle of site scale does not coincide with the line on index 12-133, unscrew the screws which fasten the coarse scale to base 12-26 of the panoramic sight socket one or two turns and move the scale so that the zero graduation is opposite the line on the index. Then fasten the scale with the screws.

If the zero graduation on the angle of site mil scale does not coincide with the line on the index, unscrew screws A51062-7 on the plane surface of the sight elevating knob one or two turns and turn ring 12-110 so that the zero graduation on its scale is opposite the line on the index. Then fasten the ring with the screws.

If the zero graduations on the range drum scales do not coincide with the line on index 12-128, unscrew screws 12-121 one or two turns and turn the range drum so that the zero graduation on its scales is opposite the line on index 12-128. Then fasten the range drum with screws 12-121.

If graduation "30" on the coarse angle of site scale does not coincide with the line on index 12-61, unscrew screws A51061-2 which fasten the coarse scale to segment Sb12-7 one or two turns, and move the scale so that graduation "30" is opposite the line on the index. Then fasten the scale with screws A51061-2.

If the zero graduation on the angle of site mil scale does not coincide with the line on clamp 12-47, unscrew screw 12-54 one or two turns and turn mil ring 12-53 so that the zero graduation on its scale is opposite the line on the clamp. Then fasten the mil ring with screw 12-54.

15. Maladjusted Longitudinal Level*

Check for maladjustment of the longitudinal level after correcting the zero point of sight (see chapter 14, section A, item 14) as follows:

-- bring the barrel into a horizontal position in the longitudinal and transverse directions (see chapter 14, item 2);

-- by turning the angle of site knob 12-49, level the longitudinal bubble;

-- by turning handle 12-15 of the cross-leveling mechanism, incline the sight as far to the right as possible, and then to the left, the longitudinal bubble [text missing]

50X1-HUM

Cause of the malfunction: [p 160]

a) The position of vial housing Sb12-10 in the eye of segment base 12-39 is out of admustment. 50X1-HUM

PM. Unscrew the left plug (when looking at the sight from the side of the coarse angle of site scale). By turning adjusting screws 12-76 (horizontally situated), adjust the position of vial housing Sb12-10 and place the plug back in place.

After eliminating the maladjustment of the level, check the zero point of sight.

b) Yoke with trunnion Sb12-1 or fork (12-7) with bracket is bent or the fork is incorrectly mounted in the cradle trunnion.

If adjusting the position of the vial housing (see above item 15, "a") does not eliminate maladjustment of the level, then the cause of the malfunction might be a bend in the yoke with trunnion or the fork with bracket.

PM. Adjust the position of the yoke with trunnion or the fork with bracket by tightening the corresponding bolts 12-8 which fasten the sight to the cradle.

If maladjustment of the level is not eliminated by the adjustments indicated, replace the yoke with trunnion or fork with bracket with a new yoke with trunnion Sb12-1 (appendix 1).

After installing a new yoke with trunnion Sb12-1, check the zero settings of the sight and adjustment of the level.

16. Maladjusted Transverse Level

Check for maladjustment of the transverse level after correcting the zero point of sight (see chapter 14, section A, item 14) in the following order:

-- bring the barrel into a horizontal position in the longitudinal and transverse directions;

-- by turning cross-leveling handle 12-15, level the transverse bubble;

-- while turning sight elevating knob to the setting 5-00, watch the position of transverse bubble. The bubble should not go beyond the terminal lines on the vial. 50X1-HUM

Cause of the malfunction: the position of vial housing Sb12-10 in the lugs of level bracket 12-70 is out of adjustment.

50X1-HUM

PM. Unscrew left plug 12-77 (when looking at the sight in the direction of firing). By turning adjusting screws 12-76 (horizontally situated), adjust the position of vial housing Sb12-10 and put plug back in place. After eliminating [text missing]

17. Maladjusted Transverse Level With Tipping Parts of Gun (Barrel) At Various Angles of Elevation [p 161]

Check for maladjustment of the transverse level after correcting the zero point of sight (see chapter 14, section A, item 14) in the following order:

-- bring the barrel into a horizontal position in the longitudinal and transverse directions (see chapter 14, item 2);

-- establish a zero sight setting;

-- by operating the gun elevating mechanism, elevate the barrel to 5-00 and check the position of the bubble in the transverse level.

The transverse bubble should not go beyond the outer lines on the vial.

Causes of the malfunction:

a) The pin of the yoke with trunnion Sb12-1 or the fork with bracket (12-7) is not parallel to the cradle trunnion pin.

PM. Adjust the position of the yoke with trunnion Sb12-1 or fork with bracket (12-7) by tightening the corresponding bolts 12-8 (horizontally situated) which fasten the sight to the cradle.

If maladjustment of the bubble is not eliminated by the above adjustment, send the gun to a higher maintenance shop.

AARM. Grind the body of the yoke with trunnion Sb12-1 or trunnion (12-1). It is permissible to scrape the conical aperture in the cradle trunnion. After grinding and scraping, there should remain a clearance of no less than 1 mm between the flange of yoke with trunnion Sb12-1 or trunnion (12-1) and the end of the cradle trunnion.

b) Bushings 12-10 are weakly tightened in the eyes of fork 12-5 or fork with bracket (12-7).

50X1-HUM

See chapter 14, section A, item 11, "a".

18. The Readings on the Angle of Sight Scale Conflict With the True Angle of Barrel Elevation

50X1-HUM

Make a check after correcting the zero point of sight (see chapter 14, section A, item 14) in the following order:

-- bring the barrel into a horizontal position in the longitudinal and transverse directions (see chapter 14, item 2);

-- establish zero sight settings (angle of elevation 0-00, angle of site 30-00, transverse and longitudinal bubbles leveled). With an angle of elevation setting at 0-00, turn the sight elevating knob in the direction of increasing angles (to the right);

-- establish a setting of 1-00 on the angle of elevation mil scale by turning the sight elevating knob in the direction of increasing angles;

-- by turning the gun elevating wheel, level the bubble in the longitudinal level;

-- determine the true angle of barrel elevation according to a quadrant placed on the clinometer plane along a longitudinal line; [p 162]

-- make the same kind of check with settings of 2-00, 3-00, 4-00, 5-00, 6-00, 7-00, and 7-50 on the angle of elevation mil scale by turning the sight elevating knob in the direction of increasing angles only (to the right) and in a reverse sequence at settings of 7-50 to 0-00 (at the intervals indicated above) by turning the sight elevating knob in the direction of decreasing angles only (to the left).

While making the prescribed check at all angles of elevation, watch the transverse bubble to see that it does not go beyond the outer lines on the vial.

Conflicting quadrant readings and angle of elevation mil scale readings of no more than 0-02 at sight settings up to 3-50 and no more than 0-03 at sight settings larger than 3-50 are permissible.

Cause of the malfunction: play in the angle of elevation mechanism.

Check for play in the following order:

-- by turning the sight elevating knob in one direction, level the longitudinal bubble and read the setting on the angle of elevation mil scale;

50X1-HUM

-- by turning the knob in the same direction, change the setting on the angle of elevation mil scale to 40 - 50 mils;

-- by turning the knob in the opposite direction, level the longitudinal bubble again and read the setting on the angle of elevation mil scale. 50X1-HUM

The difference between the first and second readings will be the amount of play in the angle of elevation mechanism.

Measure the amount of play two or three times and take the arithmetic average of the readings as the amount of play.

Play in the angle of elevation mechanism of no more than 0-01 is permissible.

Play in the angle of elevation mechanism of more than 0-01 is permissible if the readings on the angle of elevation mil scale and the true angle of barrel elevation do not exceed the amounts indicated above and if dislodging of the settings on the angle of elevation scale during firing of the gun does not exceed 0-01.

Reasons for free play:

a) Spring 12-38 is not inserted.

PM. Insert the spring.

b) A break or fatigue in spring 12-38 or spring 12-94.

PM. If the springs are broken, replace them with ones made at DARM (chart 3).

If the springs are not broken, measure the height of spring 12-94 in a free state. If the height of the spring is less than 57 mm, replace it. After replacing, check for play in the angle of elevation mechanism. [p 163]

If the play exceeds 0-01, replace spring 12-38.

19. Readings on Angle of Site Scale Conflict With The True Angle of Barrel Elevation

Make the check after correcting the zero point of sight setting (see chapter 14, section A, item 14) in the following order:

-- set the barrel horizontally, according to the gunner's quadrant in the longitudinal and transverse directions (see chapter 14, i 50X1-HUM

-- set the value 28-00 on the angle of site scales by turning knob 12-49 in the direction of increasing angles (to the right);

50X1-HUM

-- by turning the sight elevating knob, level the longitudinal bubble;

-- by turning handle 12-15 of the cross-leveling mechanism, level the transverse bubble;

-- set the value 29-00 on the angle of site mil scale by turning knob 12-49 of the angle of site mechanism in the direction of increasing angles (to the right);

-- level the longitudinal bubble by turning the gun elevating wheel;

-- determine the true angle of barrel elevation according to the quadrant placed on the clinometer plane along the horizontal line;

-- make the same check at each 100 mils up to 34-00 on the angle of site mil scale by turning the angle of site knob only in the direction of increasing angles (to the right) and in a reverse sequence from 34-00 to 28-00 at each 100 mils by turning the angle of site knob in the direction of decreasing angles (to the left).

While making the check as indicated at all angles of elevation, watch the bubble in the transverse level to see that it remains within the outer lines on the bubble vial.

A conflict of quadrant readings and readings on the angle of site mil scale with regard to a correction of the initial angle of site setting of no more than 0-02 is permissible.

Cause of the malfunction: play in the angle of site mechanism.*

Check for play in the following order:

-- by turning knob 12-49 in one direction, level the longitudinal bubble and read the setting on the angle of site scale;

-- by turning knob 12-49 in the same direction, change the setting on the angle of site scales 40 - 50 mils [text missing]

-- by turning knob 12-49 in the opposite direction, level the longitudinal bubble again and read the setting on the angle of site scales. [p 164]

50X1-HUM

The difference between the first and second settings will be the amount of play in the angle of site mechanism.

Measure the play two or three times and take the arithmetic average of the values as the amount of play.

50X1-HUM

Play in the angle of site mechanism of no more than 0-01 is permissible.

Play in the angle of site mechanism of more than 0-01 is permissible if the difference between the readings on the angle of site mil scale and the true angle of barrel elevation does not exceed 0-02 and if dislodging of the angle of site scale settings during test firing of the cannon does not exceed 0-01.

Causes of free play:

a) Spring 12-43 is not inserted.

PM. Insert the spring.

b) Spring 12-55 or spring 12-43 is broken or fatigued.

PM. If the springs are broken, replace them with ones made at DARM (chart 3).

If the springs are not broken, measure the height of spring 12-55 in a free state. If the height of the spring is less than 13 mm, replace it. After replacing, check for play in the angle of site mechanism.

If play exceeds 0-01, replace spring 12-43.

20. A Conflict of Readings of the Range Drum Scales And the True Angle of Barrel Elevation

Make a check after correcting the zero point of sight (see chapter 13, section A, item 14) in the following order:

-- set the barrel horizontally, according to the gunner's quadrant, in the longitudinal and transverse directions (see chapter 14, item 2);

-- establish a zero sight setting (angle of elevation 0-00, the line on index 12-128 opposite the zero graduation on scales of "BR-OF polnyy" [BR-OF full] of the sight range drum on the M-46 or scales "OF polnyy" [OF full] on the sight range drum of the M-47, angle of position 30-00, bubbles in longitudinal and transverse levels centered);

-- by turning the sight elevating knob in the direction 50X1-HUM- ing angles (to the right), set the line on index 12-128 opposite graduation 20 on the range drum scales "BR-OF polnyy" or "OF polnyy";

Graduations on range drum scale "BR-OF polnyy" of sight S-71-35 (for gun M-46)	Angles of Elevation	
	In mils	In degrees and minutes
0	00	0
20	05.5	0 20.6
40	12	0 43.9
60	19.5	1 10.1
80	28	1 40
100	34	2 02.9
120	42	2 30.9
140	51.5	3 05
160	62	3 42.6
180	73.5	4 24.4
200	86.5	5 10.9
(for gun M-47)		
0	0	0
20	9	0 33
40	18.5	1 06
60	28.5	1 43
80	40	2 24
100	52.5	3 09
120	67	4 01
140	84	5 02
160	103	6 10
180	124	7 27
200	148.5	8 54

-- determine the true angle of barrel elevation according to the quadrant placed on the clinometer plane along the longitudinal line;

-- make the same check at settings of 40, 60, 80, 100, 120, 50X1-HUM [p 165]
160, 180, and 200 on range drum scales "BR-OF polnyy" or "OF-polnyy" by turning the sight elevating knob in the direction of increasing angles (to the right) and in a reverse sequence from 200 to 0 with the settings indicated above on the range drum scales "BR-OF polnyy" or "OF polnyy" by turning the sight elevating mechanism only in the direction of decreasing angles (to the left).

While making the indicated check at all the settings, watch to see that the transverse bubble stays between the outer lines on the vial.

The angle of barrel elevation (in mils and minutes) corresponding to the given graduation on the range drum scales "BR-OF polnyy" or "OF polnyy" is determined from the tables printed below.

The difference between the quadrant readings and the table angle [p 166]
of elevation values will also be the difference between the quadrant readings and the range drum scale readings.

A difference between quadrant readings and range drum scale readings of no more than 0-02 (or 7.2') is permissible.

Cause of the malfunction:

Play in Range Drum Gear*

By holding the drum by hand and turning the sight elevating knob, take up the play and note the setting on the mil scale. Then, by turning the knob in the opposite direction, take up the play and again note the mil scale setting.

The difference between the first and second readings will be the amount of play in the range drum gear.

Play in the range drum gear of more than 0-00.5 is permissible if the difference between readings on the range drum scales and the true angle of barrel elevation does not exceed 0-02 (or 7.2').

Reasons for the play:

a) Spring 12-89 is not inserted.

PM. Unscrew screws A51061-8, take off cap 12-131, and check 50X1-HUM
whether the spring has been inserted.

If the spring has not been inserted, hammer out conical pin A51042-108, screw off nut 12-90, take out the narrow half of pinnion Sb12-13, insert spring 12-89, and take up the play again. 50X1-HUM

b) Spring 12-89 is broken.

PM. Replace the spring with one made at DARM (chart 3).

21. Checking the Zero Line of Sight

Checking the zero line of sight should be done with the panoramic sight mounted on the gun.

The zero line of sight is considered correct when the optical axis of the panoramic sight, mounted on the gun after mounting has been correctly checked, is parallel to the axis of the bore and when the panoramic sight and the mounting have the following settings:

-- panoramic azimuth 30-00

-- panoramic reflector 0-00

-- angle of elevation 0-00

-- transverse bubble centered

A check of the zero line of sight can be made on an aiming point at a distance from the gun of no less than 1,000 m, or on a bore sight (appendix 13) set up in front of the gun (no closer than 40 m from the gun) in a vertical position perpendicular to the line of sighting.

PM. When checking, the following steps should be taken: [p 167]

-- place the gun in combat position[1] on perfectly level ground. When checking the gun with the bore sight, the gun should be placed horizontally in the direction of the axis of the trunnions according to the gunner's quadrant which is placed on the clinometer plane perpendicular to the axis of the bore;

-- place the panoramic sight in the panoramic sight socket and fasten it with clamping screw A52152-2;

-- fasten hairs to the graduation lines marked on the muzzle face;

-- take the striking mechanism out of the breechblock;

-- level the transverse bubble by operating the cross-leveling mechanism; 50X1-HUM

-- establish an angle of elevation mil scale setting of 0-00;

-- by operating the aiming mechanism and by sighting through 50X1-HUM
aperture in the breechblock wedge for protrusion of the striker, center the muzzle crosshairs at the aiming point or in the center of cross hairs 0 on the bore sight;

-- by turning the azimuth knob and the panoramic reflector knob, align the cross hairs (the top of the center V) of the panoramic sight with the aiming point or with the center of cross hairs π (without extension piece) on the bore sight.

In this position, the settings on the panoramic sight should read 30-00 on the azimuth scale and 0-00 on the reflector scale.

If there is a deviation of more than 0-00.5 between the azimuth and reflector settings, loosen the four screws in the azimuth ring and the lock nuts in the azimuth knob and turn the rings until an alignment of the zero graduations and the index is achieved. After this, fasten the screws and nuts.

Check the rotating head sighting device with settings of 30-00 on the panoramic azimuth and 0-00 on the reflector; the aiming point should be visible between the hairs and the slit of the sighting box.

If the aiming point is not visible between the hairs and the slit of the sighting box, turn the screws which fasten the hairs, and move both hairs so that the aiming point is visible through the view finder.

The same zero line of sight check should be made with extension Sb41-37 mounted.

Make the check in the same manner as without the extension, but with the panoramic azimuth scale set at 30-00. When checking by the bore sight, the cross hairs (top of the center V) of the panoramic sight should align with the center of cross hairs π_y (with the extension) on the bore sight.

In case the cross hairs (top of center Vs) do not align with the [p 168]
aiming point or with the center of cross hairs π_y, adjust the position of screw A51065-11 on extension to provide alignment with accuracy of 0-00.5.

50X1-HUM

[1] If it is not possible to sink winter spades into the ground, place wooden blocks 170 mm high under the wheels.

22. Axes of Bore Sighting Lines Are Not Parallel With The Tipping Parts of the Gun (Barrel) At Various Angles of Elevation[1].

50X1-HUM

Check whether the axes of the bore sighting lines are parallel when the barrel is at various angles of elevation after zero point of sight settings have been corrected (see chapter 14, section A, item 14) in the following order:

-- fasten a plumb line to the muzzle part of the barrel (appendix 14);

Note: To prevent swinging of the plumb line, it is recommended that the weight fastened to it be lowered into a container of water.

-- mount the panoramic sight in the socket and fasten it with clamping screw A52152-2;

-- bring the barrel into a horizontal position in the longitudinal and transverse directions (see chapter 14);

-- establish zero sight settings;

-- set the panoramic azimuth at 30-00;

-- while looking in the panoramic sight eyepiece and simultaneously moving the plumb line in a transverse direction, align the plumb line with the vertical line on the cross hairs (the top of the center V) and fasten the plumb line bushing with a screw;

-- set an angle of 2-00 on the sight according to the mil scale on the angle of elevation mechanism. Then level the longitudinal bubble by operating the gun elevating mechanism;

-- by turning the azimuth micrometer, sight the vertical line of the cross hairs (the top of the center V) of the panoramic sight on the plumb line and note the azimuth reading.

The difference between the first and second azimuth readings will be the amount of line of sight deviation from the axis of the bore at an angle of elevation of 2-00.

Make the same check at each 2-00 up to an angle of elevation of 7-50, repeating it two or three times at each angle of elevation reading. Take the average of all the measurements as the amount of deviation for each angle of elevation.

50X1-HUM

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[1]Make the check by the method stated with the panoramic sight mounted on gun and the zero lines of sight corrected.

A check for parallelism of the axes of bore lines of sight should also be made with extension Sb41-37 mounted. Make the check in the same manner as without the extension.

50X1-HUM

A line of sight deviation from the axis of the bore of no more than 0-03 is permissible.

Cause of the malfunction: yoke with trunnion Sb12-1 or fork (12-7) with bracket is bent.

If the line of sight deviation from the axis of the bore is more than 0-03, the reason for this might be a bend in the fork with bracket. [p 169]

PM. Adjust the position of the yoke with trunnion or the fork with bracket by tightening the corresponding bolts 12-8 which fasten the sight to the cradle.

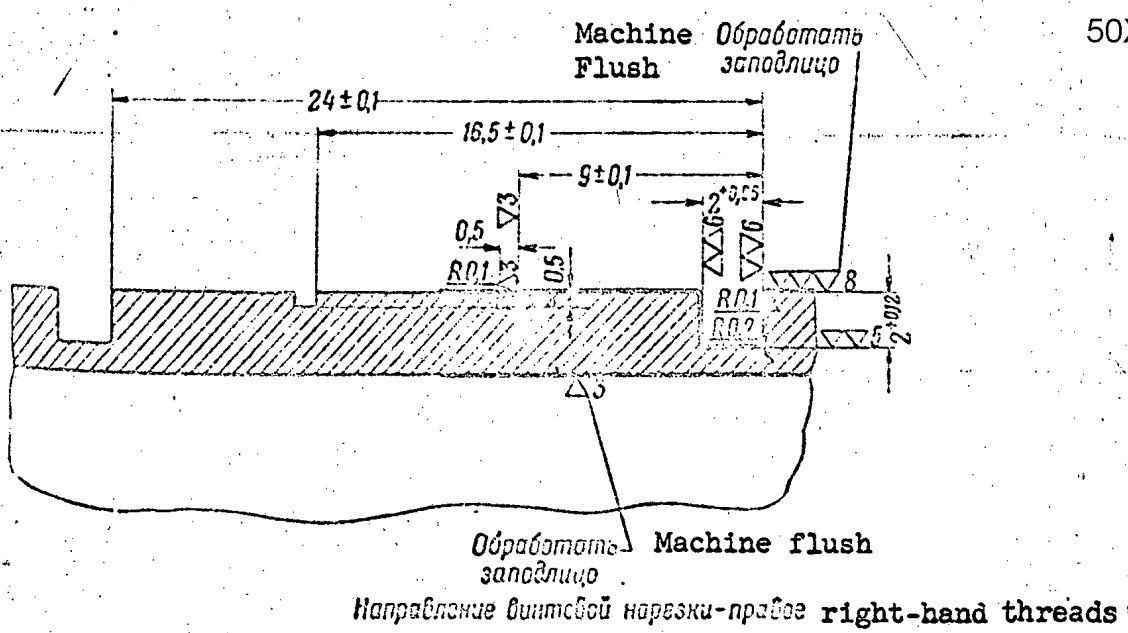
If the amount of deviation after the indicated adjustment has been made is still more than 0-03, replace the yoke with trunnion or fork with bracket with a new yoke with trunnion (appendix 1).

After installing a new yoke with trunnion Sb12-1, check for parallelism of the axis of the bore line of sight, and, if the amount of deviation is more than 0-03, send the gun to a stationary repair organ for repair.

23. Nicks, Dents, and Holes in Range Drum 12-119

PM. Nicks and dents on the range drum are permissible in sections of no more than three graduation marks in a row if, after trimming off the upraised metal at the damaged places, it is possible to set the index at any specific graduation mark in the damaged area.

50X1-HUM



Sketch 83. 12-119 -- range drum

Tin the damaged areas with POSS-4-6 solder.

If nicks and dents cover a larger area or if there are holes up to 15 mm, send the sight or the cannon to a higher maintenance shop.

If there are nicks, dents, or holes lager than those indicated, replace the range drum (appendix 1).

AARM. When nicks and dents cover more than three graduation marks in a row, and when holes measure up to 15 mm, weld them with an E42 electrode and machine. [p 170]

Make graduation marks on the newly welded areas according to the scales on a good drum from another sight.

Measurements for machining the screw grooves on the drum are given in sketch 83.

B. Optical Sight OP-2

1. Checking the Sight Setting on the Gun

(fig. 18)

50X1-HUM

For checking the sight setting it is necessary first to install a graticule on the sight in a zero position. Install the graticule in an optical shop in the following order:

50X1-HUM

-- place wide angle collimator PZ[a] in front of the objective lens of the sight, which has been fastened to a support, so that the image of the zero line of the collimator graticule scale is in the center of the sight field of vision;

-- by turning the sight knob and the nut of the range calibration mechanism, align the top of the center V of the sight graticule with the image of the scale line situated 1° higher than the zero scale line of the collimator graticule. Non-alignment of no more than 20' is permissible;

-- by turning the nut of the height of image adjustment mechanism, align the horizontal hair with the zero lines of the sight graticule range scales.

Check the setting of sight OP-2 in the following order:

-- place the gun in combat position[1] on a perfectly level surface and set the barrel in a horizontal position in a transverse direction according to the gunner's quadrant placed on the clinometer plane perpendicular to the axis of the bore;

-- set the sight in coupling 09-198 with the graticule set in zero position and fasten it with wing nuts Sb09-37;

-- fasten hairs to the marks on the face of the muzzle brake;

-- remove the breechblock firing mechanism;

-- set the bore sight in front of the gun (appendix 13) in a vertical position perpendicular to the line of sighting at a distance of 45 m from the sight elevating knob of sight OP-2;

-- while sighting through the aperture for protrusion of the striker in the breechblock wedge and the center of the cross hairs on the face of the muzzle brake, move the barrel into the center of cross hairs 0 on the bore sight by operating the gun aiming mechanisms; [p 171]

-- by looking in the sighting eyepiece, determine the position of the top of the center V on the sight graticule in relation to the center of cross hairs OP-2 on the bore sight.

50X1-HUM

[1]If it is impossible to put the winter spades in the ground, place wooden blocks 170 mm high under the wheels.

A deviation of the top of the center V of ± 4 mils in the horizontal and verticle planes is permissible. That is, the top of the center V should not protrude beyond the limits of quadrant OP-2 on the bore sight. 50X1-HUM

AARM. If deviation of the top of the center V is more than ± 4 mils, remove coupling 09-198 and file the appropriate side of bracket platform 09-197 (on which coupling 09-198 is mounted) so that the deviation of the top of the center V is no more than ± 4 mils.

After adjustment, fasten coupling 09-198 with bolts A51000-15, expand the two holes in coupling 09-198 and bracket 09-197 by removing a minimum layer of metal, and insert two pins A51041-33 with larger diameters (appendix 1, sketch 222).

The diameters of the holes can be increased to 12 mm.

2. Checking the Zero Line of Sight

PM. Check the zero line of sight according to an aiming point placed no less than 1,000 m from the gun, or according to the bore sight (appendix 13) placed in front of the gun (no closer than 40 m from the muzzle face of the gun barrel) in a verticle position perpendicular to the line of sight.

To check the zero line of sight it is necessary to:

-- set the gun in combat position on a perfectly level surface. When checking the sight according to the bore sight, the gun should be set horizontally in the direction of the axis of the trunnions according to the gunner's quadrant placed on the clinometer plane perpendicular to the axis of the bore;

-- place the optical sight in the coupling bracket and fasten it with wing nuts;

-- fasten hairs to the lines marked on the face of the muzzle brake;

-- by turning the sight elevating knob, align the zero graduation of the range scales in the field of vision of the sight with the horizontal hairs;

-- remove the breechblock firing mechanism and by sighting through the aperture for protrusion of the striker in the breechblock wedge and the center of the cross hairs on the face of the muzzle brake, bring the barrel to a selected aiming point or the center of cross hairs 0 on the bore sight by operating the gun aiming mechanisms (see appendi 50X1-HUM

-- by sighting through the eyepiece, determine the position of the top of the center V in relation to the selected aiming point or the center of cross hairs OP-2 on the bore sight. 50X1-HUM

If the sight is mounted correctly, the top of the center V should align with the selected aiming point or the center of cross hairs OP-2 on the bore sight and the horizontal hair should pass through the zero graduations on the range scales. [p 172]

If the top of the center V is out of alignment with the selected aiming point or the center of cross hairs OP-2 on the bore sight either to the right or to the left, then the following steps should be taken:

-- loosen the screw of the range calibration mechanism and push the cap aside;

-- by turning the nut of the range calibration mechanism, align the top of the center V with the selected aiming point or the center of cross hairs OP-2 on the bore sight. After this, close the cap on the range calibration mechanism and fasten it with the screw.

If the top of the center V is out of alignment vertically with the selected aiming point or with the center of cross hairs OP-2 on the bore sight, the following steps should be taken:

-- by turning the knob of the angle of elevation mechanism, align the top of the center V with the selected aiming point or with the center of cross hairs OP-2 on the bore sight;

-- loosen the screw on the height of image adjustment mechanism and push the cap aside;

-- by turning the nut of the height of image adjustment mechanism, align the horizontal hair with the zero graduations on the range scales. After this, close the cap of the height-of-image adjustment mechanism and tighten it with the screw.

After adjusting the sight, check whether the upper graduation lines on the range scales align with the horizontal hair when turning the angle of elevation knob. If this condition is not fulfilled, then take the following steps:

-- unscrew the four screws located on the lower end of the angle of elevation knob one revolution;

-- by turning the angle of elevation knob, bring the extreme upper graduation lines on the range scales below the horizontal hair; 50X1-HUM

-- screw in the four screws as far as possible and check the limits of the movement of the range scales again.

1. Unstable Coupling of the Limber With Coupling Bar SB 46-10 and Limber Hook of the Prime Mover (fig. 19)

Reasons for malfunction:

a) Wear of the aperture of the coupling eye 46-214 (46-113).

Measure the diameter or thickness of the forward partition of the coupling eye in the horizontal or vertical directions (the cross-section of the forward partition of the coupling eye of the guns of initial issue has an oval shape, and for guns of later issue, a round shape). The diameter of the forward partition of the coupling eye (with the circular cross-section) must be not less than 40 mm, and the thickness of the partition (with the oval cross-section), not less than 36 mm in the horizontal direction and 45 mm in the vertical direction. Measure in places of the greatest wear.

PM. When the diameter of the partition of the coupling eye or the thickness of the partition are less than indicated above, weld a sheet of metal onto the worn surface with electrode ENKh-30 and trim (sketch 84).

b) Wear of pins 46-94 and apertures of lugs 46-107 and ears 46-21 of the coupling bar.

Measure the diameters of the pins and the diameters of the apertures of the lugs and ears. The difference in the diameters in each coupling should be no more than 2.5 mm.

DARM. When the difference in the diameters is more than 2.5 mm, change the shape of the apertures of the lugs and ears by removing a minimum layer of metal and replace the pins (appendix 1, sketch 279).

Trim the aperture in the lug assembly with the coupling bar of the limber so that the diameters of the apertures for both pins are identical. It is permissible to increase the diameter of the apertures up to 35 mm.

c) Wear in the coupling of the lugs 46-107 with ears 46-21 of the coupling bar.

[text missing]

Measure the width of the groove of the lugs and the thickness of th50X1-HUM] coupling bar ears. The difference in the measurements in each coupling should be no more than 4 mm.

DARM. When the difference in the measurements is more than 4 mm, eliminate the uneveness of the lug groove surfaces by removing a minimum layer of metal and weld a layer of metal onto the surface of the bar ears with electrode E50A and trim according to the actual measurements of the lugs (sketch 85). Fit measurement A (see sketch 85) into place with a total tolerance of 0.5 - 1 mm. 50X1-HUM

An increase in the width of the lug grooves up to 50 mm is permitted.

2. The Stand Sb46-7 of the Coupling Bar Does Not Lock in the Traveling Position
(fig. 19)

Reason for malfunction: **Break or fatigue of spring 19-38.**

Draw out stop 19-633 behind cap 19-632 and release. Under the action of the spring, the stop should return to its original position. [p 176]

PM. If the stop does not return to the original position replace the spring with one made by DARM (chart 3).

3. Difficult Transfer of the Coupling Bar Stand Sb46-7 From the Position for Supporting the Coupling Bar (When the Limber is Disconnected From the Gun) to the Traveling Position and Back. [p 176]
(fig. 19)

Reason for malfunction: **Bent or worn ring 46-50.**

PM. Dislodge the pin 46-137 and remove the faulty ring.

Make a ring and pin (appendix 1, sketch 274 and 282) and assemble the coupling bar stand. Spread pin 46-137 into two parts and trim flush with lug 46-22.

4. Non-Cushioning of the Limber
(fig. 19)

Reasons for malfunction:

a) Break or fatigue of spring 46-67B (46-67).

With the gun in the travelling position, measure the distance 1 between the base end of pintle 46-38A and buffer 46-64A (46-64). Distance 1 should be no less than 35 mm.

If distance 1 is less than 35 mm, remove the gun from the limber and measure distance 1_1 between the base end of pintle 46-58A (46-58) and buffer 46-64A (46-64) (without tool pressure on the limber body).

Distance 1_1 should be no more than 45 mm. 50X1-HUM

PM. 1) If distance 1_1 is less than 45 mm, place washer No 5 (see sketch 16) between the spring and washer 46-82A (46-82). The thickness of the washer should not be more than 8 mm.

Therefore, if on the limber there has been installed a washer which does not have a groove to guide spring 46-67B (46-67), then install washer No 5 which has a diameter equal to 76^{+1} mm. In this event, weld washer No 5 at 2 or 3 points to washer 46-82. 50X1-HUM

In all remaining cases, fashion a No 5 washer with a diameter equal to 100^{+1} mm and do not weld the washer.

If, after setting the washer, distance l is less than 35 mm and when the spring is broken, replace the spring (appendix 1).

2) If distance l_1 is more than 45 mm, then:

-- determine the height of the spring while it is compressed and in contact with the coils:

$h_k=(8.25 \times d+5)$ mm,

d = diameter of spring wire;

-- determine distance l_2:

$$l_2 = L - (M + N + G + V) \text{ mm};$$

-- determine measurement l_3:

$$l_3 = l_2 - h_k.$$

If l_3 measures more than the distance l_1, place washer No 5 (see sketch 16) between the spring and washer 46-82A (46-82).

Therefore, the thickness of the washer will be a $=l_3-l_1$ (mm); the thickness of the washer should be within 5 - 8 mm. If measurement l_3 is less than distance l_1 and if the spring is broken, replace the spring (appendix 1).

[p 177]

Reinsertion of washers is not permitted.

b) Wear or structural breakdown of the upper 46-64A (46-64) or lower 46-73A (46-73) buffer.

Measure the size of the protuberance of the upper buffer 46-64A (46-64) over the upper end of the covering 46-63A (46-63); the protuberance of the buffer should be no less than 7 mm.

For guns of subsequent issue check the protuberance of the lower buffer 46-73A over the surface of lower block 46-2A. Buffer 46-73A should protrude over the surface of the lower block. 50X1-HUM

For guns of initial issue, measure the height of the buffer (46-73): the height of the buffer should be no less than 15 mm.

50X1-HUM

PM. When the protuberance of the buffer 46-64A (46-64) is less than 7 mm and when the height of the buffer (46-73) is less than 15 mm, and if the buffer 46-73A does not protrude over the surface of the lower block, replace the buffer (appendix 1).

c) Wear or structural breakdown of the ring 46-138.

PM. Replace the ring (appendix 1).

For guns of initial issue, ring 46-138 is fastened to washer (46-68) by four screws A51060-8, and for guns of subsequent issue, the ring is fastened to washer 46-68A by eight screws. If the inserted rings 46-138 have four apertures for fastening the washer by screws, then for guns of [p 178] initial issue, in addition to boring four holes in ring 46-138 (sketch 86), bore four holes and cut a thread in the washer (46-68) (sketch 87) and machine four screws A51060-8 (appendix 1, sketch 283).

5. Wear in the Coupling of the Pintle 46-58A (46-58) With Bushings 46-62A (46-62) and 46-105A (46-105) (fig. 19)

Measure the diameters of the apertures of the bushings and the diameters of the pintle collars. Measure the diameter of the pintle collar, coupled with bushing 46-105A (46-105), for a length of 125 mm from the base of the collar.

The difference in the diameters in each coupling should be no more than 2 mm.

AARM. When the difference in diameters is more than 2 mm eliminate the oval shape of the pintle collar (if the oval shape is more than 1 mm) by removing a minimum layer of metal (sketch 88), and replace the bushings (appendix 1, sketches 277, 280, and 281).

Note: Use bushing (46-62) in those cases where the covering plate (46-61) has a groove with a diameter of 130 mm and a depth of 6 mm for guns of initial issue.

The covering plate 46-61A (for guns of subsequent issue) does [p 179] not have grooves. In this case use bushing 46-62A (see sketch 277).

Place bushing 46-105 in the lower block (46-2), which has a groove for the bushing collar (for guns of initial issue); for the limbers of these guns use a pintle (46-58) having the rifled part under nut 46-201 and a lower collar with a diameter of not more than 75 mm. Plac50X1-HUM 46-105A in lower block 46-2A which does not have a groove for the bushing collar (for guns of subsequent issue); for the limbers of these guns use a hollow pintle 46-58A, having a lower collar with a diameter of more than 78 mm.

After press seating bushing 46-62A (46-62), drill holes in the bushing with a diameter of 3 mm for the grease gun in covering plate 46-61A (46-61). 50X1-HUM

Lesser diameters of the pintle collars are permitted:

1) for hollow pintle 46-58A (for guns of subsequent issue) of the upper collar -- to 100 mm, of the lower collar -- to 78 mm;

2) for pintle 46-58 (for guns of initial issue) of the upper collar -- to 100 mm, of the lower collar -- to 70 mm.

When eliminating the oval shape of the lower pintle collar for guns of initial issue, machine nut 46-201 according to sketch 89.

6. Wear in the Coupling of Pintle Sb46-12 With Bushings 46-56 and 46-57 [p 180]
(fig. 19)

Measure the diameters of the bushing apertures and the diameters of the pintle collar. The difference in the diameters in each coupling should be no more than 2 mm.

DARM. When the difference in diameters is more than 2 mm, replace the bushings (appendix 1, sketches 275 and 276).

When replacing bushings 46-56 and 46-57 (for guns of initial issue), machine grooves on the pintle collar (sketch 90) and on the base of nut 46-59 (sketch 91). Also, machine the face of nut 46-59 (see sketch 91).

7. The Limber Body Sb46-17 is not Maintained in the Middle Position by Springs 26-69
(fig. 19)

Reason for malfunction: Break or fatigue of spring 26-69.

PM. If the base of the chassis, owing to stretching of the spring, occupies an inclined position which makes it difficult to join the gun to the limber, and if the spring is broken, replace the spring (appendix 1).

8. Wear of the Coupling Eye Collar 46-214 (46-113)
(fig. 19)

Measure the diameter of the coupling-eye collar and the diameter of the hole in the pintle plate 46-112. The difference in the diameters should be no more than 2.5 mm.

DARM. When the difference in the diameters is more than 2.5 mm, [p 181]
weld the keyway with electrode E50A, prepare the coupling eye for pla 50X1-HUM
ment of the housing, prepare the housing, press fit it on the coupling eye and machine (see sketch 84). When press fitting the housing it is permitted to heat it to a temperature of up to 400 degrees centigrade.

The diameter of the hole in the pintle plate should not be more than 62 mm.

50X1-HUM

9. Burrs on the Right 46-52 and Left 46-53 Braces and on Gibs 46-116 (fig. 19)

Place the forward part of the trail on the limber and check the fitting of the braces and gibs of the limber to the bearing surface of the trails along the painted mark.

Contact should be established over no less than 40% of the bearing surface area. Partial tolerances of not more than 0.4 mm are permissible.

DARM. When contact is less than 40%, file the braces and gibs of the limber along the bearing surfaces of the trails so that contact is not less than 50%. On the remaining area between the bearing surfaces, tolerances of not more than 0.4 mm are permitted.

10. Burrs on the Bearing Surface of Nut 46-77 for Guns of Initial Issue (fig. 19)

For guns of initial issue the nut has a height of 87 mm. Examine the bearing surface of the nut.

DARM. When there are burrs on the bearing surface of the nut, replace it (appendix 1, sketch 278).

11. Stiff Movement of Wheels (fig. 19)

With the aid of a jack placed under limber pintle Sb46-1, raise the limber so that the wheel does not touch the ground.

Check the ease with which the wheel turns by giving the wheel a turn with the hand. After some time the wheel will stop. Under the influence of imbalance the wheel should, after stopping, change its direction of turn and finally stop with the heavy part below.

Reasons for malfunction:

a) Excessive tightening of bearings 7612 and 7609 by nut 46-90.

PM. Remove hub cap 46-91 and adjust wheel movement. To do this it is necessary to screw on nut 46-90 as far as possible and then unscrew it for 1/6th of a turn and fasten with a cotter pin.

b) Breakage of bearings 7612 and 7609.

PM. Replace the bearings (appendix 1).

50X1-HUM

12. Leakage of Lubricant From Nave Sb46-3 (fig. 19) [p 182]

50X1-HUM

Reasons for malfunction:

a) Wear of collar 46-207 (46-172).

PM. Replace the collar seal Sb46-28 when there is wear (appendix 1).

b) Damage of the gasket 46-135.

PM. Replace the damaged gasket 46-135 (appendix 1).

13. Dents, Cracks, and Holes in the Wheel Disk (fig. 19)

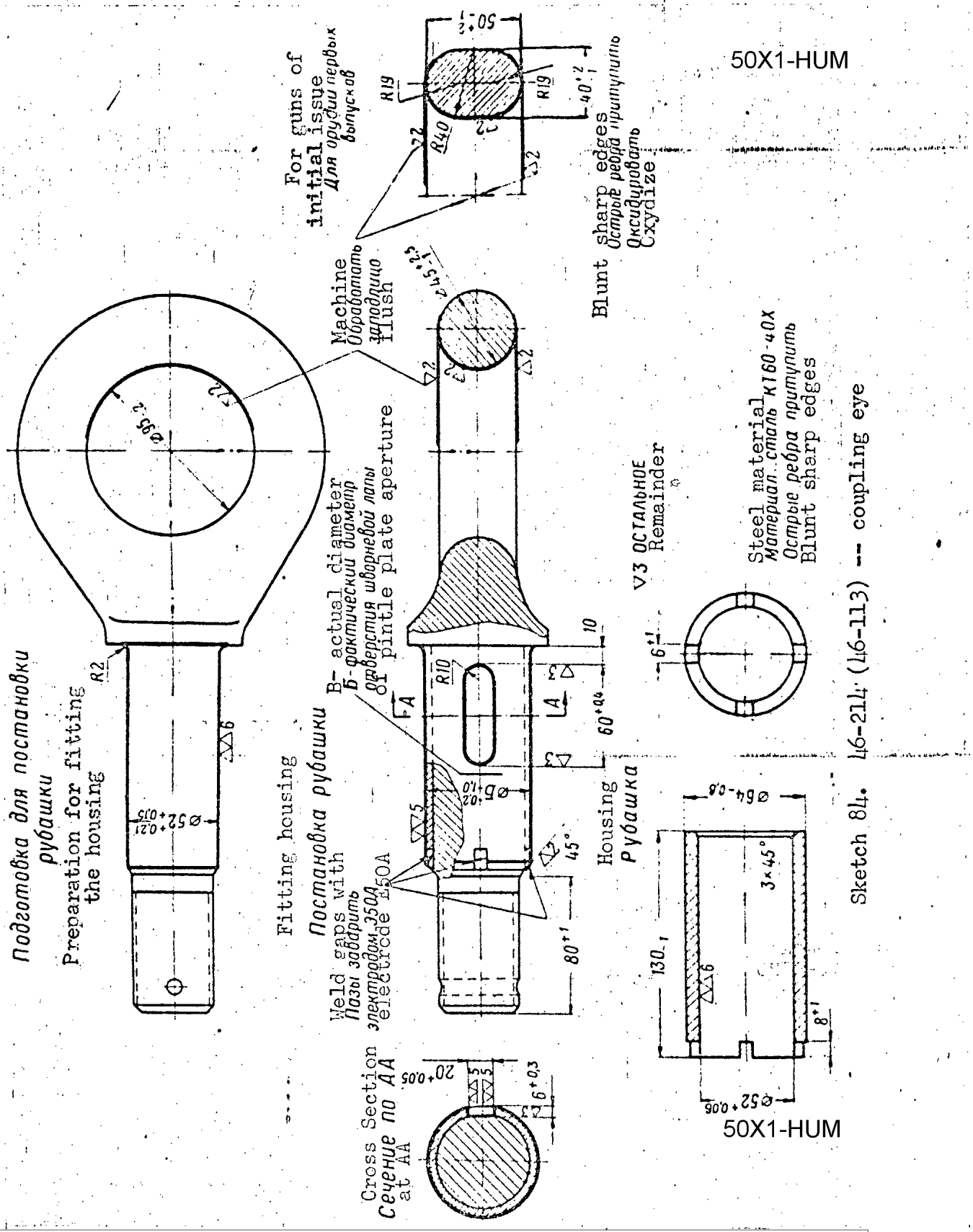
PM. Dents in the wheel disk are permissible if they do not upset the stability of the wheel.

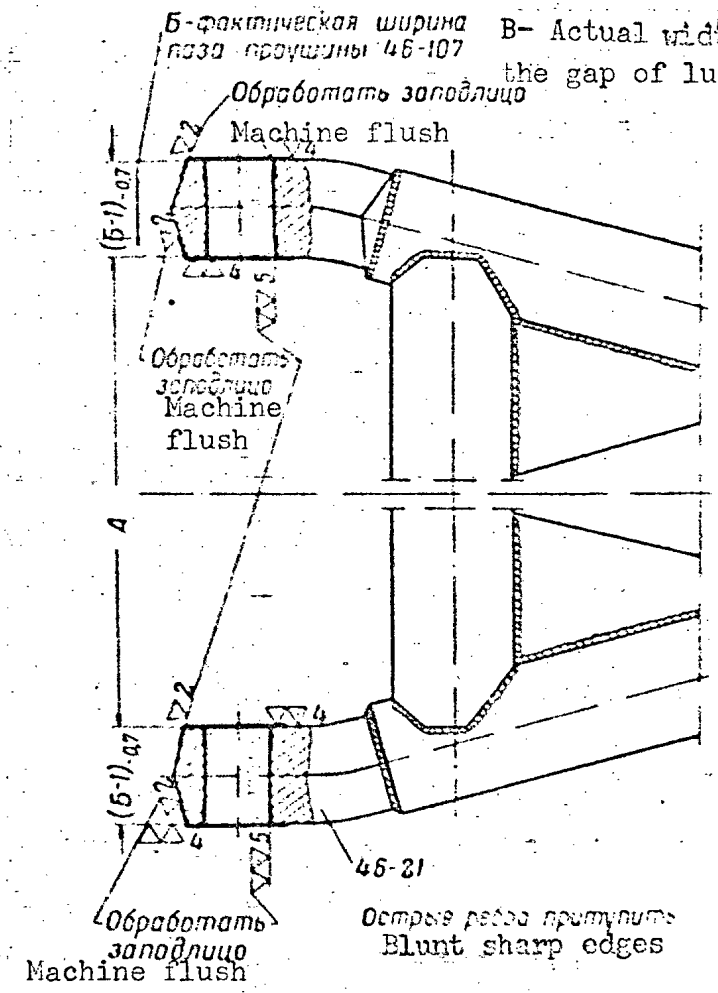
It is permissible to leave unwelded holes in the wheel disk measuring up to 30 mm. Trim the raised metal around the holes.

When there are cracks up to 30 mm in length, drill holes with a diameter of 3-6 mm at the ends of the cracks.

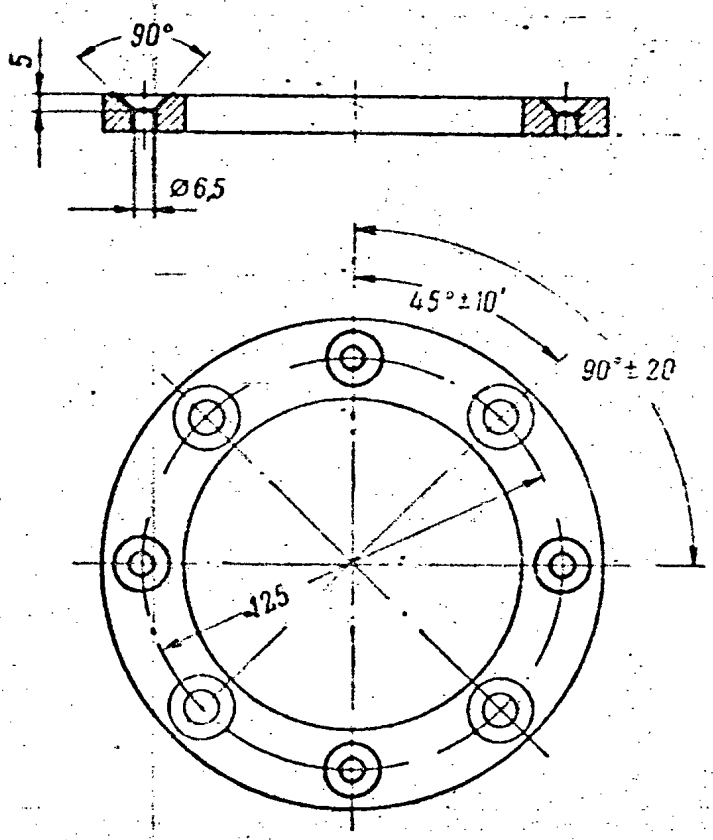
Weld cracks longer than 30 mm. When there are holes larger than 30 mm, weld a layer of any grade steel according to GOST 380-57, having a thickness of not less than 6 mm, with electrode E50A.

50X1-HUM

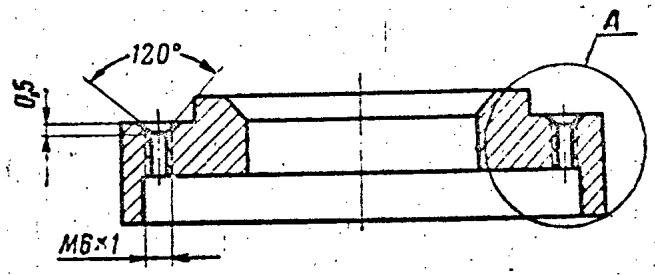




Sketch 85. Sb46-10 -- coupling bar; 46-21 -- ear



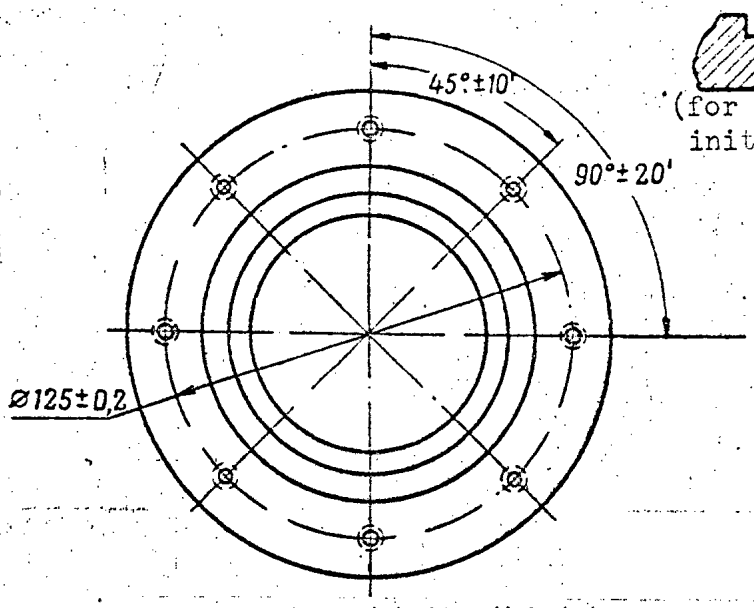
Sketch 86. 46-138 -- ring



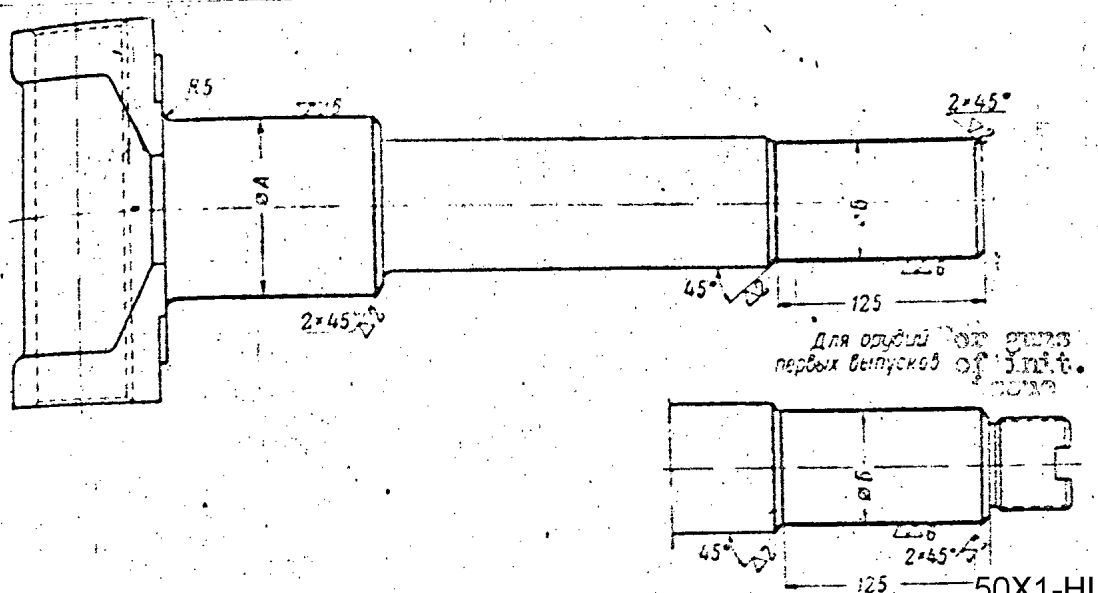
50X1-HUM

Inset A
Узел А
(для орудий первых выпусков)

(for guns of initial issues)



Sketch 87. 46-68A (46-68) -- washer

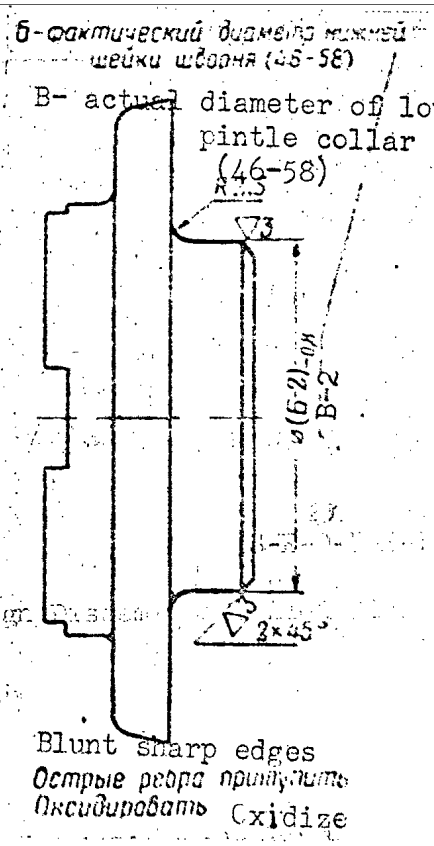


50X1-HUM

Blunt sharp edges
Oxidize

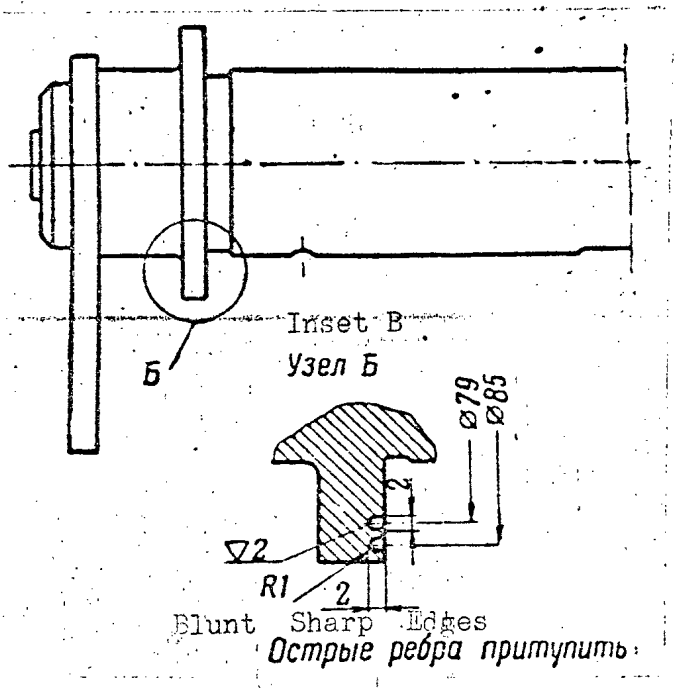
Острые ребра притупить
Оксидировать

Sketch 88. 46-58A (46-58) -- pintle

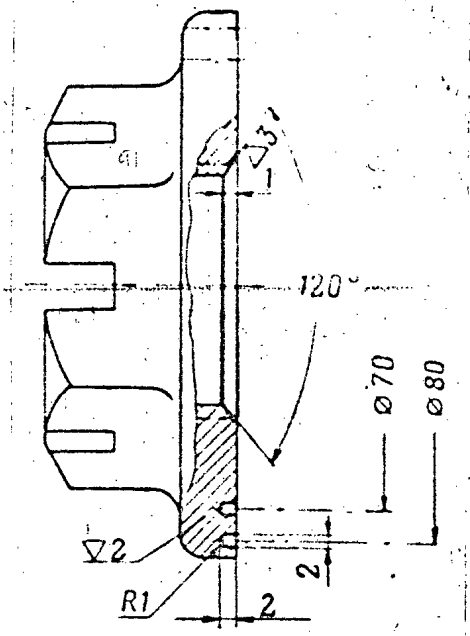


50X1-HUM

Sketch 89.
(46-201; 46-72) -- nut



Sketch 90. Sb46-12 -- pintle



50X1-HUM

Sketch 91. 46-59 -- nut

Chart One

Maintenance of Barrel

A. Removal of Bulges in the Bore

1. Take off the barrel and place it on wooden supports.

2. Remove grease from the bore.

3. Take off the muzzle brake.

4. Make a caliper for measuring the bore, using steel of any quality (sketch 92).

5. Illuminate the bore and with the caliper determine the location of the bulges.

In questionable cases determine the locations of bulges by measuring [p 184] the bore with a star gauge. The regulation size for the diameter of the bore is:

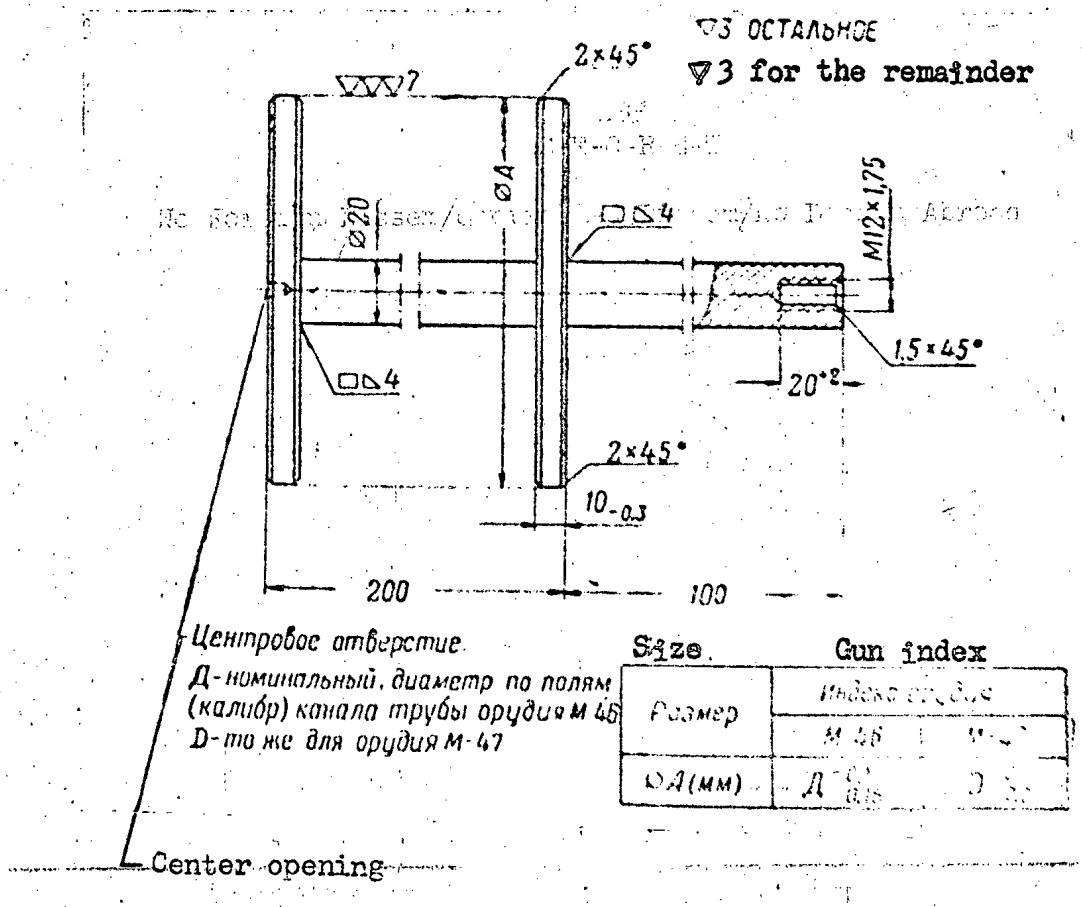
a) for gun M-46: between the lands - $Д^{+0.15}$mm, between the grooves - $(Д+5.5)^{+0.15}$mm;

b) for gun M-47: between the lands - $D^{+0.2}$mm, between the grooves - $(D+3)^{+0.2}$mm.

Note: Д and D signify nominal diameters of the bores (calibers) between the lands: Д - for gun M-46; D for gun M-47.

Mark the locations of bulges on the outer surface with chalk.

50X1-HUM



Д - nominal diameter of bore between lands (caliber) for gun M-46

D - nominal diameter of bore between lands (caliber) for gun M-47

Sketch 92. Caliper for measuring the bore between lands

In the repair of barrels having bulges in the bore the following cases are possible:

50X1-HUM

Case 1. Bulges in the bore are located up to 0.5 m from the muzzle face.

a) Make a device for removing the metal bulges (sketch 93).

Adjust the size and shape of the file to fit the location.

b) Make two scrapers out of files (sketches 94 and 95) -- one for trimming the lands and another for trimming the grooves.

Shape the working part of the first scraper to conform with the radius of the bore, and the working part of the other to conform with the profile of the grooves.

Temper the working parts of the scrapers (hardness 58-62 R_s).

c) Make a device for the local abrasion of the section being repaired in the bore (sketch 96).

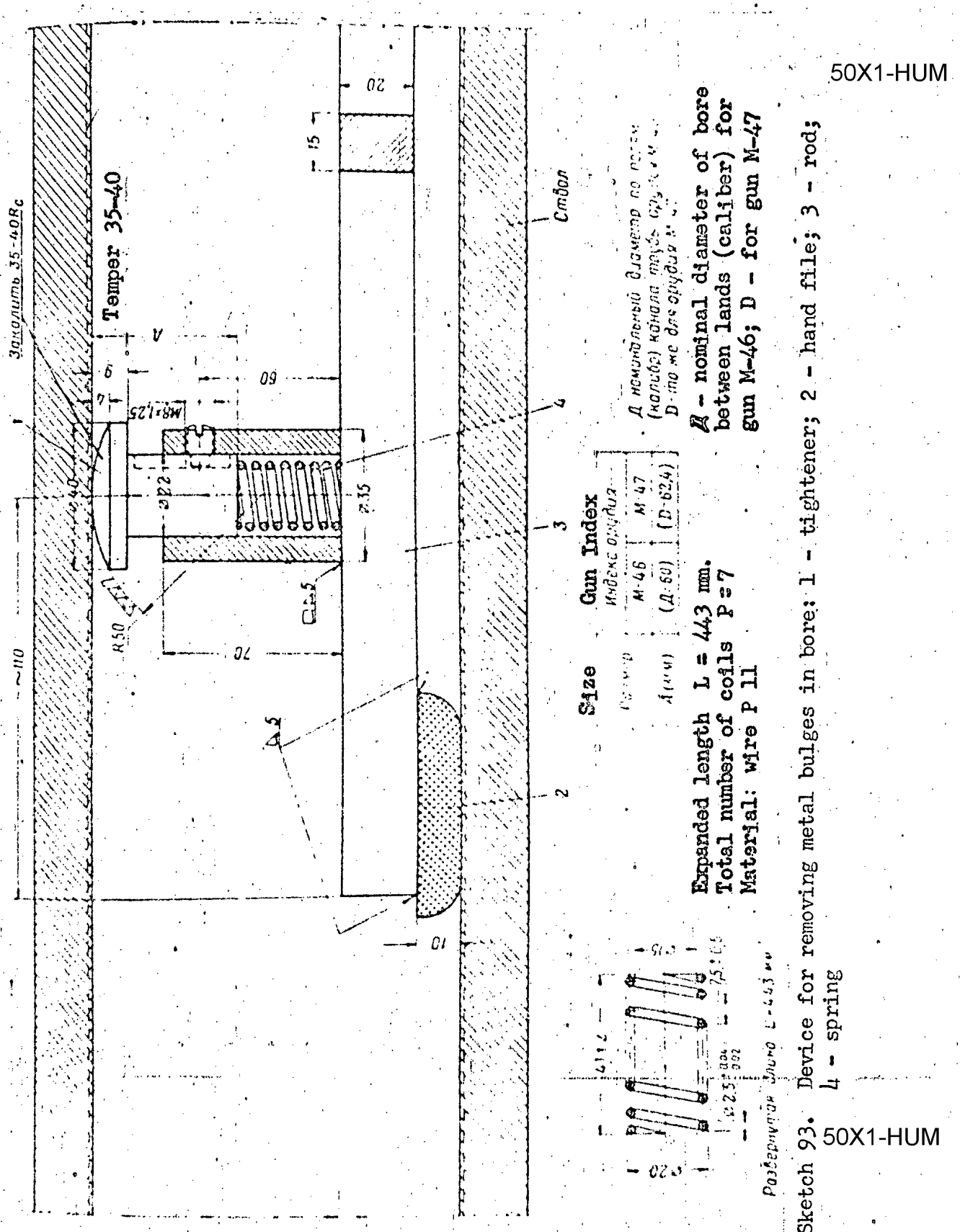
d) File off the raised metal in the area of the bulges with the device (sketch 93). Trim the lands of the section being repaired with the scraper and recondition the profiles of the grooves with the second scraper (sketches 94 and 95).

Abrade the section of the bore being repaired with the device (sketch 96), being careful not to damage the adjacent sections of the bore.

e) Thoroughly scrub and rub the bore.

f) Check the caliber of the repaired section of the bore.

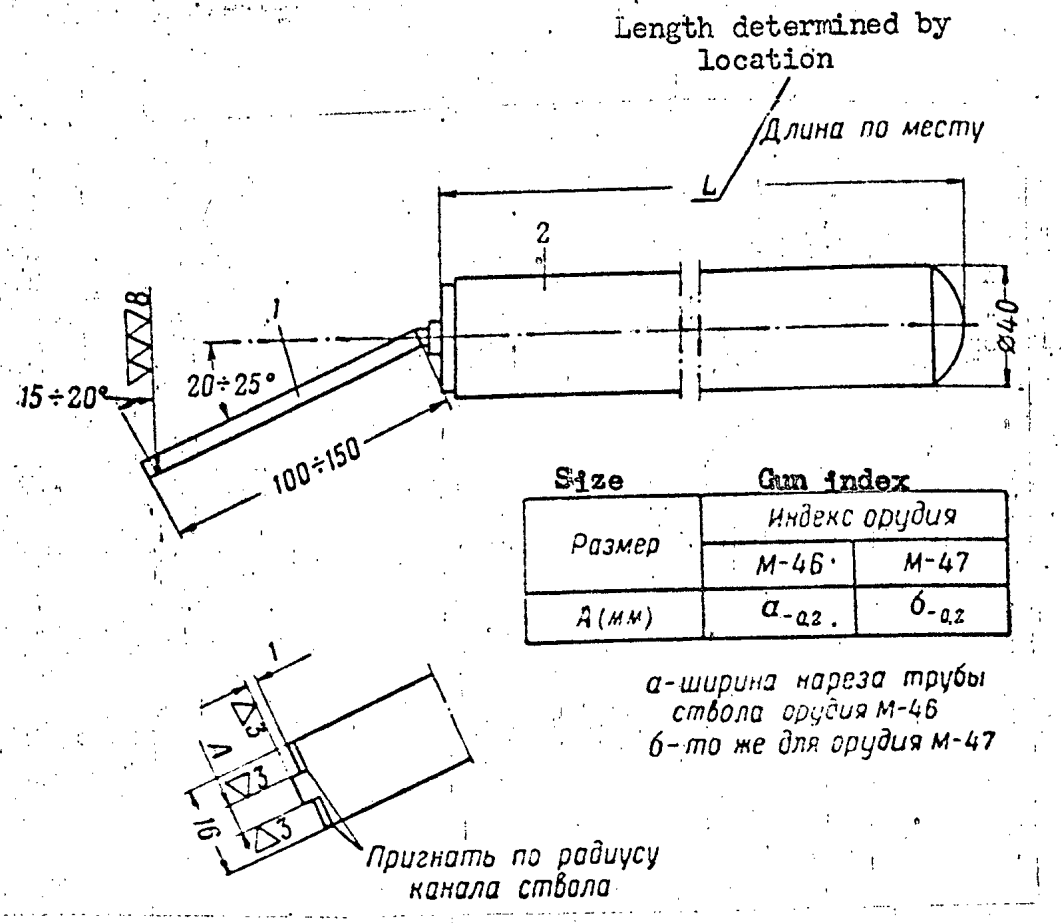
50X1-HUM



50X1-HUM

Sketch 93. Device for removing metal bulges in bore: 1 - tightener; 2 - hand file; 3 - rod; 4 - spring

50X1-HUM

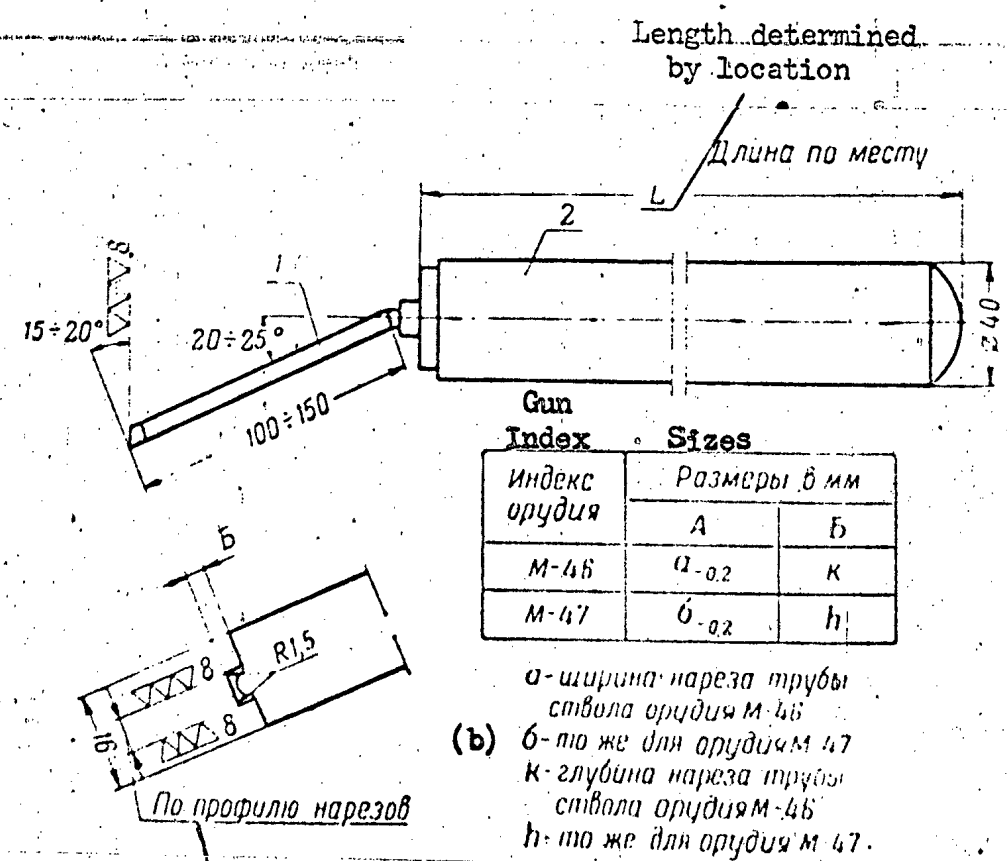


Fit to conform to radius of bore

a - width of grooves in barrel tube of gun M-46

b - width of grooves in barrel tube of gun M-47

Sketch 94. Scraper for trimming lands:
1 - scraper; 2 - wooden handle

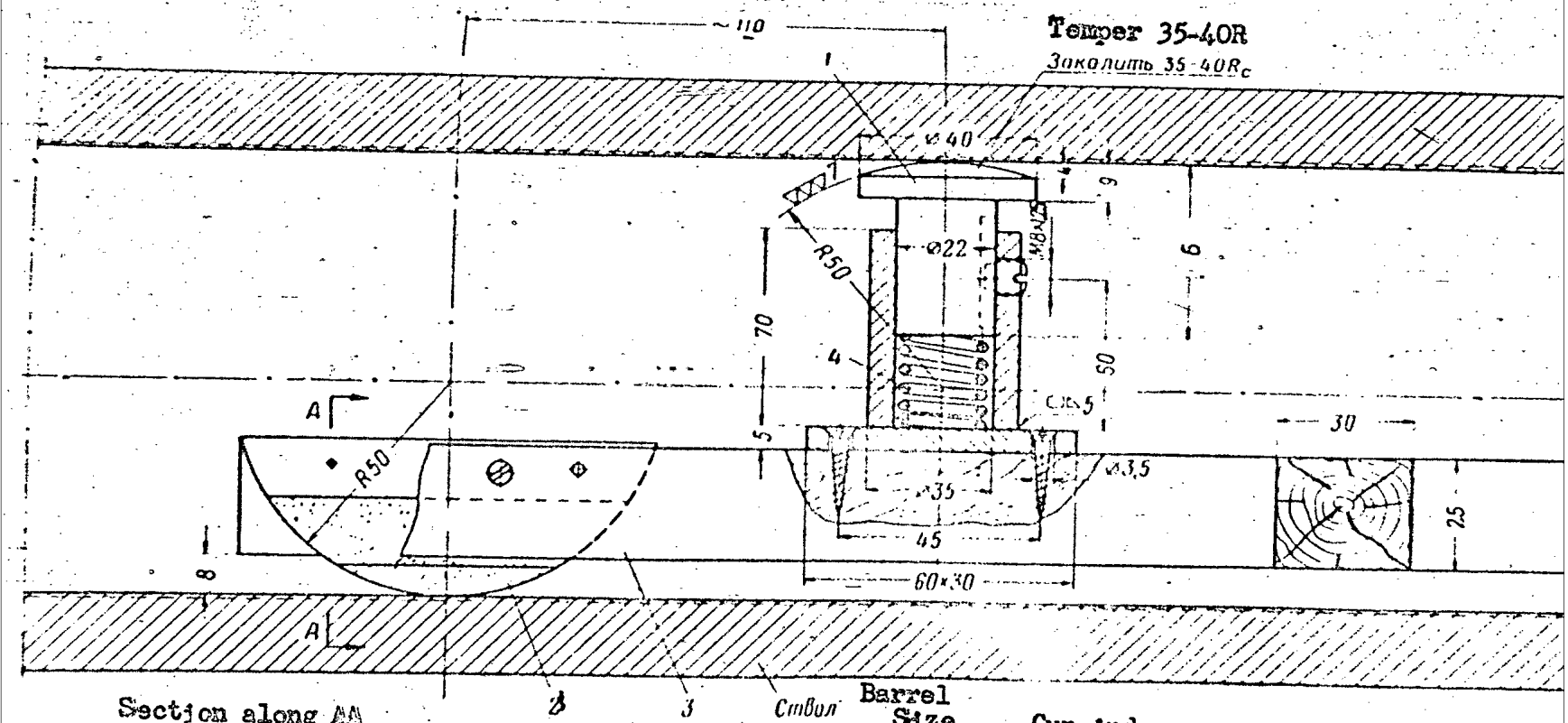


Gun Index	Sizes	
Индекс орудия	Размеры в мм	
	А	Б
М-46	$a_{-0.2}$	к
М-47	$б_{-0.2}$	h

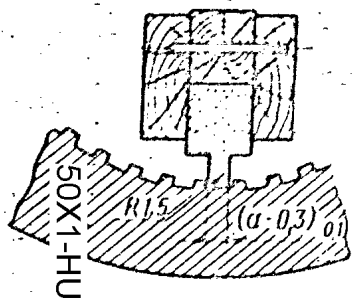
а - ширина паза трубы ствола орудия М-46
(b) б - то же для орудия М-47
к - глубина паза трубы ствола орудия М-46
h - то же для орудия М-47.

a - width of grooves in barrel tube of gun M-46
b - width of grooves in barrel tube of gun M-47
k - depth of grooves in barrel tube of gun M-46
h - depth of grooves in barrel tube of gun M-47

Sketch 95. Scraper for trimming lands:
1 - scraper; 2 - wooden handle

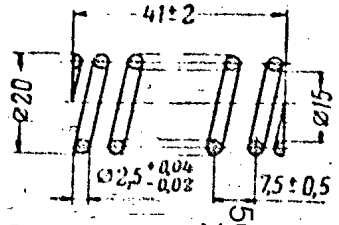


Section along AA
Сечение по АА



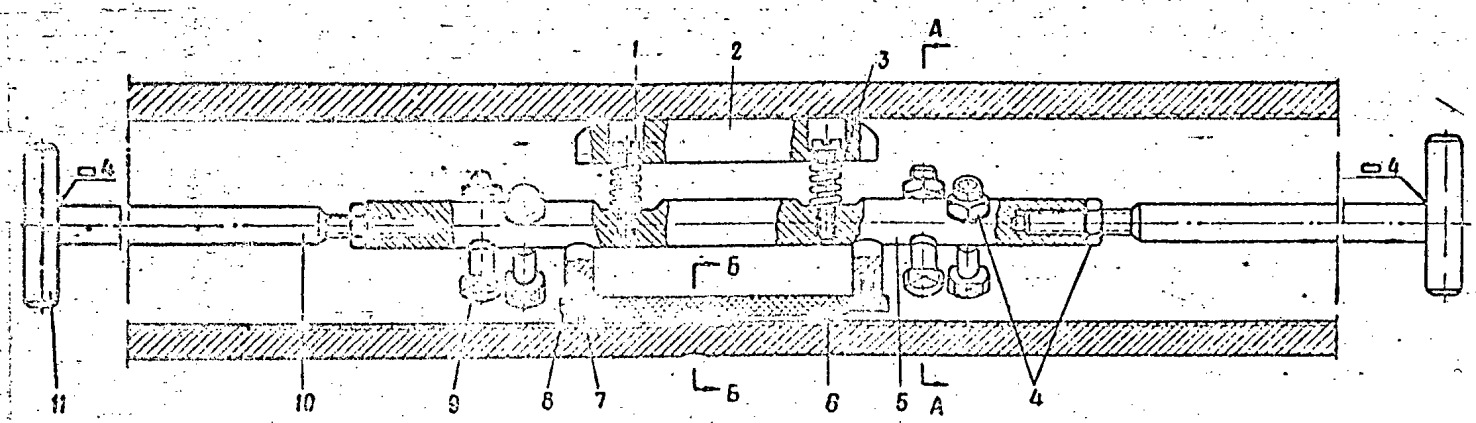
A - nominal diameter of bore between lands (caliber) of gun M-46; D - for gun M-47
a - width of grooves in barrel tube of guns M-46 or M-47

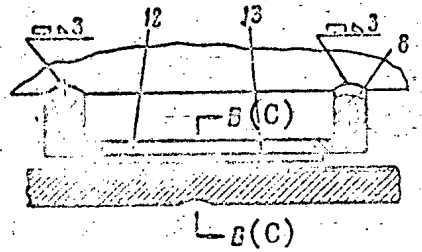
Barrel Size / Размер	Gun index / Индекс оружия	
	M-46	M-47
б (мм)	(Д-60)	(Д-62,4)



Extended length L 41 mm
Total number of coils 7
Material: wire P-11

Sketch 5. Device for local abrading: 1 - tightener; 2 - abrasive stone; 3 - wood shaft; 4 - spring

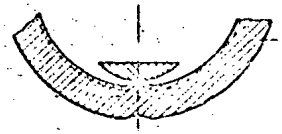




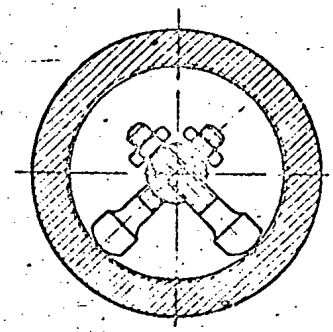
Cross section CC
Сечение по ВВ

Abrasive paper
Шлифовальная шкурка (приклеить клеем)
(glue on)

Cross section BB
Сечение по ББ



Section AA
Разрез по АА



Sketch 97. Device for trimming lands of the bore: 1 - screw; 2 - pressure plate; 3 - spring; 4 - nut M12; 5 - main shaft; 6 - semicircular file; 7 - screw M6 x 12; 8 - shank; 9 - adjuster bolt; 10 - rod; 11 - handle; 12 - plate; 13 - abrading blade

50X1-HUM

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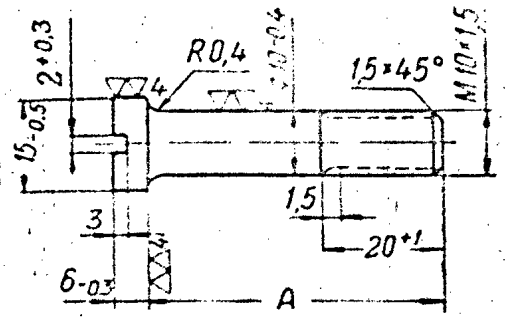
▽ 3 for the remainder

▽ЗОСТАЛЬНОЕ



Д-номинальный диаметр по полям (калибр) канала трубы орудия М-46
D-то же для орудия М-47

Материал: сталь Ст 2
Острые ребра притупить

Size / Размер	Gun index / Индекс орудия	
	М-46	М-47
A (мм)	(Д-65)	(D-77,4)

Д - nominal diameter of bore between lands (caliber) of gun M-46
D - nominal diameter of bore between lands (caliber) of gun M-47

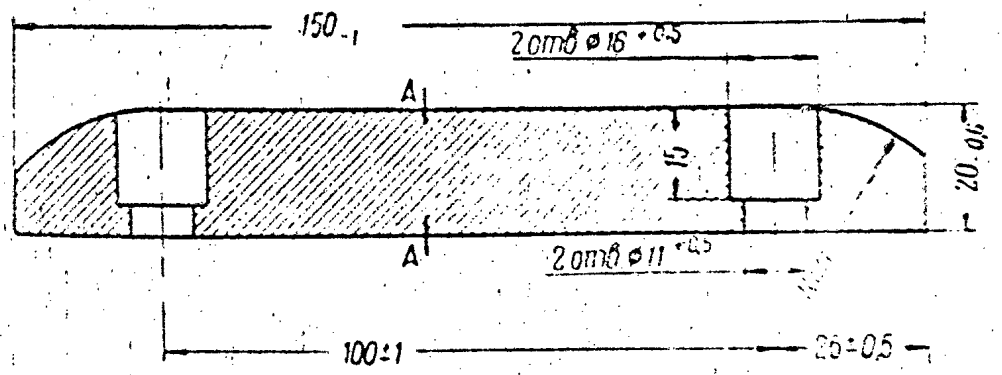
Material: steel St 2.

Blunt sharp edges

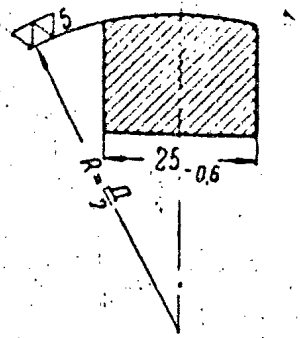
Sketch 98. 1 - screw

▽4 for the remainder

▽▽4 ОСТАЛЬНОЕ



Cross section AA
Сечение по АА



Д-номинальный диаметр по полям (калибр) канала трубы орудия М-46

Материал: латунь или бронза
Острые ребра притупить

Д - nominal diameter of bore between lands (caliber) of gun M-46

Material: brass or bronze

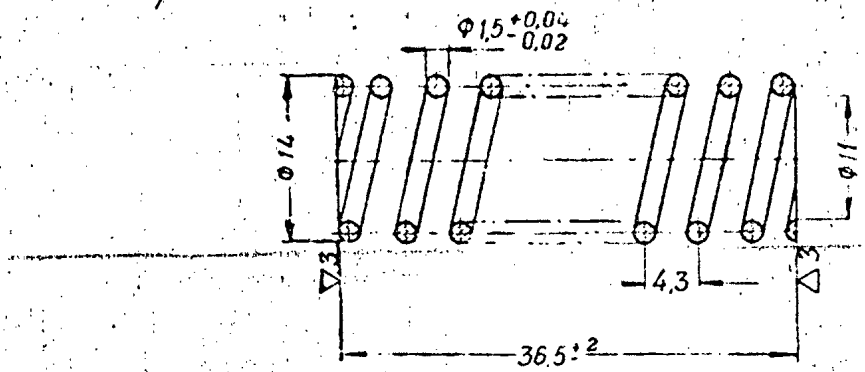
Blunt sharp edges

Sketch 99. 2 - pressure plate

~ ОСТАЛЬНОЕ

~ for the remainder

50X1-HUM

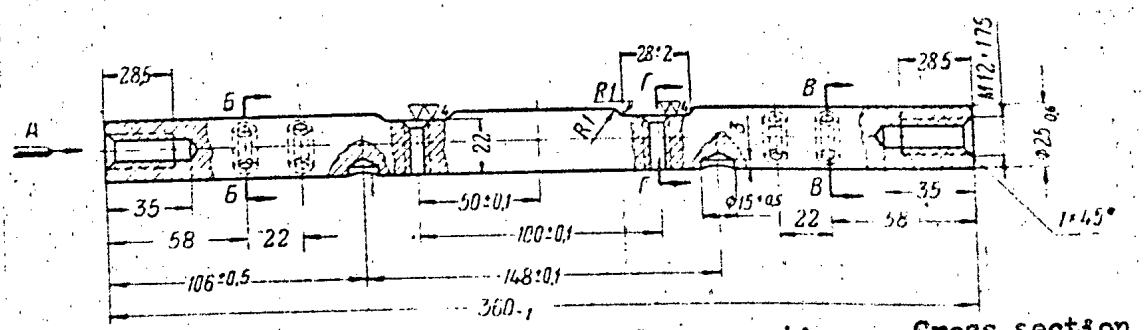


Expanded length L = 445 mm
Total number of coils P = 10
Material: wire P-11

Sketch 100. 3 - spring

▽ 3 for the remainder

▽ 3 ОСТАЛЬНОЕ

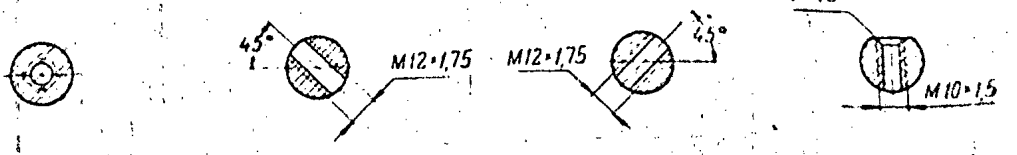


End view A
Вид по стрелке А

Cross section BB
Сечение по Б-Б

Cross section CC
Сечение по В-В

Cross section LD
Сечение по Г-Г

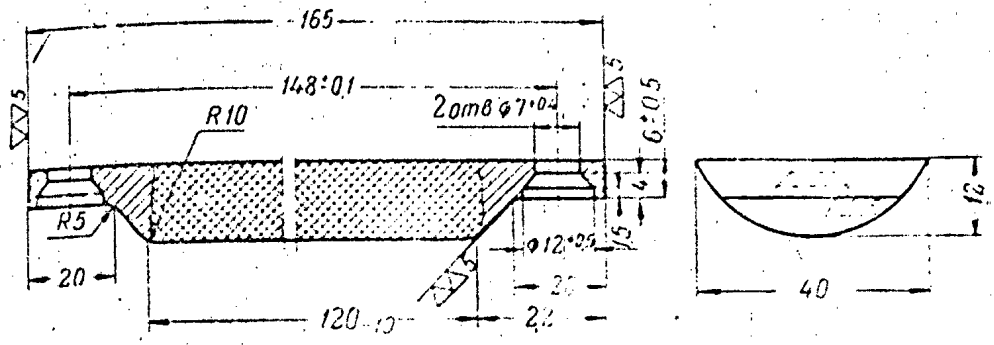


Material: steel St 3
Blunt sharp edges

Sketch 101. 5 - main shaft

50X1-HUM

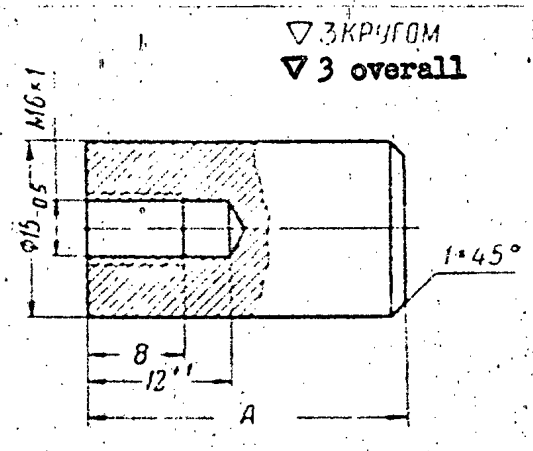
50X1-HUM



Make from semicircular file 400 N 1 GOST 1465-53. To drill two holes ⌀ 7$^{-0.4}$, anneal ends of file for length of 20 mm on each side.

Blunt sharp edges

Sketch 102. 6 - semicircular file



D - nominal diameter of bore between lands (caliber) of gun M-46
D - for gun M-47

Д - номинальный диаметр по полям (калибр) канала трубы орудия М-46
D - тоже для орудия М-47

Size / Размер	Gun index / Индекс орудия	
	M-46	M-47
A (мм)	(Д-88)	(D-99,4)

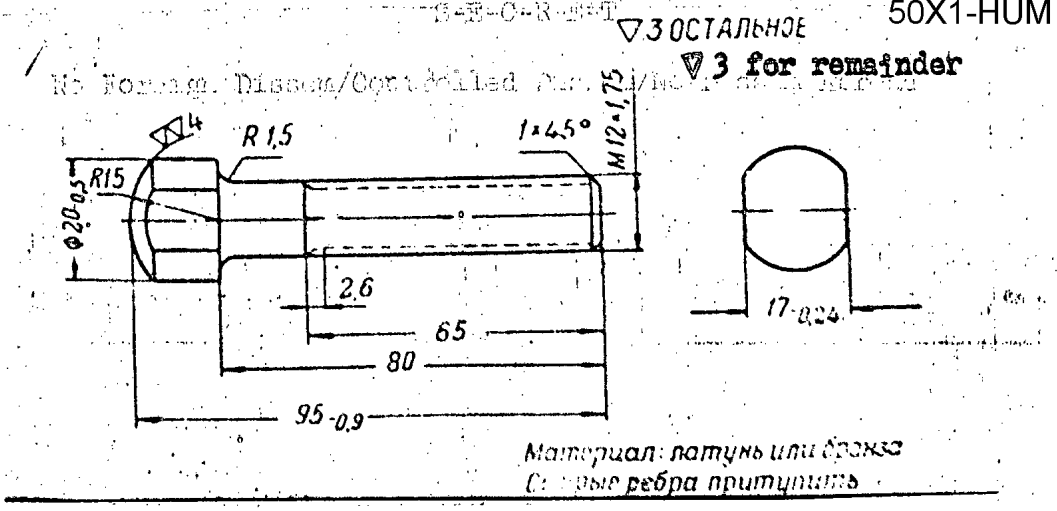
Материал: сталь Ст 3
Острые ребра притупить

Material: steel St 3
Blunt sharp edges

50X1-HUM

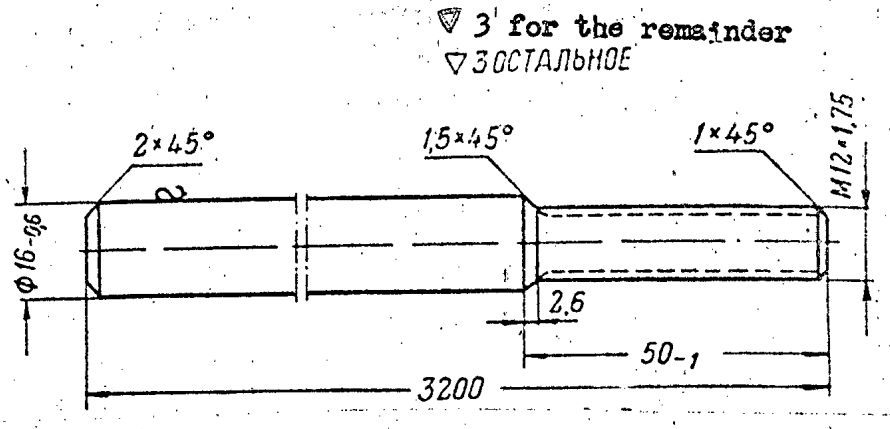
Sketch 103. Shank

50X1-HUM



Material: brass or bronze
Blunt sharp edges

[Sketch 104]



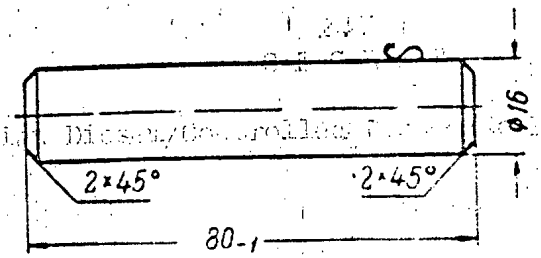
Material: steel St 3
Blunt sharp edges

Sketch 105. 10 - rod

50X1-HUM

▽3 for the remainder

▽3 ОСТАЛЬНОЕ

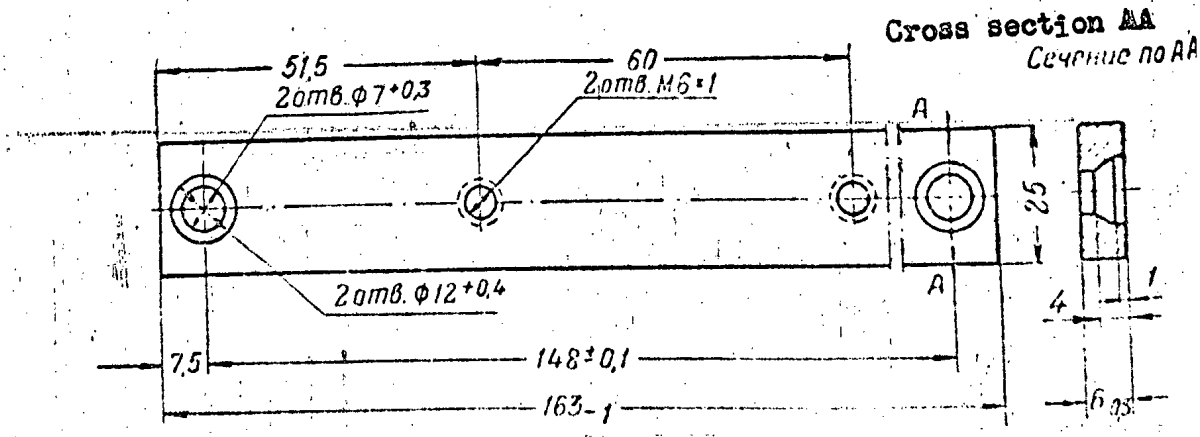


Material: steel St 3

Sketch 106. 11 - handle

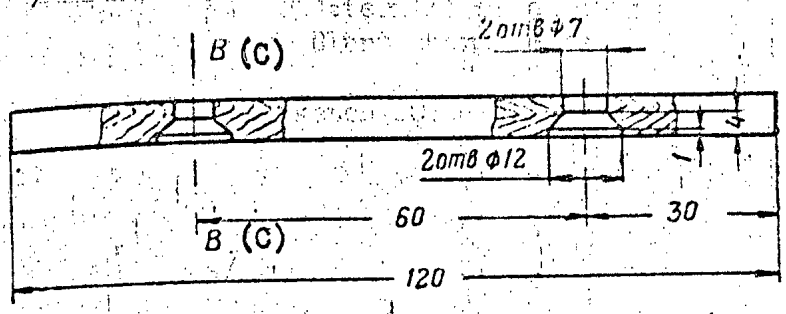
▽▽4 overall

▽▽4 КРУГОМ

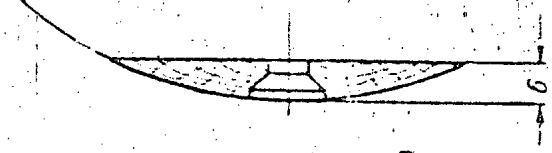


Material: steel St 3
Blunt sharp edges

Sketch 107. 12 - plate



Section along CC
Разрез по ВВ



Д - номинальный диаметр по полям (калибр) канала трубы орудия М-46
D - то же для орудия М-47

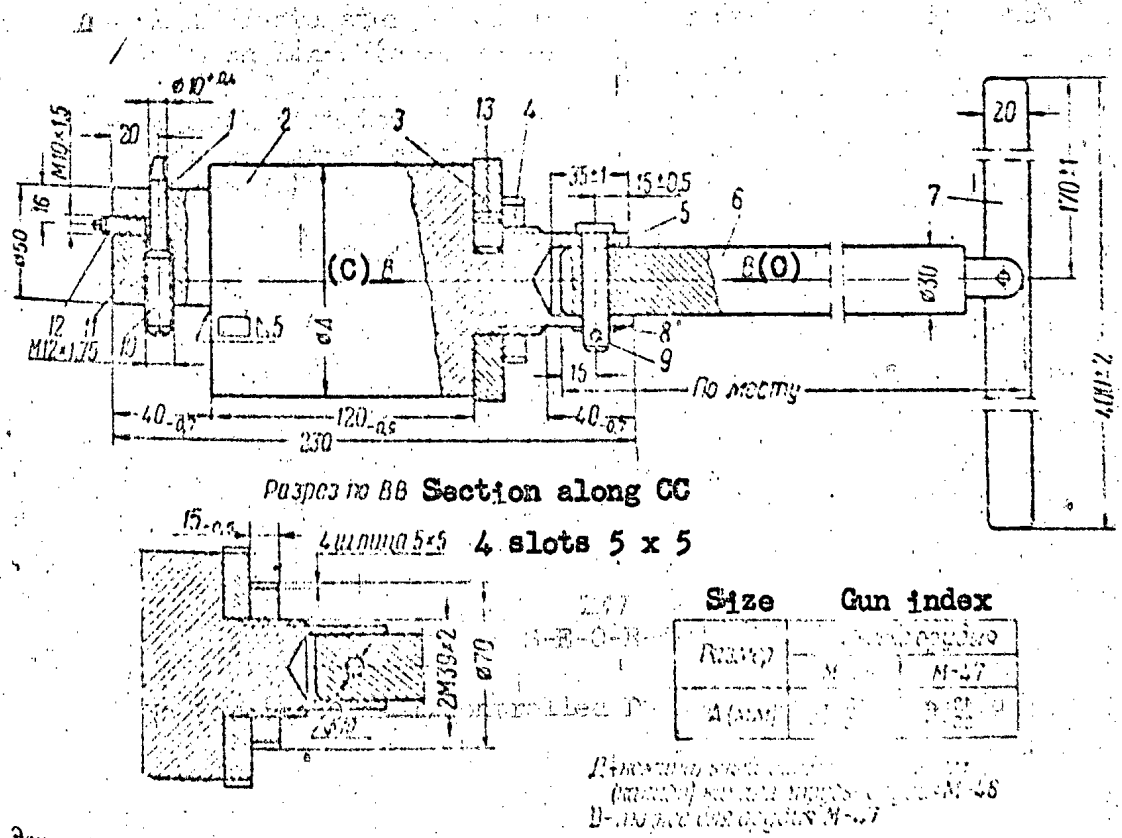
Size	Gun index	
Размер	М-46	М-47
R (мм)	$\frac{Д}{2}$	$\frac{D}{2}$

Д - nominal diameter of bore between lands (caliber) of gun M-46

D - nominal diameter of bore between lands (caliber) of gun M-47

Material: oak or beech

Sketch 108. 13 - abrading blade



Эскиз 109. Приспособление для удаления металла из канавок: 1 — резец; 2 — корпус; 3 — [illegible]

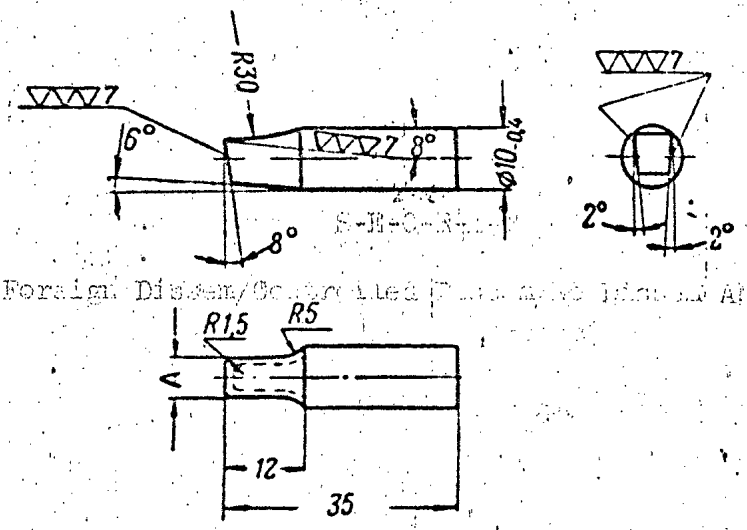
Д - nominal diameter of bore between lands (caliber) of gun M-46

D - nominal diameter of bore between lands (caliber) of gun M-47

Sketch 109. Device for removing metal from grooves:
1 - cutting tool; 2 - body; 3 - guide collar; 4 - nut;
5 - pin; 6 - rod; 7 - lever; [text missing]

▽▽ 4 for the remainder

▽▽4 ОСТАЛЬНОЕ



Size	Gun index	
Размер	Индекс орудия	
	М-46	М-47
A (мм)	a -0.2	(b) б -0.2

г - ширина нареза трубы ствола орудия М-46

-то же для орудия М-47

a - width of grooves in barrel tube of gun M-46

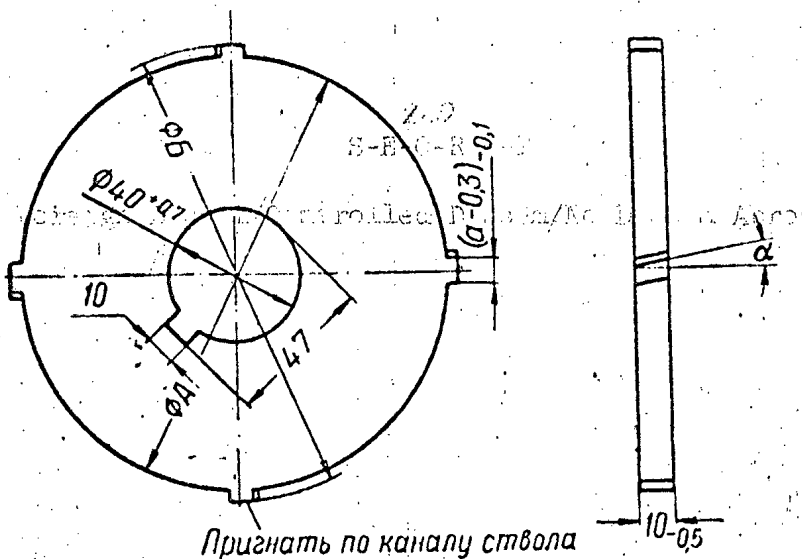
b - width of grooves in barrel tube of gun M-47

Material: steel U10A
Temper 60-64 R_s

Sketch 110. 1 - cutting tool

▽▽ 4 overall

▽▽ 4 КРУГОМ



Пригнать по каналу ствола
Fit to bore of barrel

Д-номинальный диаметр по полям(калибр) канала трубы орудия М-46
D-то же для орудия М-47
к-глубина нареза трубы ствола орудия М-46
h-то же для орудия М-47
а-ширина нареза трубы ствола орудия М-46

Gun Index / Индекс орудия	Sizes in mm. / Размеры в мм. А	Б	Angle / Угол α°
М-46	$Д^{-0,1}_{-0,15}$	$(Д+2к)_{-0,4}$	5°58'
М-47	$D^{-0,1}_{-0,15}$	$(D+2h)_{-0,4}$	7°10'

Материал: латунь ЛАЖМц 66-5-3-2
Острые ребра притупить

Д - nominal diameter of bore between lands (caliber) of gun M-46
D - same for gun M-47
k - depth of grooves in barrel tube of gun M-46
h - same for gun M-47
a - width of grooves in barrel tube of gun M-46

Material: brass $LAZhT_{ts}$

Blunt sharp edges

Sketch 111. 3 - guide collar

Case 2. Bulges in the bore are located at a distance of more than 0.5 m from the muzzle face of the barrel.

50X1-HUM

a) Make a device for trimming the lands and grooves of the bore (sketches 97-108).

b) With the device (sketch 97), remove the raised metal in the area of the bulge and polish, being careful not to damage the adjacent sections of the bore.

c) Make a device for trimming the grooves of the bore (sketches 109-111).

d) Remove metal from the grooves with the special device.

e) To remove bulges, insert the device in the bore, placing the cutting tool in the grooves where the height of the bulge is at a minimum, and adjust the position of the cutting tool with the screw. The cutting head is moved by lever 7 (sketch 109). The cutting tool is reinserted after each stroke of the cutting head. [p 185]

f) Replace the cutting tool with a cast iron or copper lap made in the shape of the cutting tool, lubricate the lap with boiled oil, and, dusting with fine abrasive powder, lap the grooves of the barrel tube.

g) Thoroughly scrub and rub the bore.

h) Check the repaired section of the bore with calipers.

i) Check the repaired barrel by firing four rounds (see appendix 5), taking precautionary measures. After firing the rounds, inspect the repaired section of the bore.

B. Removal of bulges in the barrel tube by insertion of threaded plugs.

1. Determine the diameter of the threaded plug. Saw and bore the hole for threading.

For permissible diameters of plugs and their location see Chapter Two, item 7.

2. Bevel the edge 5 x 45°.

3. Thread the holes in accordance with specified dimensions.

4. Make a plug (sketch 112) with a length of L=(B+5) mm, where B is the thickness of the wall of the barrel tube at the thread (sketch 113). The size of B is determined by the following formula:

50X1-HUM

$$B = \frac{Д_1 - (Д + 5.4)}{2}$$

-- for gun M-46;

$$B = \frac{Д_1 - (D+3)}{2}$$

50X1-HUM

-- for gun M-47,

where: $Д_1$ is the outer diameter of the barrel tube in mm at the hole;

$Д$ is the nominal diameter of the bore between the lands (caliber) of gun M-46;

D is the nominal diameter of the bore between the lands (caliber) of gun M-47.

[Text missing]

5. Make a template of sheet steel [text missing?] as shown in sketch 114. [p 186]

6. Draw a line through the center of the hole for the plug in the barrel tube.

7. Screw the plug in the hole flush with the outer surface of the barrel tube.

8. Draw a line on the face of the plug by continuing the line drawn on the barrel tube.

9. Screw out the plug and file its ends according to the template for a length of $B^{+0.3}_{-0.6}$ mm as shown in sketch 112.

10. Screw in the plug flush with the surface of the barrel tube so that the lines on the plug and the barrel tube coincide.

11. Inspect the bore in the place where the plug is inserted, making sure that the radius of the recess in the plug coincides with the radius of the barrel tube between the grooves.

Protrusion of the plug beyond the grooves is not allowed; it may be recessed up to 0.5 mm.

12. Weld the plug to the barrel tube with an E50A electrode (see sketch 113).

13. Trim any projecting edges in the bore in the place where the plug is inserted with a small emery wheel attached to a wooden holder. 50X1-HUM

14. Cut off and file the protruding portion of the plug flush with the outer surface of the barrel tube.

50X1-HUM

Sketch 113. Insertion of plug

∇3 for the remainder

According to threads in barrel tube

Material: steel KT45-50
Blunt sharp edges

Sketch 112. Plug

50X1-HUM

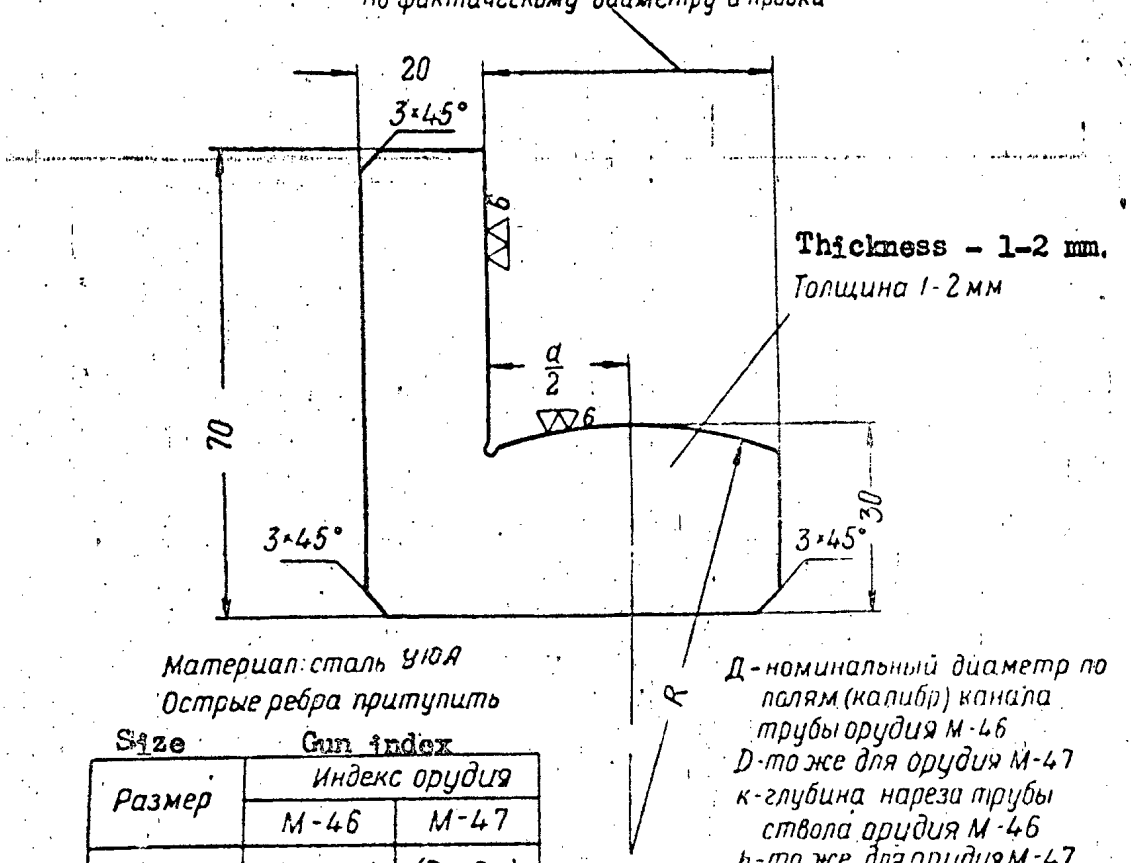
50X1-HUM

▽3 for the remainder

▽3 ОСТАЛЬНОЕ

according to the actual diameter d of the plug

По фактическому диаметру d пробки



Материал: сталь У10А

Острые ребра притупить

Size / Размер	Gun index / Индекс орудия	
	M-46	M-47
R (мм)	(Д + 2к)	(D + 2h)

Д - номинальный диаметр по полям (калибр) канала трубы орудия М-46
D - то же для орудия М-47
к - глубина нареза трубы ствола орудия М-46
h - то же для орудия М-47

Material: steel U10A
Blunt sharp edges

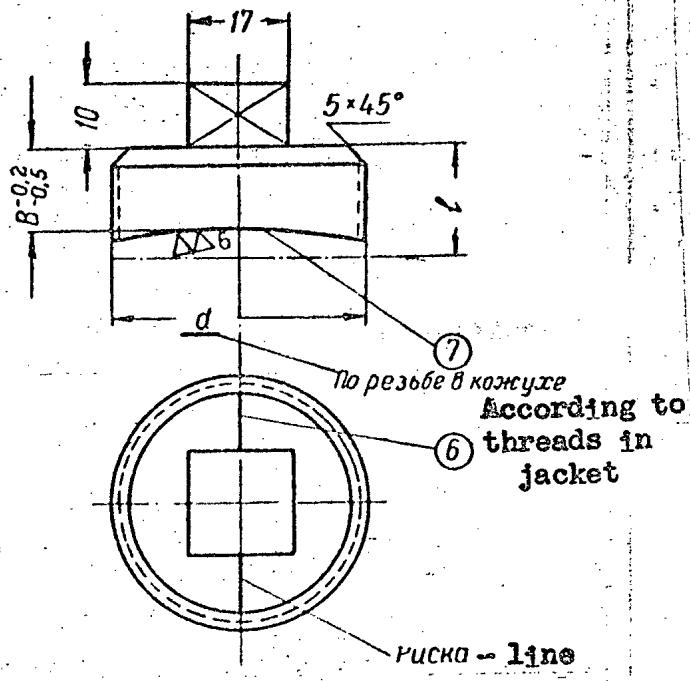
Д - nominal diameter of bore between lands (caliber) of gun M-46
D - same for gun M-47
k - depth of grooves in barrel tube of gun M-46
h - same for gun M-47

Sketch 114. Template

50X1-HUM

▽3 for the remainder

▽3 ОСТАЛЬНОЕ

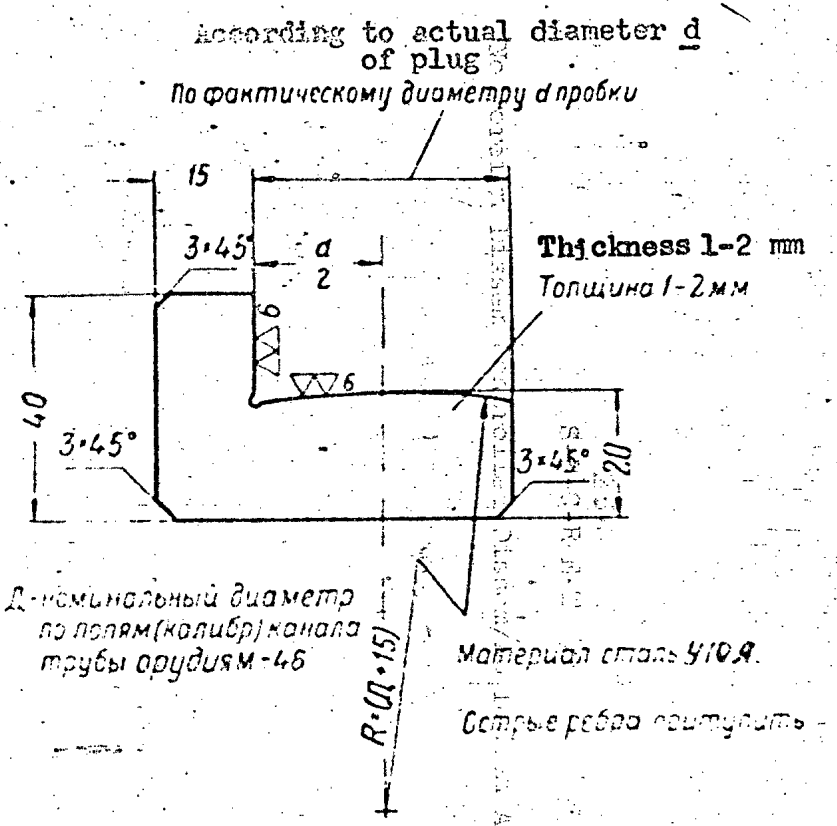


Material: steel КТЦ5-50
Blunt sharp edges

Sketch 115. Plug

▽3 for the remainder

▽3 ОСТАЛЬНОЕ



Д - nominal diameter of bore between lands (caliber) of gun M-46

Material: U10A
Blunt sharp edges

Sketch 116. Template

15. Wash the bore with warm soapy water and rub dry.

16. Paint the exterior of the repaired area of the barrel tube the color of the cannon.

17. Check the repaired barrel by firing; then inspect the repaired section of the bore.

C. Removal of dents in the barrel jacket by insertion of threaded plugs.

1. Perform steps 1, 2, and 3 of section B.

2. Make a plug (sketch 115) with the length l=(B+3) mm, where B is the thickness of the wall of the jacket at the place where the plug is to be inserted.

Fit the threads of the plug to correspond closely to those of the jacket.

3. Make a template as shown in sketch 116 from sheet steel [text missing?]

4. Draw a line through the center of the hole for the plug in the jacket.

5. Screw the plug into the hole flush with the outer surface of the jacket.

6. On the face of the plug draw a line forming a continuation of the line drawn on the jacket.

7. [Text missing].

8. Screw in the plug flush with the surface of the jacket so that the lines on the plug and jacket coincide.

9. Inspect the bore of the jacket in the place where the plug is inserted, making sure that the radius of the recess in the plug coincides with the radius of the bore of the jacket.

Protrusion of the plug inside the jacket is not allowed; it may be recessed up to 0.5 mm.

10. Weld the plug to the jacket with an E50A electrode (sketch 113).

11. Trim any projecting edges in the bore of the jacket in the place where the plug is inserted with a small emery wheel attached to a wooden holder.

12. Cut off and file the protruding portion of the plug flush with the outer surface of the jacket.

50X1-HUM

13. Paint the exterior of the repaired area of the jacket the color of the gun.

Chart Two [p 199]

Replacement of Cradle Guides 01-12 of the Barrel Clamping Pieces and Cradle Guides 01-52 of the Breech Ring

1. Remove the barrel and place it on trestles.

2. Unscrew the grease cups from the barrel clamping pieces, drill out the heads of rivets 01-13 fastening the cradle guides, and hammer out the rivets.

Bore holes 5 mm in diameter and 8 - 10 mm deep in screws 01-14 and, [p 200] with the aid of a square tapered punch, screw out screws 01-14 (sketch 117).

3. Remove old cradle guides 01-12.

4. Remove 18 screws 01-53 and detach cradle guides 01-52 (sketch 118).

5. Mark the cradle guides and the breech ring and clamping pieces with corresponding punch marks.

6. Measure the thickness T of the guides on the cradle (maximum dimension).

7. Make 4 cradle guides 01-12 (sketch 119) of bronze Br. AZhMts10-3-1.5.

8. Fit the outer surfaces of cradle guides 01-12 tightly to the clamping pieces. Make the fitting by filing surface a (sketch 119).

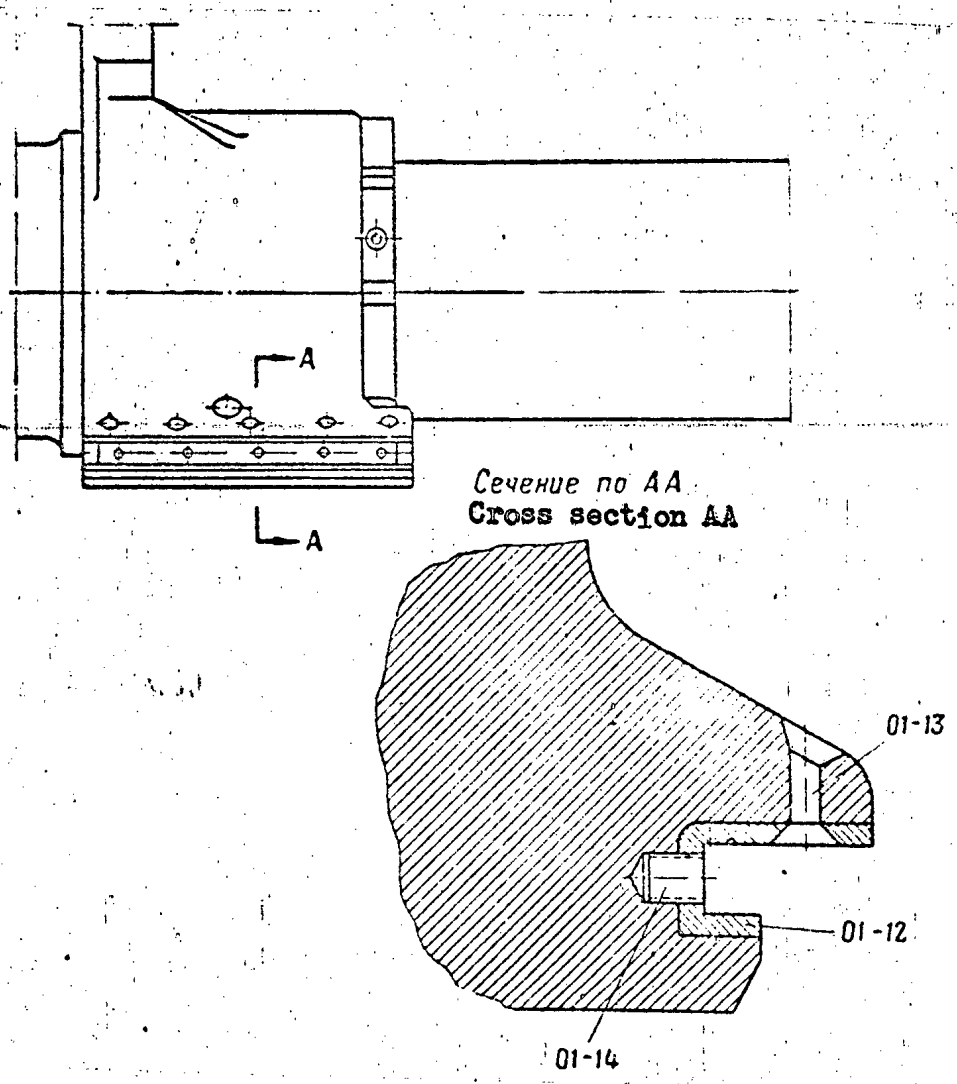
9. Make 2 cradle guides 01-52 of bronze Br. AZhMts10-3-1.5 [p 204] (sketch 120).

10. Measure the diameter of the hole for rivet 01-13. If the diameter of the hole is 5 mm, bore and countersink a hole according to sketch 121.

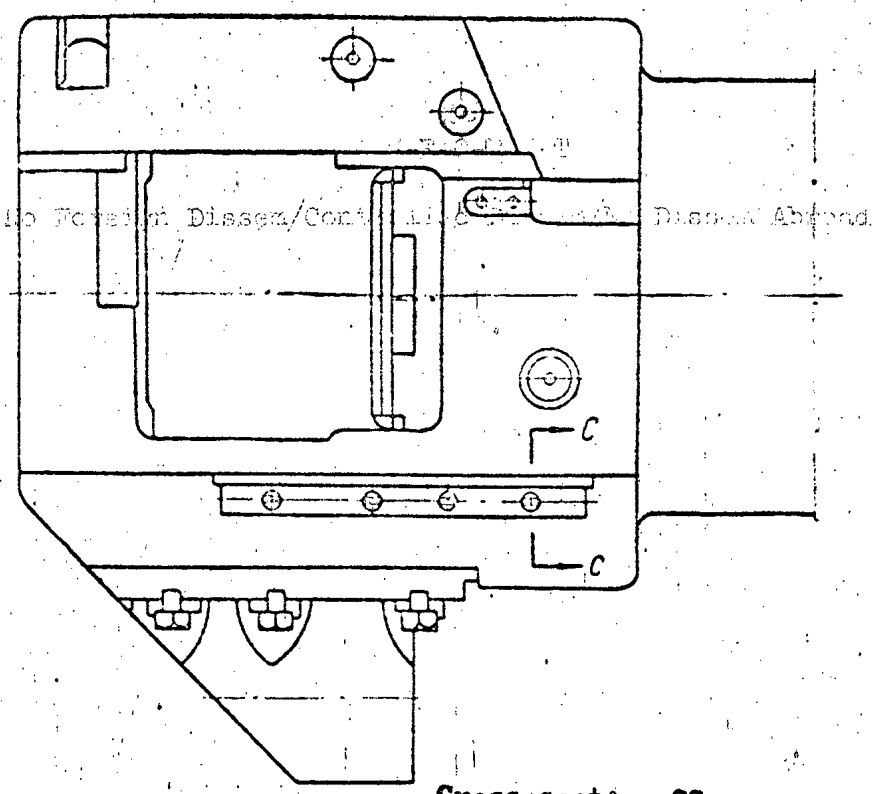
11. Transfer the hole from the old cradle guide to the new one and mark it with the punch mark on the old cradle guide.

12. Bore and countersink holes in cradle guides 01-12 and 01-52 as marked (see sketches 119 and 120).

50X1-HUM

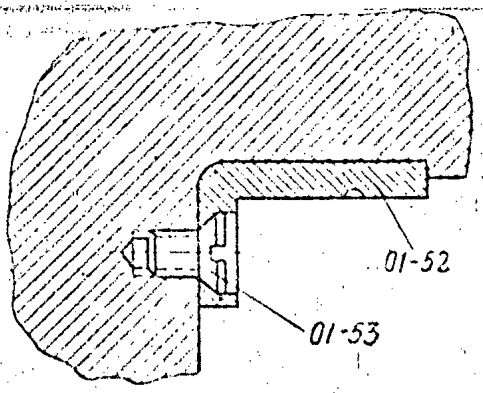


Sketch 117. 01-12 -- cradle guide; 01-13 -- rivet; 01-14 -- screw



Cross section CC

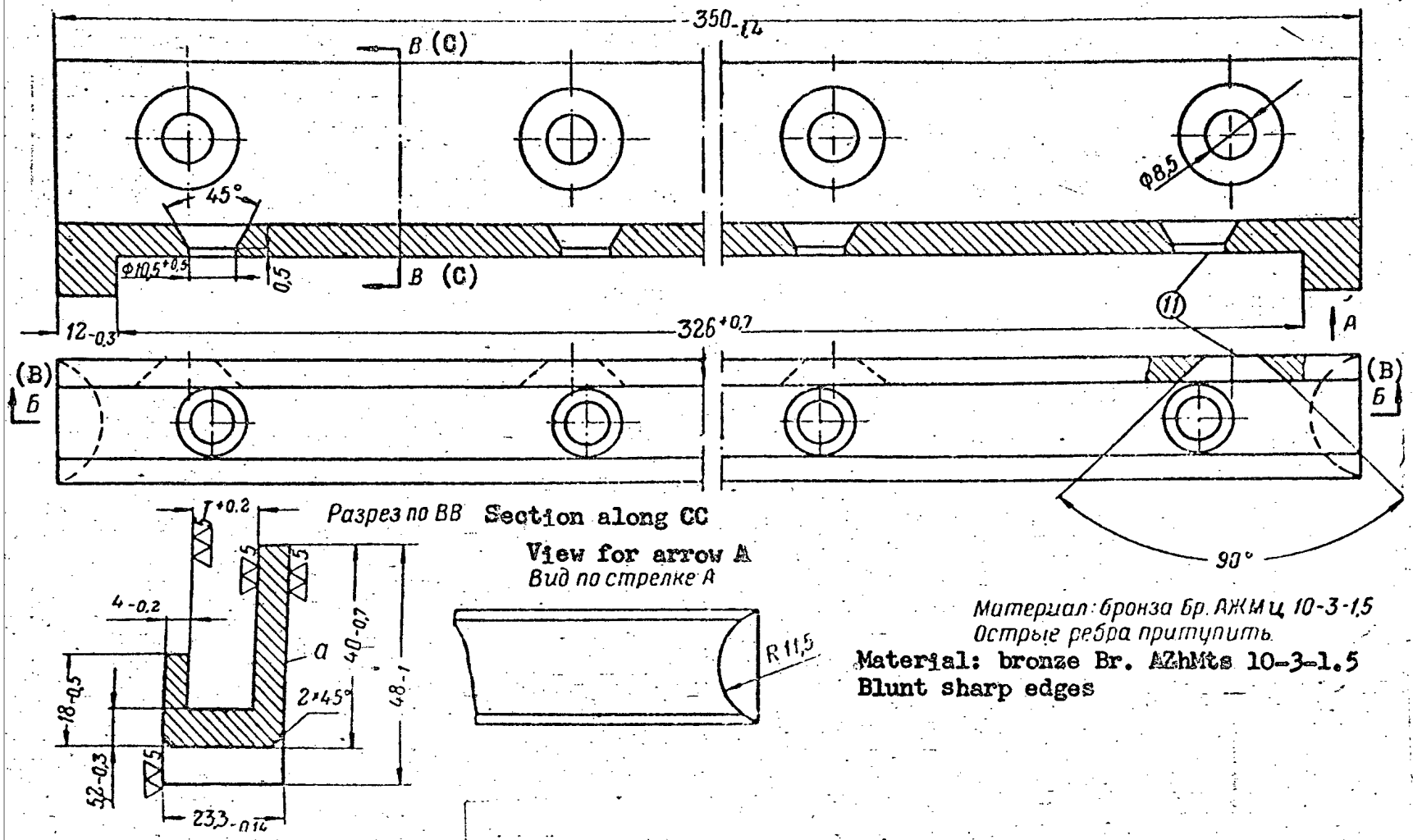
Сечение по CC



Sketch 118. 01-52 -- cradle guide; 01-53 -- screw

Section along BB
Разрез по ББ

▽3 for the remainder
▽3 ОСТАЛЬНОЕ



Разрез по ВВ Section along CC

View for arrow A
Вид по стрелке А

Материал: бронза Бр. АЖМц 10-3-1,5
Острые ребра притупить.

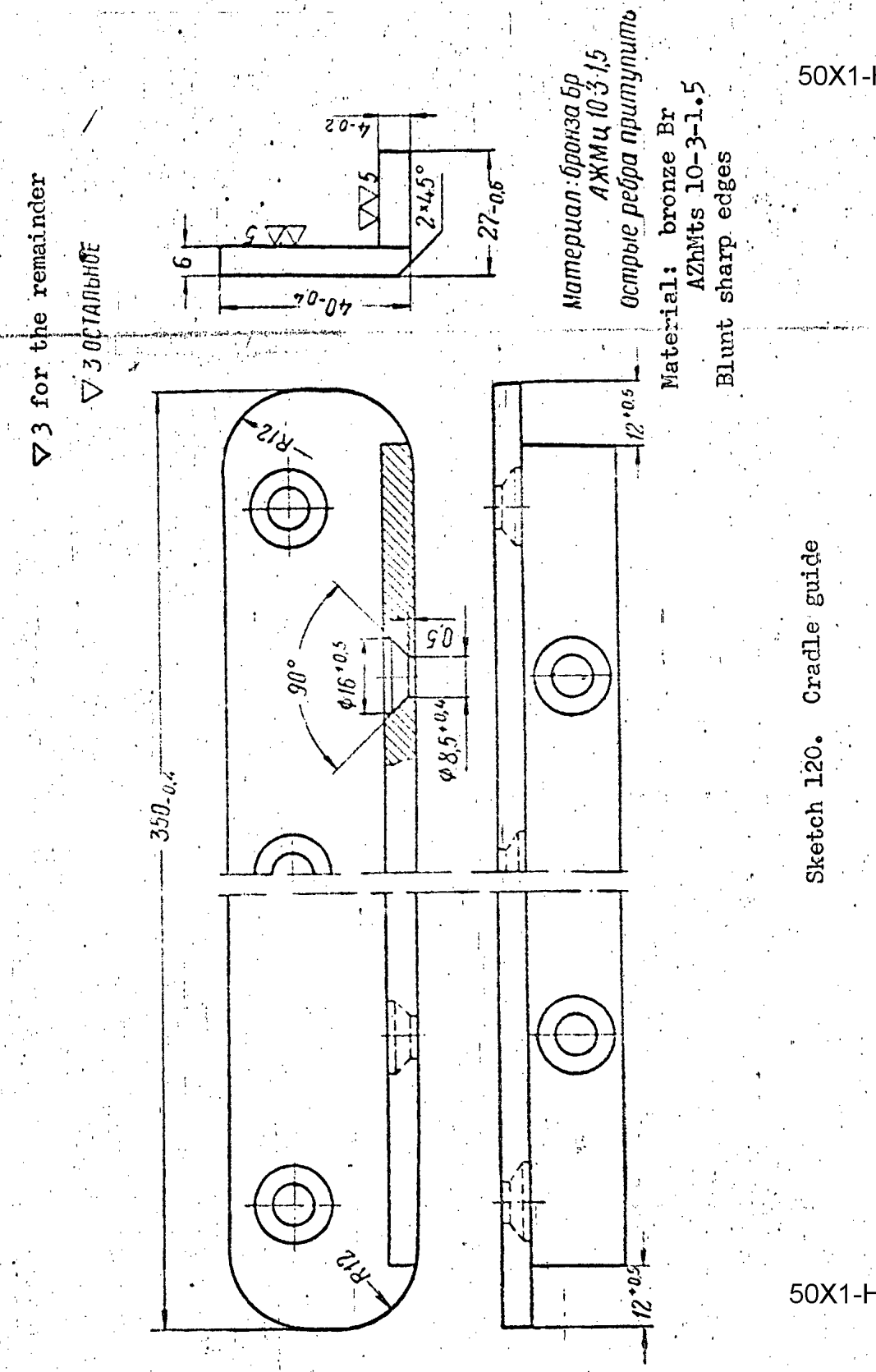
Material: bronze Br. AZhMts 10-3-1.5
Blunt sharp edges

Sketch 119. 01-12 -- cradle guide

50X1-HUM

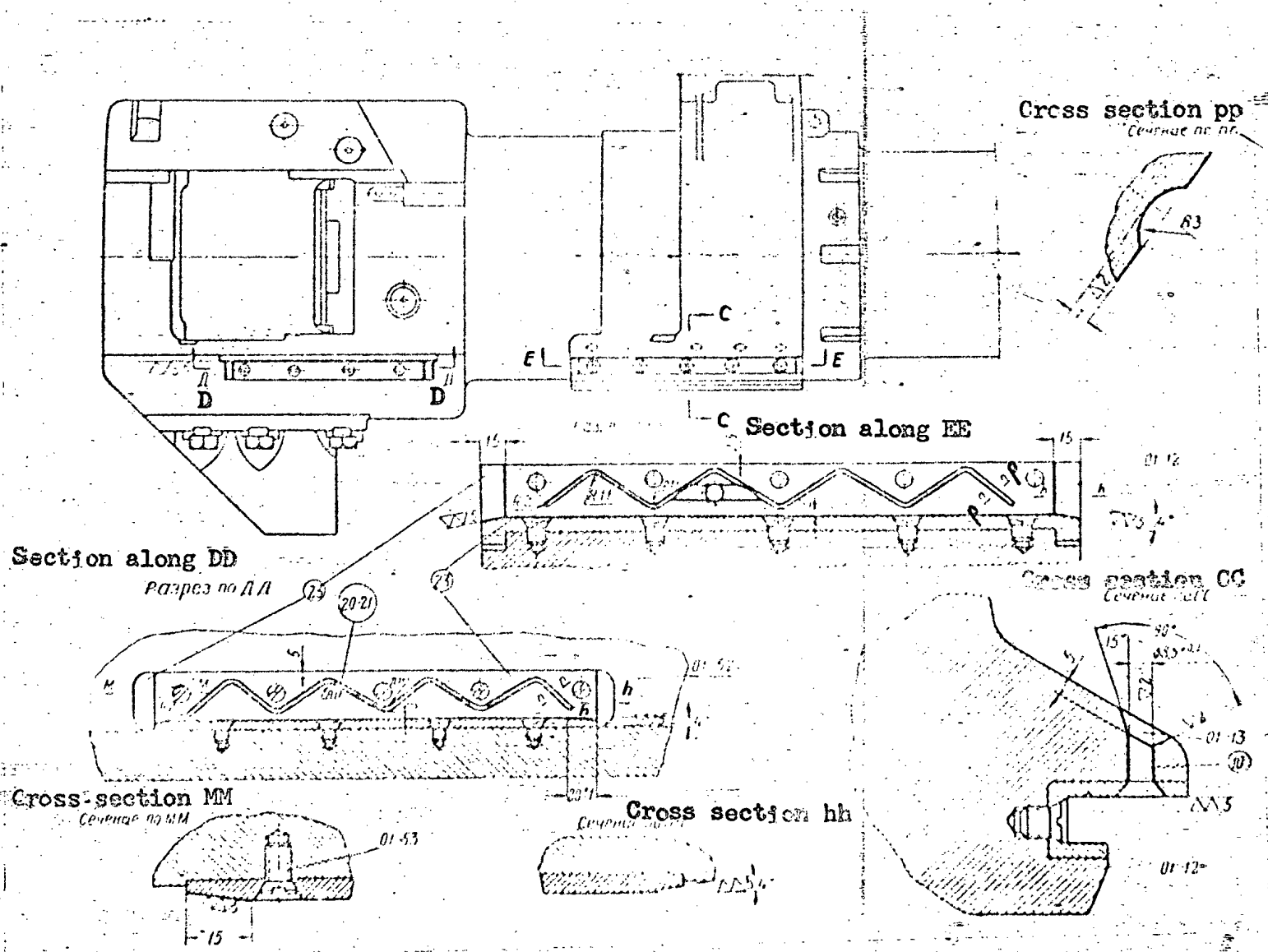
50X1-HUM

50X1-HUM



Sketch 120. Cradle guide

50X1-HUM



Sketch 321. Installation of cradle guides: 01-12 -- cradle guide; 01-13 -- rivet; 01-52 -- cradle guide; 01-53 -- screw

50X1-HUM

50X1-HUM

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13. Make 20 screws of brass LS-59-1 (sketch 122).

14. Make 18 screws 01-53 of brass LMtsA-57-3-1 (sketch 123). 50X1-HUM

15. Make 20 rivets 01-13 of copper M2 (sketch 124).

16. Place cradle guides 01-52 on the breech ring according to the punch marks and fasten them with screws 01-53.

17. Place cradle guides 01-12 in the clamping pieces according to the punch marks and fasten them with screws. Place rivet 01-13 in the hole and rivet it flush (see sketch 121).

18. Bore holes for grease in the gradle guide to coincide with those for grease cups in the clamping pieces.

19. Using a straightedge, scrape the bearing surfaces of cradle guides 01-12. The scraping of the two cradle guides located on the same side in the front and rear clamping pieces should be done simultaneously. File and scrape the bearing surfaces of cradle guides 01-52 of the breech ring.

Use the cradle guides of the clamping pieces which have already been scraped as guides for scraping cradle guides 01-52.

20. Mark grooves for grease.

21. Cut out grooves for grease.

22. Prick punch the screws fastening the cradle guides.

23. Trim the cradle guides and bevel the ends of the guides.

24. Place the barrel in the cradle and check how it moves in the cradle. If it sticks, remove it and scrape the cradle guides in the place where it sticks.

Place the barrel in the cradle and check the fit of the cradle guides of the barrel and the guides on the cradle. The barrel should rest on no less than 4 cradle guides. Place the barrel in the traveling position and check the fit of the lower surfaces of the breech ring and supports 19-438 and 19-439 of the trails. Local gaps up to 0.5 mm over half the length of the bearing surface of the supports are allowed. If the two surfaces do not fit, file the upper bearing surface of clamps 19-193.

Note: If key 08-55 catches on the lower surface of the k 50X1-HUM the breech lug, file the lower surface of the key.

26. Insert the grease cups in the barrel clamping piece.

27. When the gun is assembled, place the barrel in a horizontal position, check by means of a level the levelness of the clinometer plane in longitudinal and transverse directions. A deviation of up to 1.5 minutes is permissible. [p 206] 50X1-HUM

If the deviation is greater, scrape the clinometer plane. Scraping of the clinometer plane should be done with the gun in a horizontal position in the direction of the axis of the cradle trunnion and with the barrel in a horizontal position.

Placing of the barrel in a horizontal position is done according to linear and control levels.

The gun is placed in a horizontal position (in the direction of the axis of the trunnion) in the following manner:

-- place a plumb line in front of the barrel at a distance of no more than 3 m;

-- glue a thread along the vertical lines on the face of the muzzle brake;

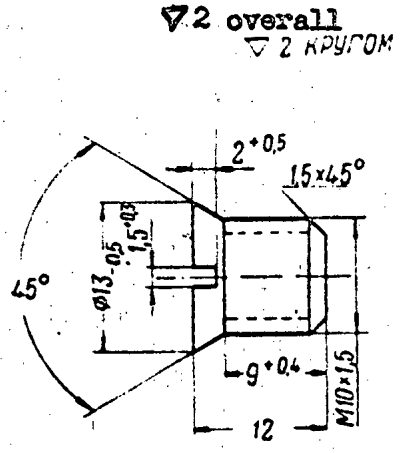
-- remove the striker mechanism from the breech;

-- operating the aiming mechanisms and sighting through the firing-pin hole in the breechblock wedge, aim the vertical thread on the muzzle brake at the plumb line;

-- elevating the barrel and sighting through the hole in the breech-block, check whether the vertical thread deviates from the plumb line;

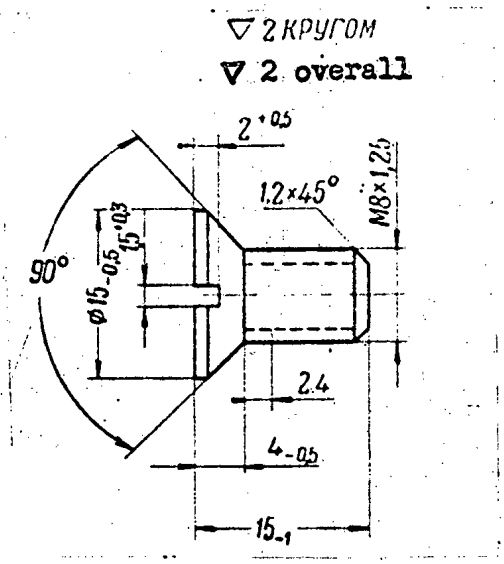
-- if there is a deviation, place a block under the corresponding trail spade.

50X1-HUM



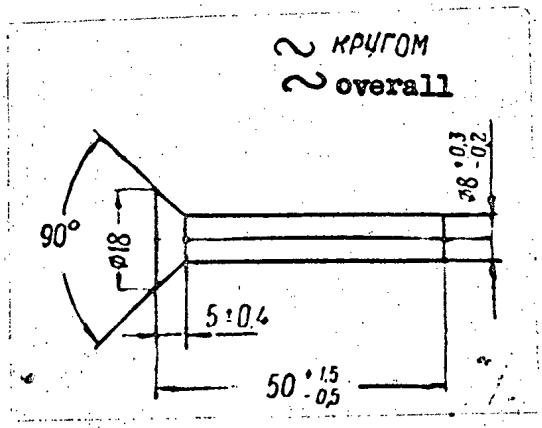
Material: brass LS59-1
Blunt sharp edges R0.4

Sketch 122. Screw



Material: brass LMtsA-57-3-1
Blunt sharp edges 0.6

Sketch 123. 01-53 -- screw



Material: copper M2

Sketch 124. 01-13 -- rivet

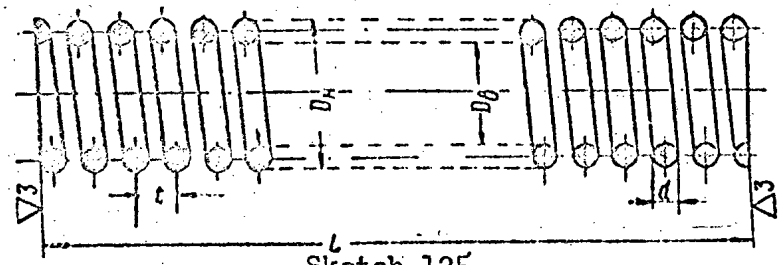
Chart Three

MANUFACTURE OF CYLINDRICAL SPRINGS

I. Data for Manufacture of Springs

(Sketch 125)

2 ОСТАЛЬНОЕ
remaining



Sketch 125
Эскиз 125

Навивка правая (right coiling)

Spring no. № пружин	Material Материал	Stock size Размеры заготовки, мм: diameter диаметр d,	Stock size: len. длина	Dimensions of spring Размеры пружины, мм: $D_н$	$D_{нн}$	t	L	No. of coils Число витков: working рабочих	total общее	Diameter of mandrel Ориентировочный диаметр оправки D_o, мм D_o
01-27	П-II	$2^{+0,05}_{-0,02}$	1400	25	21	8,25	135±7	16	17,5±0,25	19,3
02-8	П-II	$2^{+0,05}_{-0,02}$	700	20,5	16,5	7,57	56±2	7±0,5	9±0,5	15,3
02-12	П-II	$1,2^{+0,03}_{-0,02}$	575	14	11,6	5,4	50,7±2	9±0,5	11±0,5	11,2

50X1-HUM

50X1-HUM

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Spring no. № пружин	Material Материал	Stock size Размеры заготовки, мм		Dimensions of spring Размеры пружины, мм				No. of coils Число витков		Dia. of Ориентировочный диаметр оправки D_o, мм
		diameter диаметр d	len. длина	$D_н$	$D_{вн}$	t	L	working рабочих	total общее	mandrel D_o
02-26	П-II	$0,9^{+0,03}_{-0,01}$	350	5,9	4,1	1,97	25±1	12	14±0,25	3,8
02-39	П-II	$1^{+0,03}_{-0,02}$	400	7	5	2,27	31±1	13±0,5	15±0,5	4,6
08-19	60С2А	$2^{+0,05}_{-0,02}$	750	33	29	9,5	45,5±2,3	4,5±0,25	6,5±0,25	27,2
09-47	60С2А	$1,5^{+0,01}_{-0,02}$	500	11,5	8,5	3,6	39±1	10±0,5	12±0,5	8,1
09-85	60С2А	$1,5^{+0,01}_{-0,02}$	1450	25,5	23,5	12,5	177±5	14±0,5	16±0,5	21,8
09-95	60С2А	$2,2^{+0,05}_{-0,02}$	700	22,2	17,8	5,7	35±1,5	5,5±0,5	7,5±0,5	16,2
12-21	П-I	2	500	14,5	10,5	3,96	32,7±2	7,5	9,5	8,7
12-55	П-I	1,2	300	12	9,6	4,1	14±1	3	5	9,1
12-94	П-I	3	950	27,5	21,5	7,8	59±2	7	9	20
12-127	П-I	0,5	175	4,5	3,5	1,77	7,85±1	6	4	3,2
17-8	60С2А	2±0,05	1100	26,5	22,5	10,9	112±5	10±0,25	12±0,25	20,6
19-38	П-II	$1,5^{+0,01}_{-0,02}$	675	13,5	10,5	4,13	56±2	13±0,5	15±0,5	9,6
19-52	П-II	$1,5^{+0,01}_{-0,02}$	650	14,8	11,8	5	52±2,5	10±0,5	11,5±0,5	10,7
19-133	60С2А	$2,5^{+0,05}_{-0,02}$	700	22	17	6,57	50±2	7±0,5	8,5±0,5	15,2
19-437	П-II	$1,5^{+0,01}_{-0,02}$	475	11	8	3,6	38±2	10±0,5	11,5±0,5	7,2
[illegible]-459	60С2А	$2,5^{+0,05}_{-0,02}$	1050	29,5	15,5	6	85±4,3	14±0,75	15,5±0,75	13,7
[illegible]-29	П-II	$1^{+0,03}_{-0,02}$	400	7	5	2	29,5±1,5	14±0,5	15,5±0,5	4,6
[illegible]-53	П-II	$1^{+0,03}_{-0,02}$	275	9	7	2,4	16±1	6±0,5	7,5±0,5	6,5
26-54	П-II	$1,8^{+0,01}_{-0,02}$	650	13,8	10,2	4,2	53±2,5	12	14±0,25	9,6
26-122	60С2А	$1,8^{+0,01}_{-0,02}$	700	29,6	26	9,86	52±3	5	6,5±0,75	25,2
26-123А	60С2А	$2,5^{+0,05}_{-0,02}$	700	37	--	12,75	42±2	3	4,5±0,25	31,5
27-129	П-II	$1,5^{+0,01}_{-0,02}$	950	19	16	7,5	100±5	11,5	13,5±0,5	15,3

50X1-HUM

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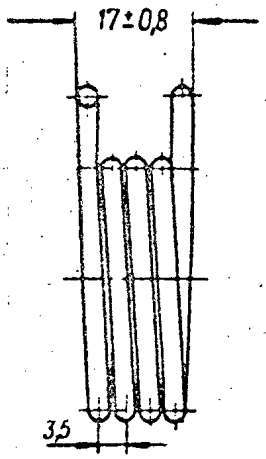
Note: 1. When spring steel of the quality indicated in the table of flow chart 3 and in the sketches is absent, it is permissible to use spring steel of another quality, in which case the necessary technological process of heat treatment should be selected so as to provide the specified resilient characteristics of the spring and guarantee normal operation of the mechanism.

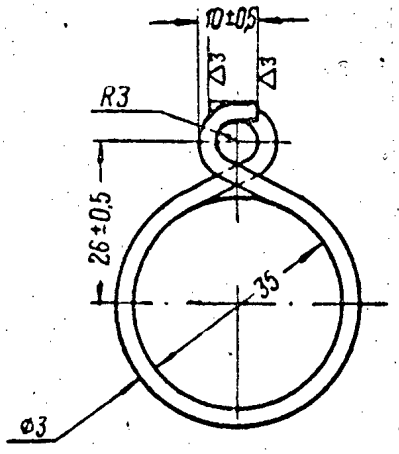
2. It is recommended that springs with outside diameters up to 10 mm be made by hand, and springs with outside diameters of 10 mm or more be made by machine.

3. Anneal raw wire from steel 60S2A before coiling, heating it to a cherry-red color and cooling it in air.

remaining

~ ОСТАЛЬНОЕ





Число витков рабочих	*n=4*
Навивка	*правая*
Развернутая длина проволоки	*L=520 мм*
Ориентировочный диаметр оправки	D_0=33,4 *мм*

Материал: проволока П-I

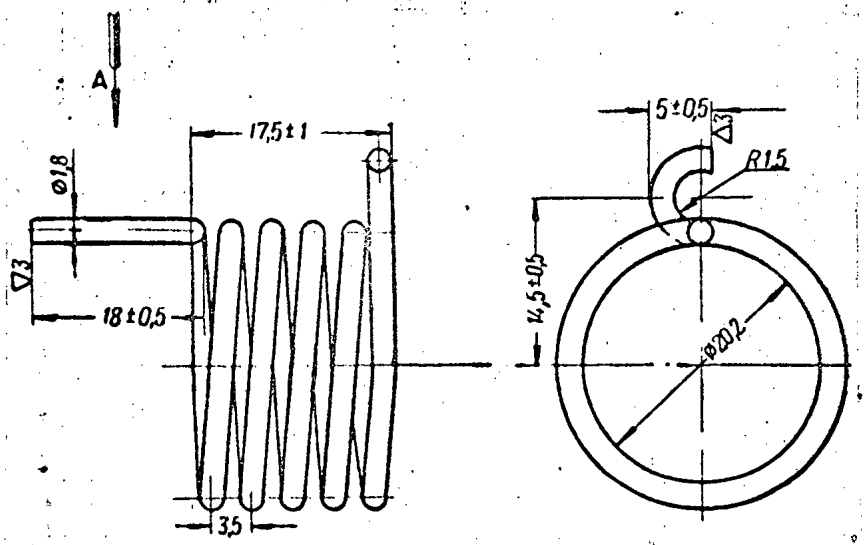
No. of working coils	P = 4	Material: wire P-I
Coiling	Right	
Length of uncoiled wire	L = 520 mm	
Approx. diameter of mandrel	D_o = 33.4 mm	

Sketch 126. 12-38 -- spring

50X1-HUM

remaining

~ ОСТАЛЬНОЕ



View at arrow A

Вид по стрелке А

Число витков рабочих	*n = 5*
Навивка	*левая*
Длина развернутой пружины	*L = 370 мм*
Ориентировочный диаметр оправки	D_0 *= 19,7 мм*

Материал: проволока П-I

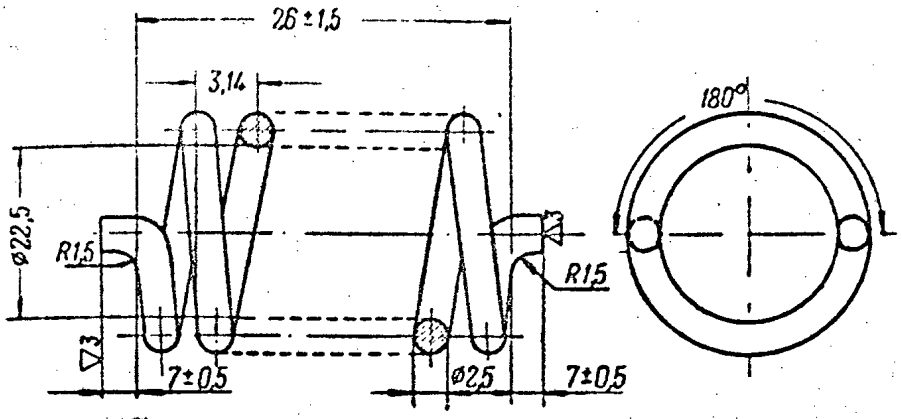
No. of working coils	P = 5	Material: wire P-I
Coiling	Left	
Length of uncoiled spring	L = 370 mm	
Approx. diameter of mandrel	D_o = 19.7 mm	

Sketch 127. 12-43 -- spring

50X1-HUM

remaining

~ ОСТАЛЬНОЕ



Число витков рабочих	n=7,5
Навивка	левая
Развернутая длина проволока	L=615 мм
Ориентировочный диаметр оправки	D_o=21,1 мм

Материал: проволока П-I

No. of working coils	P = 75	Material: wire P-I
Coiling	Left	
Length of uncoiled wire	L = 615 mm	
Approx. diameter of mandrel	D_o = 21.1 mm	

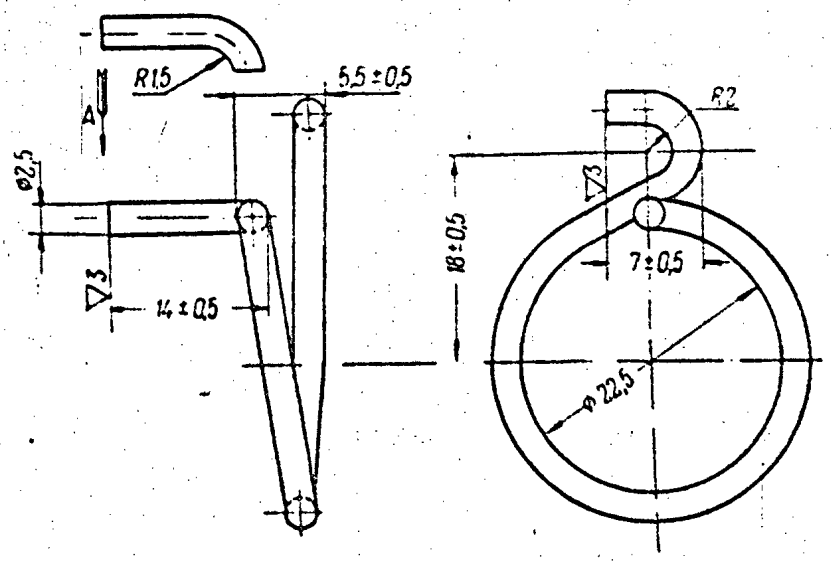
Sketch 128. 12-66 -- spring

View at A

Вид по А

remaining

~ ОСТАЛЬНОЕ



Число витков рабочих	n=1
Навивка	правая
Развернутая длина проволоки	L=110 мм
Ориентировочный диаметр оправки	D_o=21,1 мм

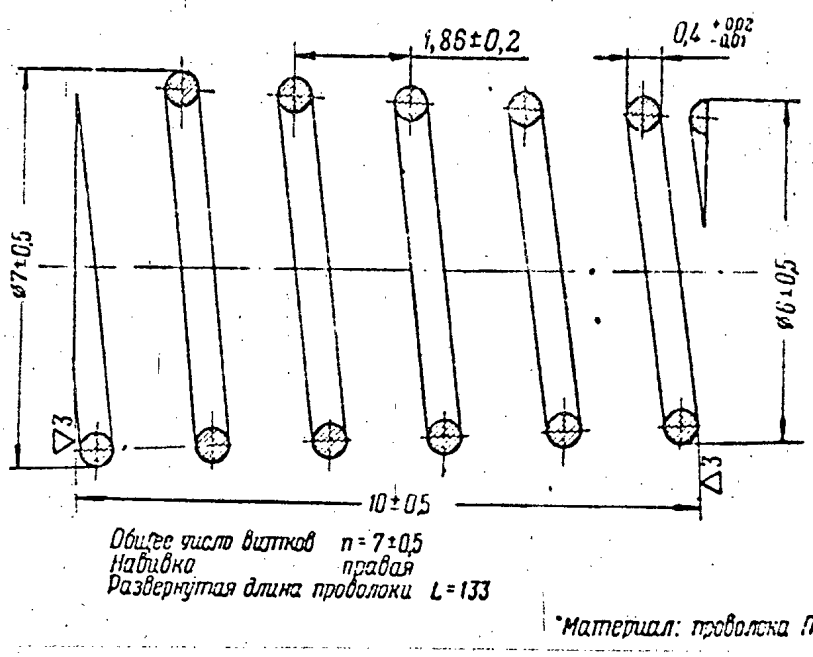
Материал: проволока П-I

No. of working coils	P = 1	Material: wire P-I
Coiling	Right	
Length of uncoiled wire	L = 110 mm	
Approx. diameter of mandrel	D_o = 21.1 mm	

Sketch 129. 12-89 -- spring

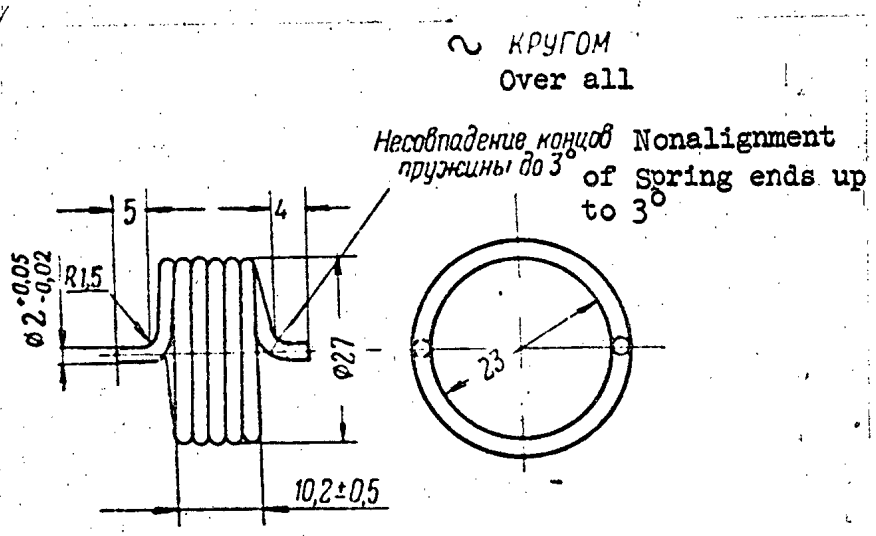
remaining

~ ОСТАЛЬНОЕ



Total number of coils P = 7 ± 0.5 Material: wire P-II
Coiling Right
Length of uncoiled wire L = 133

Sketch 130. 24-80 -- conical spring



Число витков	n=5,5
Навивка	левая
Развернутая длина проволоки	L=440мм
Ориентировочный размер оправки	D_0=21,5 мм

Материал: сталь 60С2А
Воронить

No. of coils	P = 5.5	Material: steel 60S2A
Coiling	Left	Burnish
Length of uncoiled wire	L = 440 mm	
Approx. diameter of wire	D_0 = 21.5 mm	

Sketch 131. 41-104 -- spring

II. Coiling the Springs by Hand

[p 213]

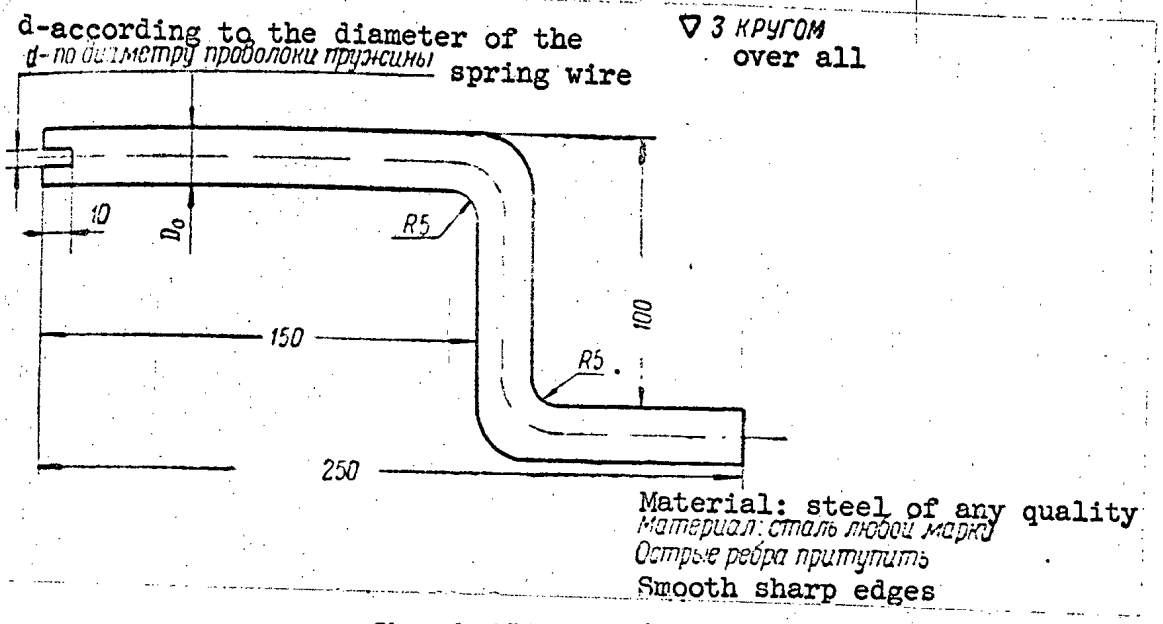
1. Make a mandrel (sketch 132) from steel of any quality for coiling the spring.

50X1-HUM

2. Fasten the end of the wire in the mandrel slots. Press the mandrel in a vise between two wooden blocks and wind the specified number of spring coils on the mandrel.

3. Free the mandrel with the spring, remove the spring, extend its coils to the specified spacing, cut the spring to the appropriate length, set the ends of the spring correctly, and adjust them.

4. Heat treat the spring (see below, Section IV).

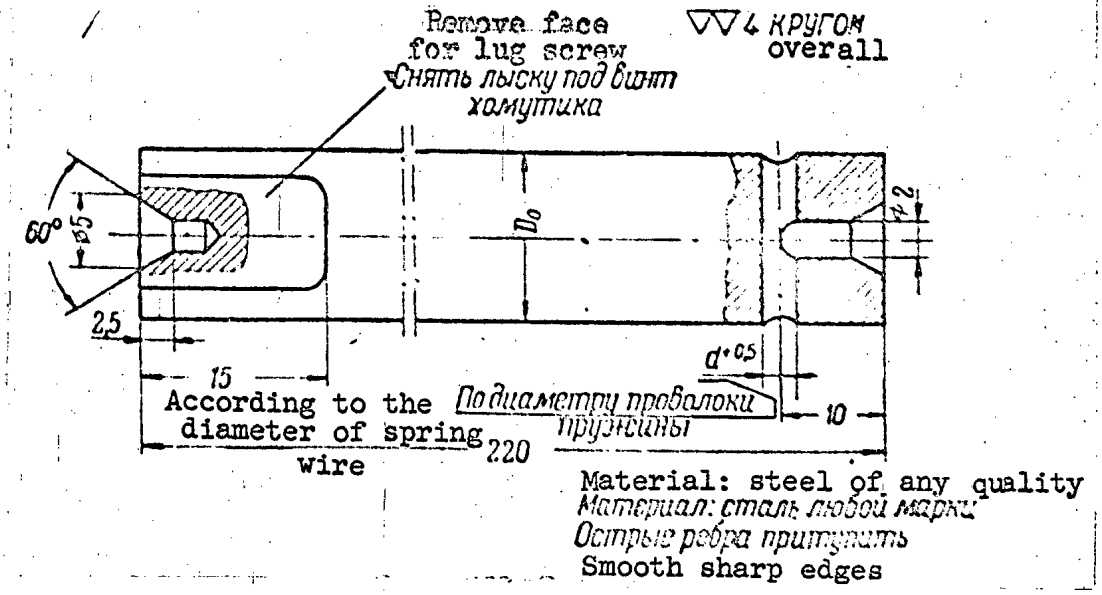


Sketch 132. Mandrel

III. Coiling the Springs on a Lathe

1. Make a mandrel from steel of any quality for coiling the springs (sketch 133).

50X1-HUM



Sketch 133. Mandrel

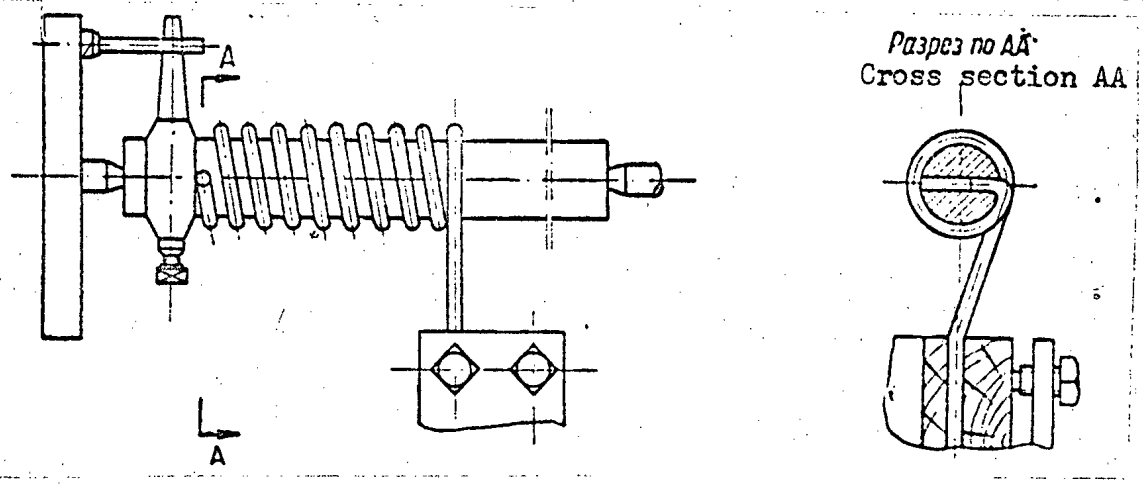
2. Mount the mandrel in the center of the turning lathe. [p 214]

3. Set the feed lever according to the spacing of the spring. Set the lever of the speed box to the minimum number of revolutions. Tighten the wire in the carriage between two wooden blocks and fasten one end of the wire in the aperture on the mandrel. Wind the specified number of spring coils on the mandrel (sketch 134).

4. Remove the spring from the mandrel, cut the spring to the appropriate length, set the ends of the spring correctly and adjust them.

5. Heat treat the spring (see below).

50X1-HUM



Sketch 134. Drawing of spring coiling on lathe

IV. Heat Treatment of the Springs

1. Place the spring in an iron box, heat in a furnace or forge to a cherry-red incandescent color, and cool (temper) in oil.

2. Clean the spring to a metallic shine.

3. Place the spring in an iron box, heat in a forge to a gray temper color and cool in oil (tempering).

Note: 1. Heat red hot and temper only those springs made from steel 60S2A. 2. Do not heat red hot springs from steel P but subject them to tempering after coiling by heating according to the above instructions to a brownish-yellow temper color (255°C) and cool in air.

Chart Four [p 214]

Eliminating Eccentricity in the Striking of the Firing Pin

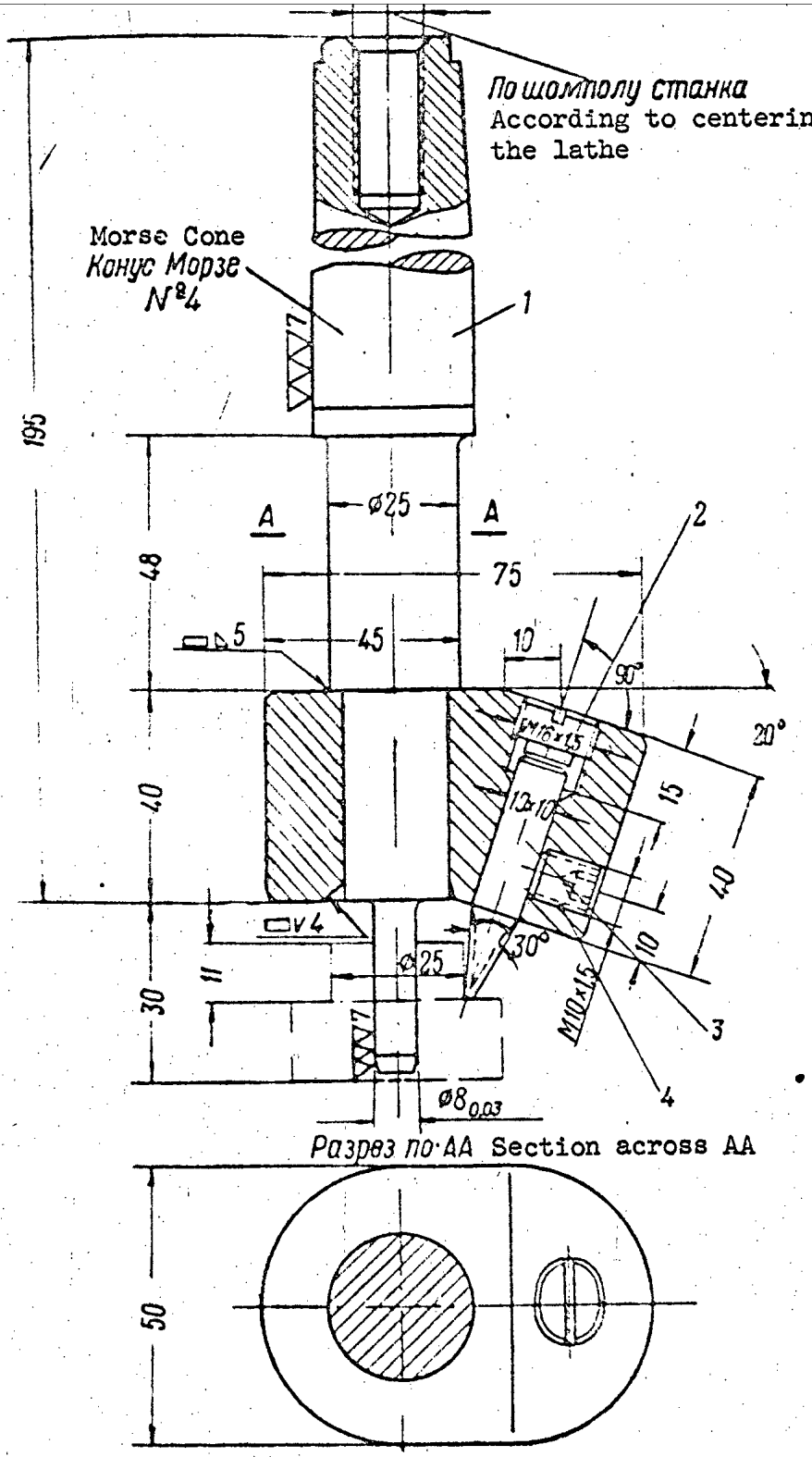
1. Drill the riveted part of the slide with a bit 15 mm in diameter which has been ground almost to a 90° angle.

2. Remove the slide catch and take off slide 02-5A (or 02-5).

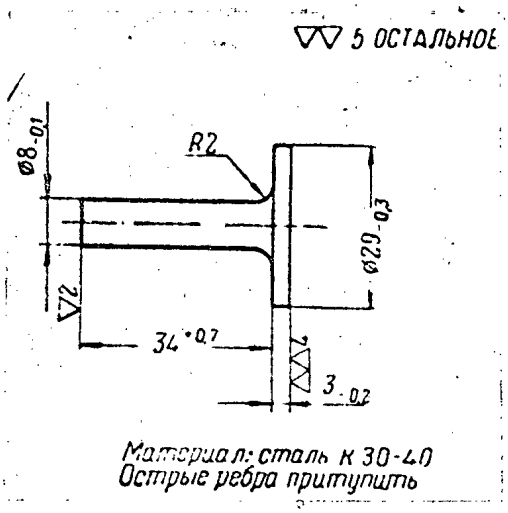
3. Measure difference T between the diameter of the opening in slide 02-5A (02-5) and the diameter of arm trunnion 02-1A of the breechblock lever. [p 216]

50X1-HUM

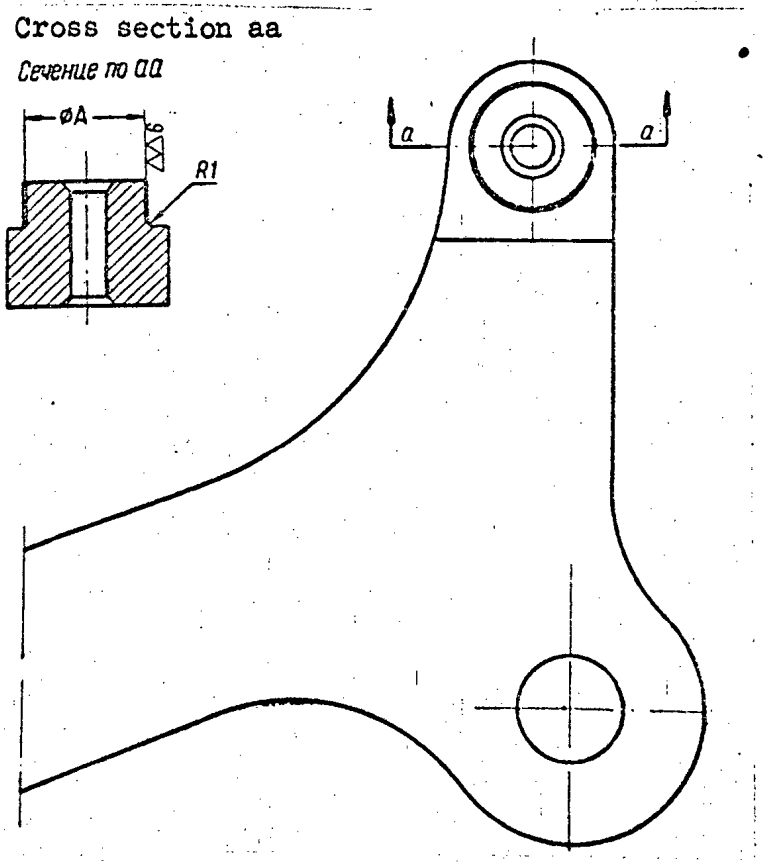
4. Make an arbor with a cutting tool for machining the arm trunnion of the breechblock lever (sketch 135).



Sketch 135. Arbor with cutting tool: 1 -- arbor; 2 -- adjus 50X1-HUM;
3 -- cutting tool; 4 -- stop screw



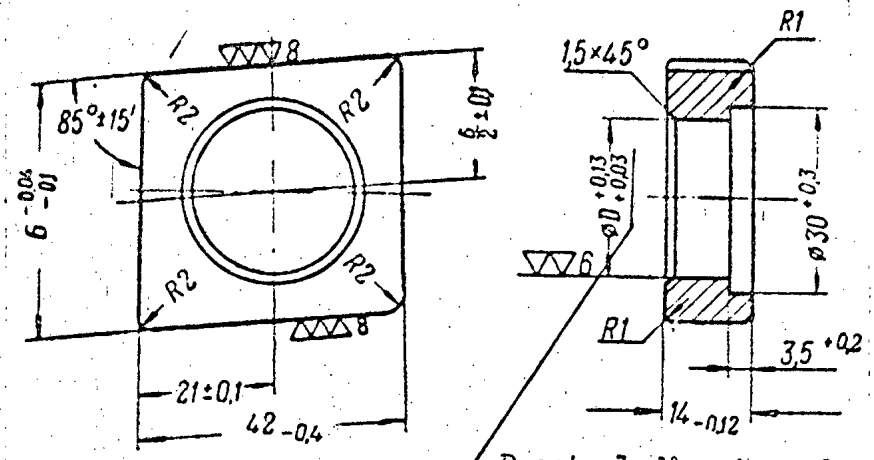
Sketch 136. 02-36 -- slide catch



Sketch 137. Machining the breechblock lever arm trunnion

▽▽ 5 ОСТАЛЬНОЕ ▽▽ 5 for the remaining

50X1-HUM



D-фактический диаметр цапфы плеча рукоятки 02-1А затвора

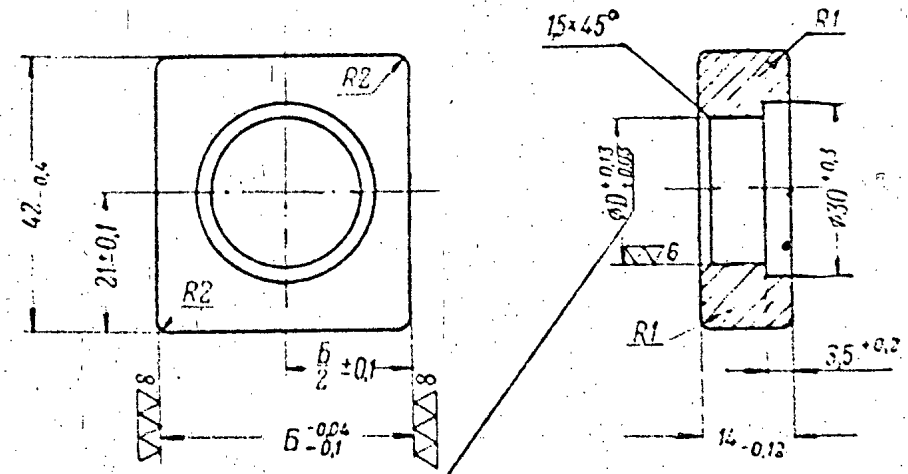
D-actual diameter of arm trunnion of breechblock lever 5b02-1A

Material: steel 40X
Smooth sharp edges
Temper 45-55Rc

Sketch 138. 02-5A -- slide

▽▽ 5 ОСТАЛЬНОЕ

5 for the remainder



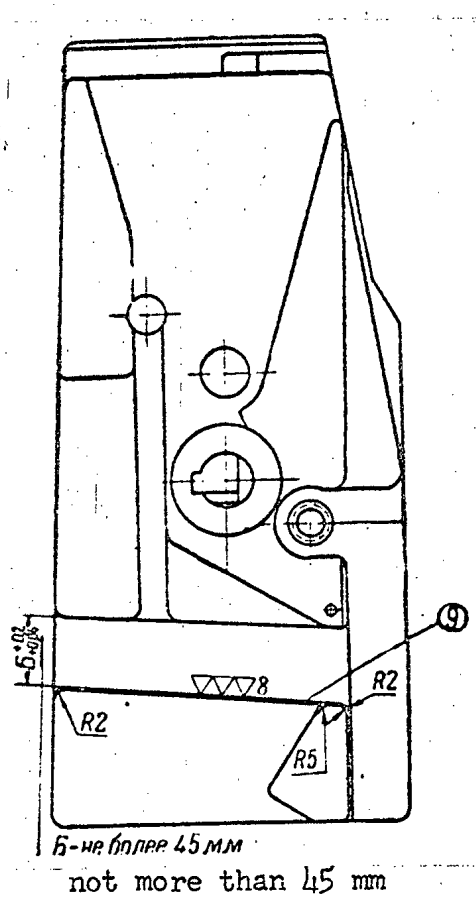
D-фактический диаметр цапфы плеча рукоятки 02-1А затвора

D-actual diameter of arm trunnion of breechblock lever 5b02-1A

Материал: сталь 40Х
Острые ребра притупить
Закалить 45-55 Rc

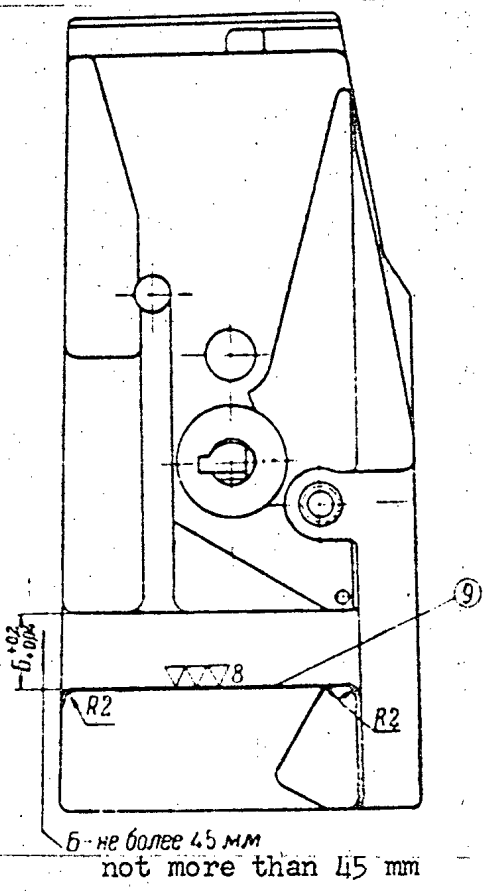
Material: steel 40X
Smooth sha50X1-HUM
Temper 45-55Rc

Sketch 139. (02-5) -- slide



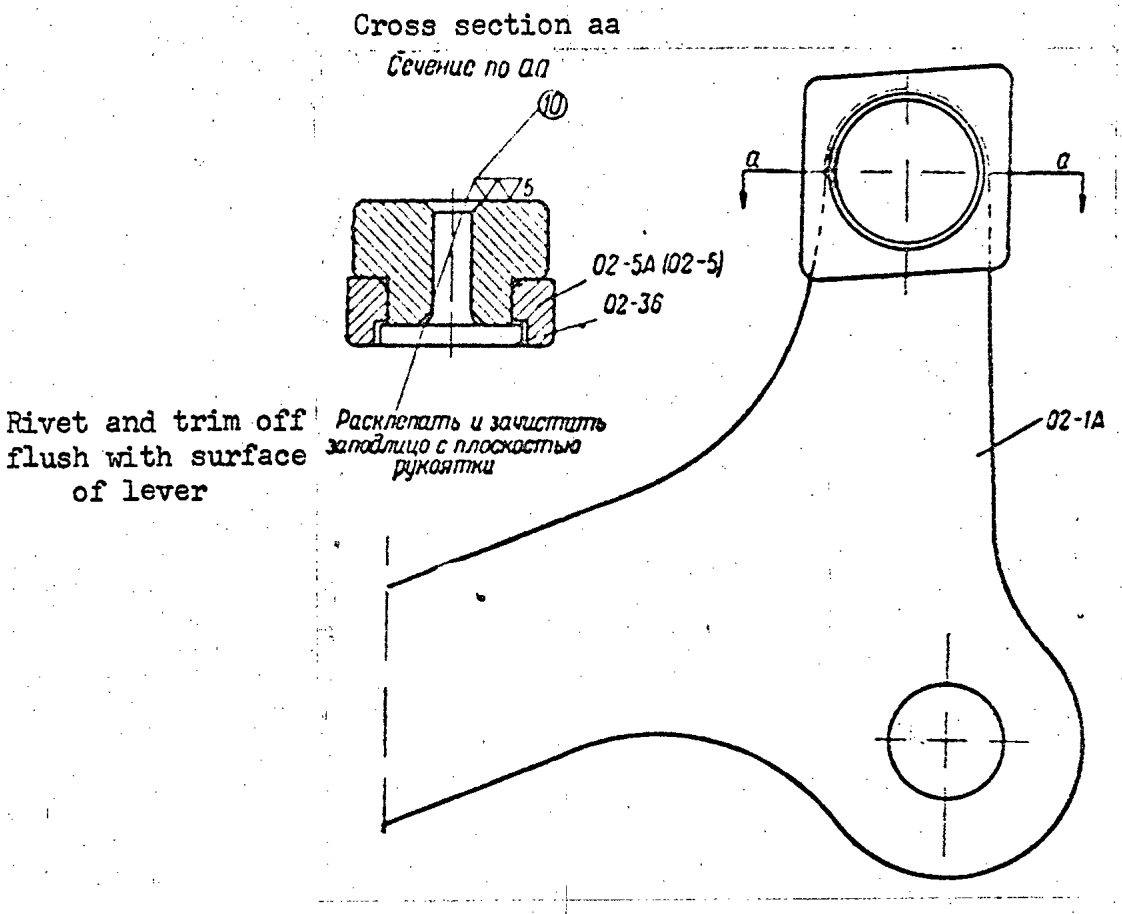
not more than 45 mm

Sketch 140. Clearing the channel of the breechblock wedge (on guns of subsequent issue)



not more than 45 mm

Sketch 141. Clearing the channel of the breechblock wedge (on guns of initial issue)



Sketch 142. Mounting the slide on the breechblock lever arm: 02-1A -- breechblock lever arm; 02-5A (02-5) -- slide; 02-36 -- slide catch

5. Make slide catch 02-36 from steel 40 (sketch 136).

6. Place the breechblock lever arm on the milling machine table and set the arbor with the cutting tool on the vertical spindle. 50X1-HUM

7. Removing a minimum layer of metal, machine the arm trunnion of the breechblock lever until the oval shape is completely eliminated. The smallest tolerable diameter of the trunnion is 24 mm (sketch 137).

8. Make slide 02-5A (or 02-5) from steel 40X (sketches 138 and 139).

Slide measurement B is determined according to the formula

$$B = (V + A - T - 3.5)^{-0.04}_{-0.1}$$

where: V -- the actual width of the rejected slide taken from the breechblock lever.

A -- the actual measurement of the outline of two firing pin impressions.

T -- the difference between the diameter of the opening in the slide and the diameter of arm trunnion 02-1A of the breechblock lever.

9. File the right side of the breechblock wedge channeling, maintaining measurement $B^{+0.2}_{+0.04}$ (sketches 140 and 141); B is the actual width of the slide which has been made.

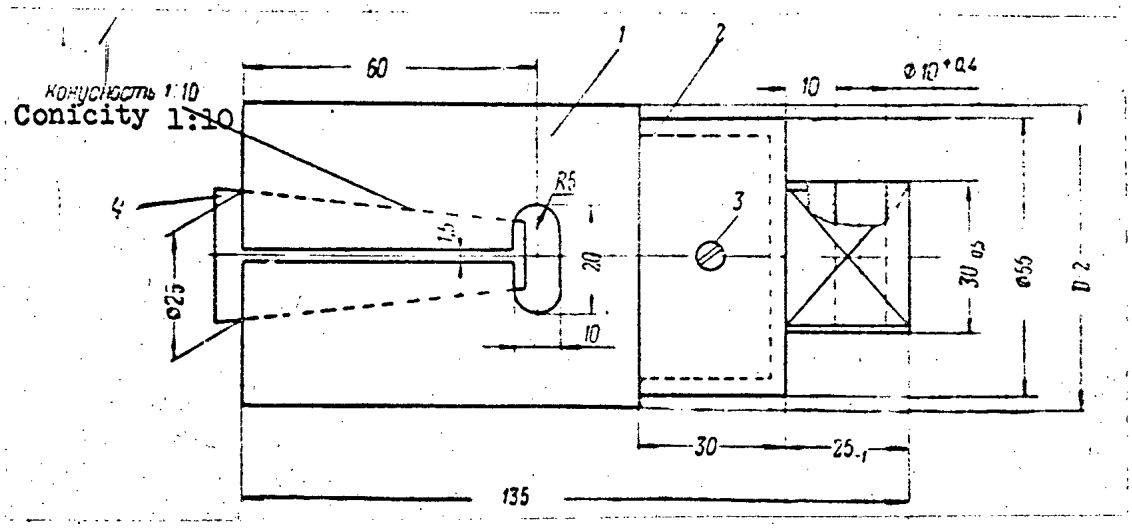
10. Put slide 02-5A (or 02-5) on arm trunnion 02-1A of the breechblock lever and insert slide catch 02-36. Flush rivet the slide catch. Trim the riveted area flush with the surface of the lever (sketch 142).

11. Assemble the breechblock, mount it on the cannon, and check the operation of the breechblock. In the places where the slide sticks, scrape the wedge channeling.

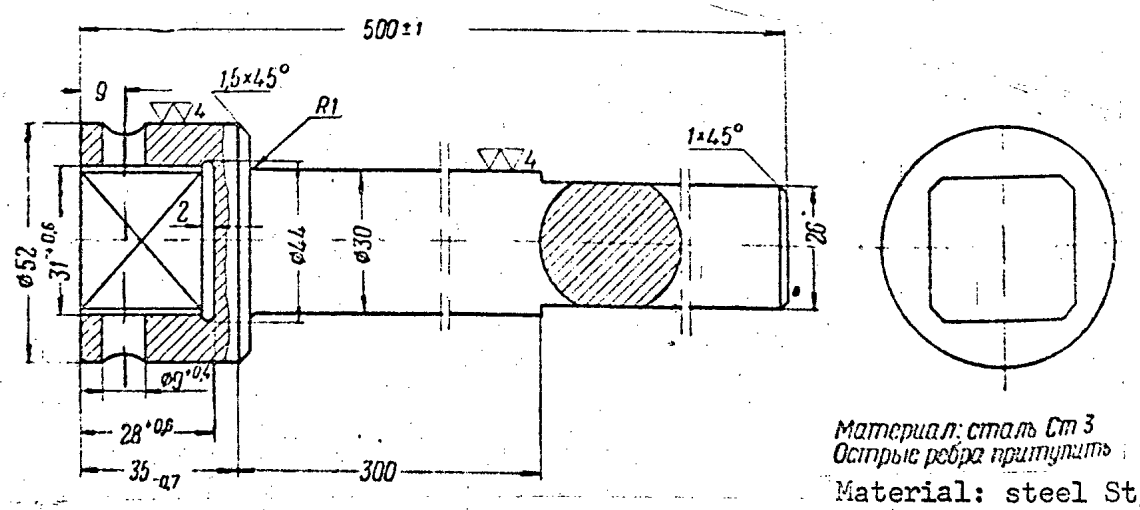
Chart Five [p 220]

Removing Rust From the Surfaces of Recoil Cylinder 08-1, Stuffing Box 08-2, Rod 08-12, Inner Tube 08-22, Forward Cap 08-23, Intermediate Cylinder 10-9, Stuffing Box 10-75, External Cylinder Sb24-1 of the Jack, and Cylinder (Sb26-3)

A. Removing Rust From the Inner Surfaces of Stuffing Box 08-2, Forward Cap 08-23, and Stuffing Box 10-75. 50X1-HUM

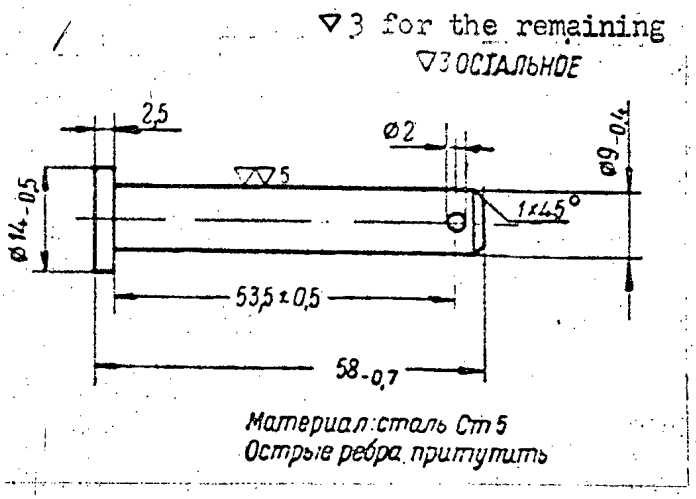


Sketch 143. Grinding head:
1 -- shoe; 2 -- band; 3 -- wood screw; 4 -- wedge



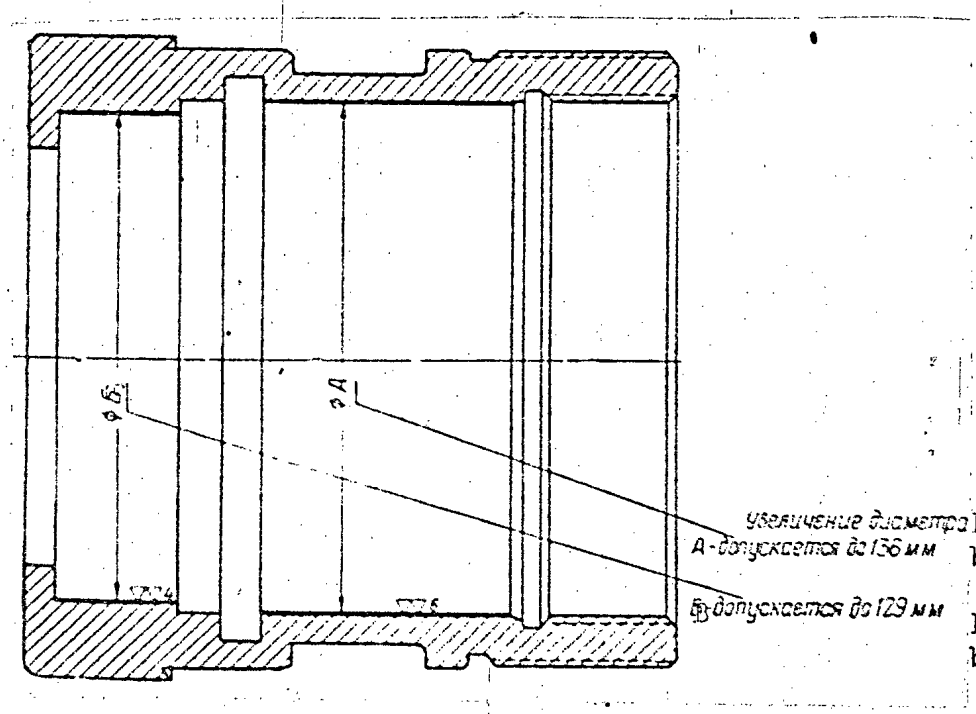
Sketch 144. Rod

50X1-HUM



Material: steel St5
Blunt sharp edges

Sketch 145. Pin

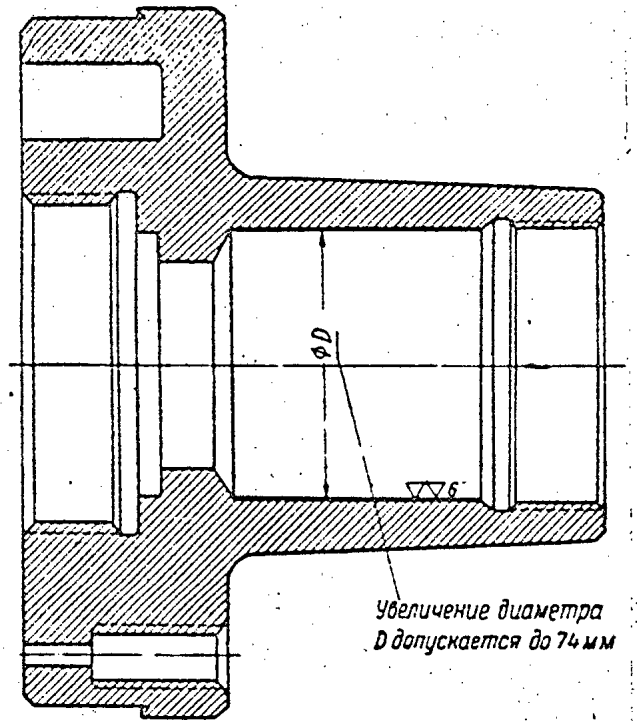


Diameter A may be increased to 136 mm
Diameter B may be increased to 129 mm

50X1-HUM

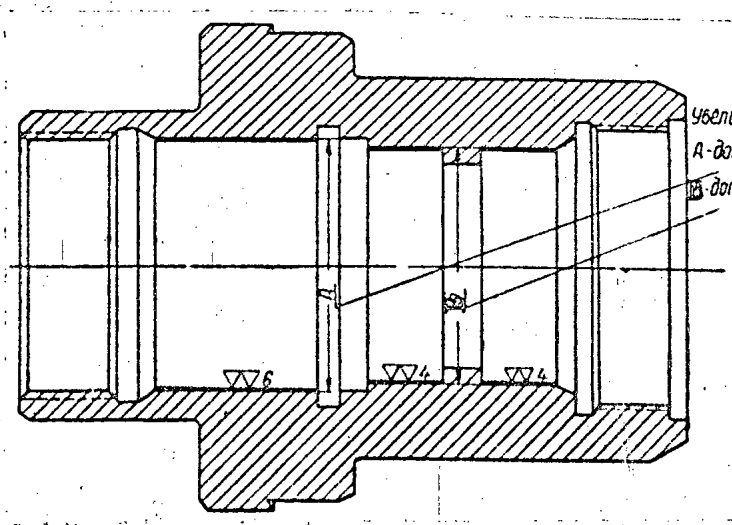
Sketch 146. 08-2 -- stuffing box

50X1-HUM



Diameter D may be increased to 74 mm

Sketch 147. 08-23 -- forward cap

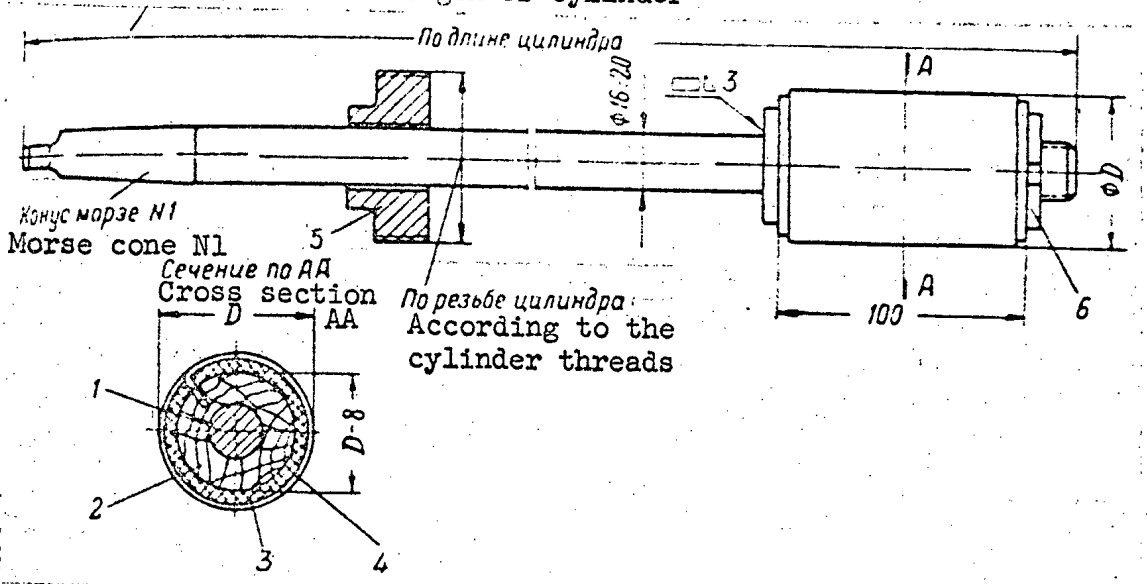


Diameter A may be increased to 70 mm
Diameter B may be increased to 66 mm

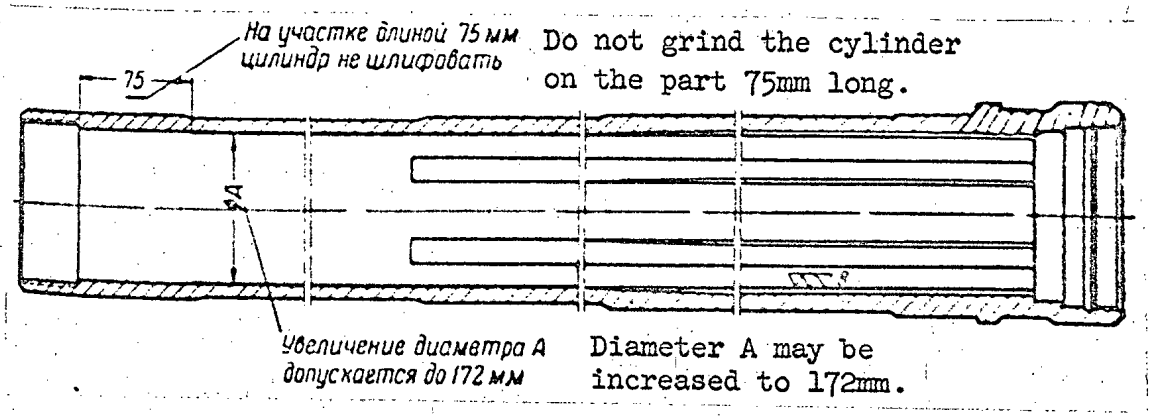
50X1-HUM

Sketch 148. 10-75 -- stuffing box

50X1-HUM



Sketch 149. Device for internal grinding: 1 -- rod; 2 -- wooden head; 3 -- felt; 4 -- emery cloth; 5 -- regulating nut; 6 -- round holding nut



Sketch 150. 08-1 -- recoil cylinder

50X1-HUM

1. Make a grinding head, a rod, and a pin (sketches 143-145).

2. Mount the piece being repaired in a three-jawed chuck and adjust it for play according to the inner surfaces. Play of (50X1-HUM is permissible.

3. Mount the rod in the tool holder (sketch 144). Mount the rod conforming to the axis of the centers of the lathe. Connect the grinding head to the rod.

4. Wrap emery cloth around the grinding head. Insert the grinding head in the piece being ground and grind the interior of the piece until rust is eliminated. While grinding, lubricate the cloth with mineral oil. Pad the wedge of the grinding head and change the emery cloth depending upon the amount of grinding. Make the final grinding with an emery cloth having a 180-200 grain texture (sketches 146-148).

5. Wash the piece and wipe it dry.

B. Removing Rust From the Inner Surfaces of Recoil Cylinder 08-1, [p 223] Inner Tube 08-22, Rod 08-12, Intermediate Cylinder 23-146, External Cylinder Sb24-1 of the Jack, and Cylinder (Sb26-3).

1. wake a device for grinding the interior of the cylinder (sketch 149).

2. Mount the cylinder in a vise.

3. Wrap the head of the grinding device with emery cloth. Insert the device into the cylinder, screw the regulating nut of the device into the cylinder, and connect the rod of the device to an electric drill.

4. Grind the interior of the cylinder until rust is removed, taking a minimum layer of metal from the entire length of the cylinder.

During grinding, lubricate the emery cloth with mineral oil (sketches 150-155). The diameters may be increased by grinding: to [p 226] 172 mm for recoil cylinder 08-1, to 65 mm for inner tube 08-22, to 80.6 mm for rod 08-12, to 126 mm for intermediate cylinder 10-9, to 151 mm for external cylinder 23-146, to 51 mm for external cylinder Sb24-1 of the jack, and to 100.3 mm for cylinder (Sb26-3).

Note: Do not grind rod 08-12 and intermediate cylinder 10-9 along their entire lengths but trim off only local corrosion.

50X1-HUM

5. With a star gage, measure the inner diameters of recoil cylinder 08-1 and the inner tube at 100 mm intervals both vertically and horizontally. The difference between a horizontally measured diameter and its adjacent vertically measured diameter should not exceed 0.08 mm. 50X1-HUM

The difference between the largest and the smallest diameter along the entire length of the interior surface should not exceed 0-15 mm.

6. Make a device for cleaning the grooves of recoil cylinder 08-1 (sketch 96).

7. Clean and polish the rusted areas in the grooves.

8. Wash the cylinder and wipe it dry.

C. Removing Rust From the External Surfaces of Throttling-Rod 08-28

1. Fill in the grooves along the length of the throttling rod with strips of hard wood.

2. Mount the throttling rod in a three-jawed chuck and stay and adjust for play; play up to 0.5 mm is permissible (sketch 156).

3. Grind the non-chromed part of the throttling rod along its entire length until rust is removed, taking a minimum layer of metal evenly from the entire length. Grind with an emery cloth with the aid of clamps. Lubricate the emery cloth with mineral oil.

4. The smallest diameter of the throttling rod permissible after grinding is 58.5 mm.

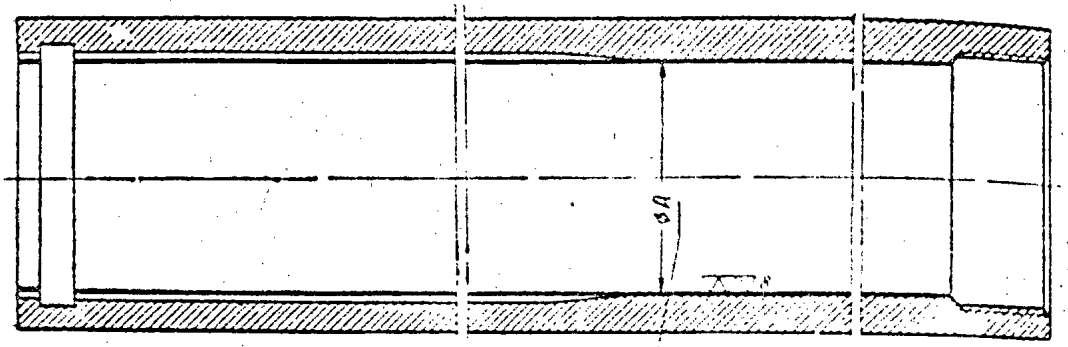
5. Measure the throttling rod.

Measure at each 100 mm of length. The difference between the smallest and largest diameter along the entire length should not exceed 0.15 mm.

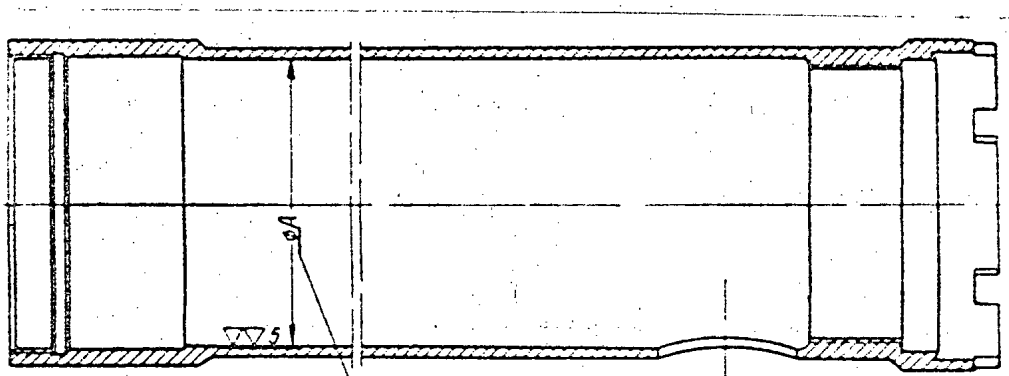
6. .Remove the strips from the grooves and clean off the rust deposits in the grooves.

50X1-HUM

50X1-HUM



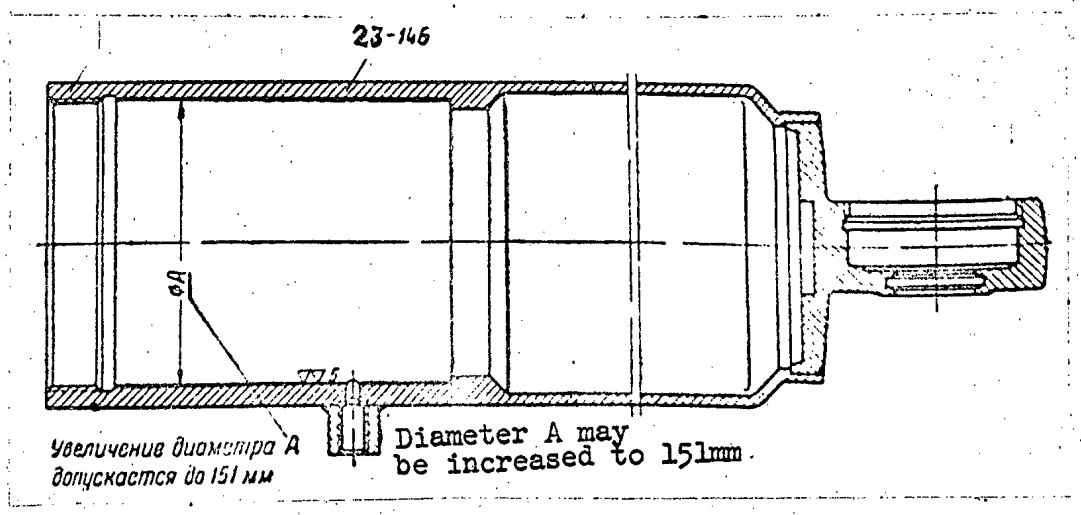
Sketch 151. 08-22 -- inner tube



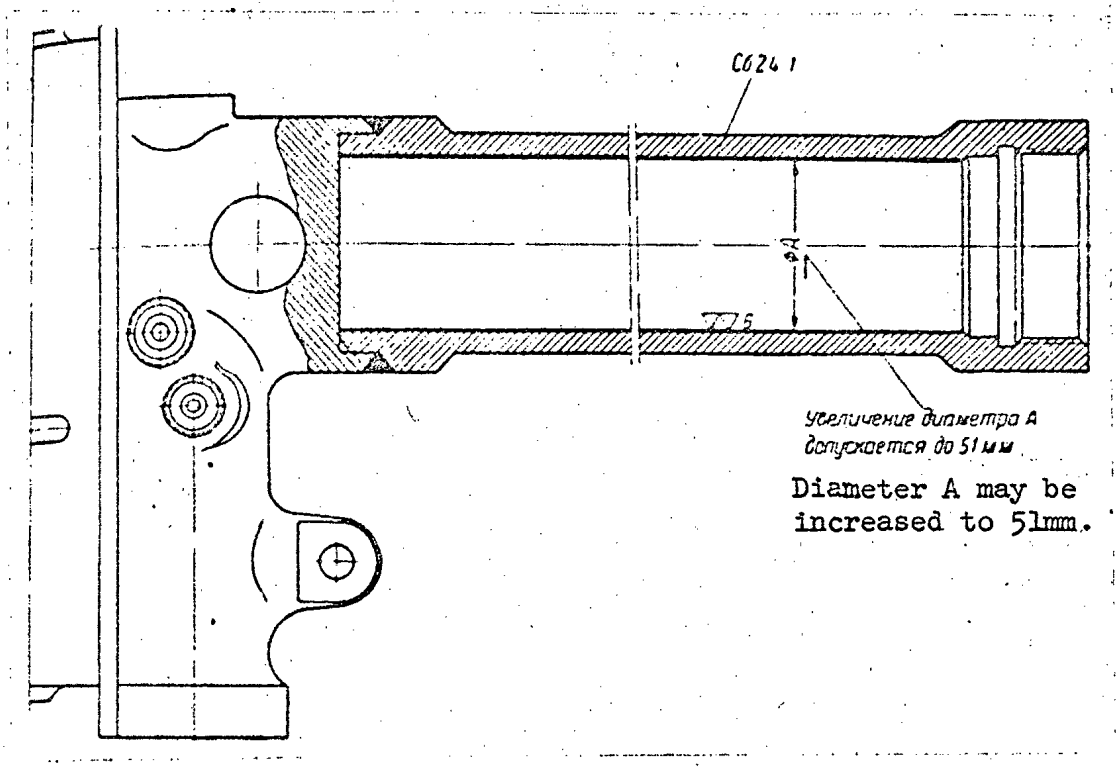
Sketch 152. 10-9 -- intermediate cylinder

50X1-HUM

50X1-HUM



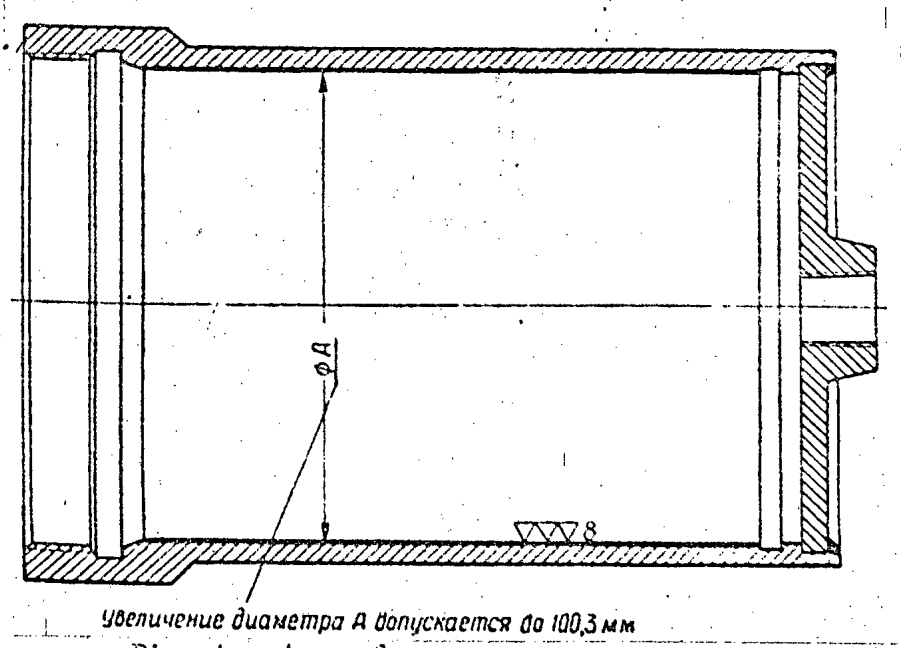
Sketch 153. Sb23-3 -- external cylinder; 23-146 -- external cylinder



Sketch 154. Sb24-2 -- jack housing; Sb24-1 -- external cylinder

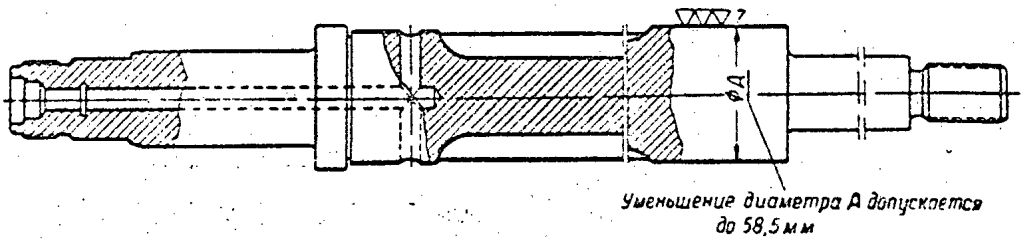
50X1-HUM

50X1-HUM



Diameter A may be
increased up to 100.3 mm

Sketch 155. Sb26-3 -- cylinder



Diameter A may be
reduced to 58.5 mm

Sketch 156. 08-28 -- counterrecoil buffer

50X1-HUM

Repair of Intermediate Cylinder 10-9, Air Cylinder 10-3, Operating Cylinder 10-4[1], External Cylinder 23-146, and External Cylinder Sb624-1 of the Jack 50X1-HUM

A. Removal of Bulges by Trimming

Bulges up to 1 mm in height are removed in the following manner:

1. Make a device for trimming bulges (of the type shown in sketch 93).

2. Insert the device in the cylinder and file the raised metal flush with the undamaged surface.

3. Make a device for abrading the inner surface of the cylinder (see sketch 149).

4. Wrap abrasive paper around the head of the device for abrading the cylinder.

Insert the device in the cylinder, screw the guide nut into the cylinder, connect the shaft of the device to an electric drill, and polish the section being repaired.

5. Wash the cylinder and wipe it dry.

B. Removal of Bulges by Straightening

Bulges greater than 1 mm in height are removed in the following manner:

1. Make a device for straightening the bulges (sketch 157).

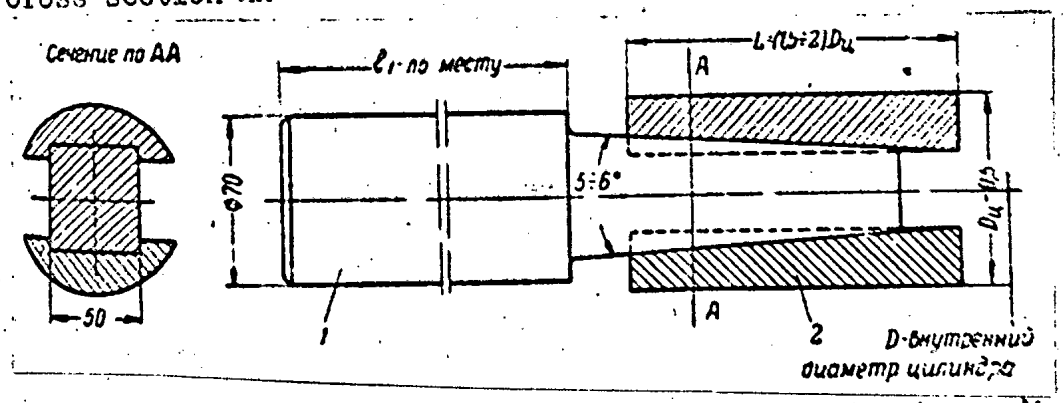
2. Select a tube or rod for installing the device for straightening the bulges.

3. Slip the cylinder on the tube or rod as far as possible, insert the device into the cylinder so that its segments are aligned with the bulge in the cylinder. Open the segments as far as possible.

4. Coat the cylinder in the area to be heated with moist asbestos, [p 228] leaving uncovered the dent and the surface surrounding it for 15-20 mm.

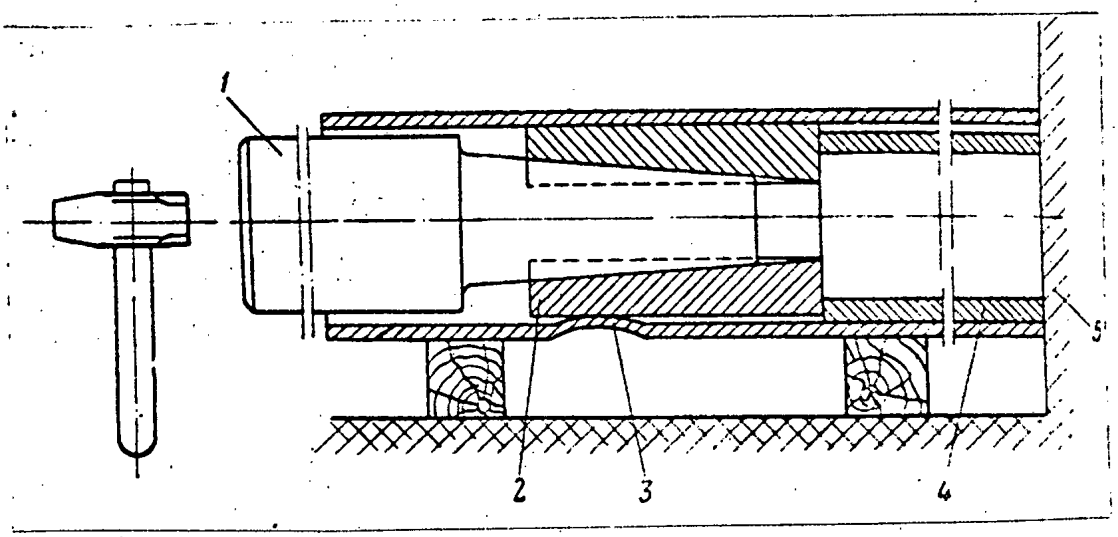
5. Heat the area of the dent to a temperature of 650-700° (to a dark red color) with a gas burner or torch. 50X1-HUM

Cross section AA

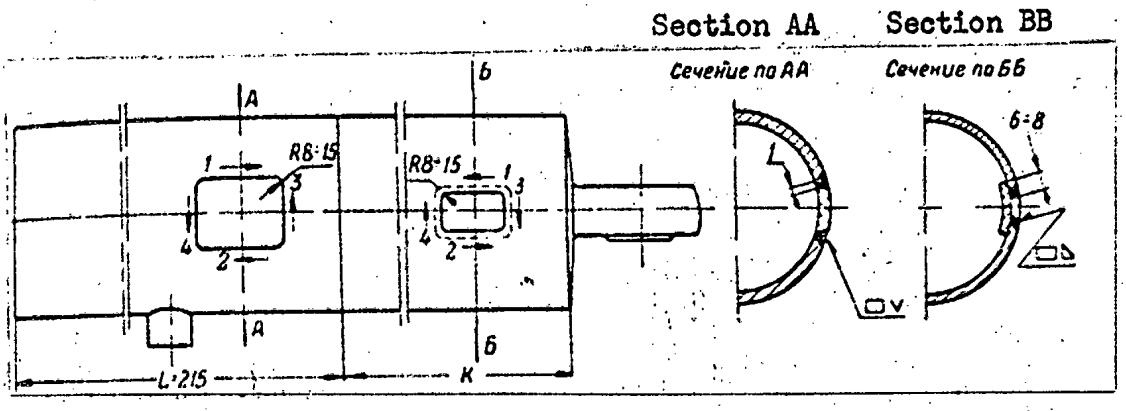


D - inner diameter of cylinder

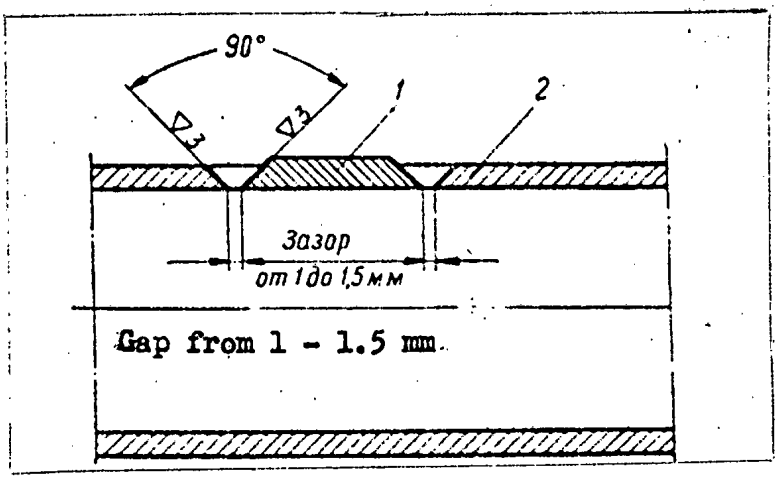
Sketch 157. Device for removing dents: 1 -- wedge; 2 -- mandrel



Sketch 158. Removal of dents: 1 -- wedge; 2 -- mandrel; 3 -- cylinder; 4 -- tube or rod; 5 -- support



Sketch 159.



Sketch 160. Installation of insert: 1 -- insert; 2 -- cylinder

6. Flatten the dent by striking the wedge with a hammer. The work should be performed as quickly as possible to avoid reheating the cylinder (sketch 158).

50X1-HUM

7. Abrade and polish the area being repaired (see item 4 of section A).

8. Wash the cylinder and wipe it dry.

Note: Remove dents which cannot be straightened by cutting out the damaged areas and sealing them with plugs.

C. Sealing Holes Up to 15 mm in Diameter

1. Remove paint and grease from the cylinder at the location of the hole.

2. File and trim the hole.

3. Place an asbestos backing inside the cylinder and weld the hole with an E50 electrode.

4. Trim off excess metal from the external and internal surfaces of the cylinder. Use the device shown in sketch 93 for trimming metal in the cylinder.

5. Abrade and polish the section being repaired (see item 4, section A).

6. Wash the cylinder and wipe it dry.

D. Sealing Holes Greater Than 15 mm in Diameter in Section L of External Cylinder 23-146 and in External Cylinder Sb24-1 of the Jack [p 229]

1. Mark the damaged area, giving it a regular shape (rectangle), and mark with a punch the centers for drilling holes 3-4 mm in diameter. The ratio of the sides of the rectangle should be 3:2 (sketch 159).

2. Bore a row of holes 3-4 mm in diameter in the area marked (to facilitate tooling).

---

[1]Holes in operating cylinder 10-4 should be removed only by st50X1-HUMg (see section B). The repaired area should not be abraded after straightening. An operating cylinder in which their are holes should not be repaired.

3. Cut out the remaining portions of the rectangle and file the edges of the opening to correspond with the outline. Bevel the edges of the opening 45° (sketch 160).

50X1-HUM

The rectangular opening should have rounded corners with a radius of 8-15 mm.

4. Make an insert of sheet steel and camber it according to the radius of the cylinder. The thickness of the insert should be the same as the thickness of the wall of the cylinder in the place of the opening or greater than it by 0.5 - 1 mm. The insert should be 2-3 mm smaller than the opening in the cylinder. Bevel the edges of the insert 45°.

Inserts for external cylinder 23-146 should be made from steel [p 230] 20, and those for external cylinder Sb24-1 of the jack, from steel 40.

5. Insert a mandrel into the cylinder. Place a steel plate having a thickness of 2-5 mm and a copper plate 4-5 mm thick between the mandrel and the cylinder. Install the insert, press it down to the copper plate, and arc weld it at several points (sketch 161).

Heat the cylinder in the place where the insert is installed to 300-350° and, without cooling it, weld the insert to it with an E50 electrode, making a uniform seam in two layers. To prevent the formation of blisters, trim the dross from the fused metal. To minimize deformations, weld the sections in the order shown in sketch 159.

6. Trim the excess metal from the interior and exterior of the cylinder. Use the device shown in sketch 93 to trim the metal.

7. Abrade the section of the cylinder being repaired (see item 4, section A.

8. Wash the cylinder and wipe it dry.

E. Sealing Holes Greater Than 15 mm in Diameter in Section K of External Cylinder 23-146

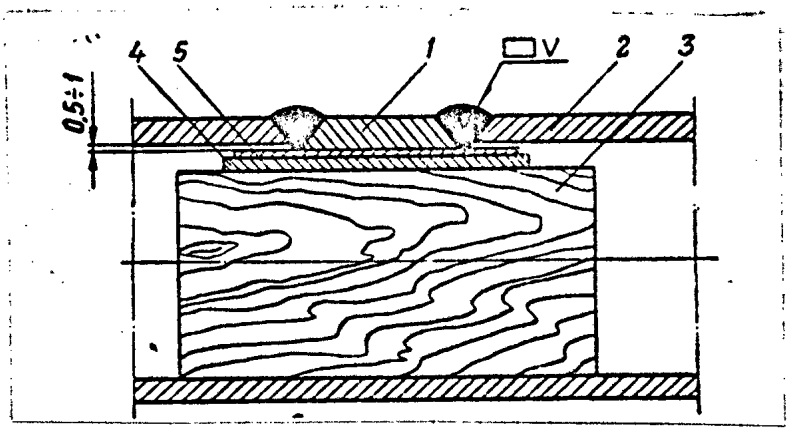
1. Perform steps 1, 2, and 3 of section D.

2. Cut out a paper pattern for a cover plate according to the contour of the hole, with a margin of 5-7 mm.

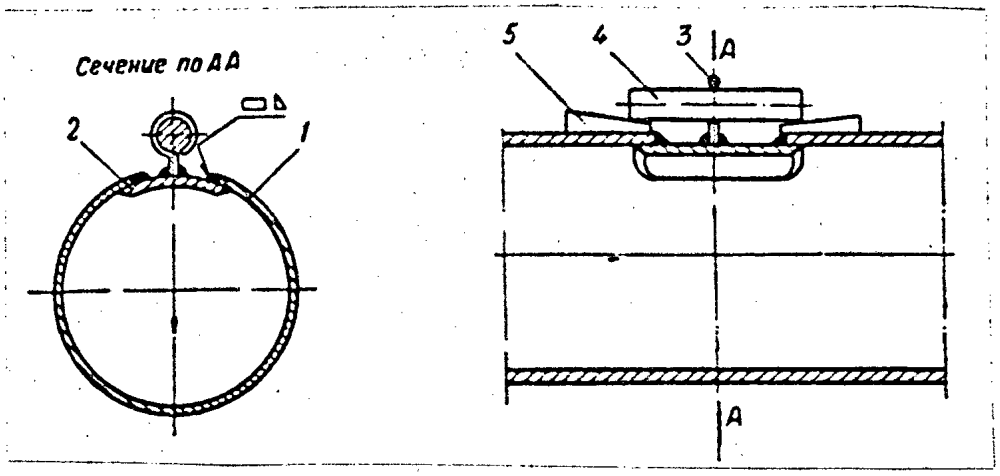
3. Following the pattern, cut a cover plate out of sheet steel 20 of the same thickness as the wall of the cylinder.

50X1-HUM

4. Camber the cover plate, fitting it to the inner surface of the cylinder.



Sketch 161. Welding insert: 1 -- insert; 2 -- cylinder; 3 -- mandrel; 4 -- steel plate; 5 -- red copper plate



Sketch 162. Installation of cover plate: 1 -- cylinder; 2 -- cover plate; 3 -- eye; 4 -- pin; 5 -- wedge

5. Draw the contour of the hole on the cover plate and weld a wire eye to the plate. [p 231]

50X1-HUM

6. Insert the cover plate in the hole, insert a pin in the eye, center the cover plate according to the contour of the hole draw on it, and bring the cover plate up tightly against the cylinder by driving wedges under the pin.

7. Weld the cover plate to the cylinder in several places. Weld the cover plate to the cylinder with a uniform seam along the contour of the hole, using an E50 electrode.

The sections should be welded in two layers and in the order shown in sketch 159.

8. Cut off the eye and trim off the excess metal.

F. Sealing Holes Greater Than 15 mm in Diameter in Intermediate Cylinder 10-9 and Air Cylinder 10-3

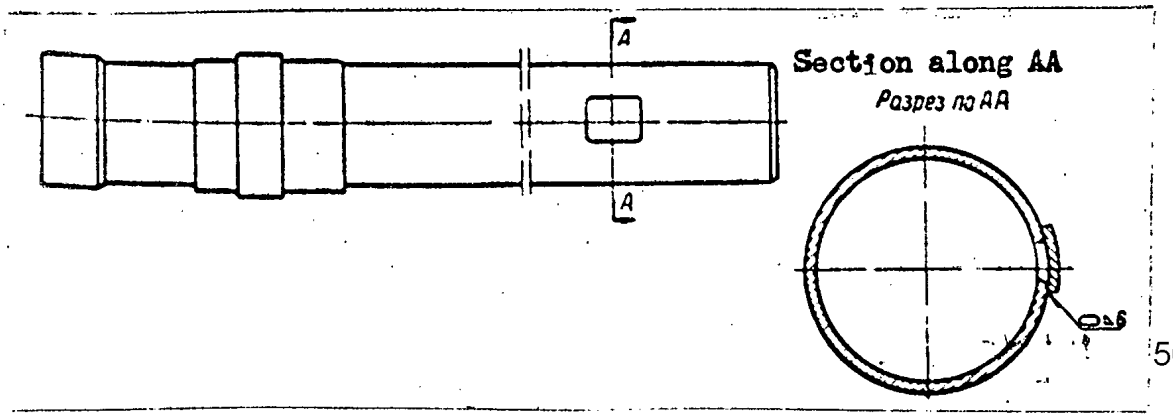
1. Perform steps 1, 2, and 3 of section D.

2. Make a cover plate from sheet steel 40.

The thickness of the cover plate should be the same as that of the cylinder (sketch 163).

3. Place the cover plate on the hole and weld it in several spots. Weld the cover plate with a uniform seam along its circumference, using an E50 electrode. The welding should be done as indicated in section D, item 5. [p 232]

4. Trim off excess metal.



50X1-HUM

Sketch 163

G. Testing Repaired Cylinders

After repairing a cylinder, subject it to a hydraulic test to check the tightness of the weld seams. 50X1-HUM

Air cylinder 10-3 should be tested at a pressure of 300 atmospheres for a duration of 10 minutes.

External cylinder 23-146 should be tested at a pressure of 60 atmospheres for a duration of 10 minutes.

External cylinder Sb24-1 of the jack should be tested at a pressure of 120 atmospheres for a duration of 15 minutes.

In the event of seepage of liquid through the weld seam, local rewelding is permitted. For this a groove is cut in the weld seam to the full depth of the welding.

After rewelding the cylinder, subject it to another test.

During testing the escape of liquid through condensation is permissible, but the pressure must be maintained for the entire period.

50X1-HUM

Changing the Position of Cradle Arc 09-50

50X1-HUM

1. Make a center plug from steel of any quality (sketch 164).

2. Mount crankshaft 21-1 in a three-jawed chuck, insert the center plug into the shaft and adjust. [p 233]

3. Machine the teeth of the shaft to a diameter of $153_{-0.3}$ mm.

4. File the heads of the arc teeth 1 mm, maintaining their height at 18.8 mm (sketch 166).

5. Smooth the sharp edges on the arc teeth and on the gears of the elevating crankshaft.

6. Mount the arc on the cradle, fastening it temporarily with bolts M30 x 170.

7. Place the cradle on the top carriage and assemble the elevating mechanism.

8. Adjust the meshing of the arc teeth with the gear shaft teeth (the clearance in the junction of the teeth should be 0.2-0.3 mm; check the clearance with a lead tape).

Adjust the meshing by moving arc 09-50. After the final adjustment, fasten arc 09-50 temporarily with bolts M30 x 170.

9. Remove the cradle from the carriage.

10. Weld the arc to the cradle with electrode E50A (sketch 167).

11. Remove temporary bolts M30 x 170.

12. Cut two openings in the trunnion yoke and arc 09-50 to the major diameter, having given the openings the correct shape.

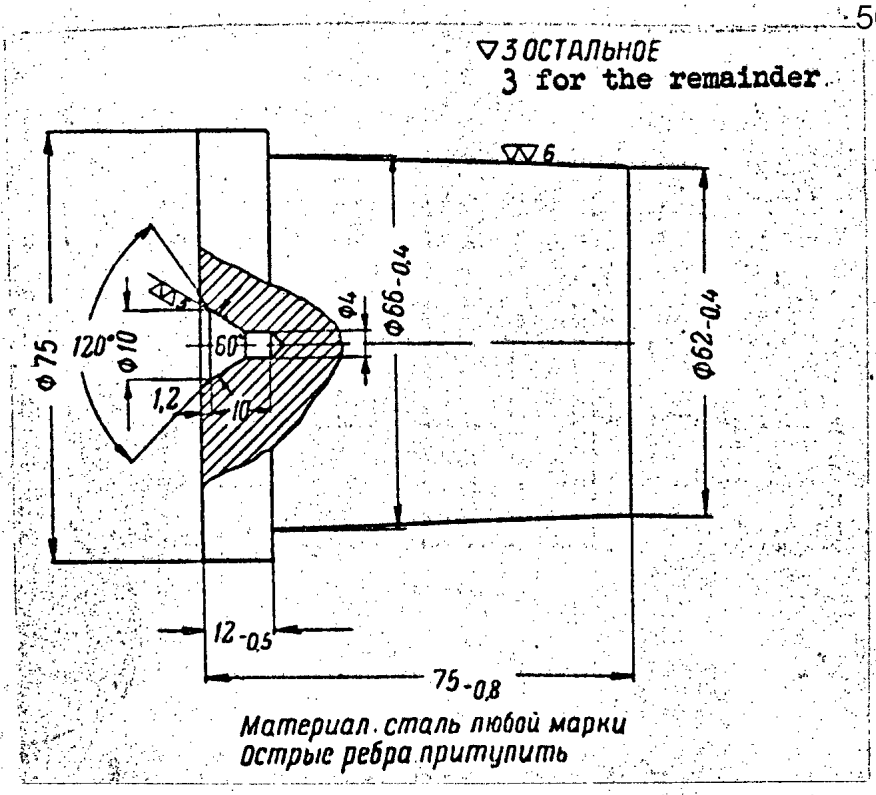
13. Expand the two openings in the trunnion yoke to a measurement $A^{+0.05}$ mm but not larger than 45 mm.

14. Make two enlarged bolts 09-37 conforming to the actual diameter of the openings in the trunnion yoke and the arc (sketch 168).

15. Insert enlarged bolts 09-37 into the openings, screw on nut A51011-10, and lock with a split pin. [p 234]

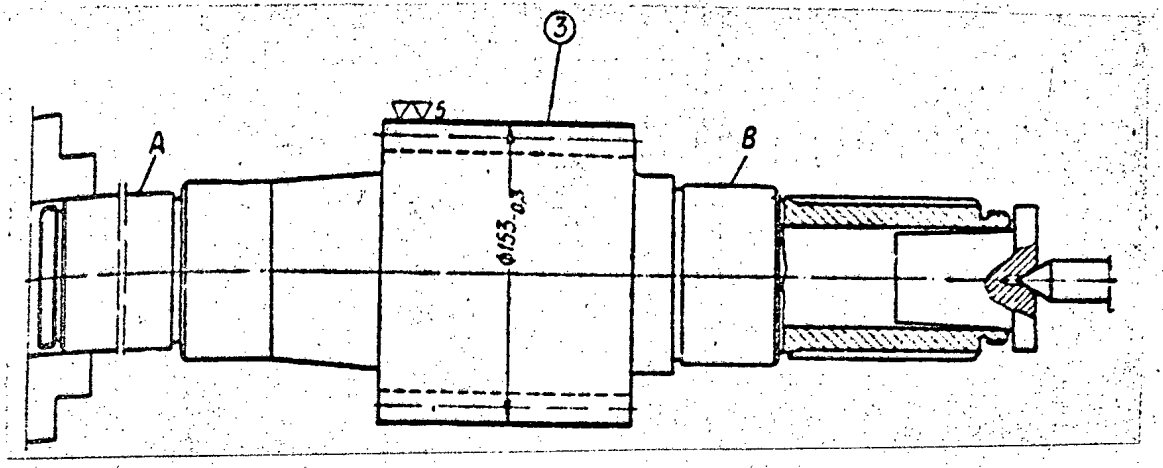
50X1-HUM

16. Mount the cradle on the top carriage. Paint the gear teeth of the crankshaft and, by gradually moving the cradle into the extreme positions, scrape the arc teeth until smooth meshing is achieved.

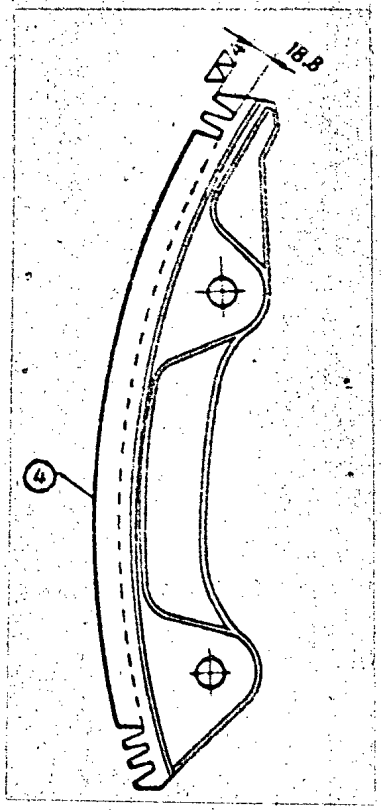


Material: steel of any quality
Smooth sharp edges

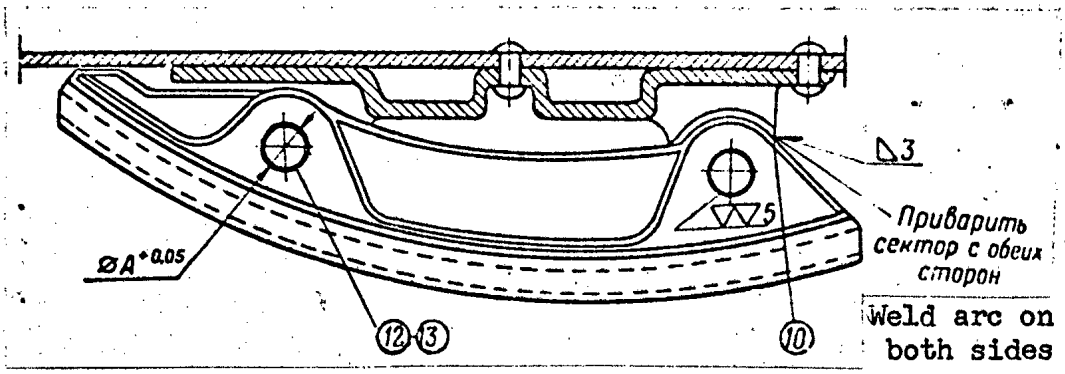
Sketch 164. Center plug



Sketch 165. Machining the gears of the shaft



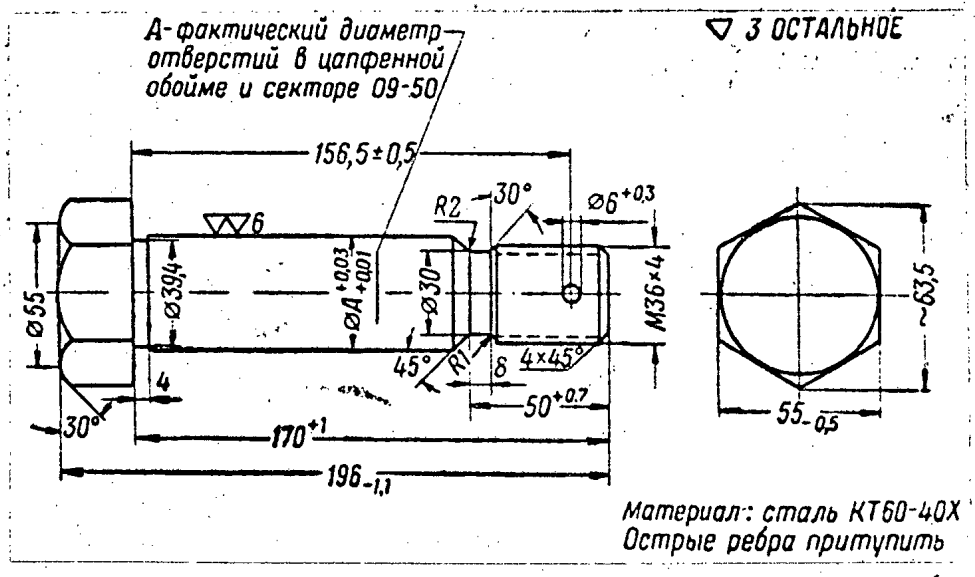
Sketch 166. 09-50 -- arc



Sketch 167. Welding the arc

A - true diameter of openings in trunnion yoke and arc 09-50

▽3 for the remaining



Material: steel KT60-40X
Smooth sharp edges

Sketch 168. 09-37 -- bolt

Chart Eight [p 234]

Repairing the Ball-and-Socket Joint of the Elevating and Traversing Mechanisms

50X1-HUM

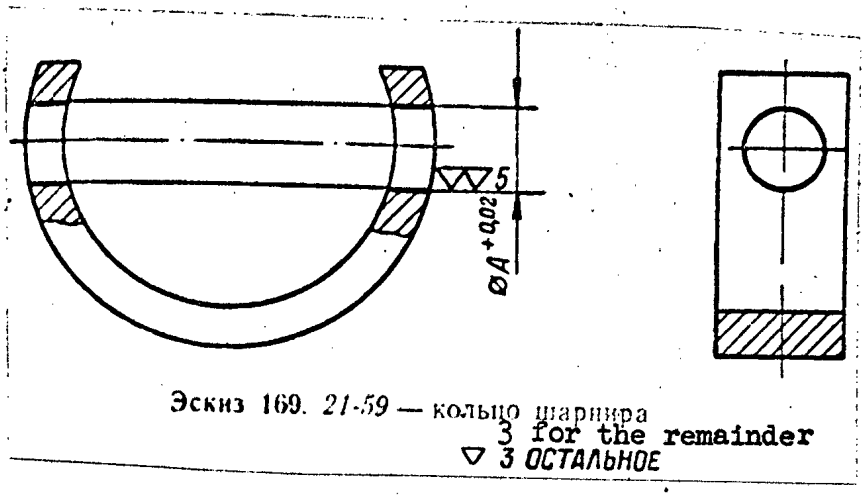
A. Removing the Oval Shape in the Openings of Socket Ring 21-59 and Joint Ball 21-58

1. Expand the two openings in the socket ring to the diameter $A^{+0.02}$ mm but no larger than 12 mm (sketch 169).

2. Make a joint pin with a diameter of $A_{-0.01}$ mm from steel 40 (sketch 170).

3. Expand the opening in the joint ball to a diameter of $A_{-0.02}$ mm but no larger than 12 mm (sketch 171).

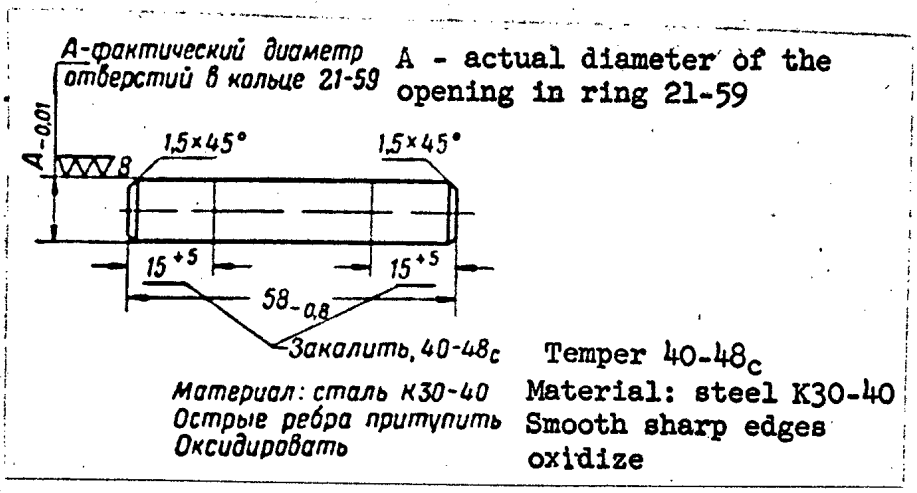
[p 235]



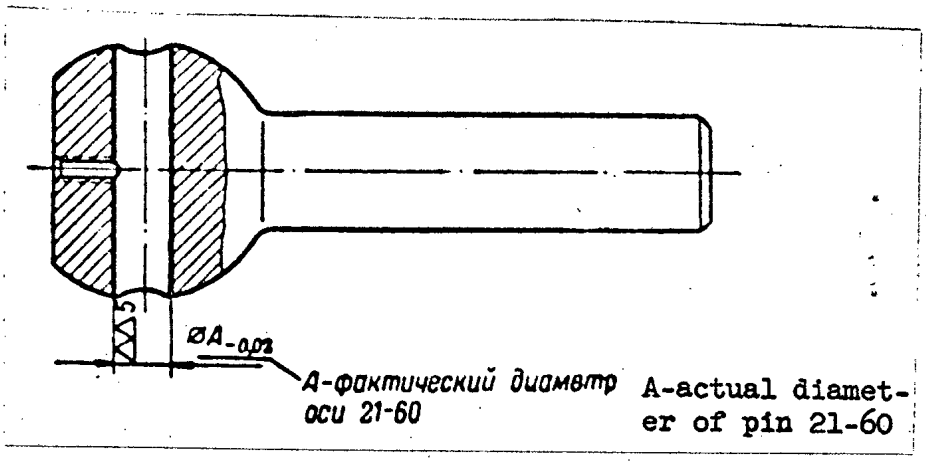
Эскиз 169. *21-59* — кольцо шарнира
▽ 3 for the remainder
▽ 3 ОСТАЛЬНОЕ

Sketch 169. 21-59 -- socket ring

50X1-HUM



Sketch 170. 21-60 -- joint pin



Sketch 171. 21-58 -- joint ball

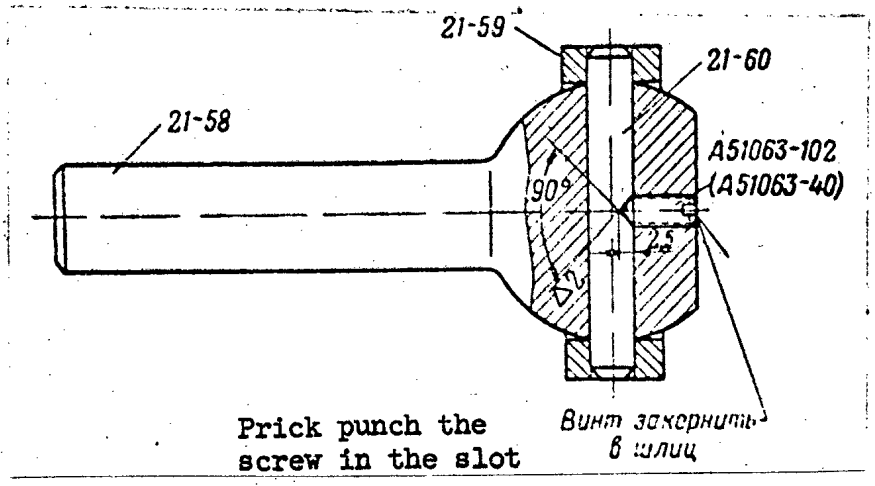
4. Assemble the socket ring with the joint ball and insert the joint pin. Try turning the ring on the joint pin. The ring should turn freely but without looseness.

50X1-HUM

5. Through the threaded opening M6 x 1, cut a hole in the joint pin and insert stop screw A51063-102. Prick punch the stop pin (sketch 172).

Note: When using the old type joint ball 21-58, insert screw (A51063-40).

[p 236]



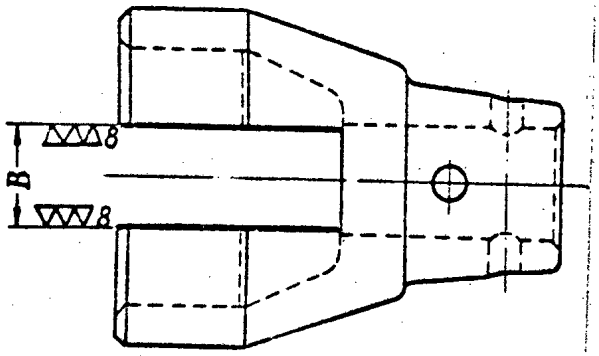
Sketch 172. Joint assembly: 21-58 --joint ball; 21-59 --socket ring; 21-60 --joint pin; A51063-102 (A51063-40) --screw

B. Replacing Joint Ball 21-58 and Socket Ring 21-59

1. Taking a minimum layer of metal from the entire length and equally from both surfaces, clean the socket groove (sketch 173).

The largest tolerable size of socket groove B is 20 mm.

50X1-HUM



Displacement of groove B in relation to the axis of the opening ϕ45 +0.17 mm within the limits of 0.1mm is permissible

Смещение паза В относительно оси отверстия ⌀45 +0,17 мм допускается в пределах 0,1 мм

Острые ребра притупить
Smooth sharp edges

Sketch 173. 21-61 --socket

2. Turn joint ball 21-58 on a lathe (sketch 174).

3. Turn socket ring 21-59 on a lathe (sketch 175).

4. Carbonize and heat socket ring 21-59 red hot.

5. Clean off the socket ring.

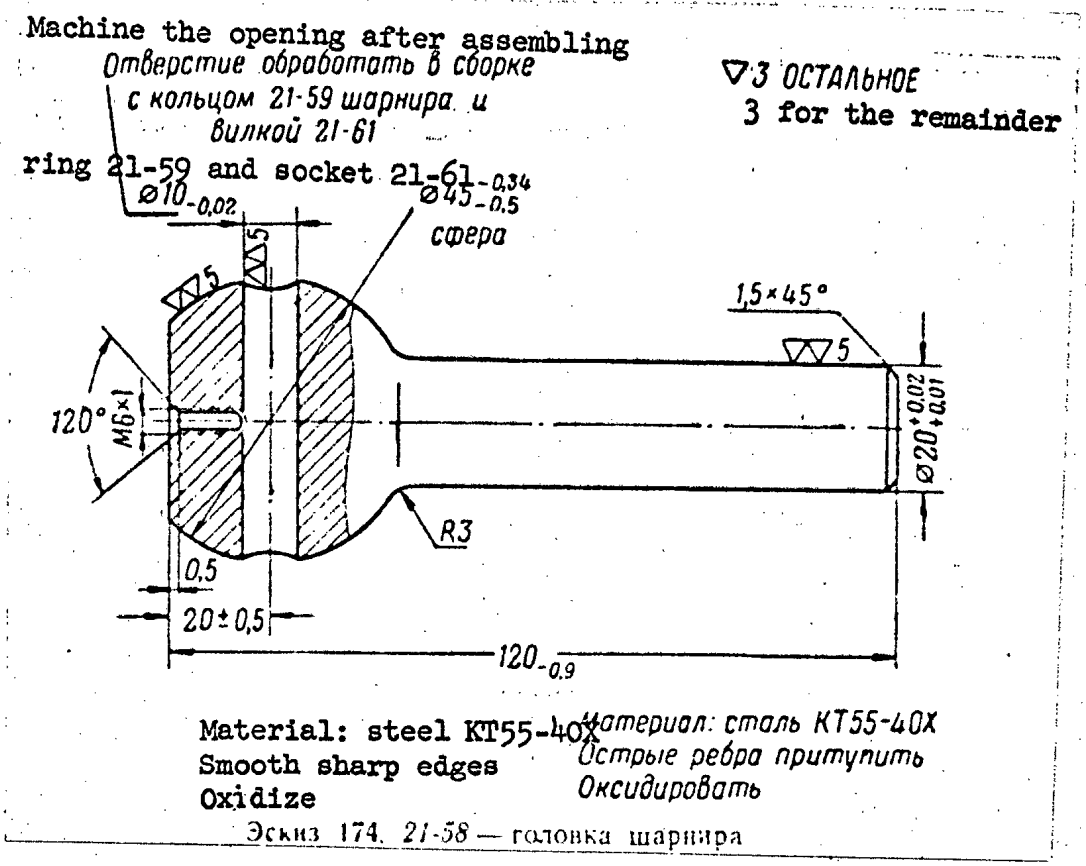
6. Oxidize socket ring 21-59 and joint ball 21-58.

7. Center punch mark the opening in the joint ball.

8. Assemble the socket ring with the joint ball and socket 21-61.

9. Drill an opening 9.5 mm in diameter simultaneously in the socket ring and the joint ball. [p 238]

10. Expand the opening in socket ring 21-59 to size $10^{+0.02}$ mm (sketch 175).



Эскиз 174. 21-58 — головка шарнира

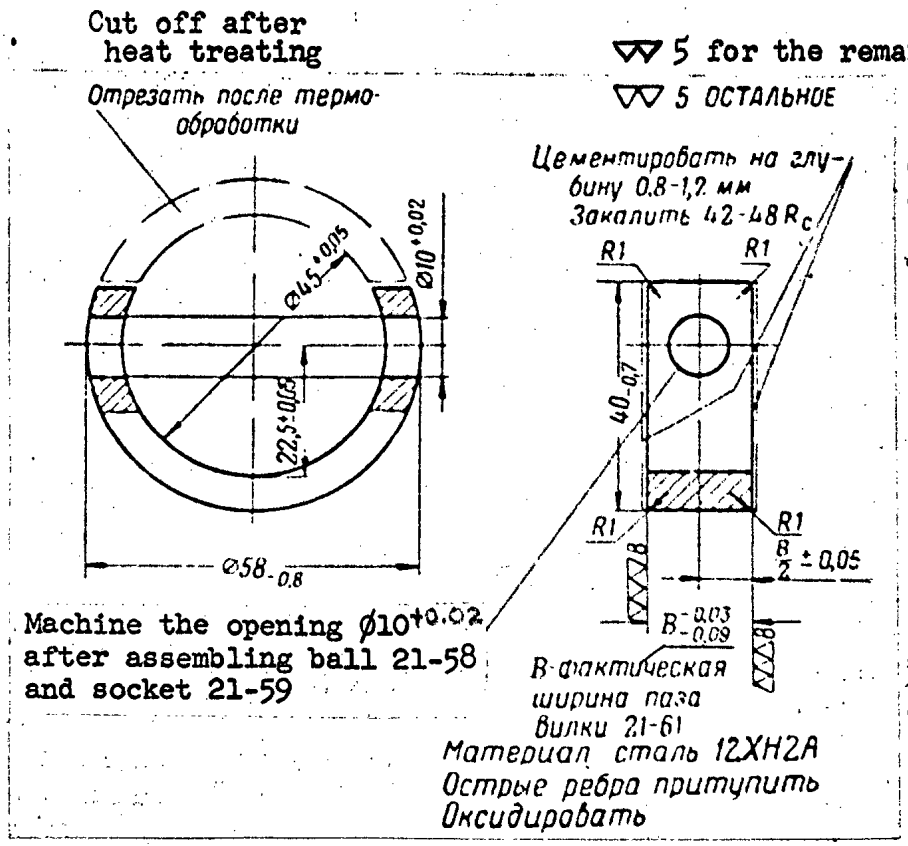
Sketch 174. 21-58 -- joint ball

11. Expand the opening in the joint ball to $10_{-0.02}$ mm (sketch 174).

12. Drill an opening in the joint ball for threads and thread M6x1.

13. Make a joint pin according to sketch 170, maintaining size A at 10 mm.

14. Repeat items 4 and 5, section A.



Sketch 175. 21-59 -- socket ring

Repairing Teeth of Arcs 18-47 and 09-50, Crankshaft 21-1, and Gear Shaft 22-1

A. Restoring Single Teeth

1. When the tooth is broken at any length but less than 5 mm from the top, or at any distance from the top but no more than 25 mm in length for the gears of crankshaft 21-1 and arc 09-50 or no more than 15 mm in length for shaft 22-1 and arc 18-47, cut off the area of the break and trim.

2. Weld on a layer of metal large enough to achieve the full shape of a finished tooth on the prepared place with a welding electrode, type EN-40.

3. File the beads of metal flush all over with the undamaged surfaces of the arc.

4. File the tooth according to a pattern. Make the pattern the shape of a hollow and a tooth of the least worn part of the arc or gear.

B. Restoring Several Teeth in a Row on Arcs 18-47 and 09-50

1. Cut off the damaged teeth.

2. Mark out a segment in the arc for an insert.

A length of no more than 40 mm is permissible for an insert in arc 18-47, and no more than 125 mm for an insert in arc 09-50.

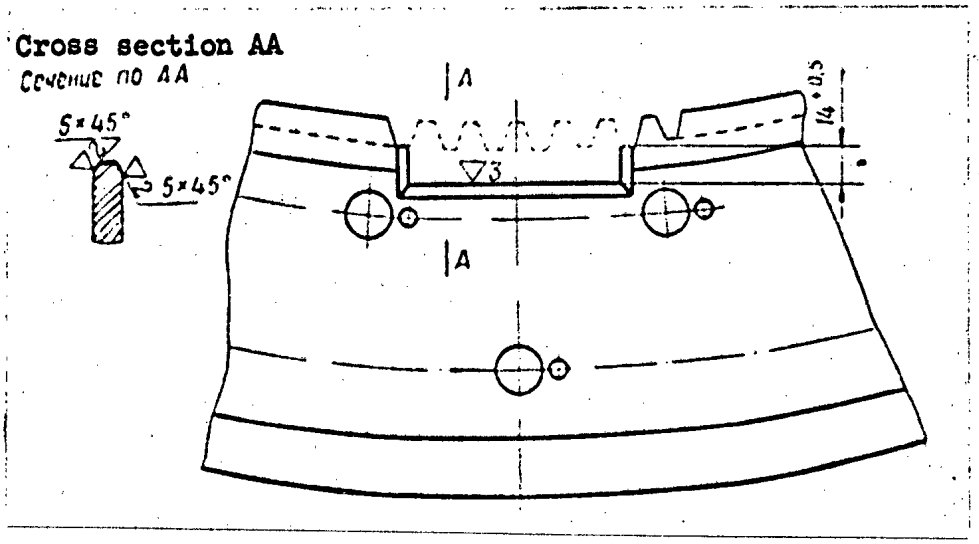
3. File out a segment for the insert and chamfer (sketches 176 and 177).

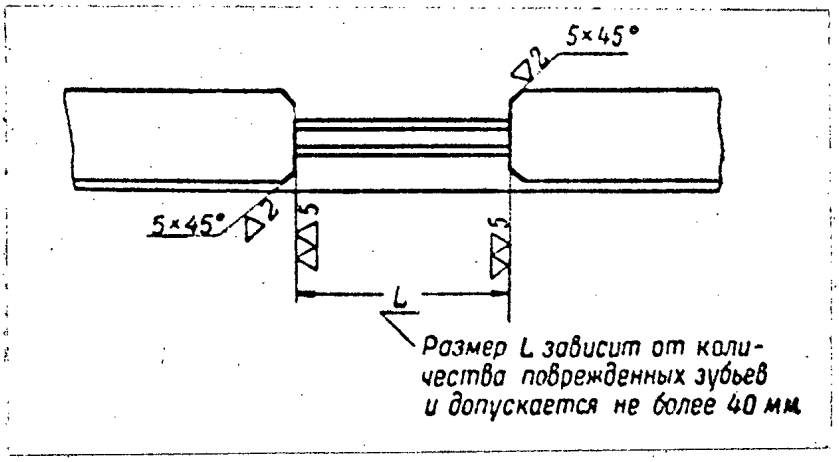
4. Make the insert for arc 18-47 from KT55-40X steel and the insert for arc 09-50 from KT70-35XMa steel (sketches 178 and 179).

5. Fit the insert tightly to the segment of the arc and chamfer for welding.

6. Weld the insert to the arc with electrode E50 (sketches 180 and 181).

50X1-HUM



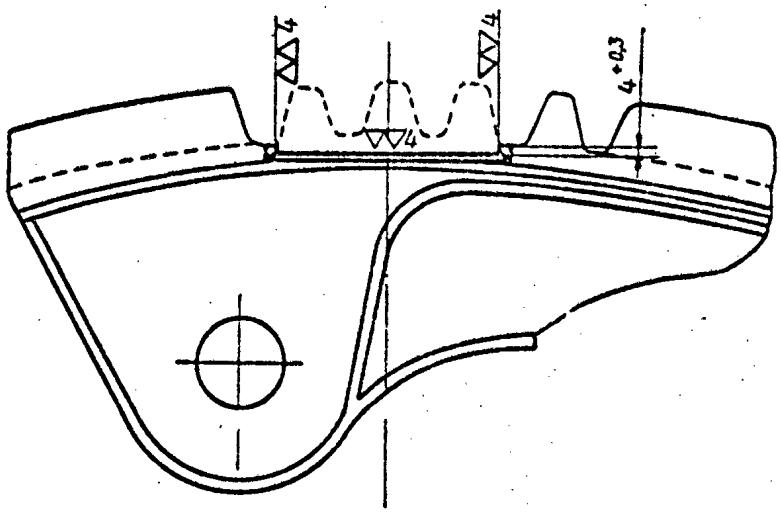


Distance L depends on the number of damaged teeth up to a maximum of 40 mm

Sketch 176. 18-47 -- arc

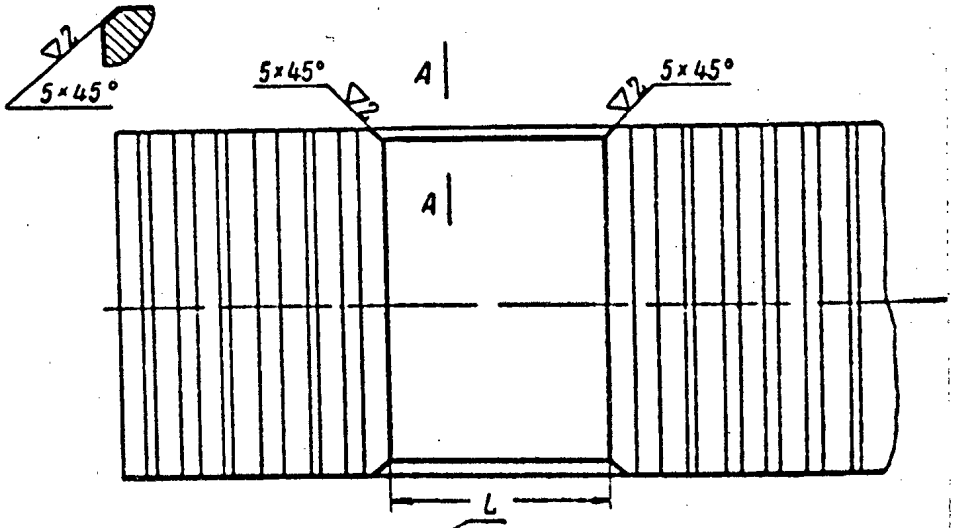
50X1-HUM

50X1-HUM



Cross section AA

Сечение по АА



Distance L depends on the number of damaged teeth but 125mm is maximum

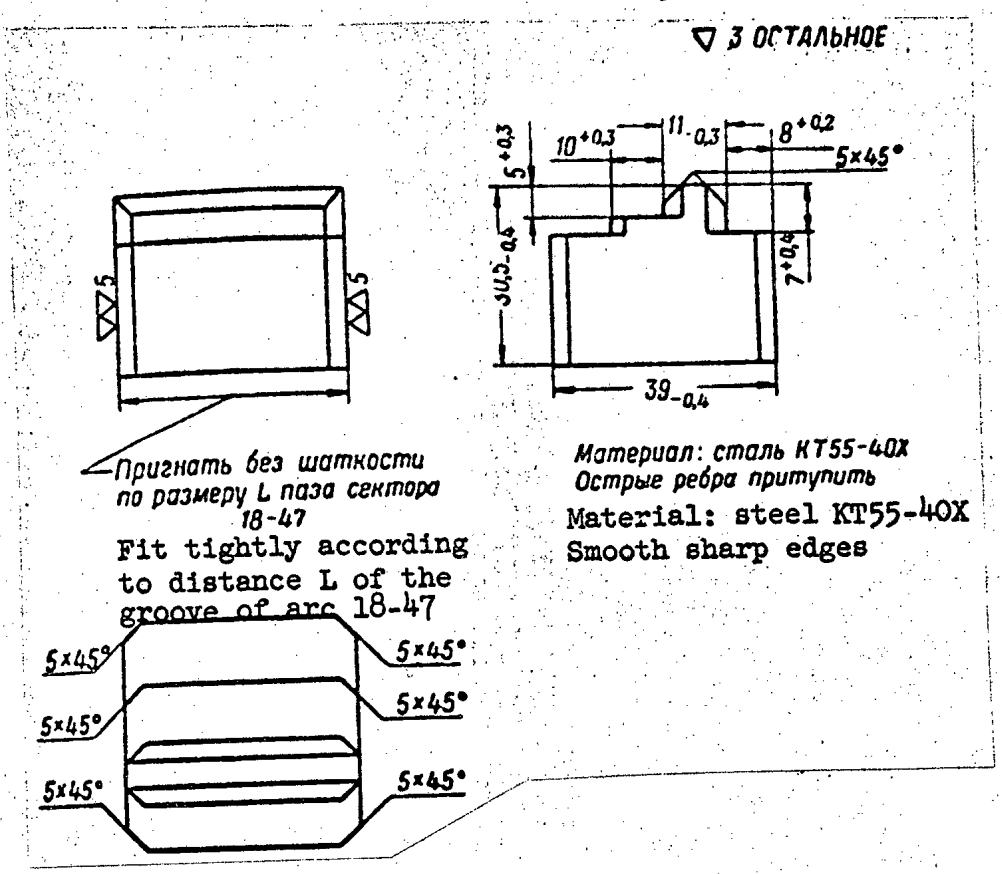
Размер L зависит от количества поврежденных зубьев и допускается не более 125 мм

Sketch 177. 09-50 -- arc

50X1-HUM

▽3 for the remaining

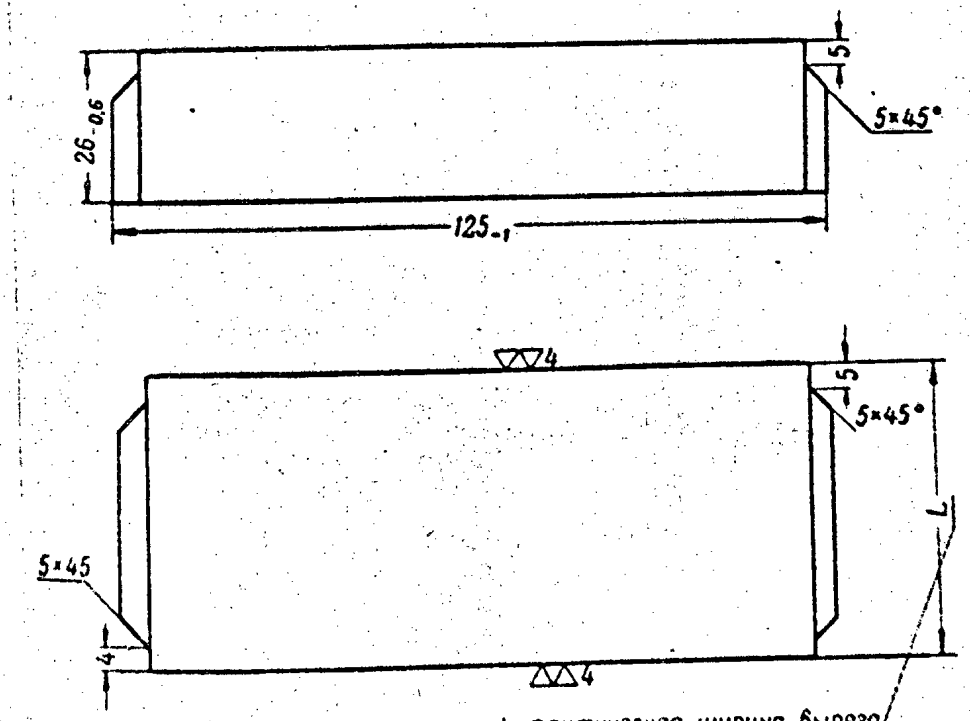
▽ 3 ОСТАЛЬНОЕ



Sketch 178. Insert for arc 18-47

▽2 for the remaining

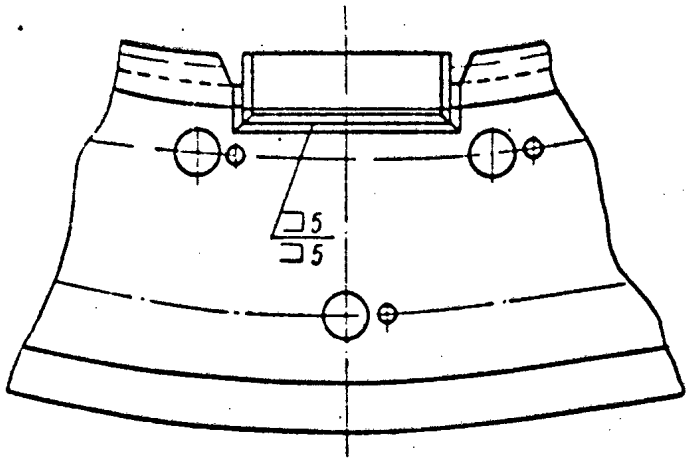
▽2 ОСТАЛЬНОЕ



L - true width of cut-out section. Fit tightly according to distance L of groove of arc 09-50

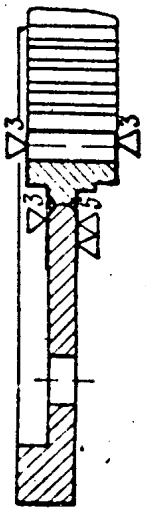
Material: steel KT70-35KhMA
Smooth sharp edges

Sketch 179. Insert for arc 09-50

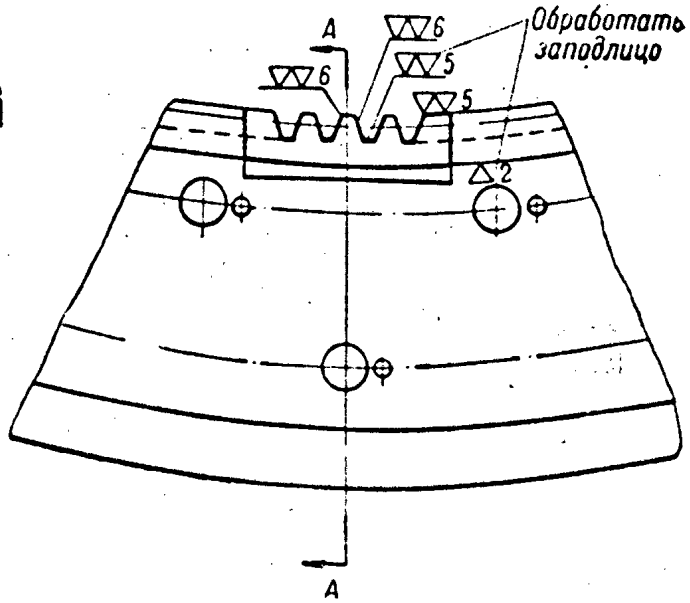


Section across AA

Разрез по АА

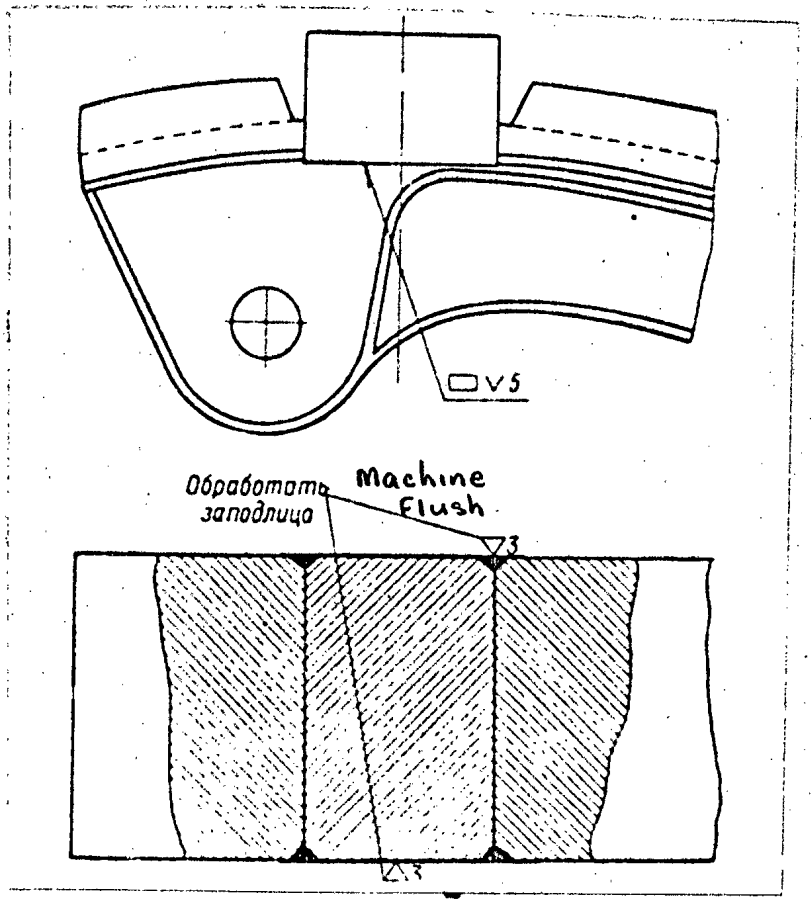


Machine flush



Smooth sharp edges *Острые ребра притупить*

Sketch 180. Welding the insert to arc 18-47



Sketch 181. Welding the insert to arc 09-50

7. Trim off the metal beading and the sides of the insert flush with the surfaces of the arc. [p 243]

8. Check whether the arc was deformed during welding. If the arc was deformed, straighten it.

9. Make two patterns from sheet metal 1 - 2 mm thick (of any quality) according to the shape of the least worn teeth of the arc, one of a tooth, and the other of a tooth and a hollow.

10. Mark off the shape of the teeth on the sides of the insert according to the pattern (of a tooth and a hollow) using an adjacent tooth as a base.

11. Place the arc in the vise of a planing machine and plane the teeth, leaving an allowance for filing.

12. File the teeth according to the pattern. Machine the teeth ▽▽5.

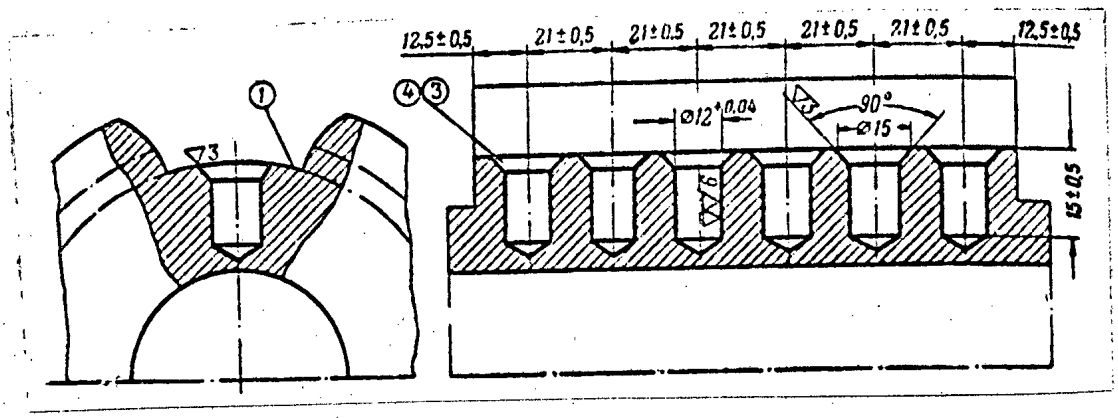
13. Finish filing the tooth after assembling the elevating or traversing mechani[illegible] teeth.

7. Restoring [illegible] 22-1 by Inserting Dowels

1. When a tooth is damaged greater than that indicated in se[illegible] 50X1-HUM cut off the damaged tooth (or part of it considering the possibility of installing one or more dowels) and trim off flush with the hollow.

2. Mark off and center-punch the necessary number of openings for the dowels. [p 244]

3. Drill and expand the openings for the dowels in conformance with the sketch (sketches 182 - 184).

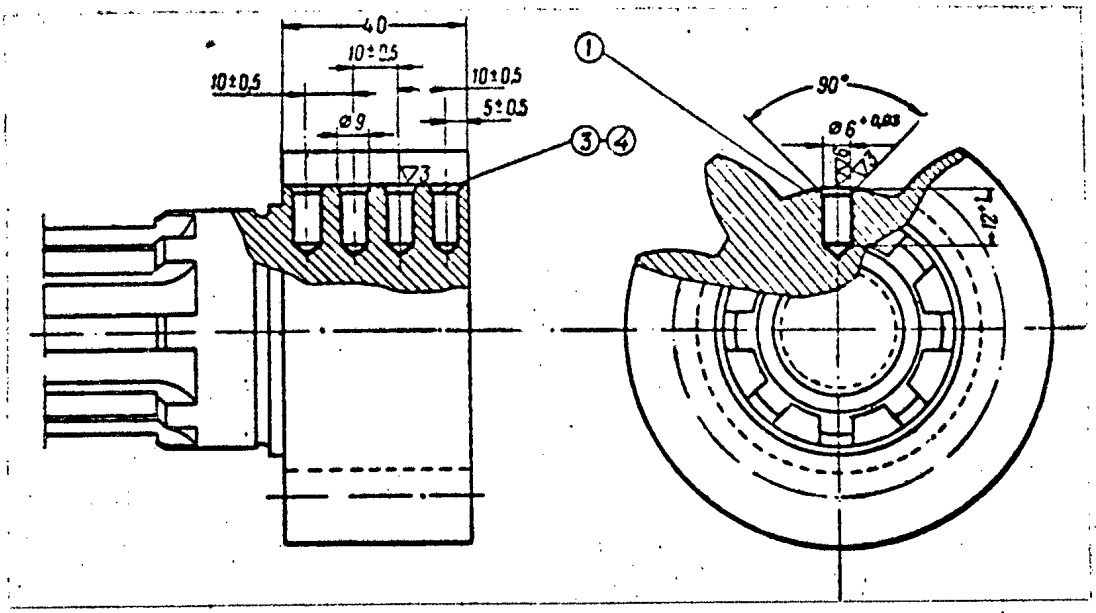


Sketch 182. 21-1 --crankshaft

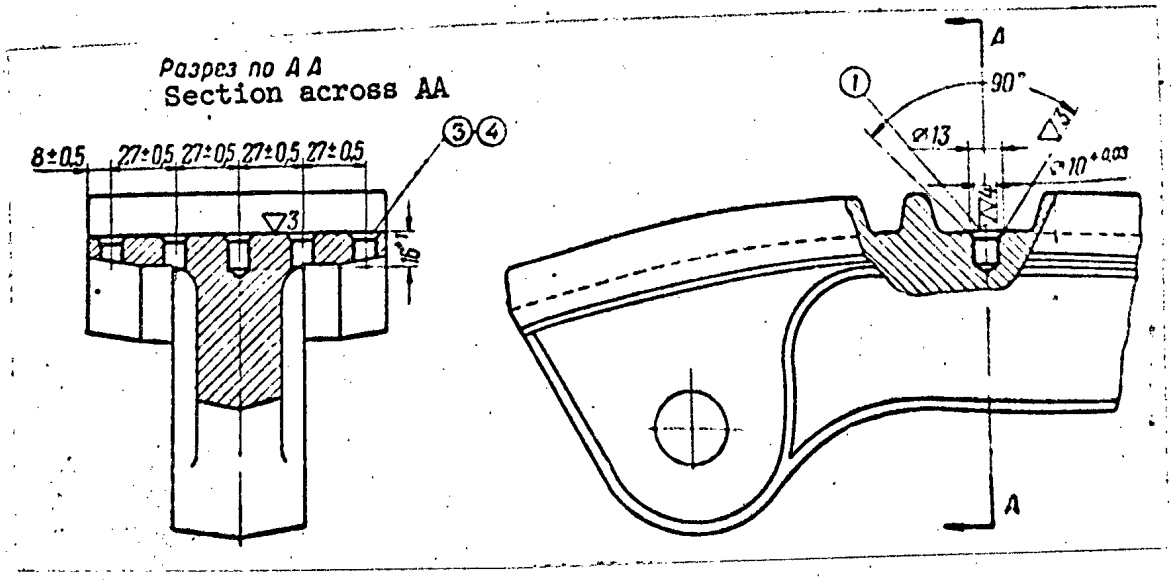
4. Countersink the openings under a 90° angle to the largest diameter of the dowel in conformance with the sketch. [p 245]

5. Make the necessary number of dowels (sketch 185).

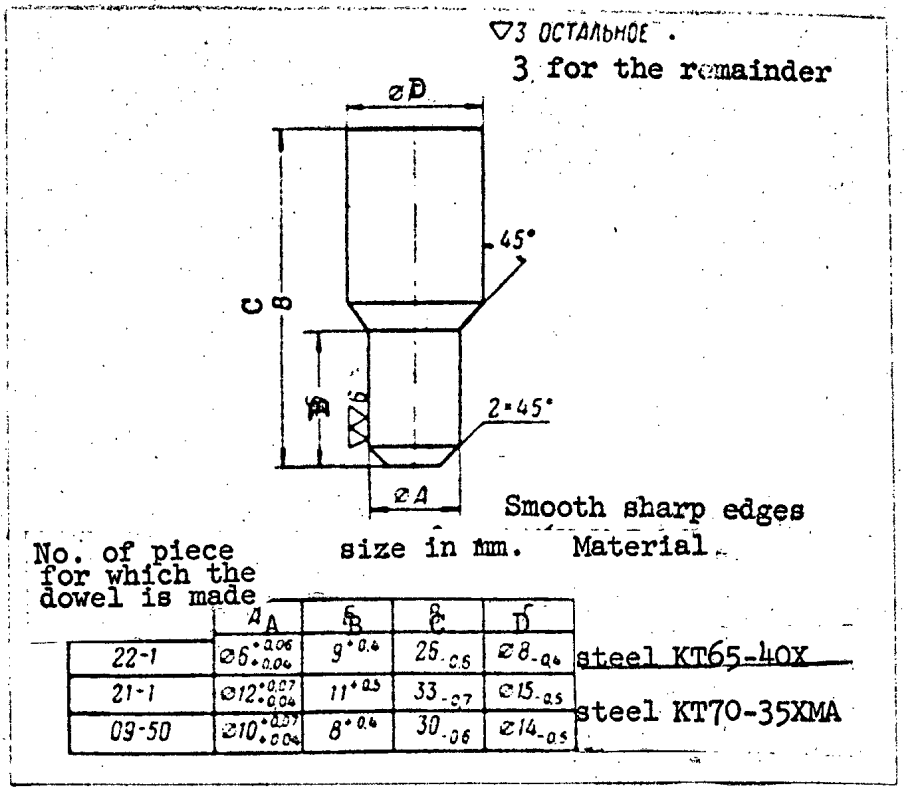
50X1-HUM



Sketch 183. 22-1 -- gear shaft



Sketch 184. 09-50 -- arc



50X1-HUM

No. of piece for which the dowel is made	A	B	C	D	
22-1	⌀6	9	25	⌀8	steel KT65-40X
21-1	⌀12	11	33	⌀15	steel KT70-35XMA
09-50	⌀10	8	30	⌀14	

Sketch 185. Dowel

6. Press fit the dowels into the prepared openings.

7. Weld the dowels with a welding electrode, type EN-40, and fuse a layer of metal onto the dowel large enough to achieve the full shape of the tooth.

8. Trim off the metal beading on the sides of the tooth flush with the sides of adjacent teeth.

9. Make two patterns from sheet metal 1-2 mm thich (of any quality) according to the shape of serviceable teeth -- one of a hollow, and the other of a tooth and a hollow. [p 246]

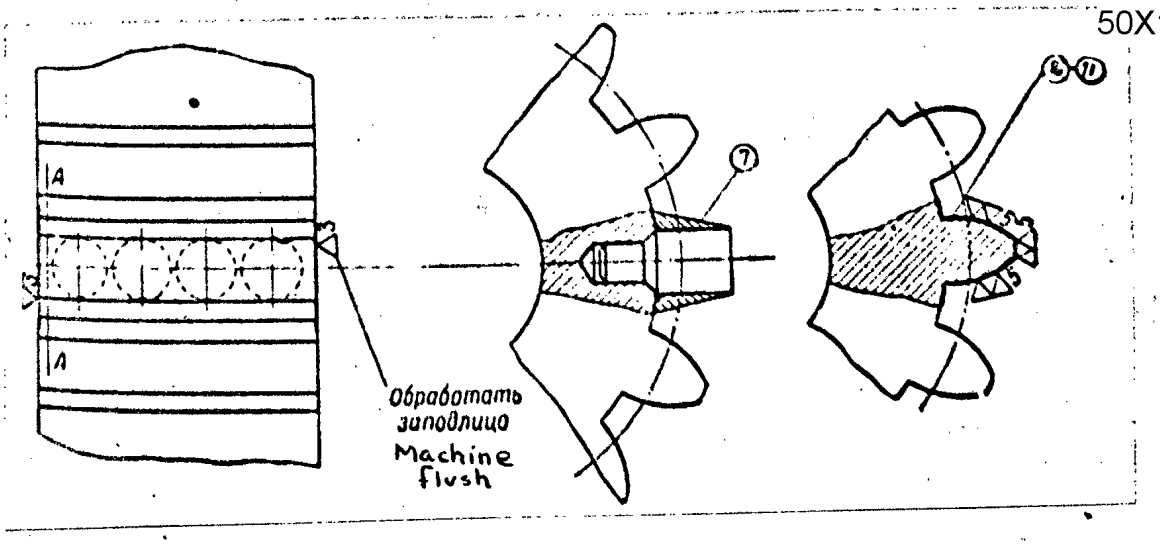
10. Mark the outline on the side of the tooth being prepared (according to the pattern), using an adjacent tooth as a base.

11. File the shape of the tooth to the pattern.

Note: When the tooth is partially damaged, machine the dowels flush with the shape of the undamaged part of the tooth.

50X1-HUM

12. Make the final fitting of the teeth after assembling the mechanism. Scrape the new teeth if there is incorrect meshing or sticking.

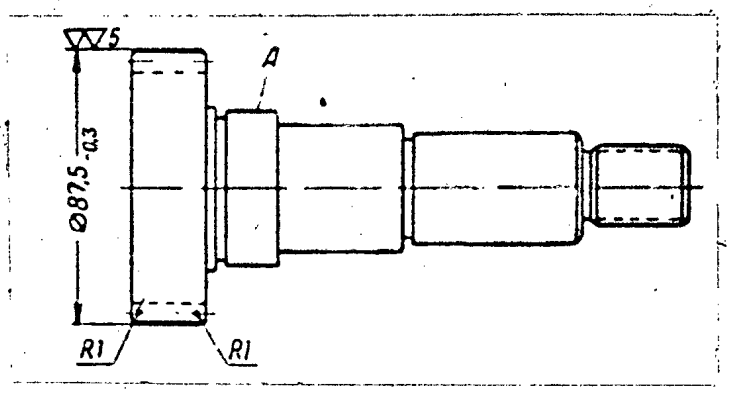


Sketch 186. Installing the dowels and filing the teeth

Chart Ten [p 246]

Changing the Position of Arc 18-47

1. Place gear shaft 22-1 in a three-jawed chuck and adjust for play according to surface A. Play of 0.05 mm is permissible (sketch 187).

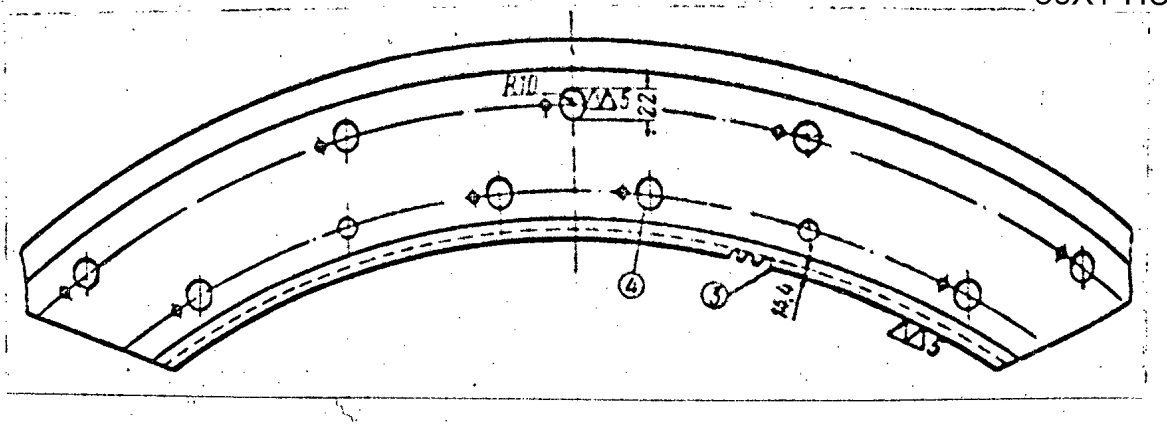


Sketch 187. 22-1 --gear shaft

2. Turn on a lathe (by the teeth of the gear) to the diameter $87.5_{-0.03}$ mm.

3. File the heads of the arc teeth 1 mm in height, maintaining their height at 14.4 mm with a depth gage (sketch 188).

50X1-HUM



Sketch 188. 18-47 --arc

4. Cut nine oval openings in the arc.

5. Remove burrs from the teeth of the arc and gear; smooth the sharp edges.

6. Make a device for mounting the arc (sketches 189-194).

7. Mount the arc on the lower carriage and fasten it temporarily with [p 248] the nine bolts 18-48 (do not tighten bolts 18-48).

8. Mount gear shaft 22-1 in the prepared device. Mount the device onto the lower carriage.

By moving the arc, regulate the meshing of the arc with gear shaft 22-1 which is mounted in the device and finish fastening the arc with the bolts (the gap in the junction of the teeth should be 0.2 - 0.3 mm).

9. Remove the device and remove gear shaft 22-1 from the device.

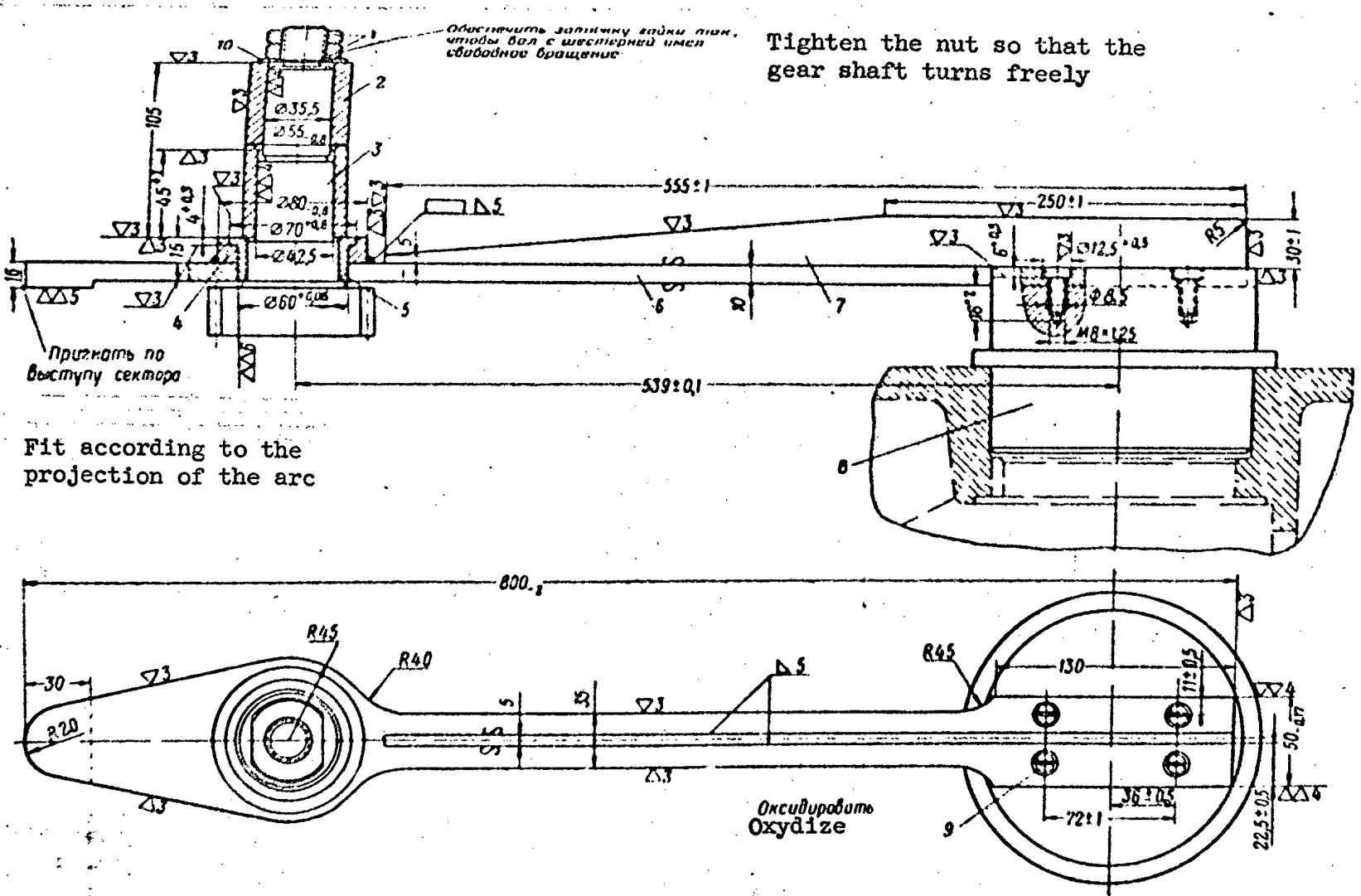
10. Assemble the top carriage and mount it on the lower carriage (text missing).

In case of sticking in the junction of the teeth with the gear shaft, [p 250] scrape the teeth.

11. Remove the top carriage.

12. Mount a joint cutter 10-12 mm in diameter in an electric drill and cut the off-center openings for the spacer, giving them the most correct form possible.

50X1-HUM



Sketch 189. Device for mounting the arc: 1 -- nut; 2 -- tube; 3 -- gear shaft; 4 -- ring; 5 -- bushing; 6 -- gib; 7 -- rib; 8 -- spindle; 9 -- screw; 10 -- washer

50X1-HUM

50X1-HUM

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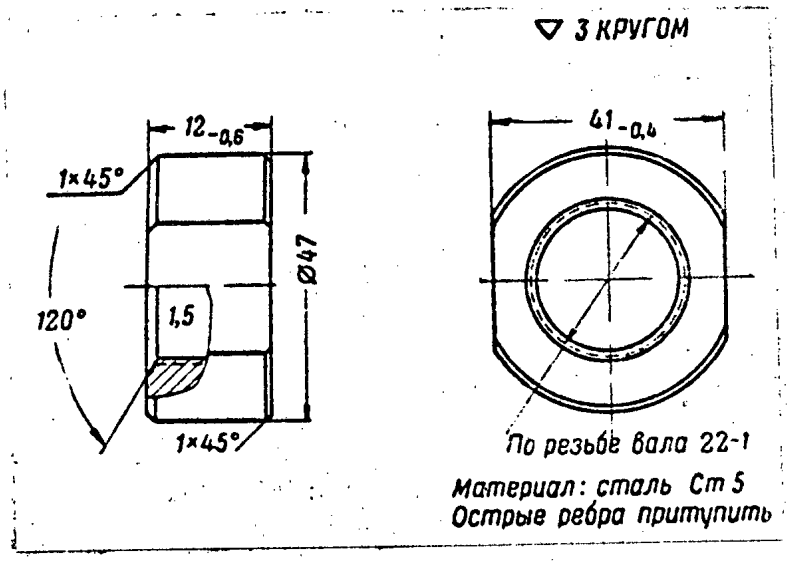
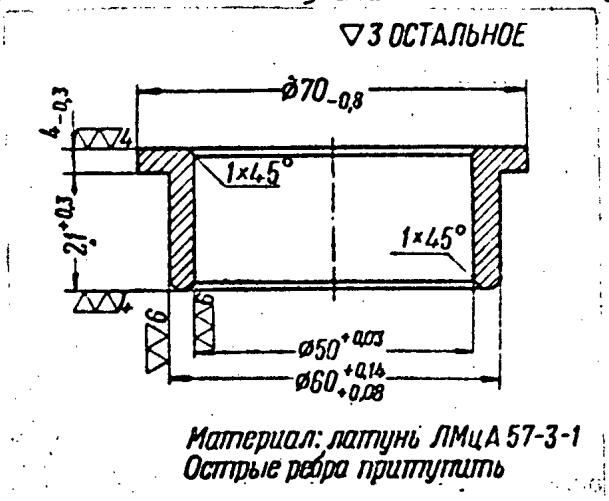
3 overall



According to threads of shaft 22-1
Material: steel St5
Smooth sharp edges

Sketch 190. 7 -- nut

3 for the remaining



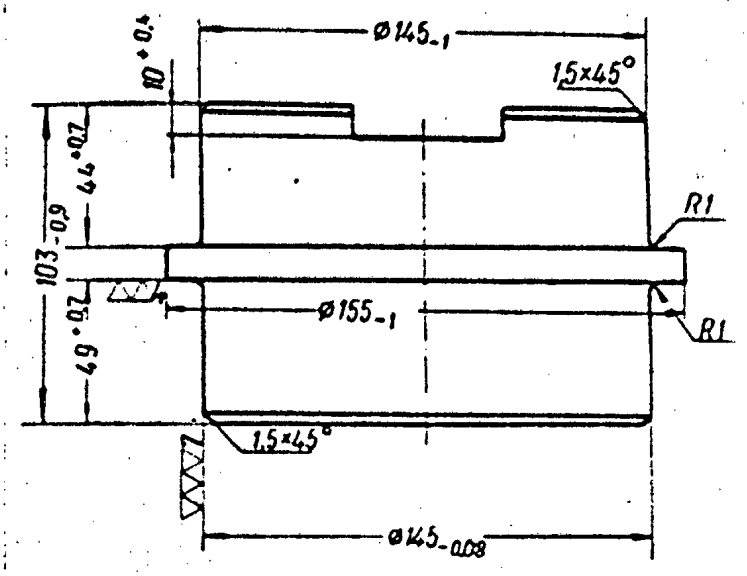
Material: brass LMtsA57-3-1
Smooth sharp edges

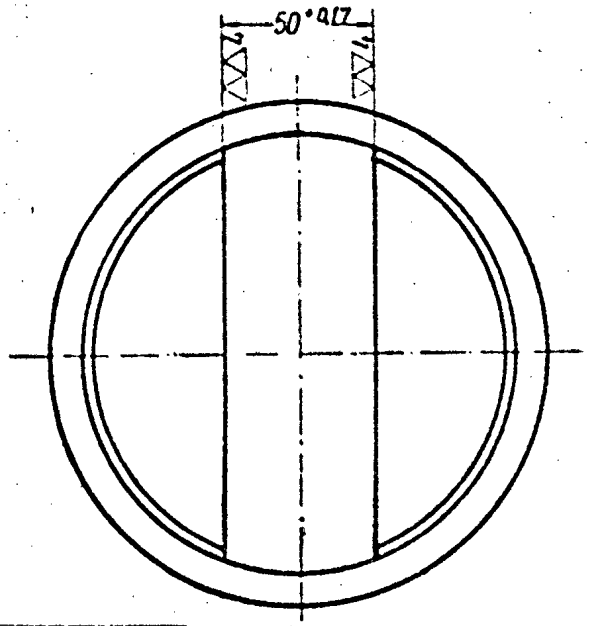
Sketch 191. 5 -- bushing

50X1-HUM

▽3 for the remaining

▽3 ОСТАЛЬНОЕ



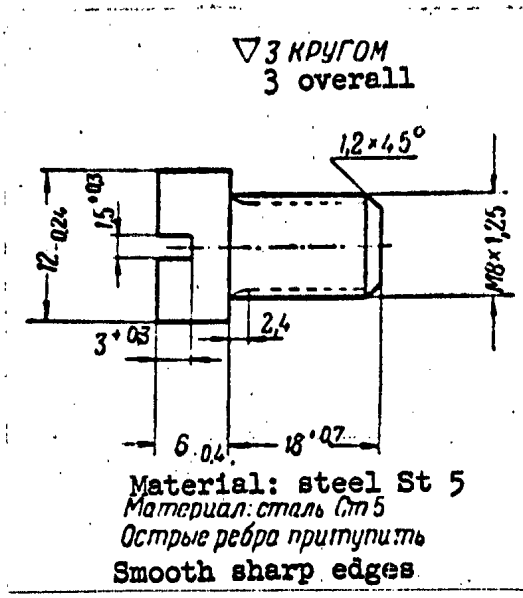


Material: steel 40
Smooth sharp edges

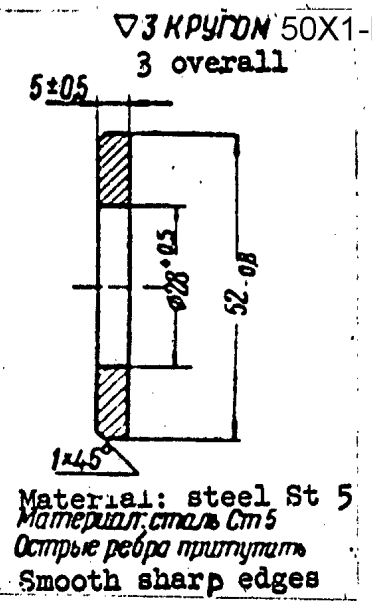
Материал: сталь 40
Острые ребра притупить

Sketch 192. 8 -- spindle

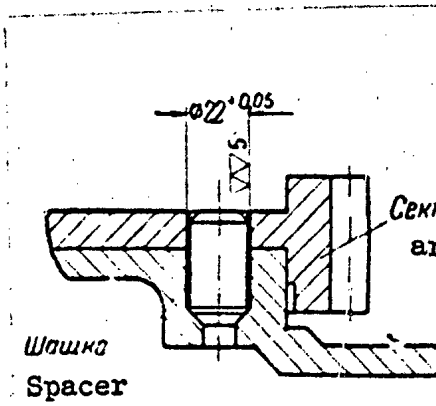
50X1-HUM



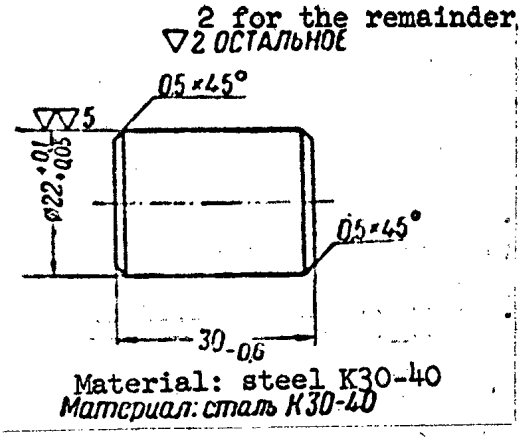
Sketch 193. 9 -- screw



Sketch 194. 10 -- washer



Sketch 195. Installing the spacers



Sketch 196. Spacer

13. Ream the two openings 22 mm in diameter for the adjusting spacers (sketch 195).

14. Make two spacers from steel 40 (sketch 196). 50X1-HUM

15. Press fit the spacers into the prepared openings.

16. Place the top carriage on the lower carriage and check the meshing (text missing).

Chart Eleven [p 251]

Fitting the Bearing Surfaces of Clamps 19-193

1. Check the contact of the clamps with the trails and, where necessary, scrape the places of contact.

At least 50% of the surfaces should contact (sketch 197).

2. Mount the trails to the limber.

Elevate the barrel to a certain angle of elevation by operation the elevating mechanism (select a gap between the cradle latches and clamps 19-193).

Disconnect the barrel from the counterrecoil mechanism and draw it off into traveling position.

3. Measure gap K between the cradle guides and the bearing surfaces of the cradle guides on the rear clamping piece and record it.

If There is a Gap K

a). Run out the barrel.

b) Remove clamps 19-193 from the trails, marking the trails and the clamps (text missing).

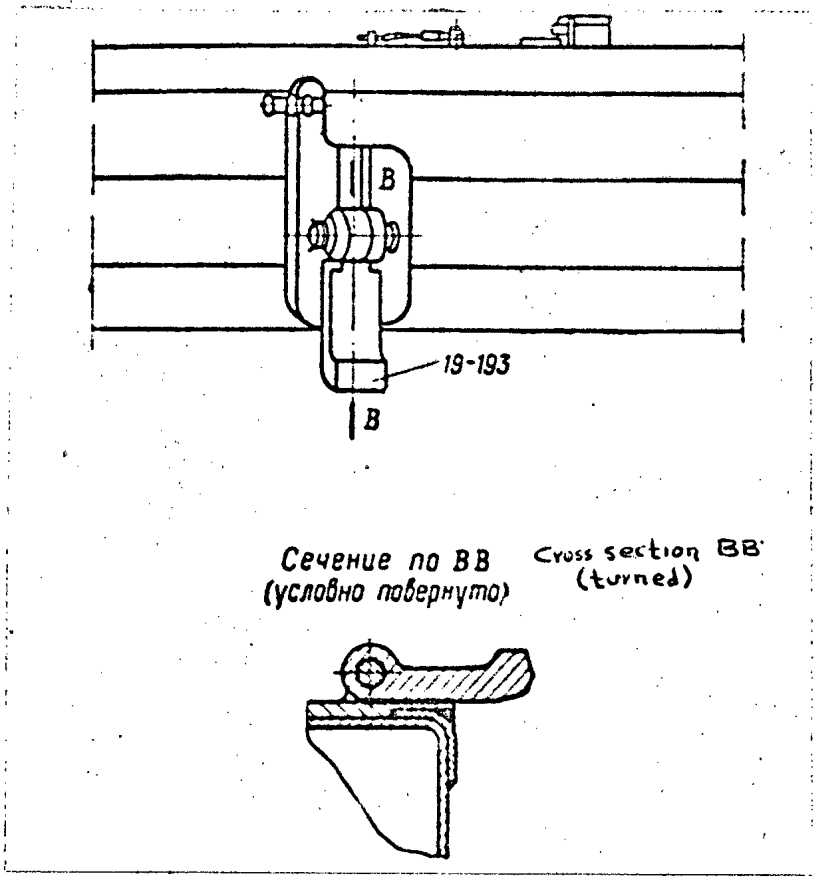
Measure height H of the bearing surface of clamp 19-193. [p 252]

c) Clean the bearing surfaces of the clamps for welding.

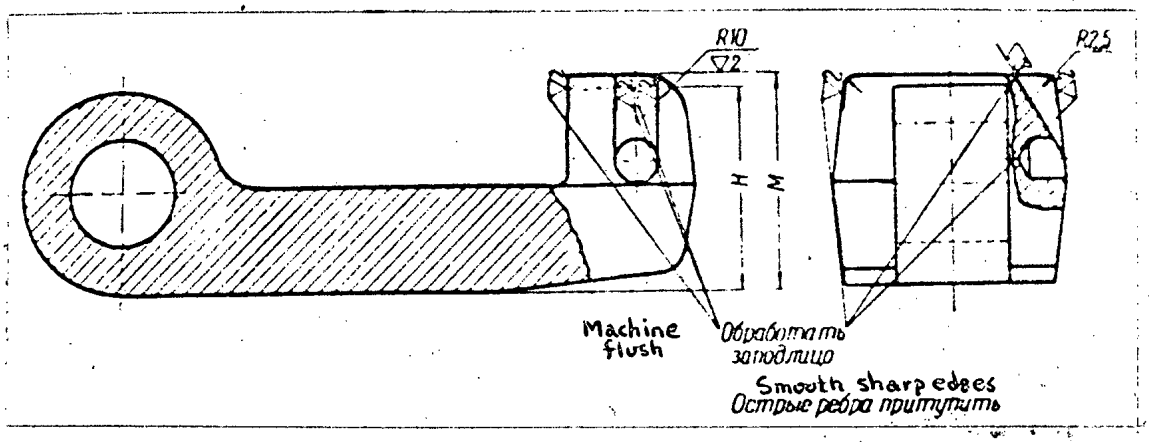
d) Weld a layer of metal (K+2) mm thick onto the bearing surface of the clamps with an E50A electrode, where K is the gap between the cradle guides and the bearing surfaces of the cradle guides on the rear clamping piece. 50X1-HUM

e) Trim off metal beading flush. File the bearing surfaces of the clamps while maintaining the height of the bearing surface $M = (H + K + 0.5)_{-0.03}$ mm (sketch 198).

50X1-HUM



Sketch 197. Trail: 19-193 -- clamp



Sketch 198. 19-193 -- clamp

50X1-HUM

f) Mount the clamps on the trails in conformance with the punch marks and fit them according to the bearing surfaces of the cradle latches so that the barrel, when drawn into traveling position, is placed on supports 19-439 and 19-438 by means of the breech ring, stop Sb19-76 holds the breech ring, the cradle is placed on clamps 19-193 by means of its latches, and there is no gap in the junction of the cradle guides with the guides of the rear clamping piece. At least 40% of the surface of the cradle latches should contact the clamps. 50X1-HUM

When There is no Gap K

Check the junction of the breech ring with supports 19-439 and 19-438 and, if a gap is detected in the junction, fit clamps 19-193 to the bearing surfaces of the cradle so that the barrel, when drawn into traveling position, is placed on supports 19-439 and 19-438 by means of the breech ring, stop Sb19-76 holds the breech ring, the cradle is placed on the clamps by means of its latches, and there is no gap in the junction of the cradle guides with the guides of the rear clamping piece.

50X1-HUM

Chart Twelve [p 252]

50X1-HUM

Repair of Winch Roller Brake

A. Replacing Slide Block 20-23

1. Make two slide blocks 20-23 from steel 40 (sketch 199).

2. Make a conductor (sketch 200) from any grade of steel.

3. Place the slide blocks in left carrier 20-25 and fasten them with screws A51062-10 (sketch 201).

4. Place left carrier 20-25 in a vise, place right carrier 20-26 [p 255] on it, lay the jig on top, and with a clearance gage measure clearance a between slide blocks 20-23 and right carrier 20-26 (sketch 201).

The clearances should be from 1 to 1.2 mm.

5. If the clearances are greater than specified above, adjust slide blocks 20-23 in the grooves of right carrier 20-26 to provide the required clearances.

A difference in clearances in diametrically opposite directions is not allowed.

B. Aligning Left Carrier 20-25

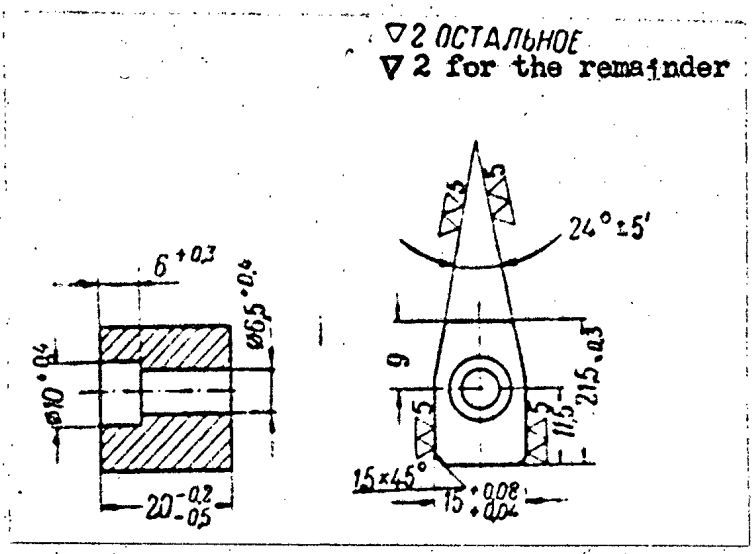
1. Insert left carrier 20-25, with slide blocks 20-23 attached, in cap 20-2. Connect right carrier 20-26 to plate 20-13. Connect carrier 20-26 to carrier 20-25.

Adjust the position of right carrier 20-26 so that the diametrically located clearances a are the same. Fasten right carrier 20-26 in this position. In doing this, insert spacers of the same size in clearances a between slide blocks 20-23 and right carrier 20-26 (sketch 202).

2. Install rollers 20-24 and jaws 20-27 with springs 20-29. With a clearance gage check the clearances between the rollers and the right carrier. The clearances should be from 0-0.03 mm and diametrically opposite clearances should be the same (sketch 202).

3. If the clearances are greater than 0.03 mm or diametrically unlike, file projection b of left carrier 20-25 until corresponding and diametrically located clearances are obtained.

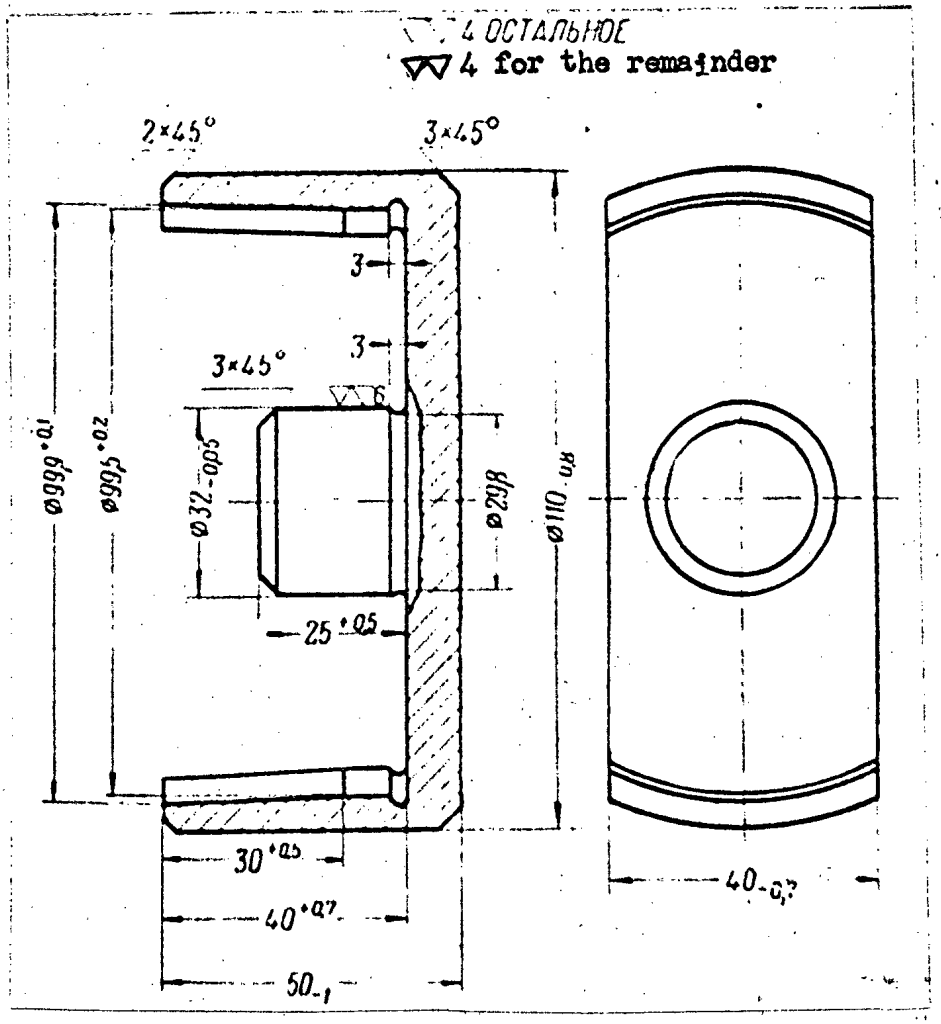
50X1-HUM



50X1-HUM

Sketch 199.
20-23 -- slide block

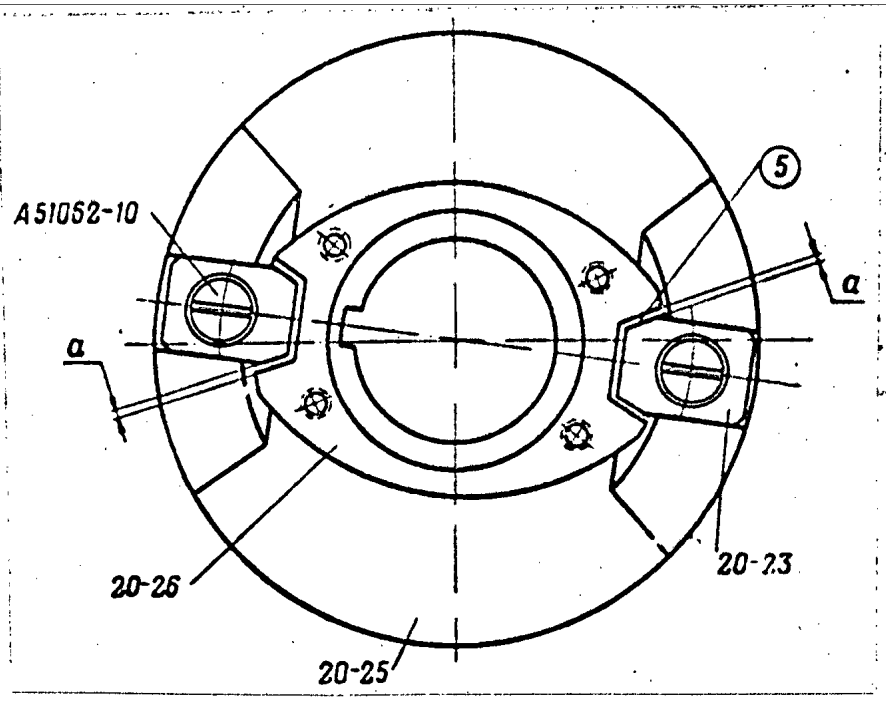
Material: steel K30-40
Blunt sharp edges
Oxidize



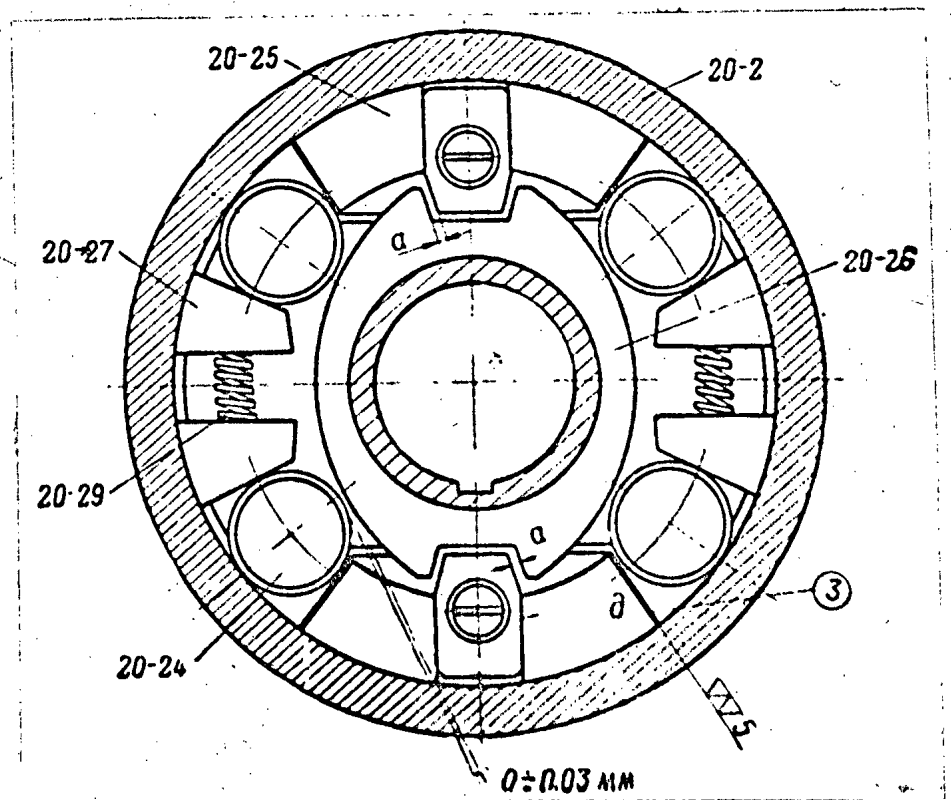
50X1-HUM

Sketch 200. Jig

Material: steel
Blunt sharp edges



Sketch 201. Installing the slide blocks: 20-23 -- slide block; 20-25 -- left carrier; 20-26 -- right carrier; A51062-10 -- screw



Sketch 202. 20-2 -- cap; 20-24 -- roller; 20-25 -- left carrier; 20-26 -- right carrier; 20-27 -- jaw; 20-29 -- spring

PART THREE
ЧАСТЬ ТРЕТЬЯ
APPENDICES
ПРИЛОЖЕНИЯ

List of Parts and Assembled Units Made in Repair Shops and Supplied in Serviceable Form

Appendix 1
Приложение 1

ПЕРЕЧЕНЬ
ДЕТАЛЕЙ И СБОРОК ИЗГОТОВЛЯЕМЫХ В РЕМОНТНЫХ МАСТЕРСКИХ И ПОСТАВЛЯЕМЫХ В ГОТОВОМ ВИДЕ

№ детали или сборки	Наименование детали или сборки	№ эскиза детали или сборки	Размеры заготовки на одну деталь, мм	Потребный мерный режущий инструмент для изготовления деталей	Какой ремонтной мастерской изготовляется или поставляется в готовом виде
	Ствол				
01-1	Труба	—	—	—	Поставляется
01-45 (01-47)	Дульный тормоз	—	—	—	"
01-51 (01-46)	Дульный тормоз	—	—	—	"
C601	Ствол	—	—	—	"
	Затвор				
02-19	Пружина	—	—	—	Поставляется
(02-27)	Боек ударника	203	∅ 24, *l* = 110	Сверло ∅ 7 *мм*	ДАРМ
02-28	Шпонка	204	∅ 15, *l* = 45	—	ДАРМ
02-29	Пружина боевая	—	—	—	Поставляется

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02-33 (02-33А02-33)	Выбрасыватель нижний	—	—	—	Поставляется
02-34 (02-33А02-34)	Выбрасыватель верхний	—	—	—	ДАРМ
02-41	Ось удержника	205	⌀ 15, l=85	Плашка М10×1,5	Поставляется
С02-5 (А31021-2)	Механизм ударный	—	—	—	ПМ
	Винт установочный	206	⌀ 10, l=35	Плашка М8×1,25	
	Тормоз отката				
03-4	Воротник	207	⌀ 140/85, l=40	—	Поставляется
03-5	Кольцо	—	—	—	ААРМ
03-6	Сальник	208	⌀ 140/85, l=80	—	Поставляется
03-8	Втулка гайки	209	⌀ 180, l=125	Сверло ⌀ 15 *мм*; сверло ⌀ 30 *мм*	ААРМ ДАРМ
03-9	Кольцо уплотняющее				
03-16	Рубашка штока	210	⌀185/135, l=150	Сверло ⌀ 10 *мм*; фреза цилиндрическая 60×75; фреза пиноч. ⌀8 *мм*	ААРМ ААРМ
03-34	Вкладыш	211	⌀115/50, l=160		
03-35	Стакан контрштока	212	⌀ 70, l=110	Сверло ⌀ 25 *мм* Сверло ⌀ 15 *мм* Сверло ⌀ 30 *мм* Сверло ⌀ 3 *мм*; сверло ⌀ 5 *мм*	ДАРМ ДАРМ
03-45	Кольцо уплотняющее	209	⌀ 195, l=25		
03-48	Вентиль	213	⌀ 22, l=120		ПМ

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08-52	Буфер	—	—	—	Поставляется
08-55	Шпонка	214	Полоса 14×30	Сверло ∅ 8,4 мм	АРМ
08-73	Кольцо уплотняющее	209	∅ 25, l=25	Сверло ∅ 12 мм	ДРМ
08-102	Кольцо резиновое	—	—	—	Поставляется
08-103	Кольцо кожаное	—	—	—	"
08-104	Воротник	—	—	—	"
C608	Тормоз отката	—	—	—	"
	Люлька				
09-11	Втулка	215	∅ 48, l=70	Сверло ∅ 20 мм	ПМ
(09-27)	Стопор штока	216	См. эскиз 216	Сверло ∅ 20 мм	ДРМ
09-56	Пружина пластинчатая	217	Лист 1×10	Сверло ∅ 4 мм	ДРМ
09-107	Ролик	218	∅ 35, l=40	Сверло ∅ 15 мм	ПМ
09-108	Ось ролика	219	∅ 25, l=80	—	ПМ
09-111	Ось рычага	220	∅ 32, l=100	Планка М16×2	ПМ
09-114	Втулка	221	∅ 48, l=70	Сверло ∅ 20 мм	ПМ
A5041-33	Штифт	222	∅ 15, l=40	—	ПМ
2218	Роликоподшипник	—	—	—	Поставляется
	Накатник				
10-22	Втулка гайки	223	∅ 50, l=60	Сверло ∅ 25 мм	ПМ
10-24	Пружина каната	—	—	—	Поставляется

50X1-HUM

50X1-HUM

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10-25	Кольцо уплотняющее	209	⌀135, l=25	Сверло ⌀ 15 мм; сверло ⌀ 30 мм	ДАРМ
10-53	Кольцо уплотняющее	209	⌀165, l=25	Сверло ⌀ 15 мм; сверло ⌀ 30 мм	ДАРМ
10-54	Кольцо кожаное	—	—	—	Поставляется
10-57	Вентиль	224	⌀22, l=110	Сверло ⌀ 2 мм	ПМ
10-77	Воротник	—	—	—	Поставляется
10-79	Кольцо	225	⌀77, l=35	Сверло ⌀ 25 мм	НМ
10-80	Сальник	—	—	—	Поставляется
10-83	Воротник	—	—	—	ДАРМ
10-97	Кольцо	226	⌀110/55, l=35	—	ДАРМ
10-99	Кольцо	227	⌀110/75, l=35	—	Поставляется
10-107	Кольцо уплотняющее	—	—	—	•
10-115	Кольцо уплотнительное	—	—	—	•
10-117	Сальниковая набивка	—	—	—	•
10-122	Сетка № 1, ГОСТ 6613—53	—	—	—	ПМ
10-126	Втулка	228	⌀21, l=30	Сверло ⌀ 10 мм; сверло ⌀ 16 мм	•
10-127	Кольцо	—	—	—	Поставляется
С610	Накатник	—	—	—	•
	Прицел С-71				
12-25	Ось	229	⌀ 20, l=60	Сверло ⌀ 2 мм	ДАРМ
12-51	Червяк	—	—	—	Поставляется
12-119	Дистанционный барабан	—	—	—	•
С612-1	Вилка с цапфой	—	—	—	•

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С612-10 А52152-2	Оправка с амулой	—	—	—	Поставляется
	Винт нажимной	230	Ø 22, l=40	Сверло Ø 4 мм; сверло Ø 10 мм; плашка М8×1,25	ПМ
	Верхний станок				
17-9	Стопор	231	Ø 40, l=160	—	ААРМ
17-24	Пружина тарельчатая	—	—	—	Поставляется
17-36	Пружина тарельчатая	—	—	—	Поставляется
17-73	Штифт установочный	232	Ø 28, l=60	—	ААРМ
(17-89)	Болт	233	Ø 22, l=115	Плашка М16×2	ПМ
205	Подшипник	—	—	—	Поставляется
8211	Подшипник	—	—	—	
	Нижний станок				
18-2	Втулка	234	Ø160;110, l=110	—	ДАРМ
18-10	Шайба	235	Ø 100, l=30	Сверло Ø 15 мм; сверло Ø 25 мм	ПМ
18-18	Штырь	236	Ø 80, l=190	Сверло Ø 15 мм; сверло Ø 30 мм	ДАРМ
18-24	Шашка	237	Ø 18, l=45	—	ДАРМ
18-25	Шашка	237	Ø 18, l=40	—	ДАРМ
18-32	Балк торсионный	—	—	—	Поставляется
18-38	Ось тяги параллелограмма	238	Ø 48, l=160	Сверло Ø 6 мм	ПМ

50X1-HUM

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18-59	Буфер	—	—	—	Поставляется
18-76	Ось	239	Ø 48, *l*=90	Сверло Ø 18 *мм*	ПМ
18-77	Ось	240	Ø 30, *l*=90	Сверло Ø 4 *мм*	ПМ
18-162	Стопор	241	Ø 65, *l*=210	—	ДАРМ
18-163	Пружина	—	—	—	Поставляется
	Станины				
(19-53)	Стопор	212	Ø 20, *l*=130	Плашка М10×1,5	ДАРМ
19-120	Болт шарнирный	—	—	—	Поставляется
19-179	Ось	243	Ø 32, *l*=110	Сверло Ø 6 *мм*	ДАРМ
19-608	Гайка	244	Ø 22, *l*=50	Сверло Ø 8,4 *мм*; сверло 10 *мм* Метчик М10×1,5	ПМ
19-701	Ручка	245	Ø 8, *l*=210	—	ПМ
A51041-11	Штифт цилиндрический	246	Ø 6, *l*=40	—	ПМ
	Лебедка				
20-55	Стопор	247	Ø 14, *l*=90	—	ПМ
207	Подшипник	—	—	—	Поставляется
211	Подшипник	—	—	—	»
305	Подшипник	—	—	—	»
A51220-11	Пружина	—	—	—	»
A51910-302	Втулка	248	Ø 45, *l*=45	Сверло Ø 18 *мм*	ПМ
A51910-344	Втулка	249	Ø 70, *l*=80	Сверло Ø 30 *мм*; сверло Ø 15 *мм*	ДАРМ

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	Подъемный механизм				
21-6	Прокладка	250	См. эскиз 250	Сверло ⌀ 10,5 *мм*	ПМ
21-21	Заклепка	251	⌀ 22, *l*=65	—	ПМ
21-22	Червячный валик	—	—	—	Поставляется
21-30	Пружина тарельчатая	—	—	—	•
21-50	Шестерня	—	—	—	•
21-62	Прокладка	252	См. эскиз 252	Сверло ⌀ 9 *мм*	ПМ
21-65	Прокладка	253	См. эскиз 253	Сверло ⌀ 9 *мм*	ПМ
21-70	Шестерня	—	—	—	Поставляется
21-88	Прокладка	254	См. эскиз 254	Сверло ⌀ 8 *мм*; сверло ⌀ 11 *мм*; сверло ⌀ 15 *мм*	ПМ
21-160	Шестерня	—	—	—	Поставляется
21-169	Шестерня	—	—	—	•
C021-4	Червячное колесо	—	—	—	•
204	Подшипник	—	—	—	•
206	Подшипник	—	—	—	•
218	Подшипник	—	—	—	•
7216	Подшипник	—	—	—	•
8211	Подшипник	—	—	—	•
5310	Подшипник	—	—	—	•
	Поворотный механизм				
22-3	Червячное колесо	—	—	—	Поставляется
22-4	Червяк	—	—	—	?
22-4	Червяк	255	⌀ 75, *l*=270	Фреза шпоночная ⌀3 *мм*	ААРМ

50X1-HUM

50X1-HUM

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22-6	Прокладка	256	См. эскиз 256	Сверло Ø 13 мм; сверло Ø 15 мм	ДАРМ
	Пружина тарельчатая	—	—	—	Поставляется
22-7	Прокладка	257	См. эскиз 257	Сверло Ø 10,5 мм	ПМ
22-19	Прокладка	258	См. эскиз 258	Сверло Ø 9 мм	ПМ
22-26	Шестерня	—	—	—	Поставляется
22-34	Крестовина	259	Ø 55, l=35	—	ДАРМ
22-66	Подшипник	—	—	—	Поставляется
224	Подшипник	—	—	—	• • •
226	Подшипник	—	—	—	• • •
210	Подшипник	—	—	—	• • •
7207	Подшипник	—	—	—	
7696	Подшипник	—	—	—	
	Уравновешивающий механизм				
23-23	Пробка	260	Ø 22, l=70	Сверло Ø 3 мм; планка М14×2	ПМ
	Воротник	—	—	—	Поставляется
23-74	Пружина	—	—	—	
23-143	Наконечник	261	Ø 22, l=70	Сверло Ø 3 мм; сверло Ø 5 мм	ПМ •
23-161	Уравновешивающий механизм	—	—	—	Поставляется
C623	Подшипник	—	—	—	•
1308					
	Домкрат				• • •
24-14	Кольцо	—	—	—	
24-16	Кольцо	—	—	—	

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24-27	Сальник	—	—	—	Поставляется
24-40	Кольцо	—	—	—	»
24-46	Вентиль	262	ø 22, l=50	Сверло ø 3 мм; сверло ø 6 мм	ПМ
24-62	Вентиль	263	ø 14, l=90	Плашка М10×1,5	ПМ
24-65	Кольцо	264	ø 18, l=25	Сверло ø10 мм	ПМ
24-95	Кольцо уплотнительное	264	ø 33, l=25	Сверло ø 21 мм	ПМ
24-104	Воротник	—	—	—	Поставляется
24-108	Воротник	—	—	—	»
24-114	Ручка	265	См. эскиз 265	—	ПМ
C624	Домкрат	—	—	—	Поставляется
	Колесо				
25-5	Сальник	—	—	—	Поставляется
25-7	Кольцо прокладное	—	—	—	»
7518	Подшипник	—	—	—	»
7714	Подшипник	—	—	—	»
	Колесный тормоз				
26-4	Обшивка тормозных колодок	—	—	—	Поставляется
26-13МП (26-10)	То же	—	—	—	»
(26-21)	Воротник	—	—	—	»
26-69	Пружина	—	—	—	»
	Пружина	—	—	—	»

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26-70	Пружина	—	—	—	Поставляется
26-121	Шайба	266	∅ 12, l=15	Сверло ∅ 6 мм	ПМ
26-122	Кольцо	—	—	—	Поставляется
26-131	Кольцо	—	—	—	•
26-132	Шайба	—	—	—	•
26-133	Манжета	—	—	—	•
26-135	Прокладка	—	—	—	ПМ
26-157	Вентиль	267	∅ 14, l=65	Сверло ∅ 8 мм; плашка 1М10×1	
26-165	Кольцо уплотнительное	264	∅ 28, l=25	Сверло ∅ 15 мм	ПМ
26-171	Пружина	—	—	—	Поставляется
26-150	Фильтр	—	—	—	•
26-191	Прокладка	—	—	—	•
26-194	Винт	268	∅ 12, l=45	Плашка М6×1	ПМ
С026-16	Трос	—	—	—	Поставляется
С026-35	Цилиндр	—	—	—	•
С026-40	Золотник	—	—	—	•
А51010-3	Гайка	269	∅ 15, l=15	Сверло ∅ 5 мм; метчик М6×1	ПМ
А52252-8	Манжета	—	—	—	Поставляется
А52000-124	Обкладонка	270	См. эскиз 270	—	ПМ
А52426-16	Хомутик	271	Лист 2 мм	Сверло ∅ 6,5 мм	ПМ
—	Резинотканевый шланг 23×13 L=2800 мм, ГОСТ 73—40	—	—	—	Поставляется
	Щитовое прикрытие				
27-6	Ось завертки	272	∅ 18, l=50	—	ДАРМ
27-124	Ось	273	∅ 32, l= 75	Сверло ∅ 4,5 мм	ДАРМ

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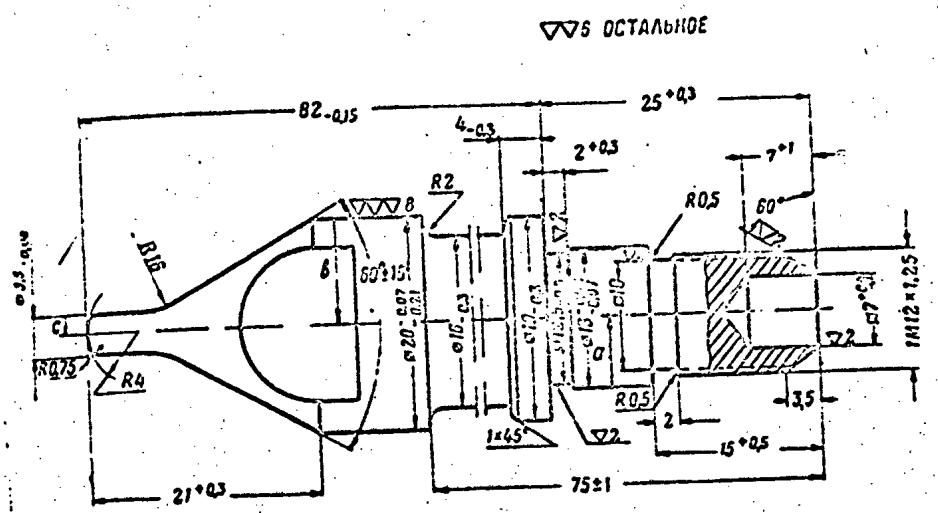
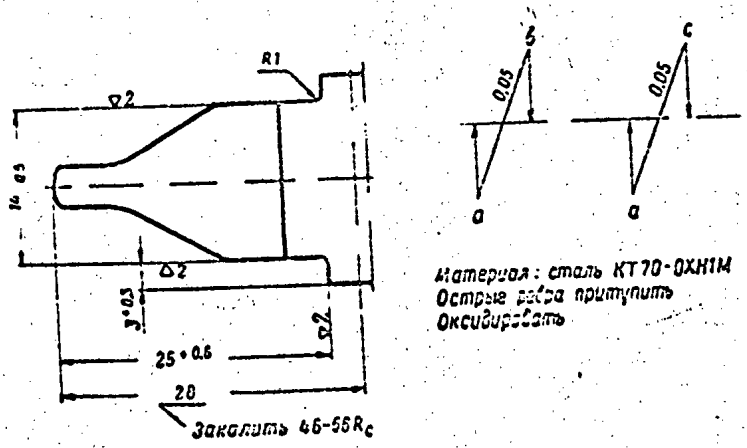
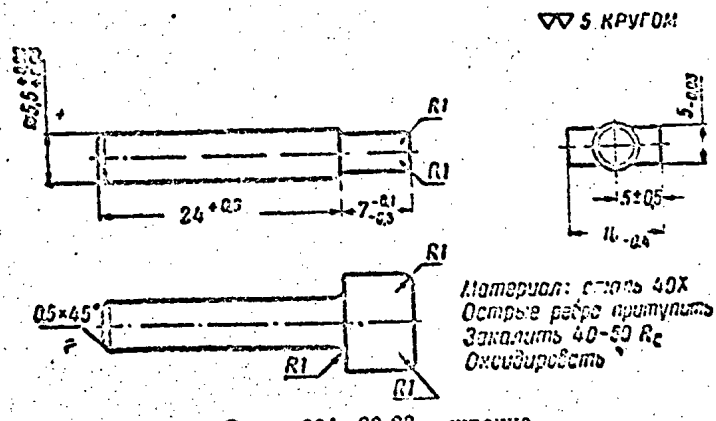
	Передок				
46-59	Кольцо	274	Ø 70, l=50	Сверло Ø 25 мм	ПМ
46-56	Втулка	275	Ø 100/50, l=110	—	ДАРМ
46-57	Втулка	276	Ø 95/40, l=110	—	ДАРМ
46-62А	Втулка	277	Ø 135/90, l=85	—	ААРМ
(46-62)	Втулка	277	Ø 140/90, l=75	—	ААРМ
46-64А	Буфер верхний	—	—	—	Поставляется
(46-64)	Буфер верхний	—	—	—	»
46-67В	Пружина	—	—	—	»
46-78А	Буфер нижний	—	—	—	»
(46-78)	Буфер нижний	—	—	—	»
46-77	Гайка	278	Ø 80, l=170	Сверло Ø 15 мм; сверло Ø 21 мм; сверло Ø 25 мм	ПМ
46-91	Палец	279	Ø 43, l=150	Сверло Ø 5 мм	ДАРМ
46-105А	Втулка	280	Ø 120/60, l=85	—	ААРМ
(46-105)	Втулка	281	Ø 105/60, l=70	—	ААРМ
46-135	Кольцо прокладное	—	—	—	Поставляется
46-137	Ось	282	Ø 16, l=75	—	ПМ
47-138	Кольцо	—	—	—	Поставляется
С646-23	Манжетное уплотнение	—	—	—	»
7609	Подшипник	—	—	—	»
7612	Подшипник	—	—	—	»
А51069-8	Винт	283	Ø 12, l=35	Плашка М6×1	ПМ

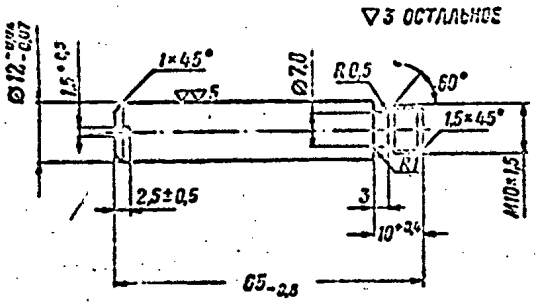




Эскиз 203. (02-27) — боек ударника

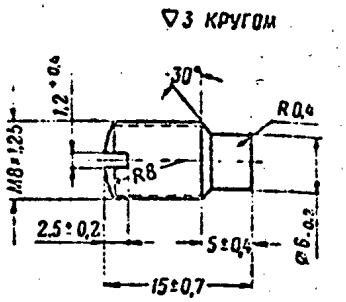


Эскиз 204. 02-28 — шпонка



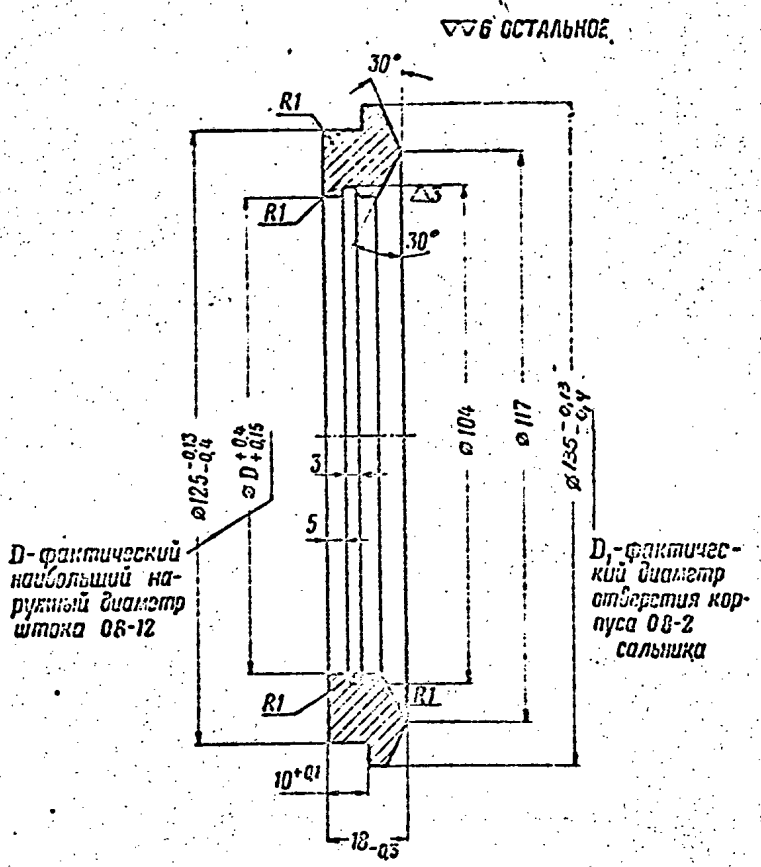
Материал: сталь КТ50-0ХНМ или сталь КТ75-40Х
Острые ребра притупить
Оксидировать

Эскиз 205. *02-41* — ось удержника



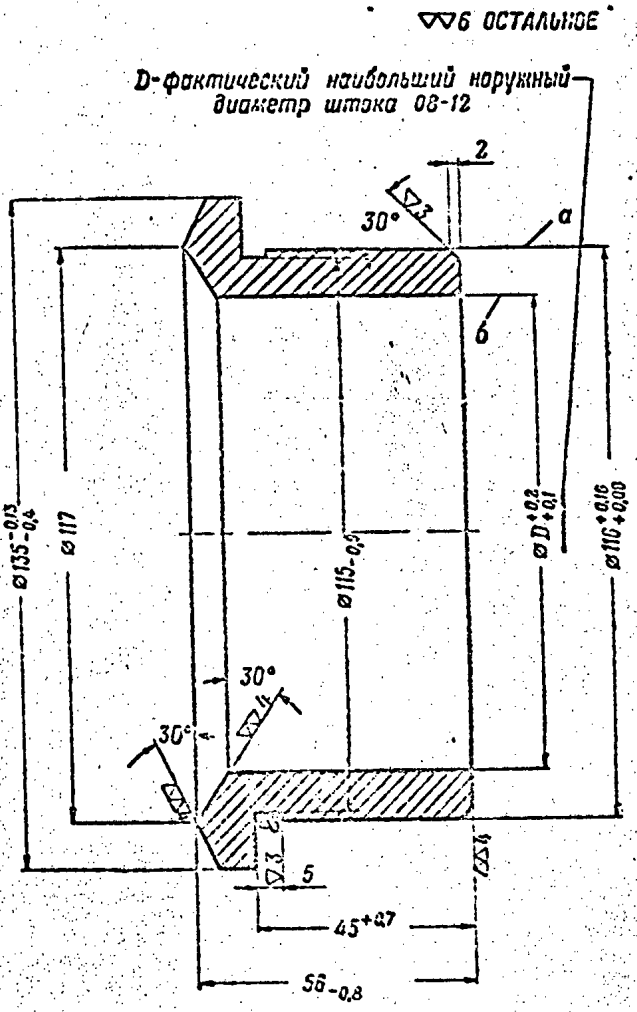
Материал: сталь КТ65-40Х
Острые ребра притупить
Оксидировать

Эскиз 206. *(Л5106-1-2)* — винт установочный



Материал: бронза Ср А10Ж4Н4Л 10-3-1,5
Острые ребра притупить

Эскиз 207. *03-5* — [illegible]



Материал: бронза Бр ОЦС 6-5-3
Поверхности а и б обрабатать с одной установки
Острые ребра притупить

Эскиз 208. 08-8 — втулка гайки

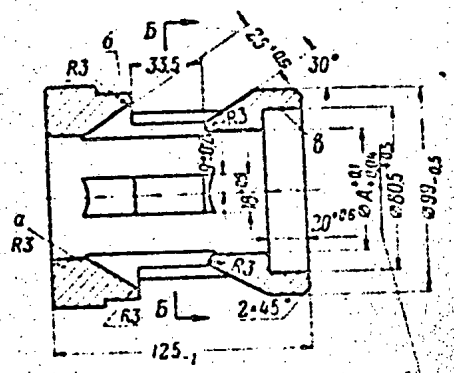
№ деталей	Размеры в мм			Угол
	D	D_1	H	α°
08-9	170	162	5	45
08-45	183	182	4	45
08-73	23	165	3	15
10-25	189	125	4	45
10-53	158	152	5	45

1) При нарезании резьбы Г в контрольное 03-25 (см. эскиз 326) D_1 = 125

Эскиз 209. 08-9 — кольцо уплотняющее; 08-45 — кольцо уплотняющее; 08-73 — кольцо уплотняющее; 10-25 — кольцо уплотняющее; 10-53 — кольцо уплотняющее

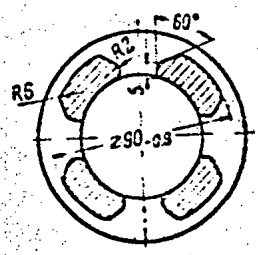
Эскиз 210. 08-16 — рубашка штока

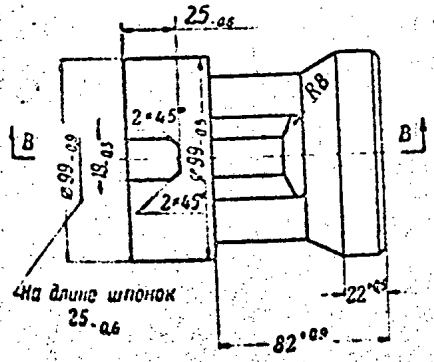
Разрез по ВВ

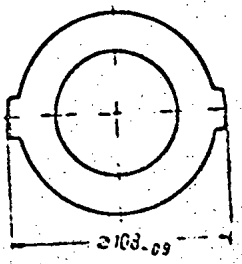


▽▽6 кругом

Разрез по ББ

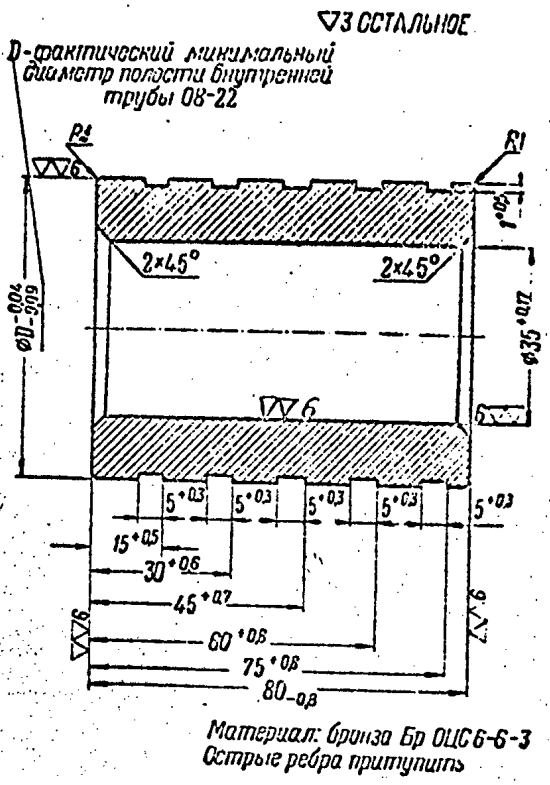






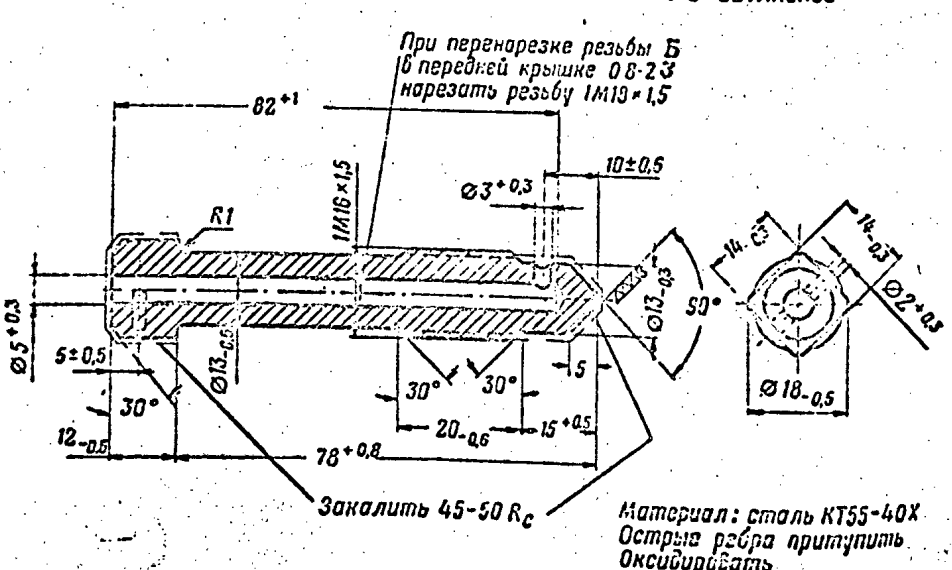
Материал бронза Бр ОЦС 6-6-3
Поверхности а, б и в обработать с одной установки
Острые ребра притупить

Эскиз 211. *OS-31* — вкладыш



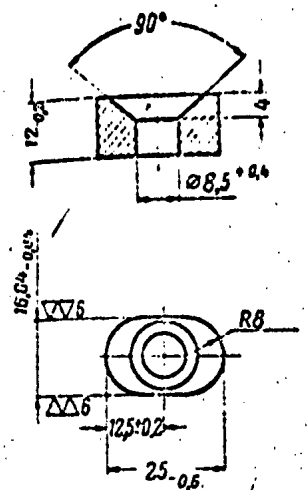
Материал: бронза Бр ОЦС6-6-3
Острые ребра притупить

Эскиз 212. 08-35 — стакан контрштока



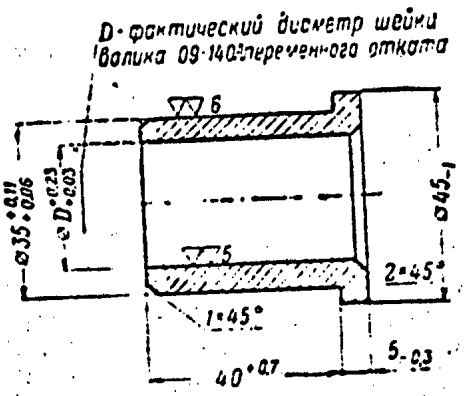
Материал: сталь КТ55-40Х
Острые ребра притупить
Оксидировать

Эскиз 213. 08-48 — вентиль



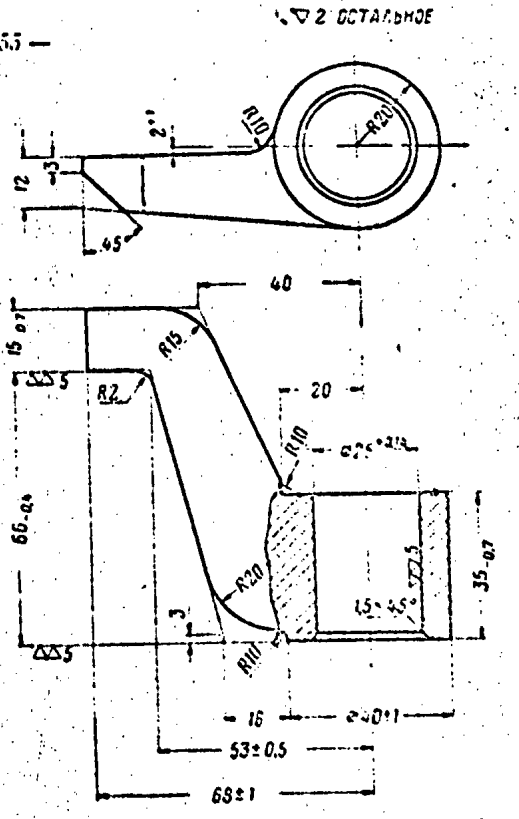
Материал: сталь К30-40
Острые ребра притупить
Оксидировать

Эскиз 214. 09-33 — шпонка



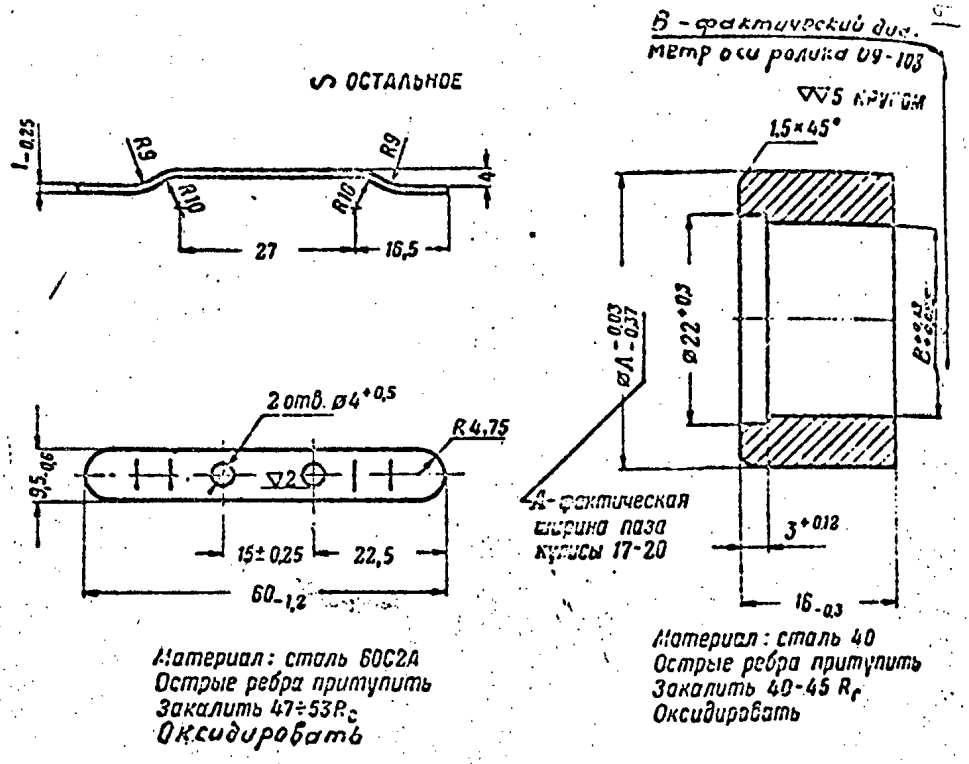
Материал: латунь ЛМц А 57-3-1
Острые ребра притупить

Эскиз 215. 09-11 — втулка



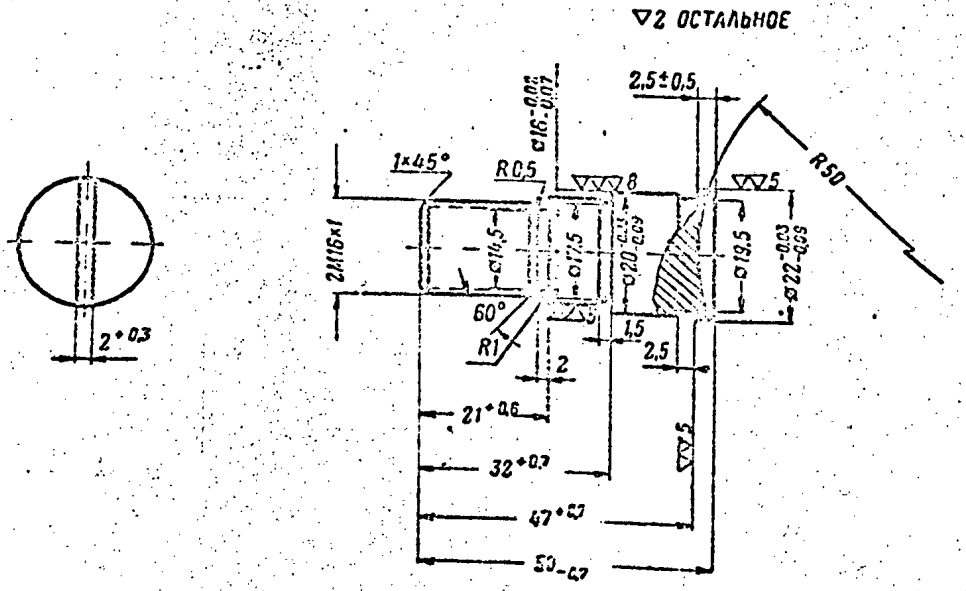
Материал: сталь К30-40
Острые ребра притупить
Оксидировать

Эскиз 216. (09-27) — стопор штока

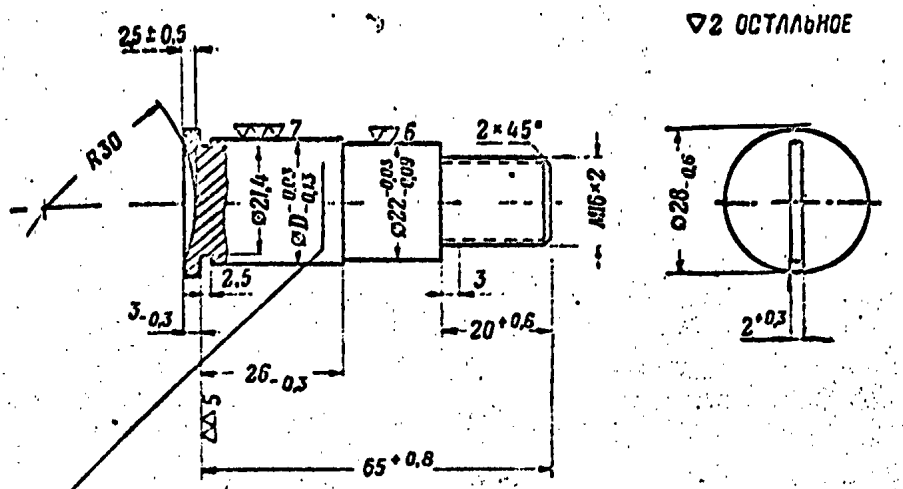


Эскиз 217. *09-56* — пружина пластинчатая

Эскиз 218. *09-107* — ролик



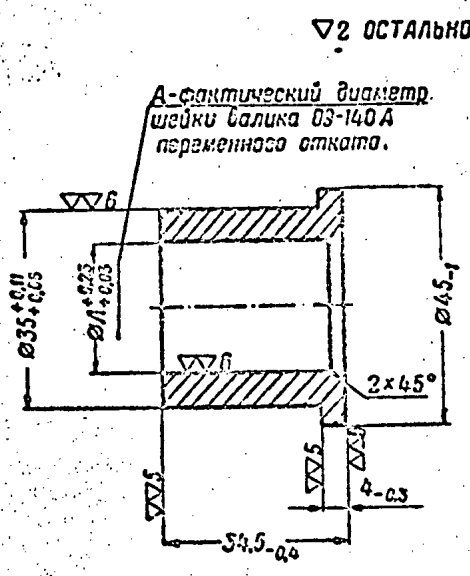
Эскиз 219. *09-108* — ось ролика



D-фактический диаметр отверстия двуплечего рычага 09-105

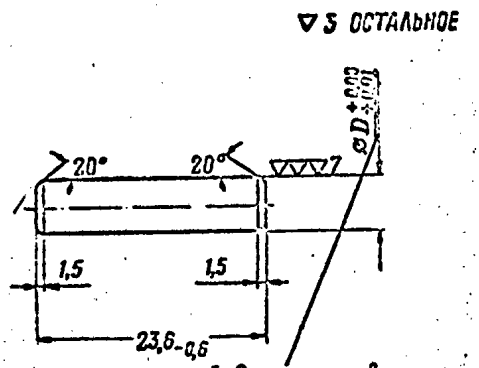
Материал: сталь КТ55-40Х
Острые ребра притупить
Оксидировать

Эскиз 220. *09-111* — ось рычага



Материал: латунь ЛМцА57-3-1
Острые ребра притупить

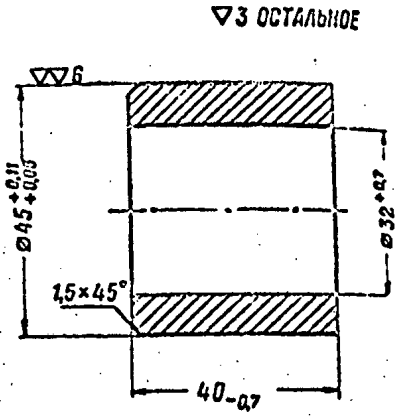
Эскиз 221. *09-114* — втулка



D-фактический диаметр отверстия в муфте 09-198 и в кронштейне 09-197

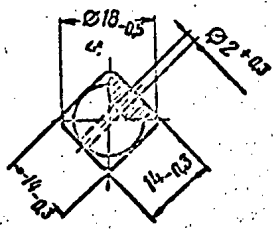
Материал: сталь Ст 6
Острые ребра притупить

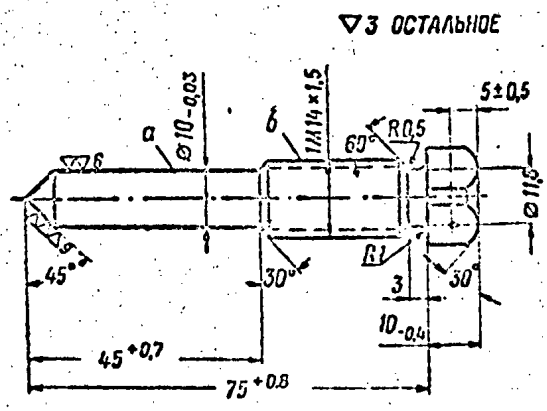
Эскиз 222. *A51041-33* — штифт



Материал: бронза Бр АЖМц 10-3-1,5
Острые ребра притупить

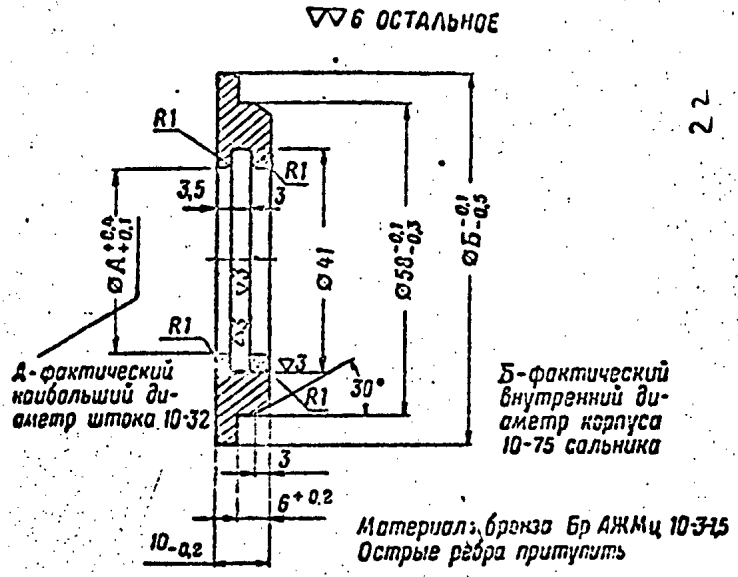
Эскиз 223. *10-22* — втулка гайки



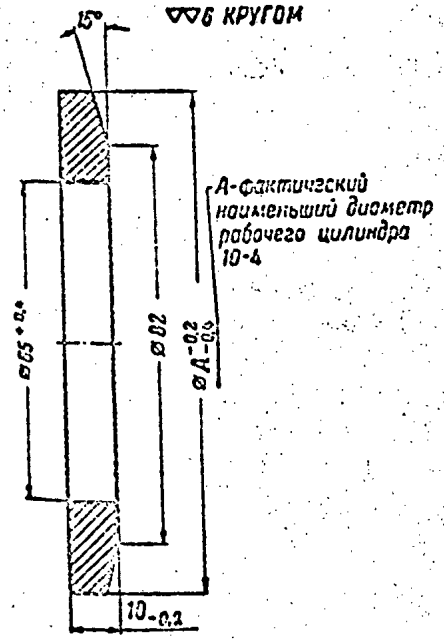


Материал: сталь 0Х18Н
Обработку поверхностей а, б и конуса производить с одной установки
Острые ребра притупить
Закалить 45-50 R_c
Оксидировать

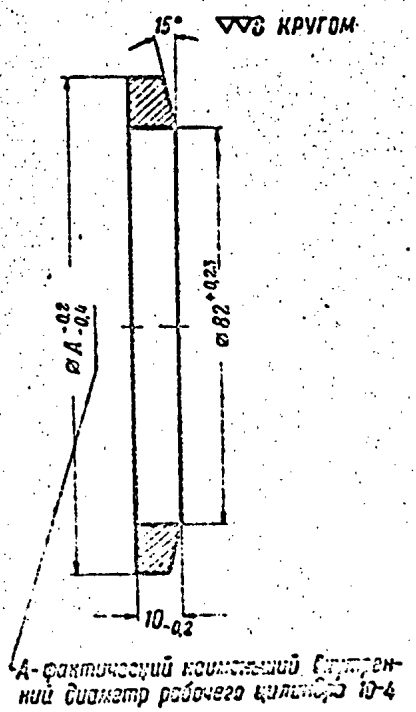
Эскиз 224. *10-57* — вентиль



Эскиз 225. 10-79 — кольцо

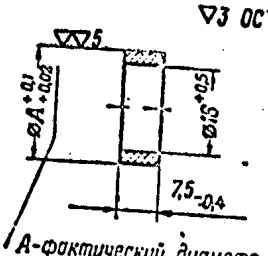


Эскиз 226. 10-97 — кольцо



Эскиз 227. 10-99 — кольцо

▽3 ОСТАЛЬНОЕ



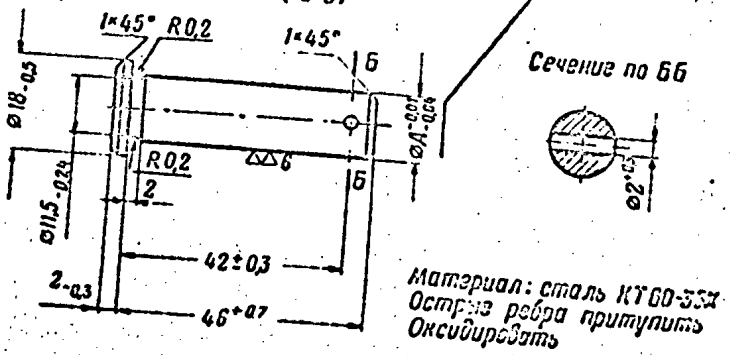
А-фактический диаметр выточки в пробке 10-121

Материал: сталь К 20-25
Острые ребра притупить

Эскиз 228. *10-126* — **втулка**

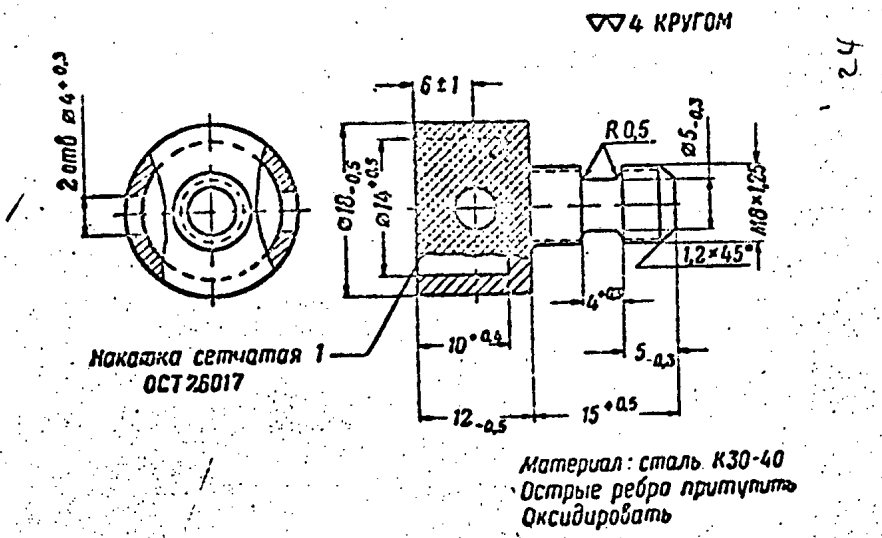
▽3 ОСТАЛЬНОЕ

А-фактический диаметр отверстия ушка болика 12-20 и вилки с цапфой Сб 12-1 или рычага (12-8)



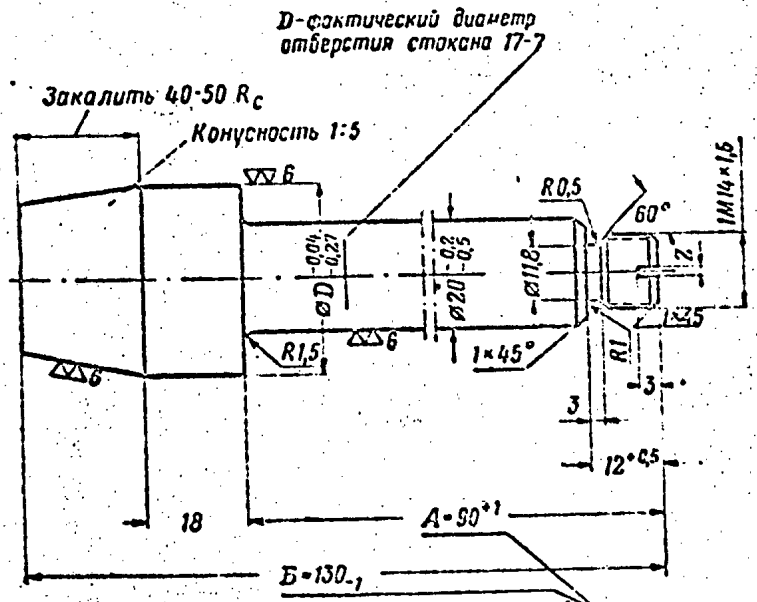
Материал: сталь КТ 60-35Х
Острые ребра притупить
Оксидировать

Эскиз 229. *12-25* — **ось**



Материал: сталь К30-40
Острые ребра притупить
Оксидировать

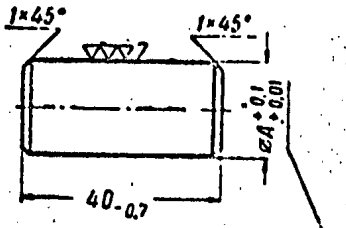
Эскиз 230. *А52152-2* — винт нажимной



Материал: сталь К30-40
Острые ребра притупить
Оксидировать

Эскиз 231. *17-9* — стопор

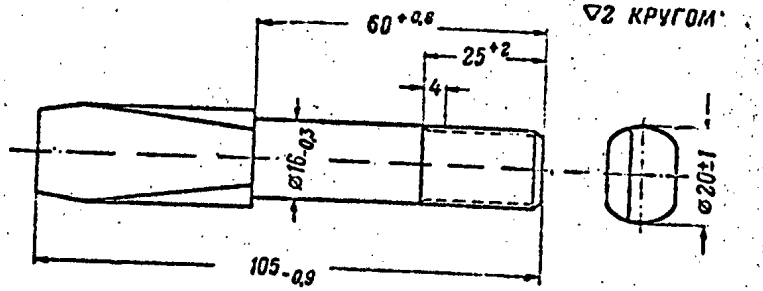
▽3 ОСТАЛЬНОЕ

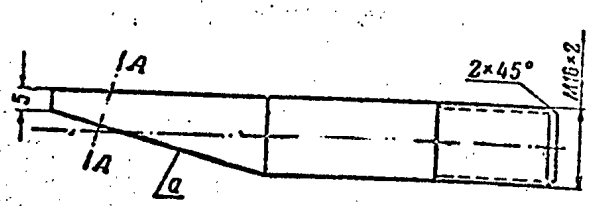


А-фактический диаметр отверстий в переднем захвате 17-70

Материал: сталь К20-25
Острые ребра притупить

Эскиз 232. *17-73* — штифт установочный



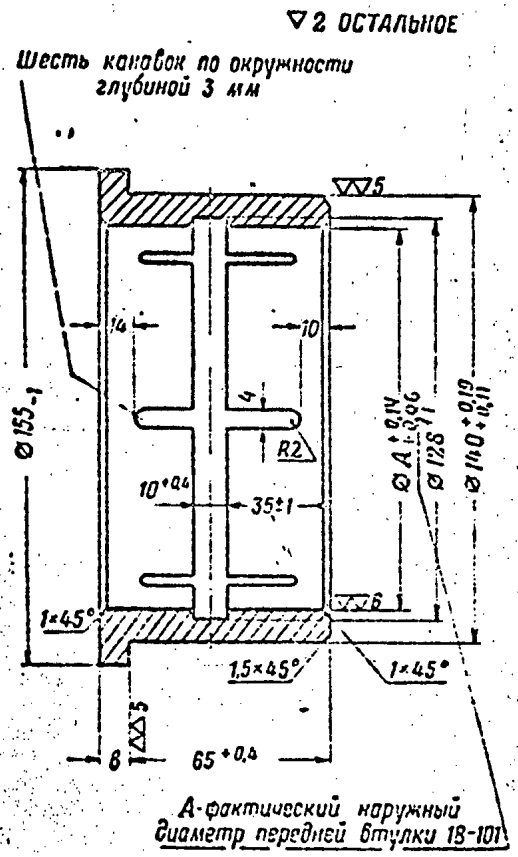


Сечение по А-А

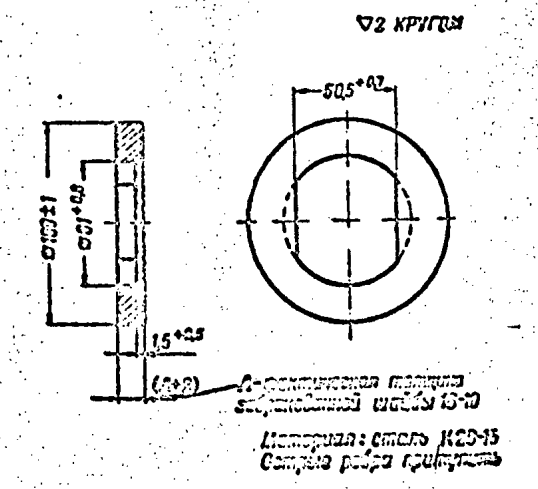
Материал: сталь К20-25
Острые ребра притупить

Примечание: R3 – радиус закругления для перехода от поверхности ⌀20±1 к поверхности а

Эскиз 233. *(17-89)* — болт

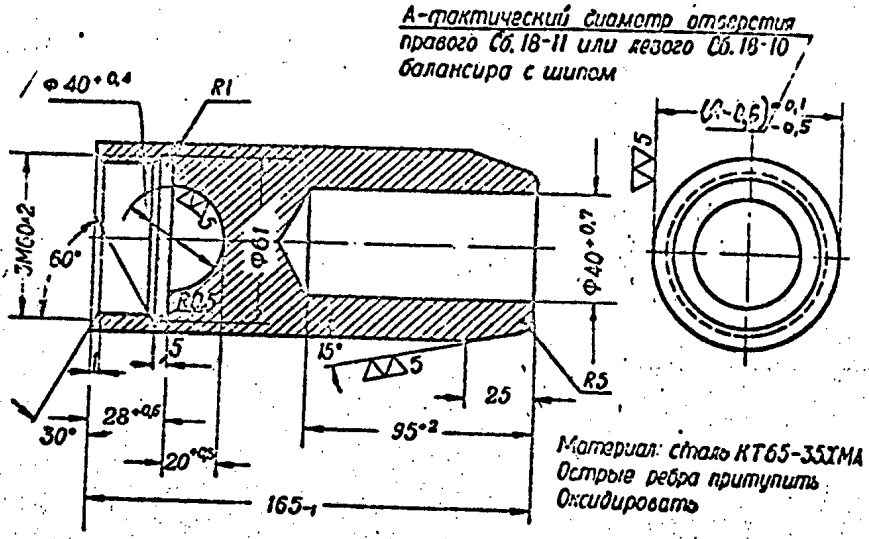


Эскиз 234. *18-2* — втулка



Эскиз 235. *18-10* — шайба

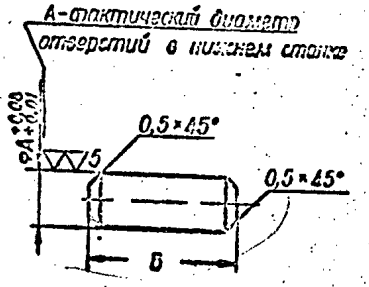
▽2 ОСТАЛЬНОЕ



Материал: сталь КТ65-35ХМА
Острые ребра притупить
Оксидировать

Эскиз 236. *18-18* — штырь

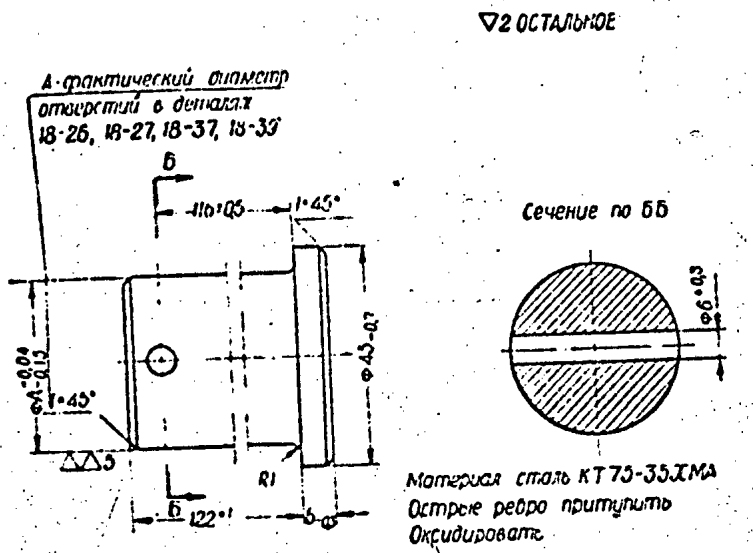
▽3 ОСТАЛЬНОЕ



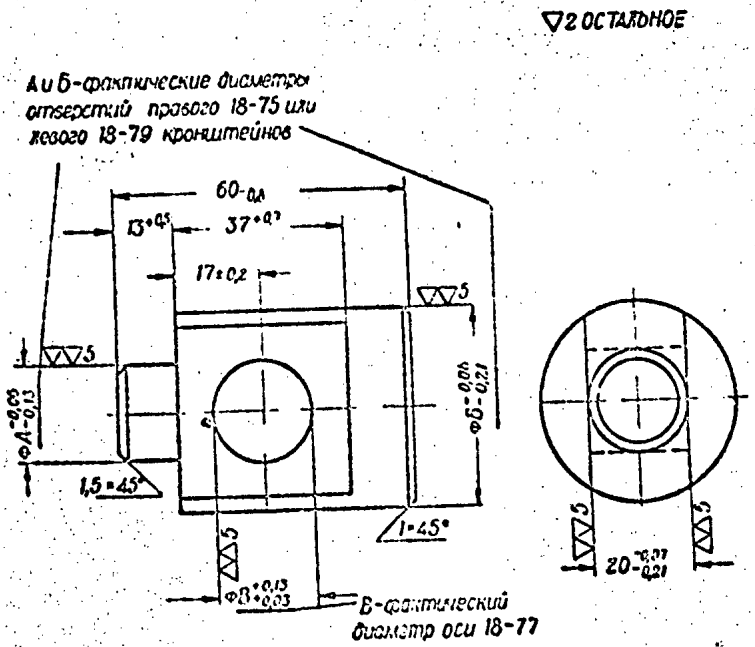
NN Сталей	Размер в мм
	Б
18-24	25-0,5
18-25	13-0,5

Материал: Сталь К20-25
Острые ребра притупить

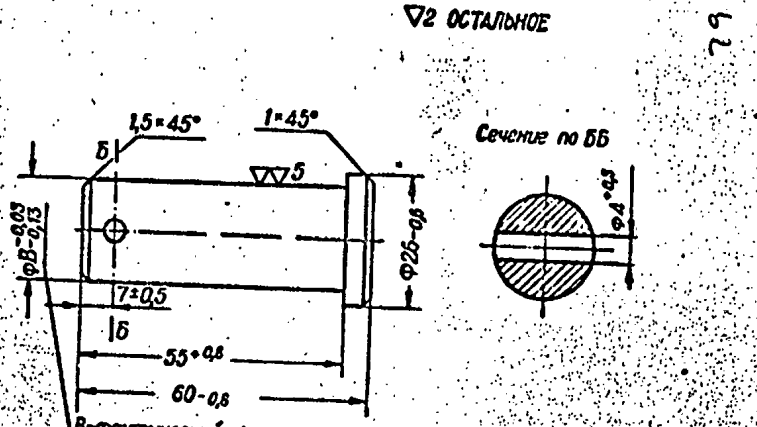
Эскиз 237. *18-24* — шашка; *18-25* — шашка



Эскиз 238. *18-38* — ось тяги параллелограмма

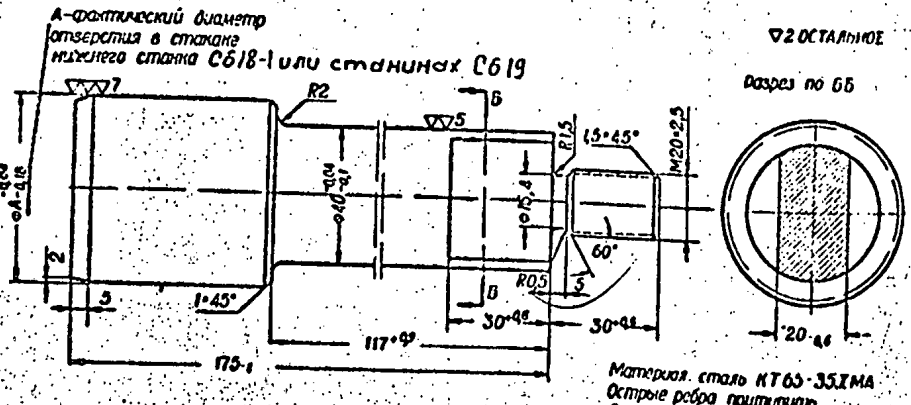


Эскиз 239 *18-76* — ось



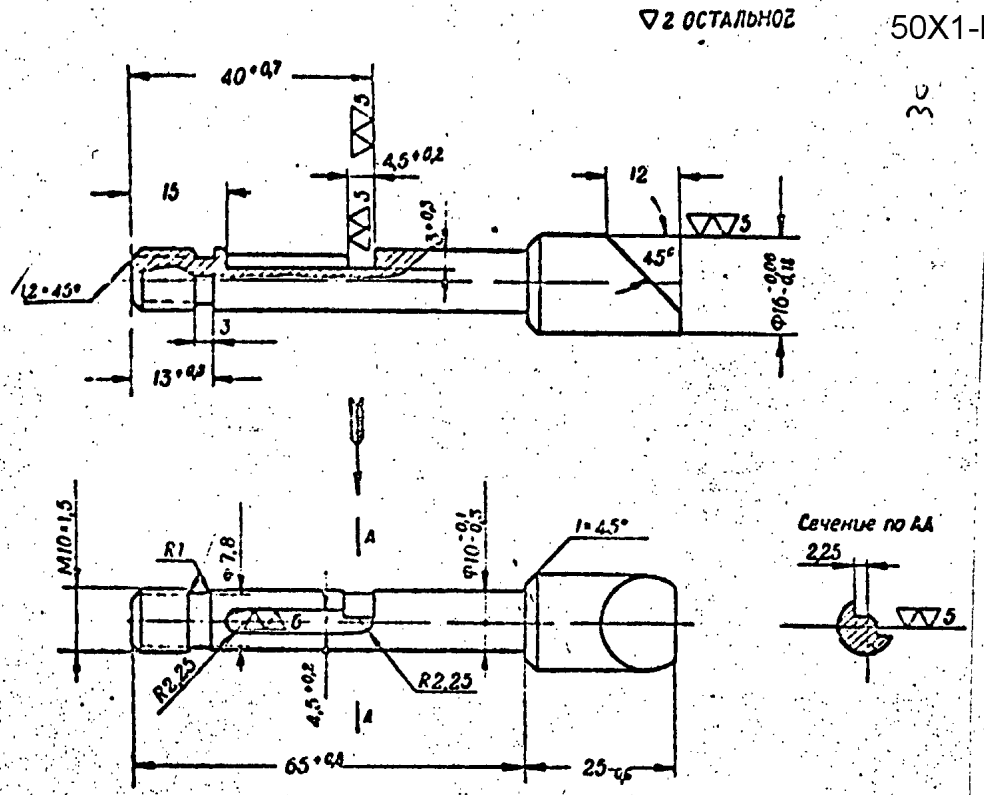
Материал: сталь КТ60-40Х
Острые ребра притупить
Оксидировать

Эскиз 240. *18-77* — ось



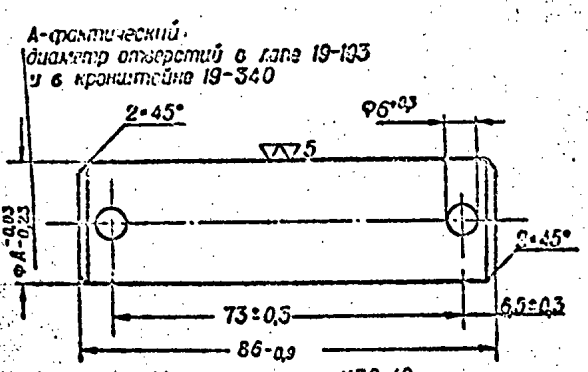
Материал: сталь КТ65-35ХМА
Острые ребра притупить
Оксидировать

Эскиз 241. *18-162* — стопор



Материал: сталь КТ60-40Х
Острые ребра притупить

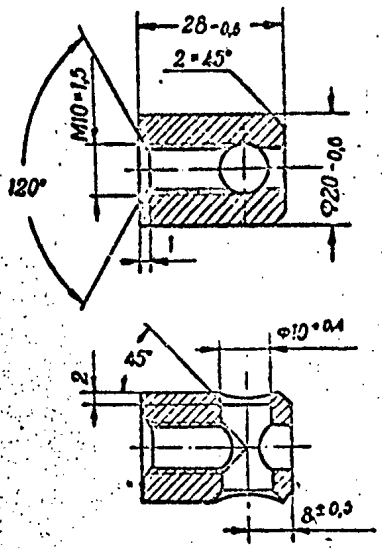
Эскиз 242. (19-53) — стопор



Материал: сталь К30-40
Острые ребра притупить.

Эскиз 243. 19-179 — ось

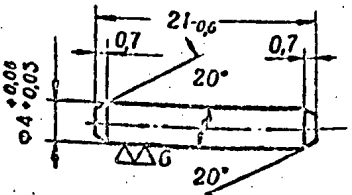
▽ОСТАЛЬНОЕ



Материал: сталь К30-40
Острые ребра притупить

Эскиз 244. 19-668 — гайка

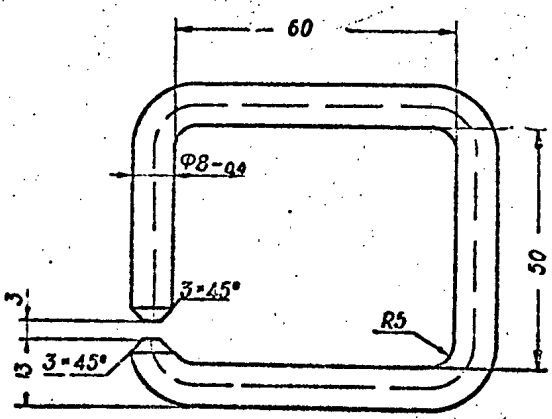
▽3 ОСТАЛЬНОЕ



Материал: сталь Ст 6
Острые ребра притупить

Эскиз 246. А51041-11 — штифт цилиндрический

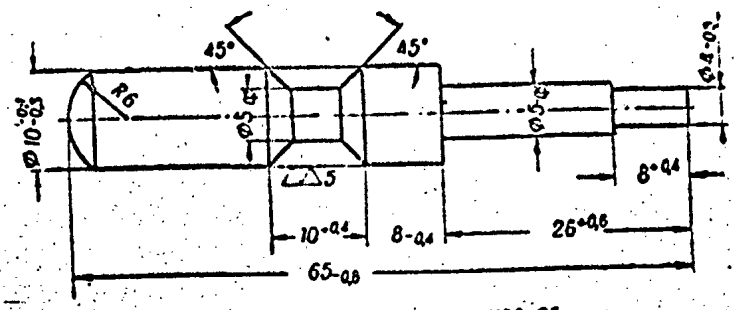
▽3 ИЗГИБ



Развернутая длина 237 мм
Материал: сталь К20-25

Эскиз 245. 19-701 — ручка

▽3 остальное

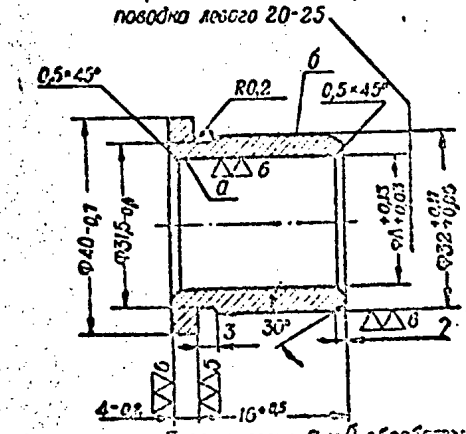


Материал сталь К20-25
Острые ребра притупить
Оксидировать

Эскиз 247. 20-55 — стопор

▽▽4 ОСТАЛЬНОЕ

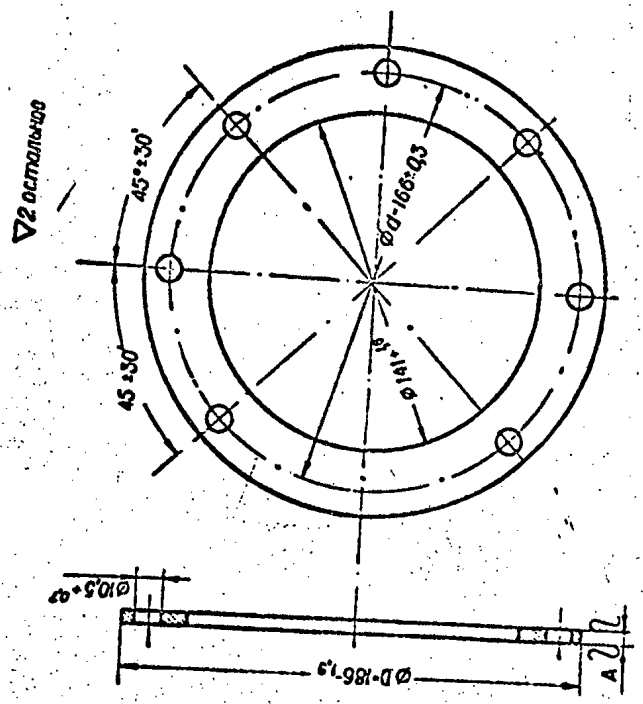
А-фактический диаметр оси 20-41, поводка левого 20-25



Поверхности а и б обработать с одной установки

Материал: бронза БрАЖ9-4
Острые ребра притупить

Эскиз 248. А51910-302 — втулка

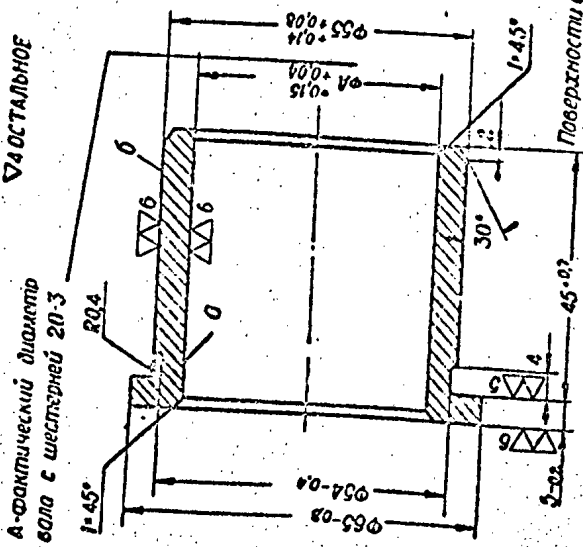


Δмм	1	0,5	0,2	0,15	0,1

Примечание
У других перечисленных выпусков размеры D и d должны быть выполнены:
ØD-192 и ød-172±0,5

Материал: сталь Ст 1
Острые ребра притупить
Оксидировать

Эскиз 250. 21-6 — прокладка



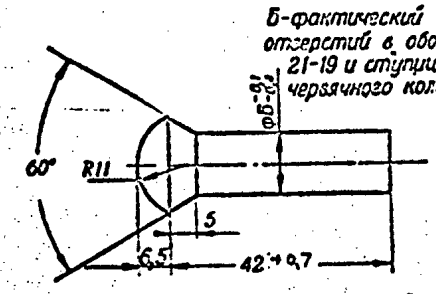
А-фактический диаметр вала с шестерней 20-3

Материал: бронза Бр.АЖ 9-4
Острые ребра притупить

Эскиз 249. А51910-344 — втулка

2 КРУГОМ

34

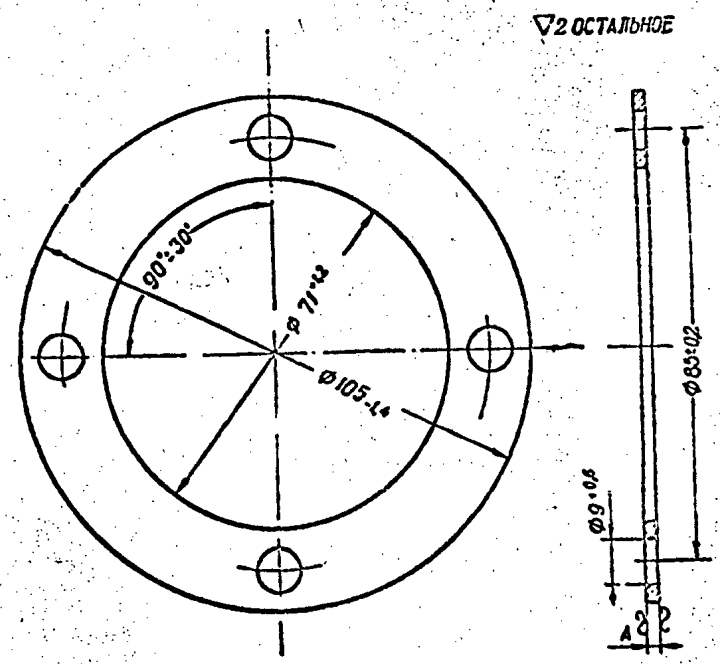


Примечание:
У некоторых пушек длина заклепки составляет не 42 +0,7, а 36 +0,7 мм. Поэтому длину заклепки выбирать в зависимости от варианта орудия по образцу.

Материал: сталь К15-10

Эскиз 251. 21-21 — заклепка

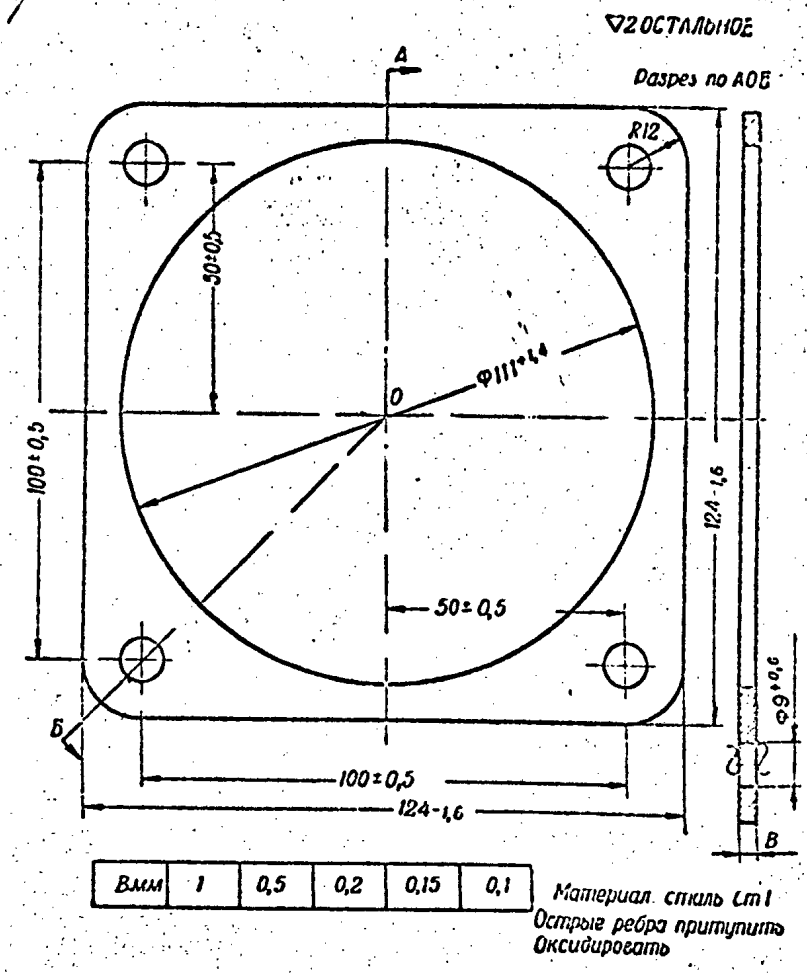
▽2 ОСТАЛЬНОЕ



Класс	1	0,5	0,2	0,15	0,1

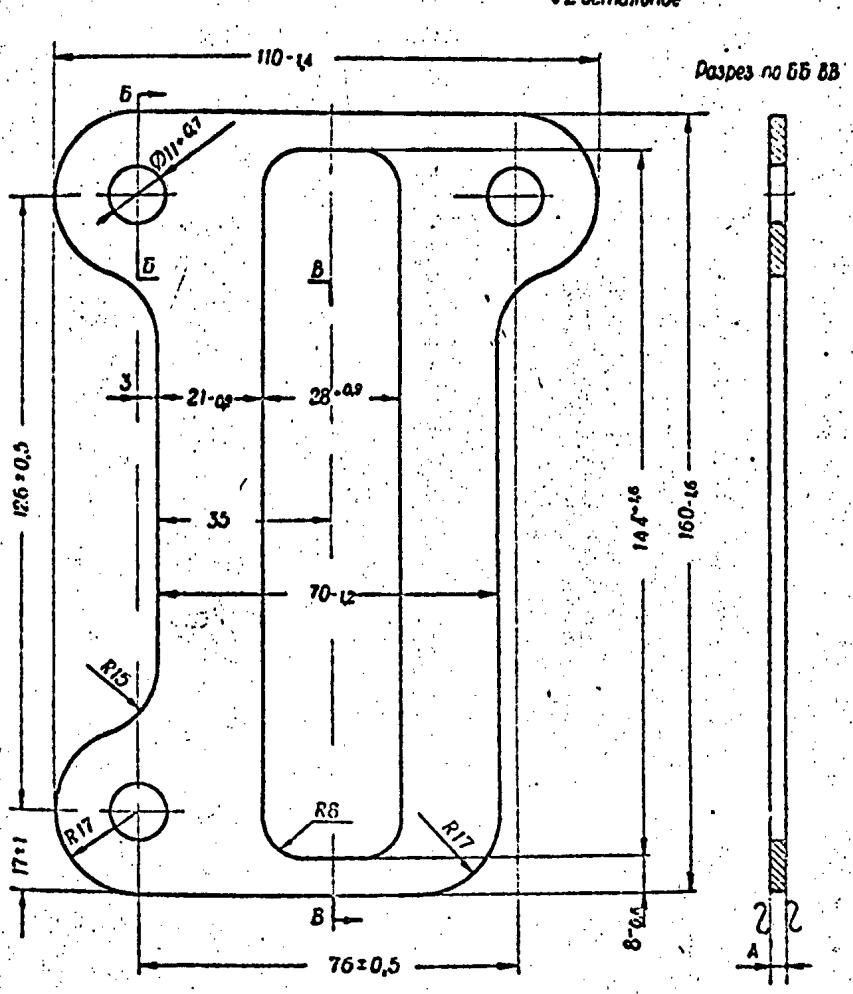
Материал сталь Ст 1
Острые ребра притупить
Окалину снять

Эскиз 252. 21-62 — прокладка



Эскиз 253. *21-65* — прокладка

36

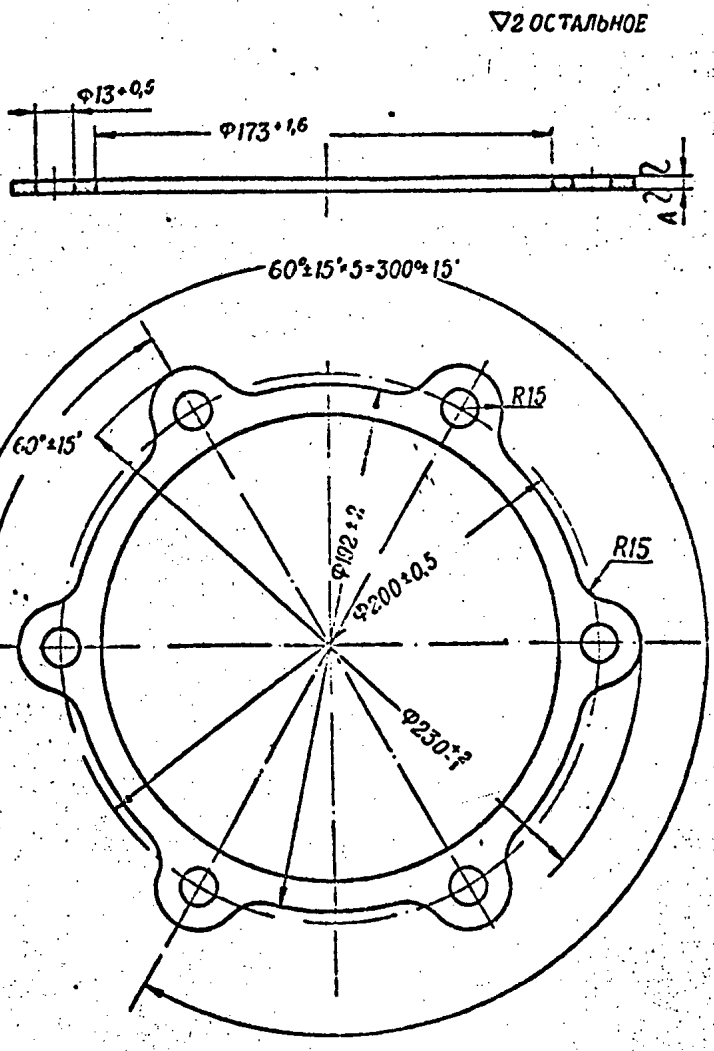


А мм	1	0,5	0,2	0,15	0,1

Материал. сталь Ст1
Острые ребра притупить
Оксидировать

Эскиз 254. 21-83 — прокладка

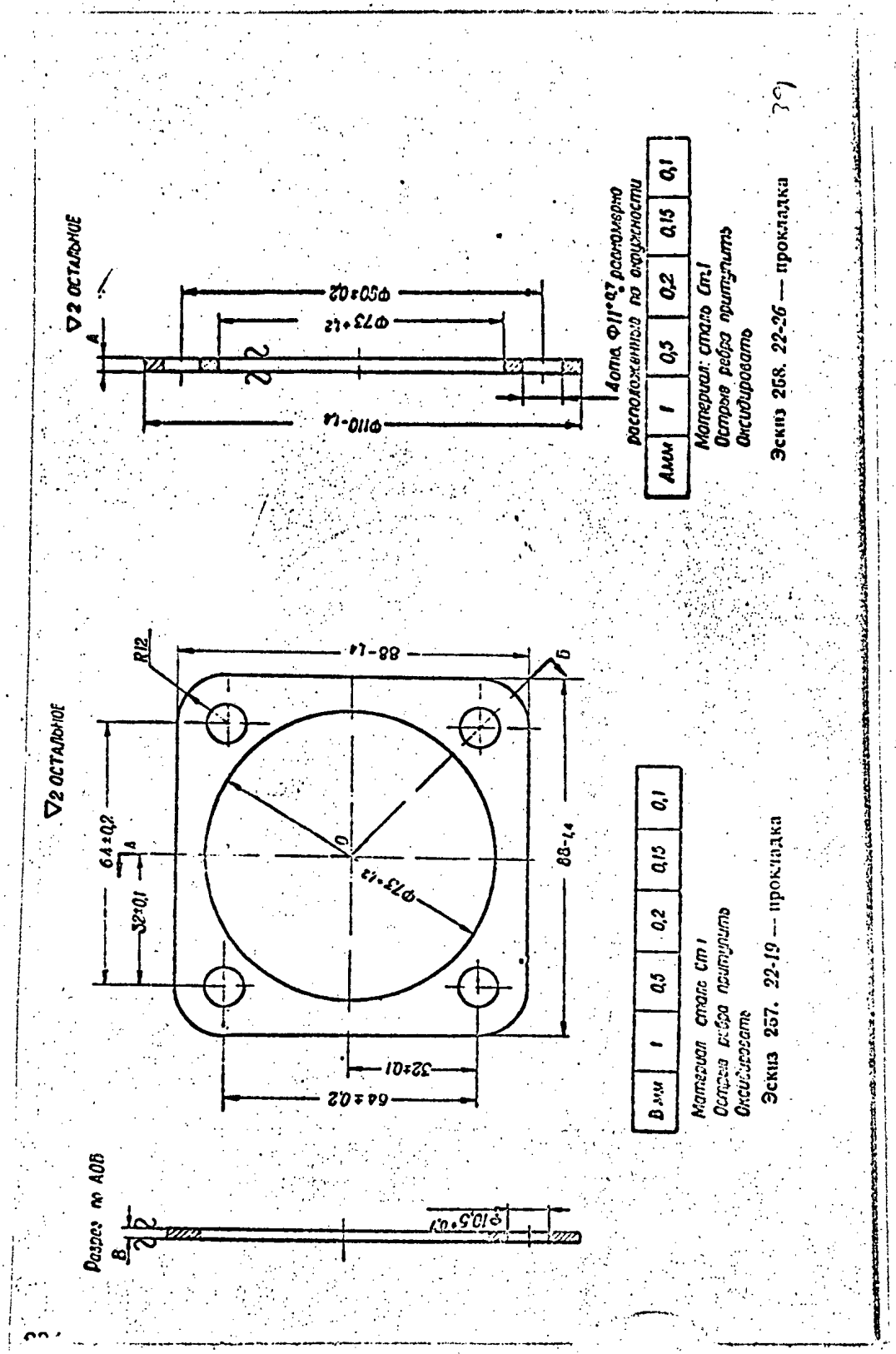
9	Делит. осевого шага	E_{01}	0,03
8	Допуск на накопл. погрешность шага	δ_f	0,03
7	Отклонение среднего шага	Δt	±0,02
6	Нормальный делительный угол профиля	β	3°40'50"
5	Угол подъема линии витка на $\phi 40$	γ	3°40'50"
4	Шаг червяка	t_{z1}	12,56
3	Осевой делительный угол в осевом сечении	α_0	20°
2	Число заходов	z_1	1
1	Модуль осевой	m	4
№№ п/п	Наименование	Ед. изм.	Величина
	Характеристика зацепления		

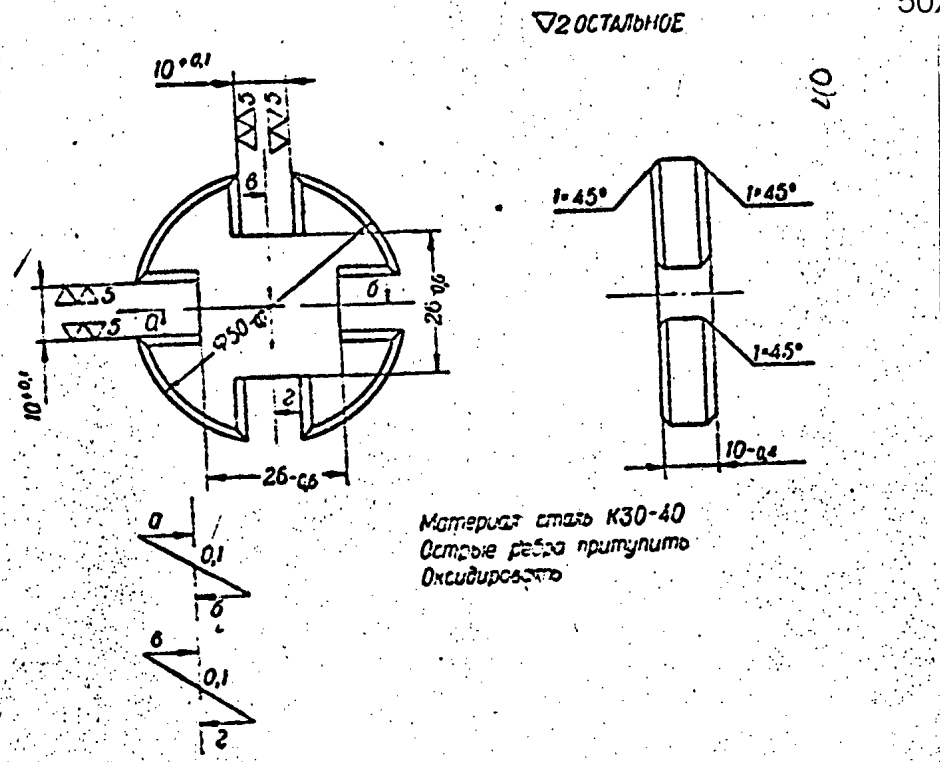


Алим	2	1	0,5	0,2	0,15	0,1

Материал: сталь Ст 1
Острые ребра притупить
Оксидировать

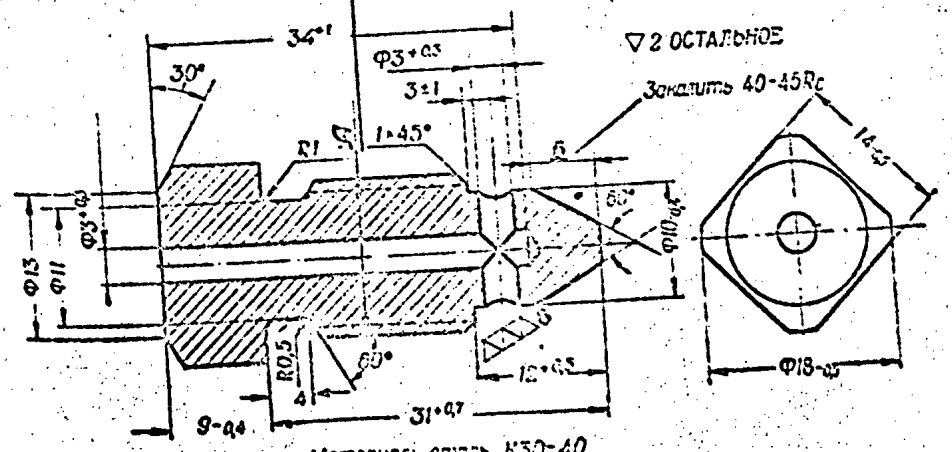
Эскиз 253. 22-6 — прокладка



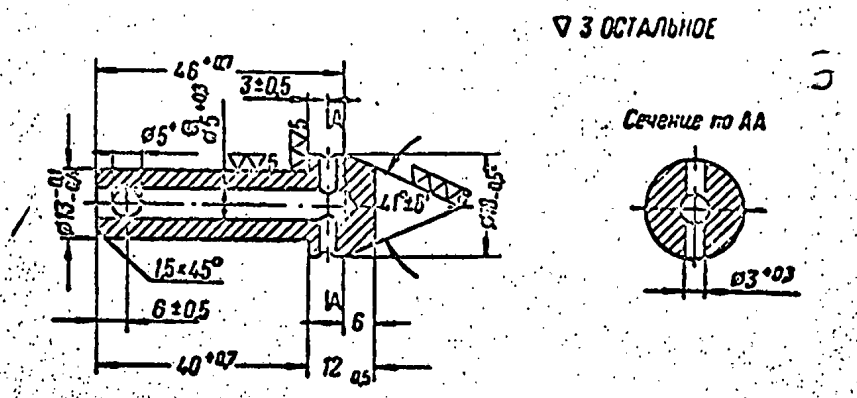


Эскиз 259. 22-66 — крестовина

По резьбе гнезда в сб 23-4 или сб 23-5 без шаткости (нормальный размер М14×2).

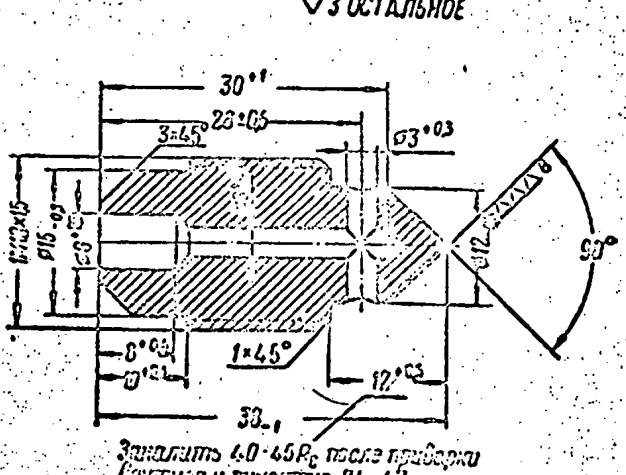


Эскиз 260. 23-23 — пробка



Материал: сталь К30-40
Острые ребра притупить

Эскиз 261. 23-161 — наконечник

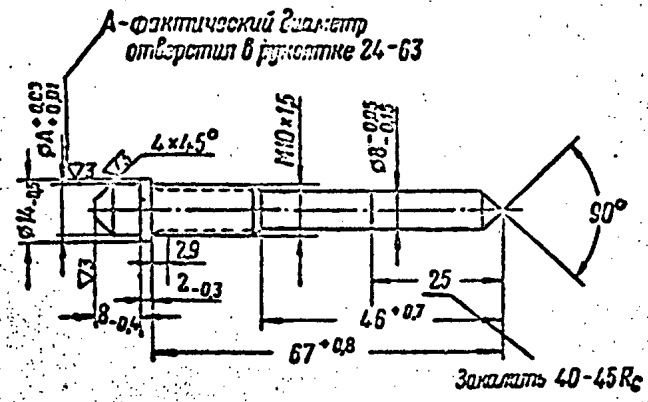


Закалить 40-45 R_c после приборки
Сектор к рукоятке 24-47

Материал: сталь К30-40
Острые ребра притупить

Эскиз 262. 24-46 — вентиль

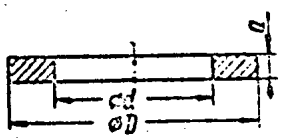
▽▽5 ОСТАЛЬНОЕ



Материал: сталь КТ55-40Х
Острые ребра притупить

Эскиз 263. 24-62 — вентиль

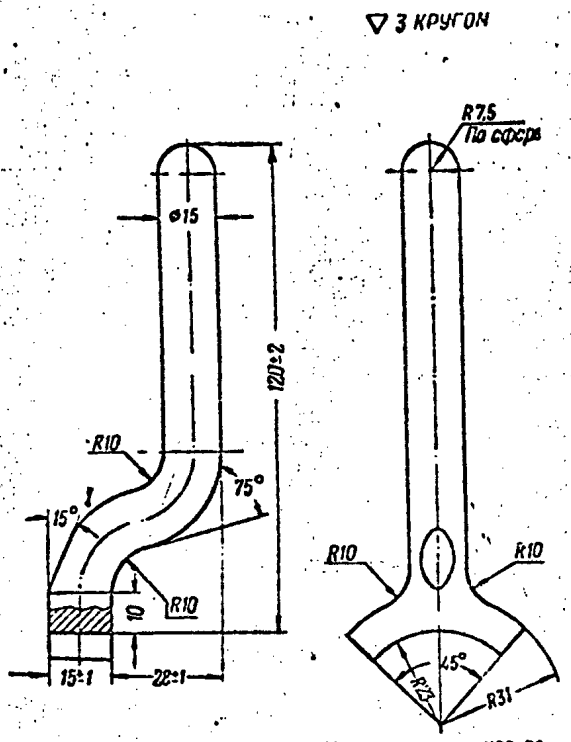
▽2 КРУГОМ



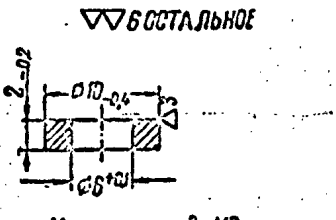
Острые ребра притупить

№ детали	Размеры в мм			Материал	Примечание
	D	d	a		
24-85	16-0,5	13+0,5	2-0,3	Медь М3	Отжечь
24-95	30-0,5	24+0,6	2±0,5	Медь М3	Отжечь
26-165	24-0,5	15+0,5	3-0,3	Сталь С4	———

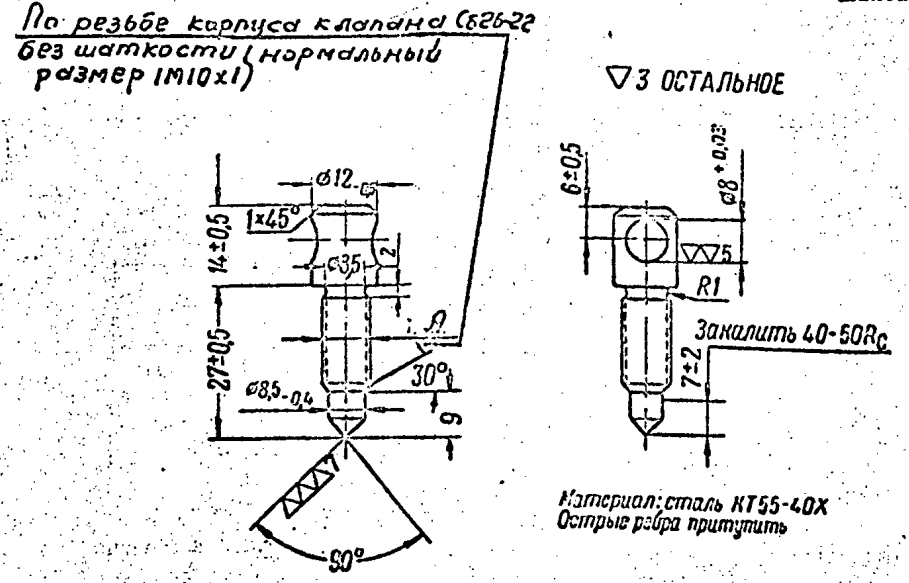
Эскиз 264. 24-85 — кольцо; 24-95 — кольцо уплотнительное; 26-165 — кольцо уплотнительное



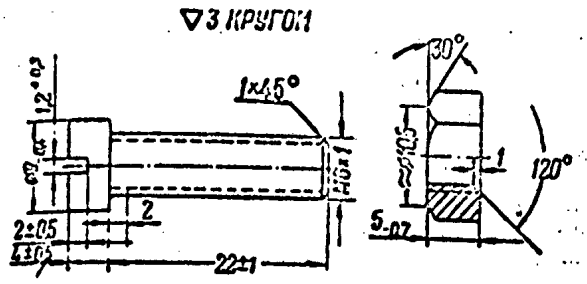
Эскиз 265. *24-114* — ручка



Эскиз 266. *26-121* — шайба

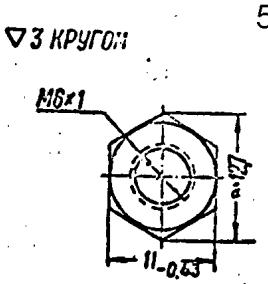


Эскиз 267. *26-157* — вентиль



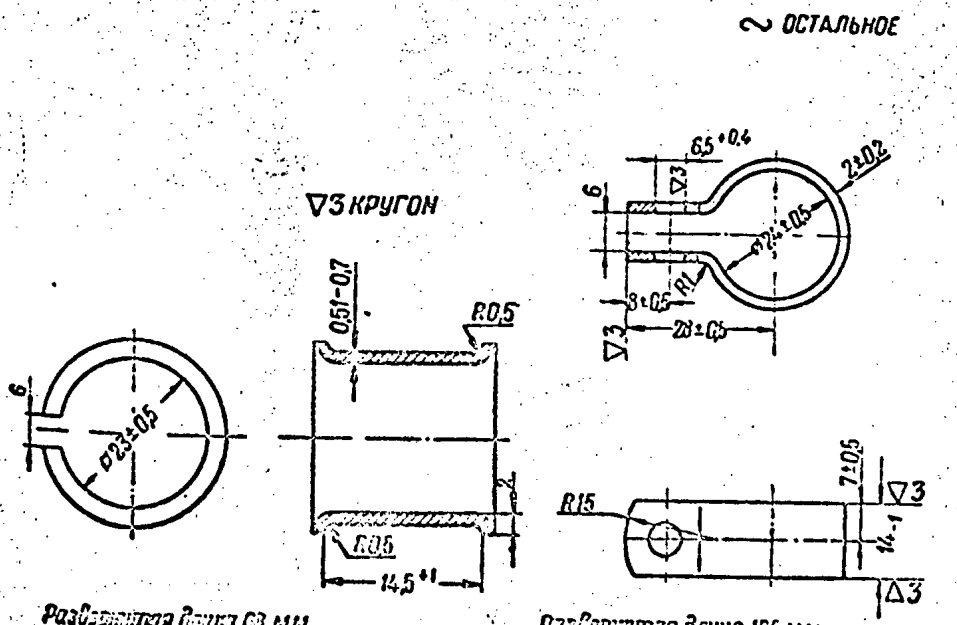
Материал: сталь К30-40
Острые ребра притупить
Оксидировать

Эскиз 268. *26-194* — винт



Материал: сталь 35
Острые ребра притупить
Оксидировать

Эскиз 269. *A51010-3* — гайка



Развернутая длина 63 мм

Материал: сталь Ст 3
Оксидировать
Острые ребра притупить

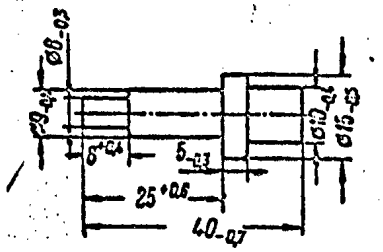
Эскиз 270. *A52420-124* — облицовка

Развернутая длина 105 мм

Материал: сталь Ст 3
Острые ребра притупить
Оксидировать

Эскиз 271. *A52426-16* — хомутик

▽3 КРУГОМ

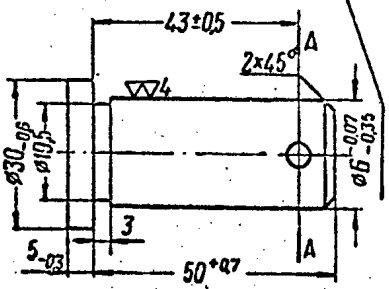


Материал: сталь К20-25
Острые ребра притупить

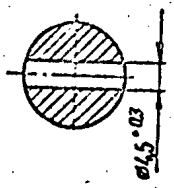
Эскиз 272. 27-6 — ось заверткн

Б-фактический диаметр отверстий пяты 27-131, 27-135 и 17-84, уха (27-19) кронштейна 27-180, 27-181 и уха 27-28

▽2 ОСТАЛЬНОЕ



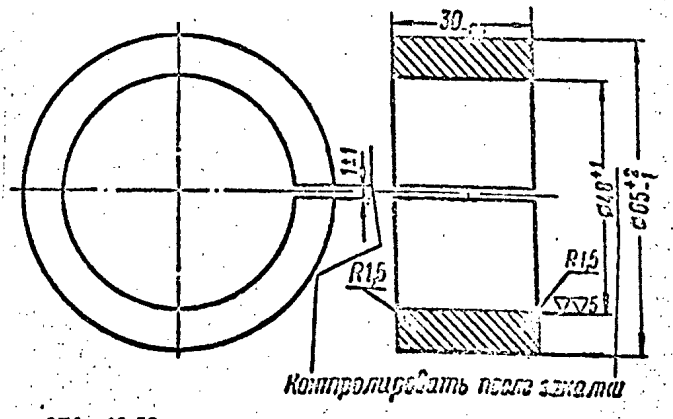
Сечение по АА



Эскиз 273. 27-124 — ось

Материал: сталь К30-40
Острые ребра притупить
Оксидировать

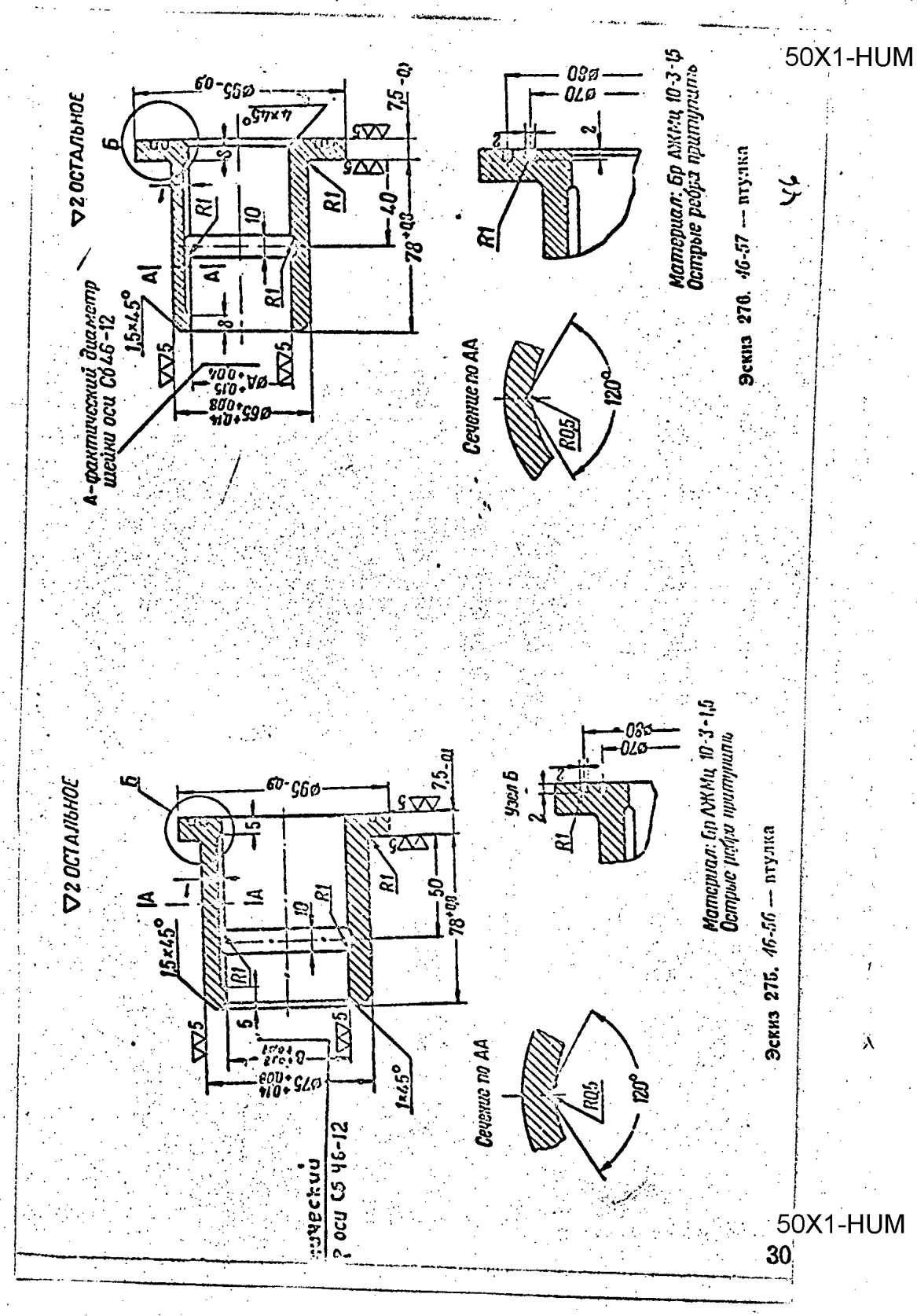
▽3 ОСТАЛЬНОЕ



Контролировать после закалки

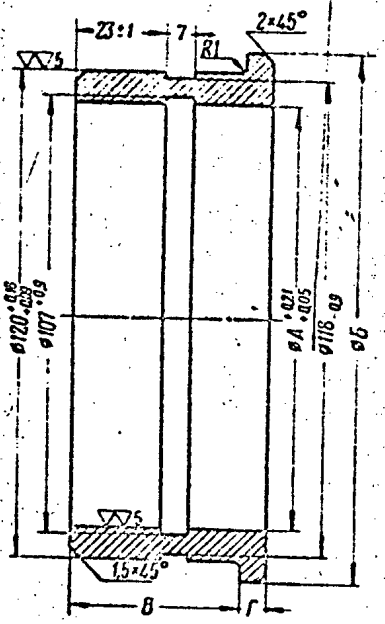
Эскиз 274. 46-50—кольцо

Материал: сталь 9ХВГА
Острые ребра притупить



∇2 ОСТАЛЬНОЕ

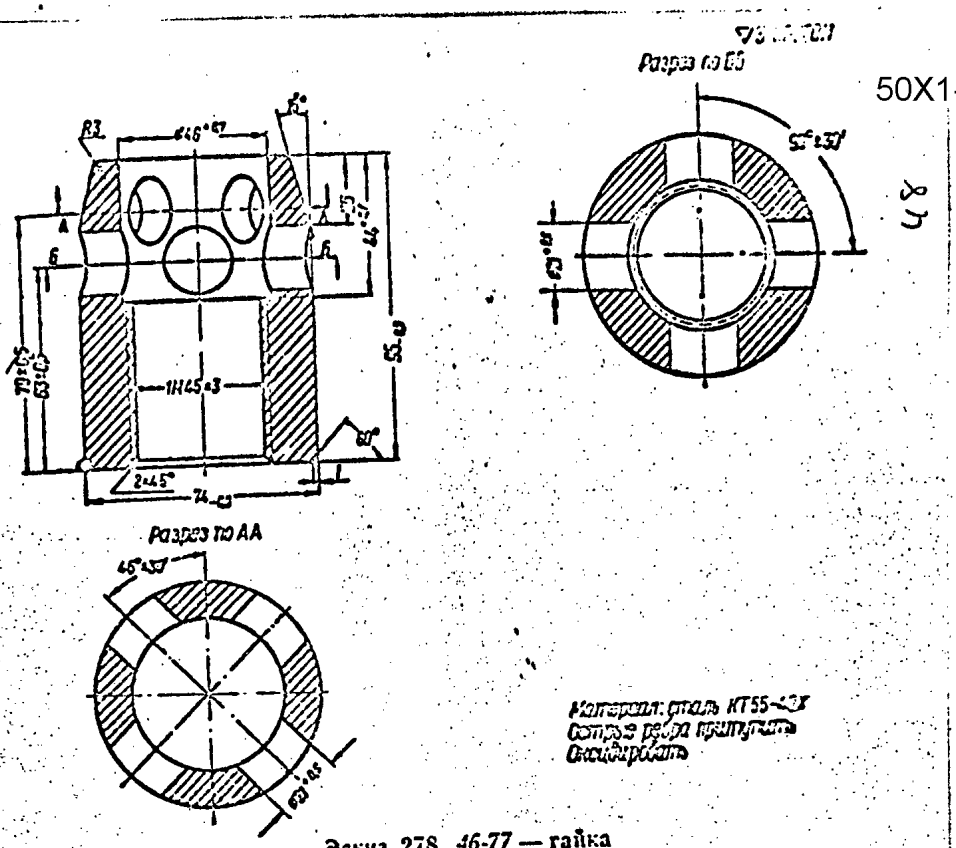
А-фактический диаметр шейки шворня 46-56А (46-58)



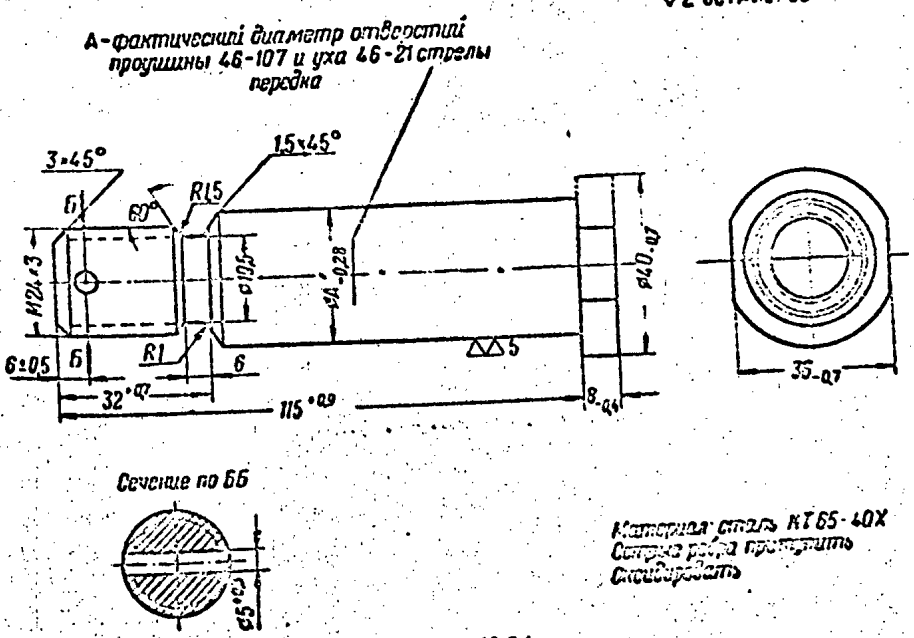
Номер детали	Размеры в мм			Примечание
	Б	В	Г	
(46-62)	120-1	42 +0,7	6-0,3	Острые 2×45° не снимать
46-62А	125-1	49 +0,7	8-0,4	

Материал: Бронза Бр.АЖМц 10-3-1. Острые ребра притупить

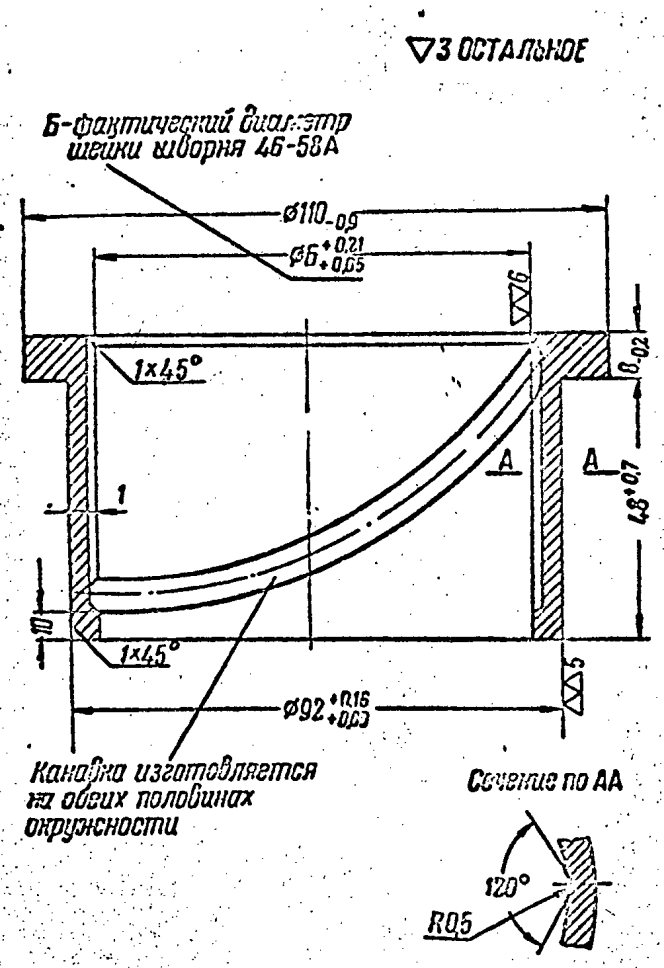
Эскиз 277. 46-62А (46-62) — втулка



Эскиз 278. 46-77 — гайка



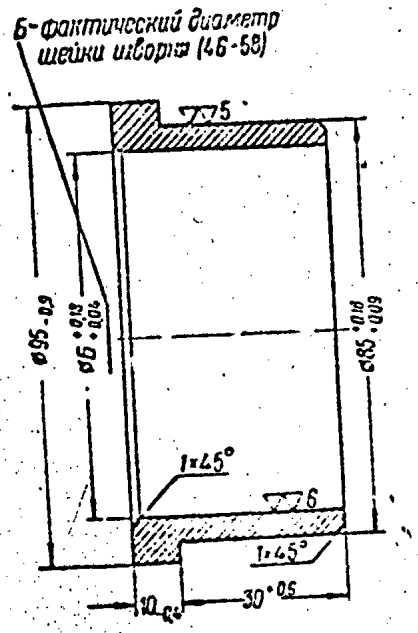
Эскиз 279. 46-94 — палец



Материал: БрАЖМц 10-3-1,5
Острые ребра притупить

Эскиз 260. 46-105А — втулка

3 ОСТАЛЬНОЕ

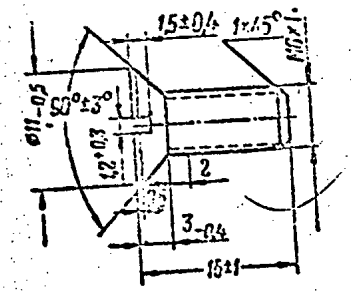


Примечание:
У некоторых орудий втулка имеет длину не 30 +0,6, а 34 +4,7 мм. Поэтому изготовление втулки производить по образцу.

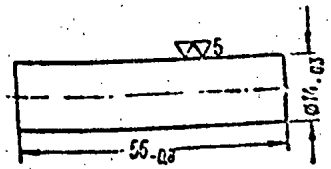
Материал: бронза Бр АЖМц 10-3-1,5
Острые ребра притупить

Эскиз 281. (46-105) — втулка

▽3 КРУГОМ



▽3 ОСТАЛЬНОЕ



Материал: сталь К20-40
Острые ребра притупить

Эскиз 282. 46-137 — ось

Материал: сталь 25
Острые ребра притупить

Эскиз 283. А51060-8 — винт

Instructions on Alteration of Parts and Assemblies for Guns M-46 and M-47 of Initial Issue

Appendix 2

Приложение 2

УКАЗАНИЯ ПО ПЕРЕДЕЛКЕ 1) ДЕТАЛЕЙ И СБОРОК ОРУДИЙ М-46 И М-47 ПЕРВЫХ ВЫПУСКОВ

№ по пор.	№ детали или сборки	Наименование детали или сборки	Причина переделки	Указания по переделке
			По стволу	
1	*C601* (рис. 1)	Ствол	Устранить при открывании и закрывании затвора возможные надиры клина о металл, выступающий в результате наклепа стопором *01-26* клина стенок отверстия Ø 8 *мм* казенника	ПМ. Снять фаску в отверстии Ø 18 *мм* казенника *01-3* под стопор *01-26* клина (эскиз 284)
			По тормозу отката	
2	*08-3* (рис. 4)	Кольцо подворотниковое	Улучшить работу воротника *08-4* и облегчить постановку сегментов *08-68*	ПМ. Обработать торец подворотникового кольца (эскиз 285)
3	*08-5* (рис. 4)	Кольцо	Создать возможность применения штатного крючка для облегчения вынимания кольца из корпуса *08-2* сальника	ПМ. Обработать в кольце канавку диаметром 101 *мм* (см. эскиз 207)
4	*08-28* (рис. 4)	Контршток	Создать возможность контроля при сборке правильной установки контрштока относительно вкладыша *08-34*, а также определения угла поворота контрштока	ДАРМ. Прорезать на переднем торце контрштока паз (эскиз 286), при этом отклонение от перпендикулярности вертикальной оси паза относительно горизонтальной оси канавок допускается ± 30′
5	*C608-13* (рис. 4)	Шайба	Создать возможность применения рыма для облегчения вынимания шайбы из корпуса *08-2* сальника	ПМ. Просверлить и нарезать резьбовые отверстия в шайбе (эскиз 287)
			По люльке	
6	*(09-212 или 09-122)* (рис. 3)	Шайба	Облегчить разборку коробки *C609-27*. Сложность разборки заключается в том, что при вынимании валика *09-120* из коробки трудно совместить пазы шайбы со шпонкой валика	ПМ. Вынуть валик *09-120* со втулкой *09-119* из коробки *C609-27*, удалить шайбу и поставить обратно валик с втулкой на место. Удаление шайбы практически не ухудшит работу механизма

50X1-HUM

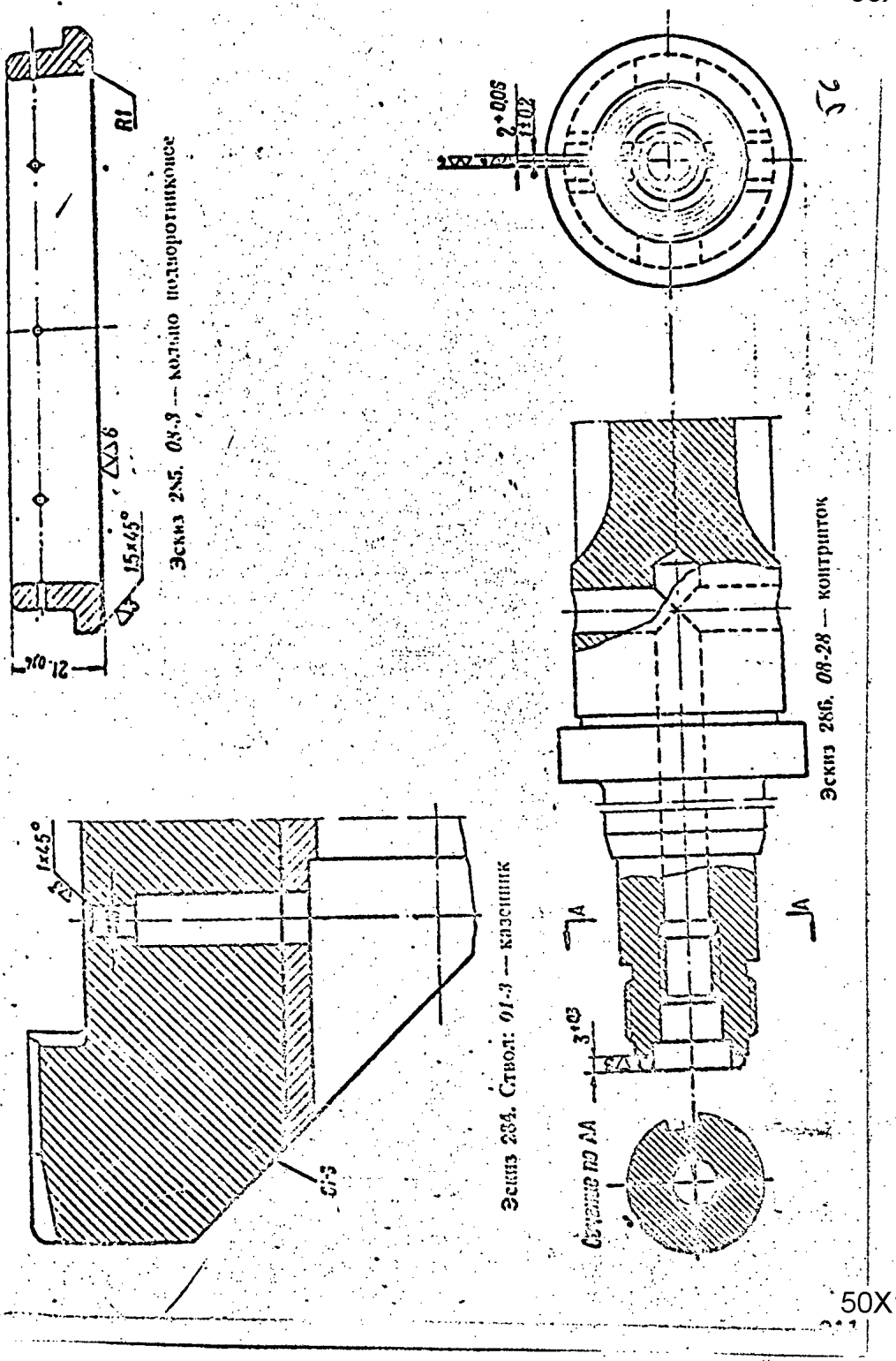
50X1-HUM

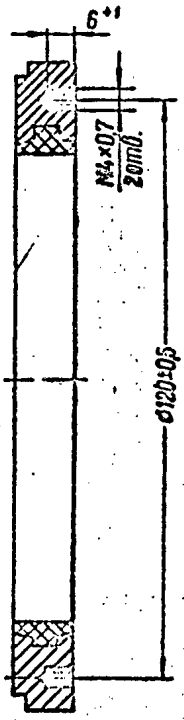
№ по пор.	№ детали или сборки	Наименование детали или сборки	Причина переделки	Указания по переделке
7	*(А51620-118)* (рис. 3)	Ось $12Х_3Х$ ×30	Устранить возможные задевания торцов оси за стенки окон кронштейна *09-22* при переключении стопора в положения „боевое" и „походное"	ПМ. Снять фаски с торцов оси (эскиз 288)
8	*С609-5* (рис. 3)	Валик	Улучшить условия сборки валика с рычагом *09-62*	ПМ. Приварить с обоих концов шпонку *А51650-24* к валику электродом Э42 (эскиз 289)
9	*С609* (рис. 3)	Люлька	Устранить возможность поломки передней крышки *09-155* при изложении ствола на люльку	ПМ. Спилить фаской возвышение выступа крышки *09-155* над уровнем усиливающего листа *09-26* (эскиз 290)
		По накатнику		
10	*10-79* (рис. 5)	Кольцо	Создать возможность применения штатного крючка для облегчения вынимания кольца из корпуса *10-75* сальника	ПМ. Обработать в кольце канавку (эскиз 291)
11	*С610-8* (рис. 5)	Шайба	Создать возможность применения рыма для облегчения вынимания шайбы из корпуса *10-75* сальника	ПМ. Просверлить и нарезать резьбовые отверстия в шайбе (эскиз 292)
12	*С610* (рис. 5)	Накатник	Предохранить уплотнительное кольцо *10-115* от возможных повреждений при поджиме его к торцу рабочего цилиндра *10-1*	ПМ. Поставить под уплотнительное кольцо *10-115* кольцо *10-127*, поставляемое в готовом виде
		По верхнему станку		
13	*17-9* (рис. 8)	Стопор	Улучшить условия сборки и разборки стопора крепления по-походному *С617-2*	ПМ. Обработать на торце резьбового конца стопора шлицевую канавку глубиной 3 *мм* и шириной 2 *мм* (см. эскиз 231), при этом шлицевая канавка не должна пересекать резьбовое полуотверстие под стопорный винт
14	*С617-3* (рис. 7, 8)	Станок верхний	Облегчить условия совмещения паза направ-	ПМ. Нанести на торце переходной втулки *17-11*

№ по пор.	№ детали или сборки	Наименование детали или сборки	Причина переделки	Указания по переделке
			ляющей втулки *21-24* с ограничителем *17-78* при сборке червячного валика *С621-2* с верхним станком	против оси ограничителя *17-78* риску глубиной 1 *мм* и покрыть риску красной нитроэмалью (см. рис. 8)
			По нижнему станку	
15	*18-18* (рис. 10)	Штырь	Улучшить условия входа и выхода штыря из отверстия левого балансира *С618-5* или правого балансира *С618-6* при включении или выключении подрессоривания	ПМ. Обработать заходный конус штыря на *R*5 по эскизу 236
16	*18-20* (рис. 10)	Гайка	Создать возможность применения штатного ключа для завинчивания и вывинчивания гайки	ПМ. Рассверлить имеющиеся в гайке два отверстия $\phi\ 5^{+0,3}$ *мм* под ключ на $\phi\ 6{,}5^{+0,4}$ *мм* и глубину 6^{+2} *мм*
17	*С618-5* Балансир левый *С618-6* Балансир правый (рис. 10)		Обеспечить соединение троса для вытаскивания пушки с крюком балансира	ПМ. Обработать крюки левого и правого балансиров (эскиз 293)
			По станинам	
18	*С619-4* Станина левая *С619-5* Станина правая (рис. 11, 13)		Создать условия, при которых домкраты, откидываемые в вертикальное положение, не выходили бы своими захватами *24-2* из зацепления с захватами *19-619* станин и тем предупреждали бы повреждение штоков и цилиндров домкратов	ДАРМ. Изготовить два упора *19-690* (эскиз 291) и приварить их электродом Э50А к левой и правой станинам (см. рис. 11)
19	*С619-12* (рис. 11)	Коробка для укладки башников	Улучшить запор коробки для укладки башника	ПМ. Изготовить разводное кольцо *27-179* (эскиз 295) и внести его в кронштейн *А51324-19* закрытого замка *А71321-13* коробки для укладки башников
20	(*С619-20*) (рис. 11)	Стопор	Создать более удобные условия для открывания и закрывания сто-	ДАРМ. Обработать отверстия $\phi\ 12^{+0,5}$ *мм* в рукоятках стопоров на

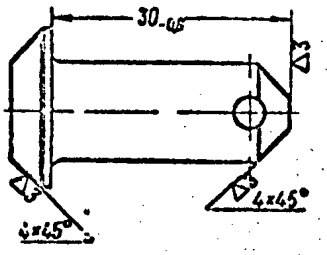
№ по пор.	№ детали или сборки	Наименование детали или сборки	Причина переделки	Указания по переделке
			пором и для сохранения надписей „Открыто" и „Закрыто"	$\phi\ 18^{+0,5}$ *мм* и снять фаски; нанести на рукоятках стопоров надписи „Открыто" и „Закрыто" (эскизы 296 и 297)
21	*С619-75* (рис. 11)	Стопор с валиком	Создать возможность разборки стопора	ААРМ. Обработать шлиц в стопоре (эскиз 298)
22	*С619* (рис. 11)	Станины	Улучшить условия соединения левого кронштейна *С619-90* со втулкой *19-518* при сведении станин	ДАРМ. Обработать скосы на левом кронштейне *С619-90* (эскиз 299) левой станины
		По подъемному механизму		
23	*21-24* (рис. 7, 8)	Втулка направляющая	Облегчить условия совмещения паза направляющей втулки с ограничителем *17-78* при сборке червячного валика *С621-2* с верхним станком	ПМ. Обработать фаски на стенках паза направляющей втулки и нанести риску на ее поверхности по оси паза (эскиз 300)
		По домкрату		
24	*С624-9* (рис. 13)	Плато	Устранить скольжение плато на мерзлом грунте при работе домкратом	ПМ. Наплавить электродом Э42 на ребра и подпятник плато 19 точек (эскиз 301)
		По колесам		
25	*С625* (эскиз 302)	Колесо *С-83* со ступицей	Облегчить и улучшить смазку колес	ДАРМ. Снять поочередно колеса с пушки и отделить подшипники *7518* и *7714* (рис. 14), после чего: 1. В ступицах колес просверлить отверстия под резьбу, обработать выточку $\phi\ 16^{+0,3}$ *мм* и нарезать резьбу 1М10×1 (эскиз 302) 2. Изготовить (для 2 колес) следующие детали: кольцо *24-85* (эскиз 264) — 2 шт.; скобу *25-9* (эскиз 303) — 2 шт.;

№ по пор.	№ детали или сборки	Наименование детали или сборки	Причина переделки	Указания по переделке
				пробку *25-19* (эскиз 301) – 2 шт.; ушко *42-72* (эскиз 305) — 4 шт.; звено цепочки *А51203-35* (эскиз 306) — 4 шт. 3. Собрать цепочку из 2 звеньев *А51203-35* цепочки и 2 ушков *42-72* и соединить ее с пробкой *25-19*, при этом ушко *42-72* в соединении с пробкой подогнуть, а в месте стыка сварить электродом Э42 (эскиз 302) 4. Соединить с цепочкой скобу *25-9* и приварить ее электродом Э42 к ступице, поставить кольцо *24-85* и завинтить пробку в ступицу (эскиз 302)
			По колесному тормозу	
26	*26-55* (рис. 16)	Тяга защелки	Обеспечить выход защелки *26-53* из зацепления с сектором *26-75* при полностью выжатой щеколде *26-60*	ПМ. Укоротить тягу защелки до размера 95 ± 1 *мм* и увеличить длину резьбы (эскиз 307)
			По щитовому прикрытию	
27	*27-129* (рис. 12, 17)	Пружина	Обеспечить надежное закрепление стопором *27-130* петли *20-70* подвески *С620-2* лебедки	ПМ. Заменить старую пружину *27-129* (высотой 60 ± 2 *мм* и шагом 5 *мм*) новой (высотой 150 ± 5 *мм* и шагом 7,5 *мм*), изготовленной по карте 3
			По передку	
28	*С646-10* (рис. 19)	Стрела передка	Улучшить крепление шлангов, уложенных на передке	ПМ. Изготовить два крючка *46-203* (эскиз 308) и приварить их электродом Э50А к трубам *46-20* рамки стрелы передка (эскиз 309)

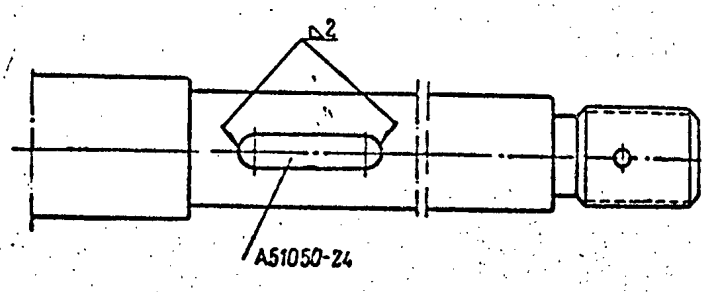




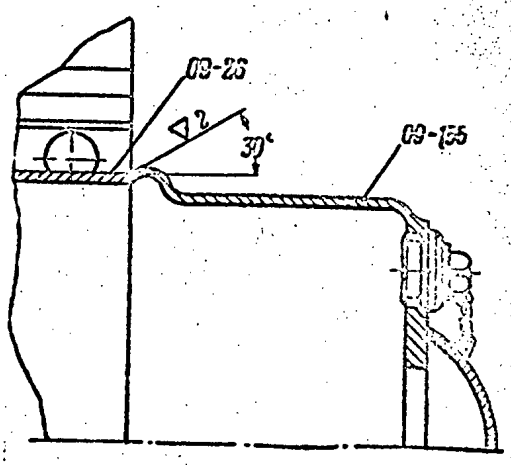
Эскиз 287.
C608-13 — шайба



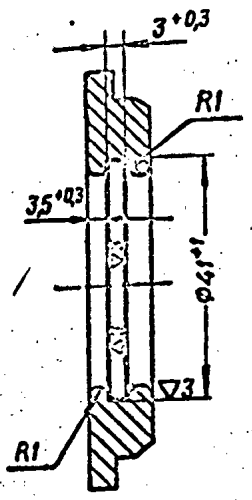
Эскиз 288. (*A51620-118*) — ось $12X_3 \times 30$



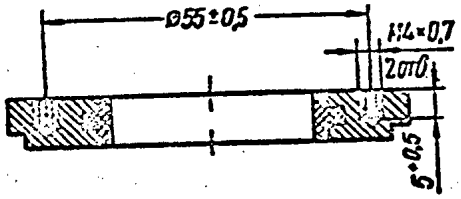
Эскиз 289. *C609-5* — валик; *A51050-24* — шпонка



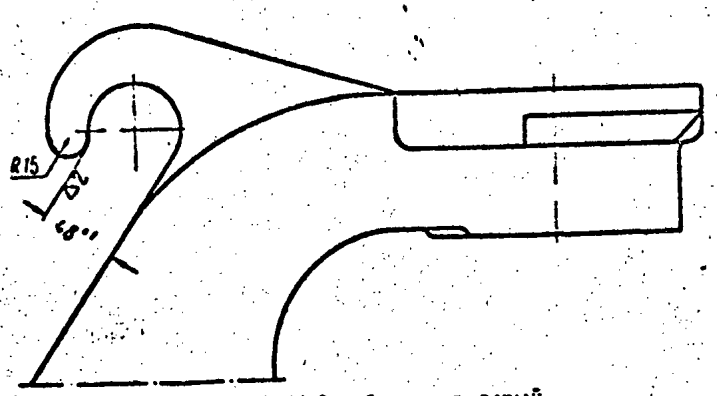
Эскиз 290. Люлька: *09-26* — лист усиливающий; *09-155* — крышка передняя



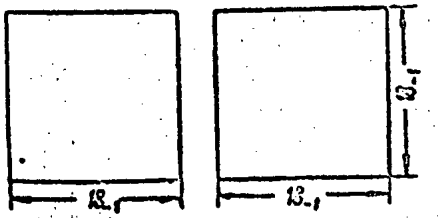
Эскиз 291. *10-79* — кольцо



Эскиз 292. *С610-8* — шайба

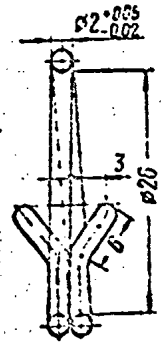


Эскиз 293. *С618-5* — балансир левый



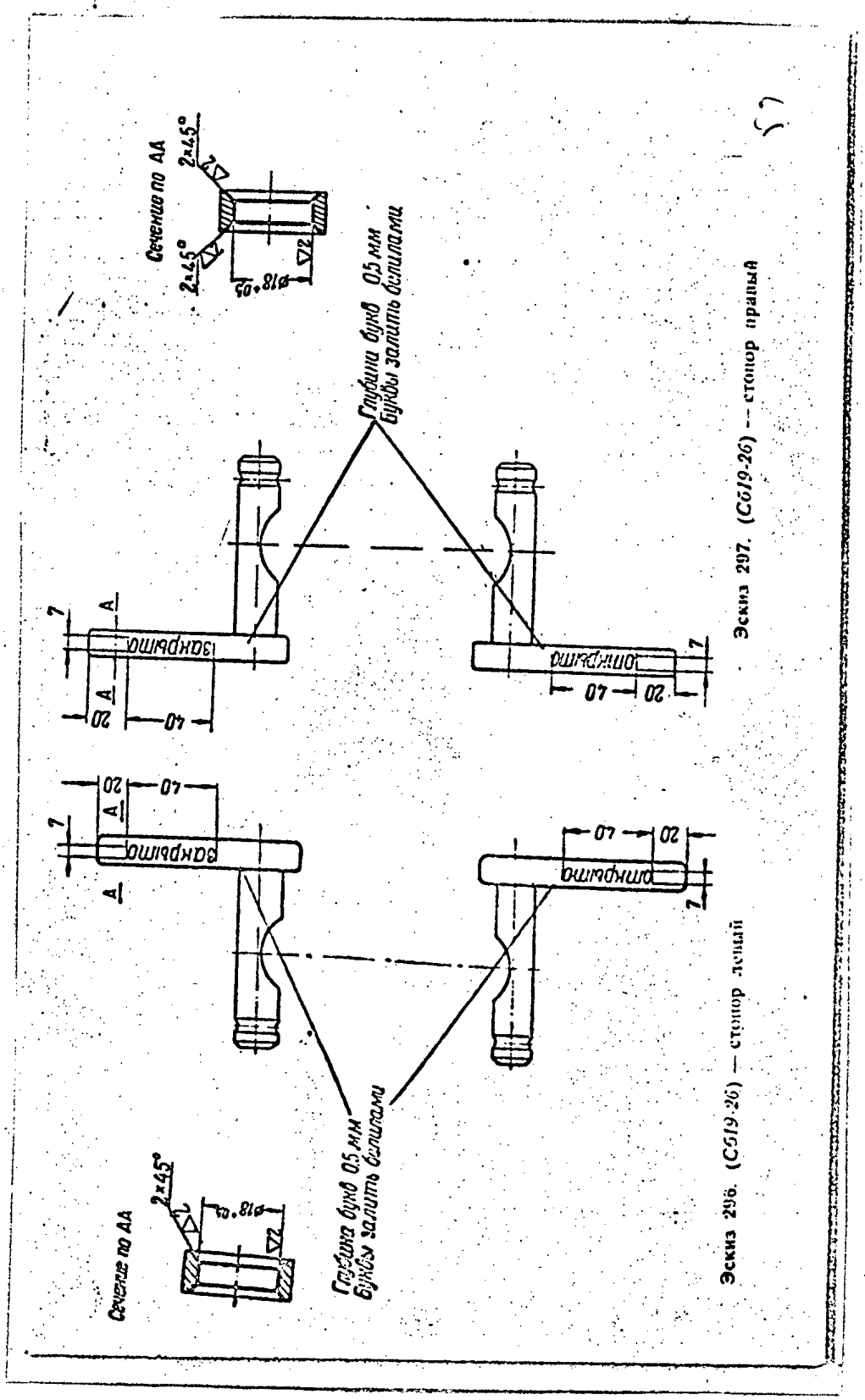
Материал: сталь К20-25
Острые ребра притупить

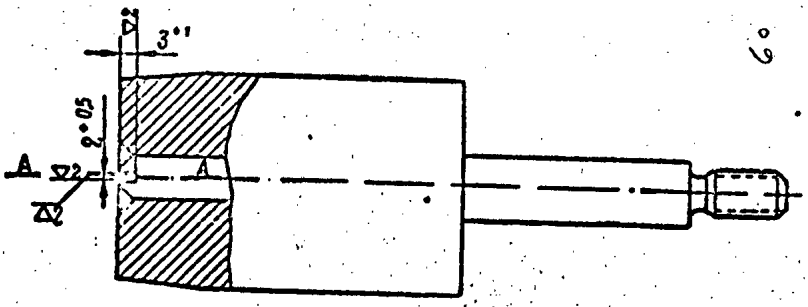
Эскиз 294. *19-690* — упор



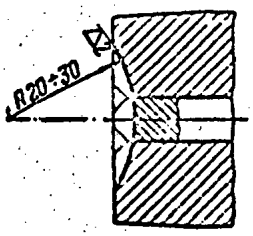
Материал: проволока П-II
Длина заготовки 132 мм
Концы закруглить

Эскиз 295. *27-179* — кольцо разводное

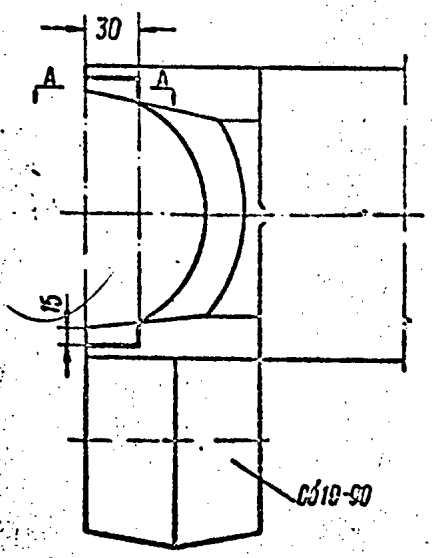




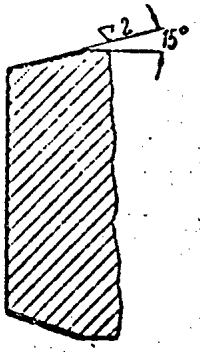
Сечение по АА



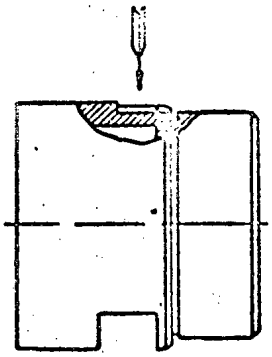
Эскиз 298. *С619-75* — стопор с валиком

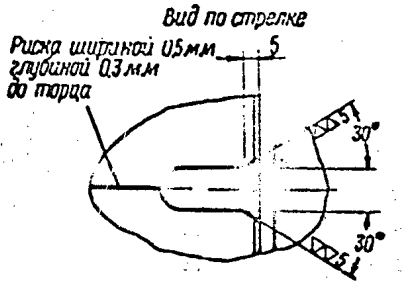


Сечение по АА

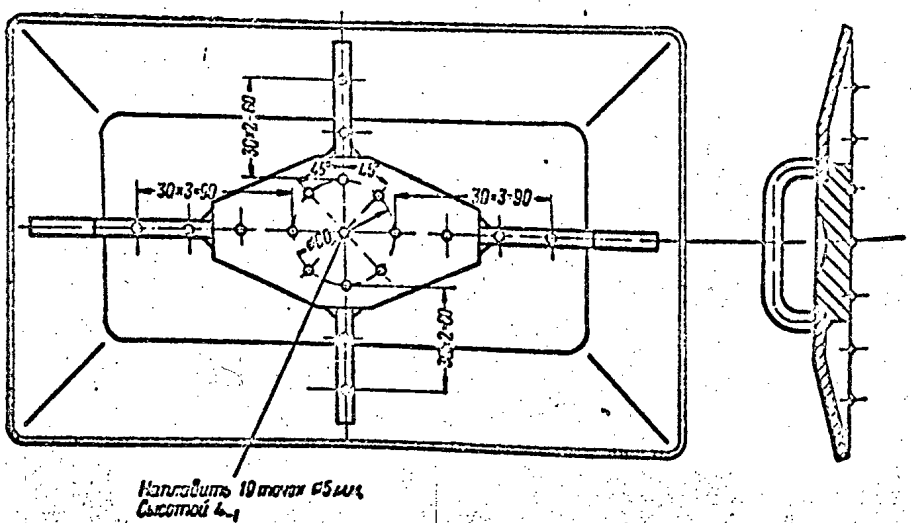


Эскиз 299. Станина левая: *С619-90* — кронштейн левый

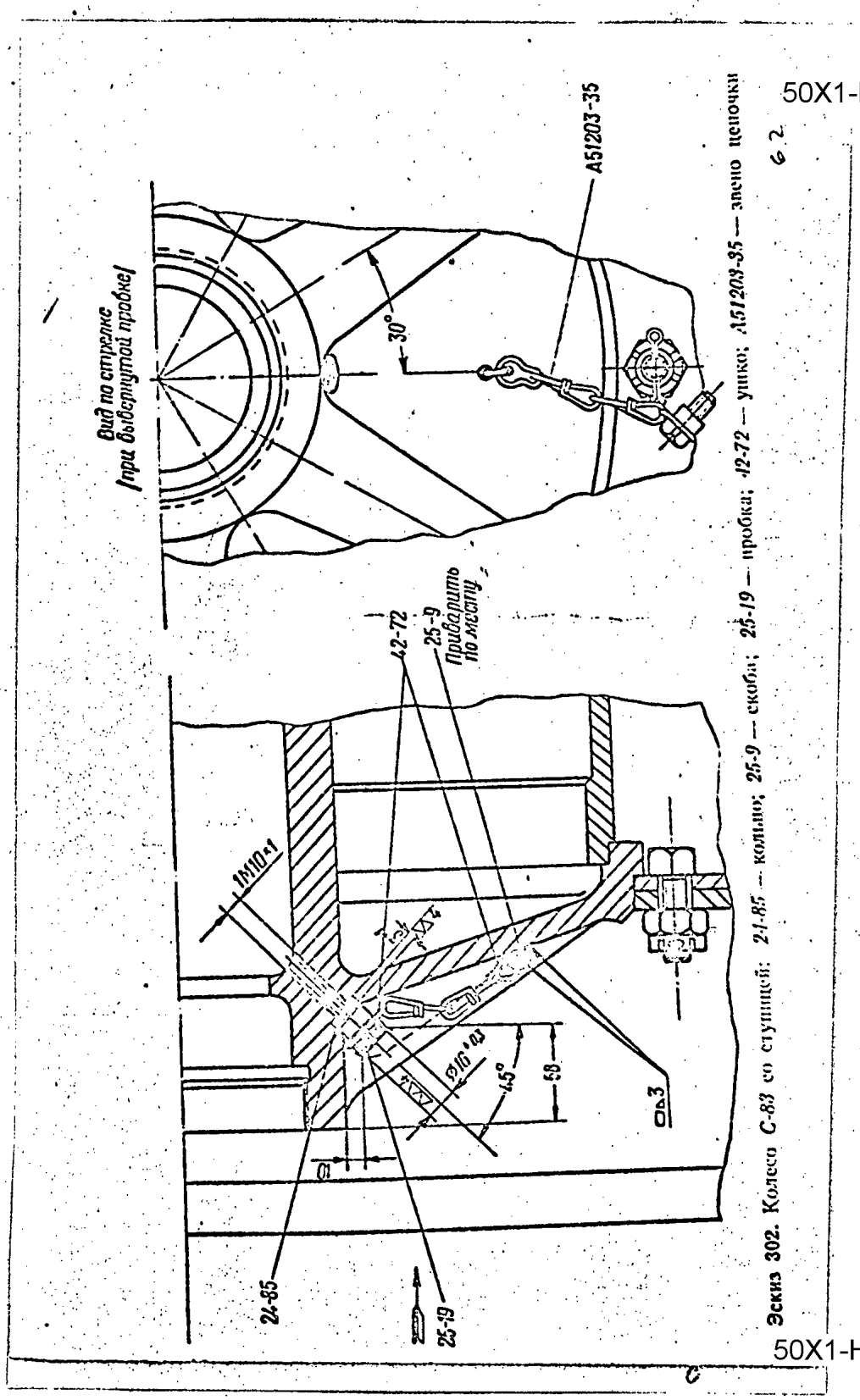




Эскиз 300. *21-24* — втулка направляющая

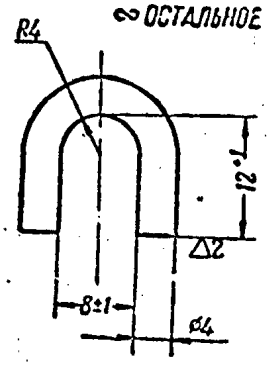


Эскиз 301. *С624-9* — плато



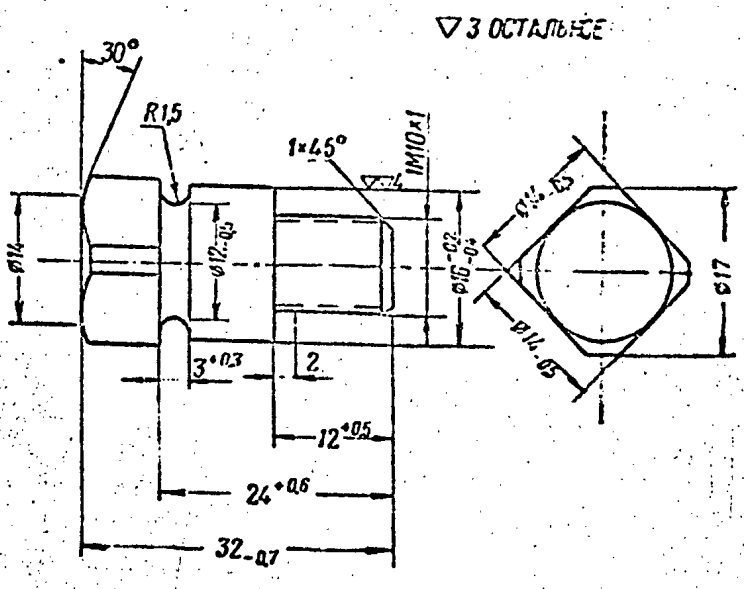
Эскиз 302. Колесо С-83 со ступицей: 21-85 — кольцо; 25-9 — скоба; 25-19 — пробка; 42-72 — ушко; А51203-35 — звено цепочки

6.2



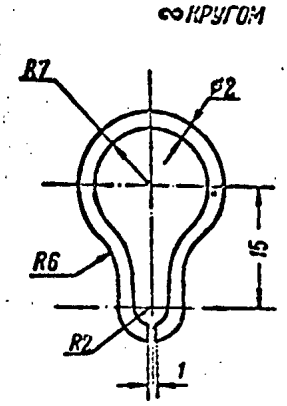
Материал: проволока ϕ4 ГОСТ 3282-46
Острые ребра притупить

Эскиз 303. 25-9 — скоба



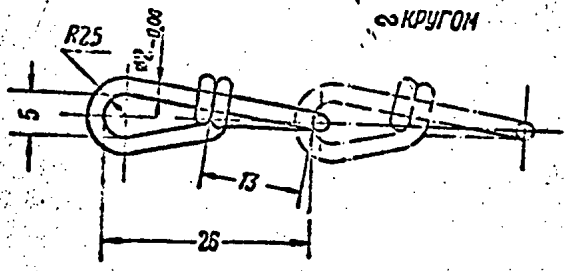
Материал: сталь К30-40
Острые ребра притупить

Эскиз 304. 25-19 — пробка



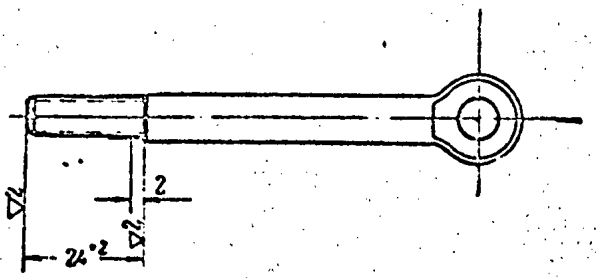
Материал: проволока Ø2 ГОСТ 3282-46

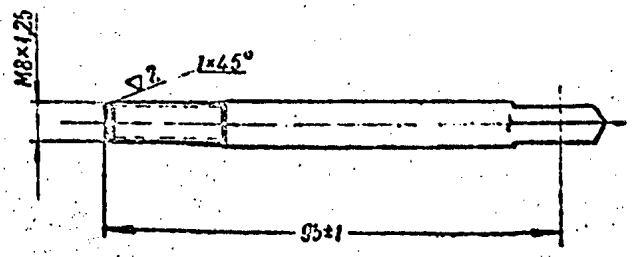
Эскиз 305. 42-72 — ушко



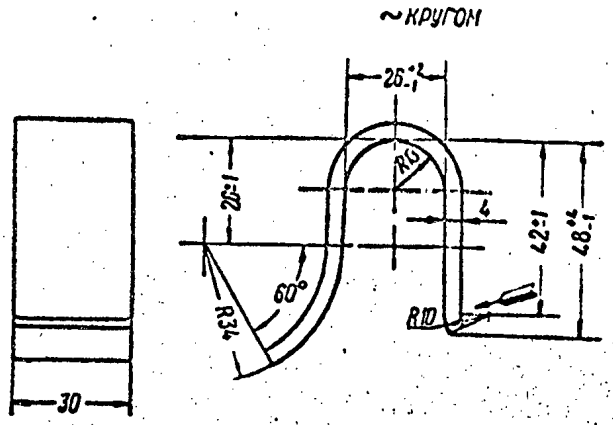
Материал: сталь 10

Эскиз 306. А51203-35 — звено цепочки

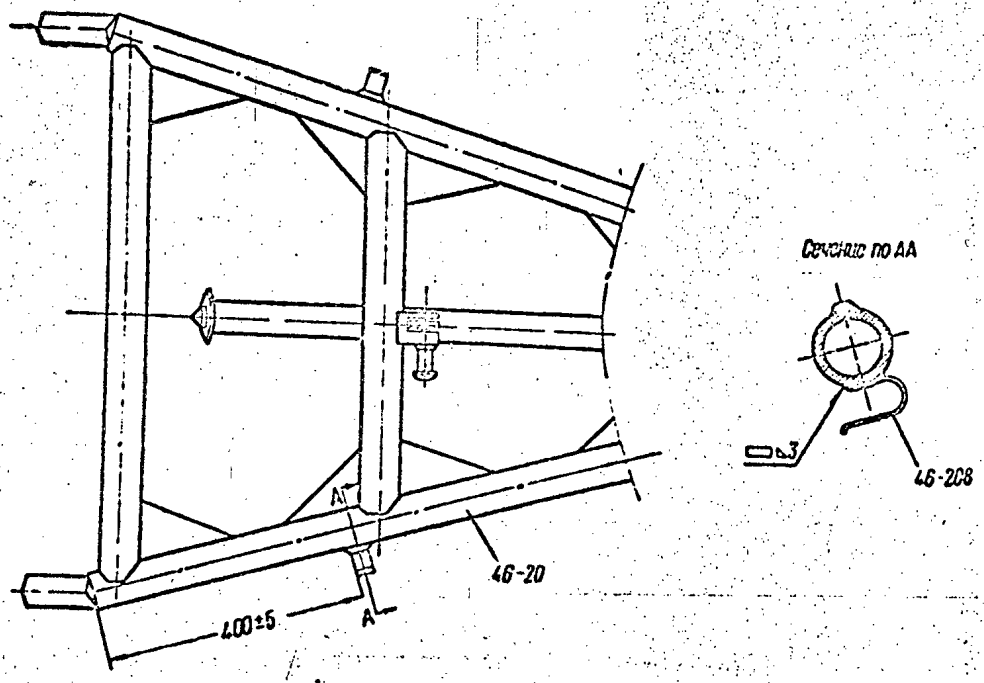




Эскиз 307. 26-55 — тяга защелки



Эскиз 308. *46-208* — крючок



Эскиз 309. *С646-10* — стрела передка: *46-20* — труба; *46-208* — крючок

Appendix 3
Приложение

50X1-HUM

Defect Reports

ДЕФЕКТАЦИОННАЯ ВЕДОМОСТЬ №_____

Наименование ремонтной мастерской _____

Время составления_____19 г.

Наименование орудия _____

Ствол №_____ знак завода _____

A. Defect of Weapon in Assembled Form
А. ДЕФЕКТАЦИЯ ОРУДИЯ В СОБРАННОМ ВИДЕ

№ по пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
1*	Выход бойка ударника за зеркало клина затвора (см. гл. III, п. 9, «а»)	2,3—2,7 *мм*			
2	Вмятины на наружной поверхности ствола (см. гл. II, п. 5)	Допускаются (см. приложения 8 и 9)			
3*	Трещины на наружной поверхности ствола (см. гл. II, п. 5)	Не допускаются			
4	Вмятины и трещины на дульном тормозе *01-51* или *01-45* (см. гл. II, п. 12)	Допускаются вмятины глубиной до 5 *мм* для орудия М-46 и глубиной до 10 *мм* для орудия М-47. Трещины не допускаются			
5	Проворот дульного тормоза *01-51* или *01-45* (см. гл. II, п. 10)	При довинченном дульном тормозе до упора в дульный срез трубы ствола риска на заднем торце тормоза должна находиться между крайними рисками на трубе ствола			
6	Не нарушена ли соосность выходного отверстия дульного тормоза и канала ствола (см. гл. II, п. 12)	Контрольный диск калибра (приложение 10) должен свободно входить в выходное отверстие дульного тормоза			
7	Забоины и задиры на контрольной площадке ствола (см. гл. II, п. 8)	Приподнятый металл на контрольной площадке не допускается			
8*	Категория годности ствола (см. гл. II, п. 1)	См. действующую Инструкцию по категорированию артиллерийского вооружения			

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9	Омеднение канала трубы ствола (см. гл. II, п. 2).	—			
10*	Изгиб ствола (см. гл. II, п. 3)	Калибр должен проходить через канал трубы ствола без заедания (размеры калибров: для орудия М-46 — диаметр $(Д-0{,}1)_{-0{,}03}$ *мм*, длина 650 *мм*; для орудия М-47 — диаметр $(D-0{,}08)_{-0{,}03}$ *мм*, длина 600 *мм*) [1]			
11*	Раздутие канала трубы ствола (см. гл. II, п. 4)	Диаметр канала трубы ствола по нарезам в месте раздутия не более $(Д+8{,}1)$ *мм* для ствола орудия М-46 и $(D+4{,}5)$ *мм* для ствола орудия М-47 [1]			
12*	Трещины на поверхности канала трубы ствола (см. гл. II, п. 6)	Не допускаются			
13*	Зазор *а* (рис. 1) между нижними плоскостями захватов ствола и усиливающим листом *09-26* люльки (см. гл. II, п. 13)	Не менее 0,8 *мм*			
14*	Зазор *б* (рис. 1) между нижними плоскостями казенника и ползками люльки (см. там же)	Не менее 0,6 *мм*			
15	Стопорит ли инерционный предохранитель *02-31* затвор в закрытом положении (см. гл. III, п. 5)	Инерционный предохранитель должен стопорить затвор в закрытом положении			
16	Не препятствует ли стопор *09-93* свободному перемещению толкателя *С609-30* при установленном стопоре *С509-15* в положение «боевое» (см. гл. IV, п. 4)	Стопор не должен препятствовать перемещению толкателя			

[1] *Д* и *D* означают номинальные диаметры по полям (калибр) трубы ствола: *Д* — для орудия М-46; *D* — для орудия М-47.

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17	Возвращается ли оттянутый в крайнее заднее положение толкатель *С609-30* в исходное положение (см. гл. IV, п. 3, «б»)	Толкатель должен возвращаться в исходное положение			
18	Взводится ли и спускается ли ударник (см. гл. III, п. 8)	Ударник должен взводиться и спускаться			
19	Выключается ли инерционный предохранитель *02-31* (см. гл. III, п. 7)	После нажатия на выключатель *02-42А (02-42)* инерционный предохранитель должен выключаться и не препятствовать открыванию затвора			
20	Возвращается ли выключатель *02-42А (02-42)* в исходное положение после нажатия до отказа на головку выключателя и освобождения ее (см. гл. III, п. 6)	Выключатель должен возвращаться в исходное положение			
21	Закрепляется ли затвор в закрытом положении (см. гл. III, п. 1)	При закрытом затворе рукоятка затвора не должна поворачиваться без предварительного нажима вниз на колпачок *02-9* ручки рукоятки			
22	Открывается ли затвор (см. гл. III, п. 2)	Затвор должен открываться плавно, без рывков при различных углах возвышения ствола			
23	Становится ли удержник *02-38А (02-38)* снаряда в рабочее (верхнее) положение (см. гл. III, п. 3)	Удержник снаряда должен находиться в рабочем (верхнем) положении			
24	Действие предохранителя преждевременного спуска ударника	Предохранитель преждевременного спуска должен обеспечивать обязательное сцепление рукоятки затвора с казенником до выстрела. Работа предохранителя считается удовлетворительной, если при не вполне закрытом затворе (зубец стопора рукоятки			

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		затвора не сцеплен с крючком *01-30* рукоятки) при нажиме на толкатель *С609-30* спуска сначала происходит сцепление зубца стопора *02-7* рукоятки затвора с крючком *01-30*, а затем спуск ударника (или сцепление зубца стопора *02-7* рукоятки с крючком *01-30* и спуск ударника не происходят).			
25	Закрывание затвора при заряжании при различных углах возвышения ствола (см. гл. III, п. 4)	При досланной штатной гильзе в патронник ствола закрывание должно происходить без заедания, при этом затвор должен полностью закрыться			
26	Выбрасывается ли гильза из патронника ствола при открывании затвора (см. гл. III, п. 10)	Гильза должна энергично выбрасываться из патронника при открывании затвора			
27*	Размер контура отпечатков бойка ударника (см. гл. III, п. 9, «в»)	Не более 6,5 *мм*			
28	Разбивается ли капсюль капсюльной втулки[1] (см. гл. III, п. 9)	Осечки не допускаются			
29*	Зазор между казенным срезом трубы ствола и зеркалом клина (см. гл. III, п. 2, «г»)	Не более 7,2 *мм*			
30	Зазор между зацепом *01-35* и наружной плоскостью щитка *С609-18* люльки при боевом положении ствола (см. гл. I, п. 3, «24»)	Не менее 1 *мм*			

[1] Проверку производить после ремонта при испытании орудия стрельбой или разбиванием двух — трех капсюльных втулок (КВ-5 — для орудия М-46; КВ-5 или КВ-13 — для орудия М-47), если испытания стрельбой не производятся.

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31	Зазор между левой плоскостью казенника и ребрами щитка *С609-18* люльки (рис. 3) при боевом положении ствола (см. там же)	Не менее 2,5 *мм*			
32	Усилие при перемещении указателя *09-55* отката по направляющей *09-53* указателя отката и удерживается ли указатель в установленном положении (см. гл. V, п. 5)	Указатель должен перемещаться от усилия руки и удерживаться в установленном положении			
33	Усилие на рукоятке маховика подъемного механизма при придании качающейся части пушки углов возвышения от — 2°30′ до +46°, а затем от +46° до — 2°30′ (см. гл. VI, п. 2.)	При установившемся движении — не более 8 *кг*; при страгивании — не более 10 *кг*			
34	Наполнение уравновешивающего механизма жидкостью (см. гл. VI, п. 1, «а»)	При угле возвышения качающейся части пушки 30—35° и открытых пробках *23-23* должна появиться жидкость из отверстия пробок *23-23*			
35	Давление в уравновешивающем механизме (см. гл. VI, п. 2, «а»)	При максимальном угле склонения качающейся части пушки — около 44 *ат*; при максимальном угле возвышения — около 25 *ат*			
36	Утечка воздуха из уравновешивающего механизма (см. гл. VI, п.1)	Не допускается			
37	Течь жидкости из цилиндра уравновешивающего механизма (см. гл. VI, п. 1, «в», «г», «д», «е»)	Не допускается			
38	Усилие на рукоятке маховика поворотного механизма при придании вращающейся части пушки различных углов наводки (см. гл. VII, п. 1)	При установившемся движении — не более 6 *кг*; при страгивании — не более 8 *кг*			

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39	Усилие на рукоятке маховика поворотного механизма при закрепленном верхнем станке в походном положении стопором *Сб17-2*. Проверку произвести на пяти оборотах маховика через каждые ½ оборота (см. гл. VII, п. 4)	При страгивании 30—50 кг			
40	Полная вертикальная шаткость качающейся части орудия. Проверку производить при угле возвышения качающейся части орудия 0° (см. гл. VI, п. 3)	Не более 12 тысячных			
41	Полная горизонтальная шаткость вращающейся части орудия. Проверку производить при угле возвышения качающейся части орудия 0° и среднем положении ствола между станинами (см. гл. VII, п. 2)	Не более 12 тысячных			
42	Мертвый ход подъемного механизма. Проверку производить при углах возвышения качающейся части орудия 0°, 12°, 36° 45° и при угле крепления качающейся части орудия походному (см. гл. VI, п. 4)	Не более ⅝ оборота маховика			
43	Мертвый ход поворотного механизма. Проверку производить при угле возвышения качающейся части орудия 0° и среднем положении ствола между станинами, а также при углах горизонтальной наводки 300 тысячных влево и вправо от среднего положения ствола (см. гл. VII, п. 3)	Не более ⅞ оборота маховика			

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44*	Зазор между зубьями сектора *09-50* люльки и зубьями шестерни коренного вала *21-1* (см. гл. VI, п. 3, «б»)	Не более 1,6 *мм*			
45*	Углы вертикальной наводки при опущенных зимних сошниках в грунт или при подложенных под колеса подкладках высотой 170 *мм* (см. гл. I, п. 3, «28» и «29»)	От — 2°30′ до +46° (допуск на суммарный угол 46°30′ — +30′)			
46*	Задевают ли наружные цилиндры уравновешивающего механизма за щитовое прикрытие при придании качающейся части орудия углов возвышения от — 2°30′ до +46°	Задевание наружных цилиндров за щитовое прикрытие не допускается			
47	Задевают ли головки заклепок, крепящие полозки люльки к коробу люльки, за щитовое прикрытие при придании качающейся части орудия углов возвышения от — 2°30′ до +46°	Задевание головок заклепок люльки за щитовое прикрытие не допускается			
48	Задевают ли головки валиков *23-22* (рис. 6), соединяющих уравновешивающий механизм с люлькой, за правый *27-180* и левый *27-181* кронштейны щитового прикрытия (рис. 17) при максимальном угле возвышения качающейся части орудия	Задевание головок валиков за кронштейны щитового прикрытия не допускается			
49	Задевает ли верхний рычаг *09-100А* за стенки окна люльки при придании качающейся части орудия углов возвышения от +15° до +40° (см. гл. I, п. 3, «19»)	Верхний рычаг *09-100А* не должен задевать за стенки окна люльки			
50	Расстояние между кернами на верхнем рычаге *09-100А* и на двуплечем рычаге *09-105* при угле	140 *мм*			

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	возвышения качающейся части 40—45° (см. гл. V, п. 5, «е»)				
51	Зазор между опорными плоскостями верхнего и нижнего станков при угле возвышения качающейся части орудия 46° (зазор измерять с казенной части и при угле склонения качающейся части 2°30′ (зазор измерять с дульной части; см. гл. VII, п. 1, «а»)	0,05—0,5 *мм*; соприкосновение опорных плоскостей не допускается			73
52*	Зазор с казенной части между опорными плоскостями верхнего и нижнего станков при максимальном угле склонения качающейся части орудия и нажатии на дульную часть ствола усилием около 125 *кг* (см. гл. VI, п. 3, «г»)	Не более 4 *мм*			
53*	Суммарный зазор с передней части между передним захватом *17-70* и нижней плоскостью ребра нижнего станка и между опорными плоскостями верхнего и нижнего станков (см. гл. VII, п. 5)	Не более 2,5 *мм*			
54	Угол поворота контрштока *08-28* при придании качающейся части орудия углов возвышения от 0° до 40—45° (см. гл. V, п. 5, «ж»)	Не менее 33°			
55*	Угол разворота вращающейся части орудия (см. гл. I, п. 3, «30»)	±25° (допуск на суммарный угол 50° — +30′)			
56	Упругий отгиб рукояти *С626-11* в заторможенном положении при крайнем левом положении люльки и при наибольшем угле склонения ствола (см. гл. XII, п. 6)	Не более 20 *мм*			

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57	Зазор между правым (по ходу) колесом и болтом *А51000-20* сектора *26-75* (см. гл. XII, п. 6)	Не менее 20 *мм*			
58	Включается ли и выключается ли подрессоривание при сведении и разведении станин (см. гл. VIII, пп. 2 и 3)	Подрессоривание должно включаться при сведении станин и выключаться при разведении станин			
59	Стопорятся ли станины в положении по-боевому (см. гл. VIII, п. 6)	Станины должны стопориться стопорами *18-162* в положении по-боевому			
60*	Прилегают ли упоры (планки *19-454*) к упорам нижнего станка при положении станин по-боевому (см. гл. VIII, п. 7)	Щуп 0,05 *мм* не должен проходить; допускаются местные зазоры до 0,5 *мм*			
61	Удерживается ли рукоятка *С624-16* на станине стопором *С619-116* (см. гл. VIII, п. 16)	Рукоятка должна удерживаться на станине стопором			
62	Удерживается ли лапа *19-193* стопором *С619-119* в боевом положении (см. гл. VIII, п. 13)	Лапа должна удерживаться стопором в боевом положении			
63	Удерживается ли коробка *С619-12* для укладки банников на станине стопором *19-134* (*19-53*) (см. гл. VIII, п. 17).	Коробка для укладки банников должна удерживаться стопором на станине			
64	Удерживается ли наметка *С619-70* стопором (см. гл. VIII, п. 18)	Наметка должна удерживаться стопором			
65	Закрепляется ли домкрат на станине стопором *С619-115* (см. гл. X, п. 1)	Домкрат должен закрепляться и удерживаться на станине стопором			
66	Удерживаются ли дверки *С627-3* и *С627-41* щита завертками *27-4* в установленном положении (см. гл. XIII, п. 4)	Дверки щита должны удерживаться завертками в установленном положении			
67	Легкость хода колес (см. гл. XI, п. 1)	—			

№ по-пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
68	Осевая шаткость колес (см. гл. XI, п. 2)	—			
69	Утечка воздуха из сети питания колесного тормоза (см. гл. XII, п. 1)	Падение давления не должно быть более 1 *ат* за 5 *мин* при проверке до торможения и в заторможенном положении			
70	Тормозятся ли и растормаживаются ли колеса от пневматического управления колесного тормоза (см. гл. XII, п. 3)	Колеса лафета орудия должны тормозиться и растормаживаться от пневматического управления колесного тормоза			
71	Тормозятся ли и растормаживаются ли колеса от ручного управления колесного тормоза (см. гл. XII, п. 2)	Колеса лафета орудия должны тормозиться и растормаживаться от ручного управления колесного тормоза			
72	Стопорится ли рукоять *Сб26-11* защелкой *26-53* на секторе *26-75* (см. гл. XII, п. 5)	Рукоять должна стопориться на секторе			
73	Течь жидкости из тормоза отката и накатника (см. гл. V, пп. 1 и 3)	Не допускается			
74	Утечка воздуха (азота) из накатника (см. гл. V, п. 4)	Не допускается			
75	Количество жидкости в накатнике (проверить по графику)	21,6 ± 1 *л*			
76	Начальное давление в накатнике	54—58 *ат*			
77	Наполнение тормоза отката жидкостью (см. гл. V, п. 5, «а»)	При угле возвышения качающейся части орудия 6° из отверстия в контрштоке для винта *08-72* должна появиться жидкость			
78	Свободно ли сводятся и закрепляются станины в положении по-походному	Станины должны сводиться усилием 2 человек на каждую станину и закрепляться стяжным болтом *Сб19-92*			
79	Провисание одной станины относительно другой (см. гл. VIII, п. 11)	Не более 60 *мм*			

№ по пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
80*	Прилегают ли упоры станин (планки *19-645*) к упорам нижнего станка при свободно сведенных до упора станинах (см. гл. VIII, п. 8)	Прилегание упоров должно быть не менее 40% площади опорных плоскостей. Допускаются местные зазоры до 0,5 *мм* на остальной площади			
81*	Разность расстояний $X_1 - X_2$ (см. гл. VIII, п. 8)	5—30 *мм*			
82*	Суммарный зазор *а* (рис. 10) между упорами *19-646* станин и площадками задних втулок с рычагами *18-26* и *15-27* при закрепленных по-походному станинах (см. гл. VIII, п. 10)	Не более 1,5 *мм*			
83	Величина *б* (рис. 10) выхода нарезной части винта *18-39* стяжки из матки *18-42* стяжки (см. гл. VIII, п. 1)	Не более 55 *мм*			
84	Не затруднена ли установка подвески *С620-2* в походном (рабочем) и боевом положениях и надежно ли крепление подвески в указанных положениях (см. гл. IX, п. 2)	Подвеска должна свободно устанавливаться и закрепляться в походном и боевом положениях			
85	Расстояние *а* (рис. 12) между контргайкой *20-71* и петлей *20-70* при закрепленной в походном (рабочем) положении подвеске лебедки (см. гл. IX, п. 2, «д», «е»)	8—50 *мм*			
86	Стопорится ли рукоятка *С620-5* стопором *20-55* на оси левого поводка *20-25* (см. гл. IX, п. 1)	Рукоятка должна стопориться стопором на оси левого поводка			
87	Усилие на рукоятке *С620-5* лебедки при ненагруженной лебедке (см. гл. IX, п. 3)	Не более 5 *кг*			
88	Удерживаются ли сошники *С619-51* стопорами в положении по-походному (см. гл. VIII, п. 12)	Сошники должны удерживаться стопорами в положении по-походному			

№ по пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
89	Удерживается ли рама *С646-17* передка пружинами *26-69* в среднем положении (см. гл. XV, п. 7)	Рама передка должна удерживаться в вертикальном положении			
90	Легкость хода колес передка (см. гл. XV, п. 11)	—			
91	Толщина передней стенки сцепной петли *46-214 (46-113)* (см. гл. XV, п. 1, «а»)	Не менее 40 *мм* (для орудий последних выпусков) Не менее 36 *мм* в горизонтальном направлении и не менее 45 *мм* в вертикальном направлении (для орудий первых выпусков)			
92	Утечка жидкости из домкрата (см. гл. X, пп. 2 и 3)	Не допускается			
93	Достаточен ли ход штока домкрата для подъема станин при снятии станин с передка или при постановке их на передок (см. гл. X, п. 4)	Ход штока должен обеспечивать снятие станин с передка и их постановку на передок			
94	Удерживаются ли станины домкратами в поднятом положении (см. гл. X, п. 5)	Станины должны удерживаться домкратами в поднятом положении			
95	Надежность крепления станин на шворне рамы передка	—			
96	Зазор между опорными плоскостями выступов втулки с кронштейном *С609-10* и соединительной гайки *10-65* (см. гл. IV, п. 5, «б»)	1—2 *мм*			
97	Удерживается ли стопор *С609-15* в положениях «походное» и «боевое» (см. гл. IV, п. 1)	Стопор должен удерживаться в положениях «походное» и «боевое»			
98	Усилие при переводе стопора *С609-15* из положения «походное» в положение «боевое» и об-	Усилие одного человека			

50X1-HUM

50X1-HUM

№ по пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
	ратно при соединении или разъединении накатника с люлькой (см. гл. IV, п. 5)				
99	Стопорится ли втулка с кронштейном *С609-10* стопором *09-18* при установленном стопоре *С609-15* в положение «походное» (см. гл. IV, п. 2)	Стопор должен стопорить втулку с кронштейном			
100	Стопорится ли толкатель *С609-30* стопором *09-93* при установленном стопоре *С609-15* в положение «походное» (см. гл. IV, п. 3)	При походном положении стопора *С609-15* толкатель не должен перемещаться			
101*	Зазор (внизу) между образующей выступа соединительной гайки *10-65* и пазом втулки с трефами *09-42* (см. гл. II, п. 13)	Не менее 0,5 *мм*			
102*	Зазор (вверху) между отверстием в бороде казенника и сухарными выступами гайки *08-53* штока (см. там же)	Не менее 0,5 *мм*			
103	Соответствует ли расстояние между поводком *01-28* указателя отката и указателем *09-55* отката показанию указателя *09-55* на направляющей *09-53* указателя отката (см. гл. I, п. 3, «26»)	Несоответствие допускается ±3 *мм*			
104	Зацепление поводка *01-28* указателя отката с указателем *09-55* отката (см. гл. I, п. 3, «27»)	Не менее 4 *мм* в вертикальном и горизонтальном положениях			
105*	Закрепляется ли ствол стопором *С619-76* в положении по-походному (см. гл. VIII, п. 14, «а»)	Ствол должен закрепляться стопором			
106*	Прилегают ли опорные плоскости казенника к опорным плоскостям опор *19-438* и *19-439* при	Допускаются местные зазоры до 0,5 *мм* до половины длины опорной поверхности опор			

№ по пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
	походном положении ствола, когда упоры *09-32* и *09-33* люльки прилегают к откидным лапам (см. гл. VIII, п. 14, «в»)				
107*	Зазор между полозками люльки и опорными плоскостями полозков заднего захвата ствола при закрепленном по-походному стволе (см. гл. VIII, п. 14, «в»)	Не более 1 *мм*			
108*	Суммарный боковой зазор между казенником и опорами на станине, когда ствол не закреплен стяжками (см. гл. VIII, п. 15)	Не более 1,5 *мм*			
109	Прилегает ли казенник к боковым поверхностям опор *19-438* и *19-439* при походном положении ствола и закрепленном стяжками (см. гл. VIII, п. 15)	Допускаются местные зазоры до 0,5 *мм* до половины длины опоры			
110	Расстояние *l* (рис. 19) между опорным торцом шворня *46-58А (46-58)* и верхним торцом буфера *46-64А (46-64)* при походном положении орудия (см. гл. XV, п. 4, «а»)	Не менее 35 *мм*			
111*	Прилегают ли упоры *46-52* и *46-53* и планки *46-116* передка к опорным плоскостям станин при походном положении орудия (см. гл. XV, п. 9)	Прилегание должно быть не менее 40% площади опорных плоскостей. Допускаются местные зазоры до 0,4 *мм*			
112	Свободно ли переводится стойка *С646-7* стрелы из положения для поддержания стрелы (при отсоединенном от пушки передке) в походное положение и обратно (см. гл. XV, п. 3)	Стойка должна свободно переводиться из положения для поддержания стрелы в походное положение и обратно			

№ по пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
113	Стопорится ли стойка *С646-7* стрелы в походном положении (см. гл. XV, п. 2)	Стойка должна стопориться в походном положении			
114	Касаются ли верхние плоскости балансиров *С618-10* и *С618-11* буферов *18-50* (см. гл. VIII, п. 1)	Балансиры не должны касаться буферов			
115	Усилие на рукоятке *С620-5* лебедки при переводе ствола из походного положения в боевое (см. гл. IX, п. 3)	Не более 25 *кг*			
116	Нет ли самопроизвольного проворота рукоятки *С620-5* лебедки под действием усилия от натянутой цепи лебедки (см. гл. IX, п. 4)	Самопроизвольный проворот рукоятки не допускается			
117	Надежность крепления инструмента и принадлежности, возимых на орудии	Инструмент и принадлежность должны быть надежно закреплены			
	Проверка панорамного прицела С-71 и оптического прицела ОП-2				
118	Прочно ли закреплен и правильно ли установлен прицел на пушке (см. гл. XIV, разд. А, п. 1)	—			
119	Вертикальная шаткость удлинителя *С641-37* или панорамы в корзинке панорамы (см. гл. XIV, разд. А, п. 2)	Не допускается			
120	Горизонтальная шаткость удлинителя *С641-37* или панорамы в корзинке панорамы (см. гл. XIV, разд. А, п. 3)	Не допускается			
121	Вертикальная шаткость панорамы в корзинке удлинителя *С641-37* (см. гл. XIV, разд. А, п. 4)	Не допускается			

№ по пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
122	Горизонтальная шаткость панорамы в корзинке удлинителя *С641-37* (см. гл. XIV, разд. А, п. 5)	Не допускается			
123	Удерживается ли указатель *12-128* дистанционного барабана в установленном положении на направляющей *12-125* (см. гл. XIV, разд. А, п. 6)	Указатель должен удерживаться в установленном положении			
124	Легкость хода механизма углов места цели (см. гл. XIV, разд. А, п. 7)	Механизм должен работать плавно, без заедания			
125	Легкость хода механизма поперечного качания (см. гл. XIV, разд. А, п. 8)	Механизм должен работать плавно, без заедания			
126	Чувствительность пузырьков уровней прицела (см. гл. XIV, разд. А, п. 9)	При вращении маховичка механизма углов места цели и рукоятки механизма поперечного качания пузырьки уровней должны перемещаться плавно, без рывков			
127	Проверка цены деления продольного и поперечного уровней (см. гл. XIV, разд. А, п. 10)	—			
128	Невозвратимая продольная шаткость прицела (см. гл. XIV, разд. А, п. 11)	Не более 1 тысячной			
129	Невозвратимая поперечная шаткость прицела (см. гл. XIV, разд. А, п. 12)	Не более 2 тысячных			
130	Невозвратимая шаткость механизма углов места цели (см. гл. XIV, разд. А, п. 13)	Не более 1 тысячной			
131	Нулевые установки прицела (см. гл. XIV, разд. А, п. 14)	—			

№ по пор.	Что подлежит проверке	Величины технических характеристик, при которых разрешается выпускать орудие из ремонта	Результаты дефектации	Способ ремонта	Отметка о выполнении ремонта
132	Не сбивается ли продольный уровень (см. гл. XIV, разд. А, п. 15)	Пузырек продольного уровня не должен выходить за крайние риски ампулы			
133	Не сбивается ли поперечный уровень (см. гл. XIV, разд. А, п. 16)	Пузырек поперечного уровня не должен выходить за крайние риски ампулы			
134	Не сбивается ли поперечный уровень при различных углах возвышения (до 5-00) качающейся части орудия (ствола) (см. гл. XIV, разд. А, п. 17)	Пузырек поперечного уровня не должен выходить за крайние риски ампулы			
135	Несоответствие показаний шкалы механизма углов прицеливания действительным углам возвышения ствола (см. гл. XIV, разд. А, п. 18)	Не более 2 тысячных на установках прицела до 3-50 и не более 3 тысячных на установках прицела больше 3-50			
136	Несоответствие показаний шкалы механизма углов места цели действительным углам возвышения ствола (см. гл. XIV, разд. А, п. 19)	Не более 2 тысячных			
137	Несоответствие показаний шкал дистанционного барабана действительным углам возвышения ствола (см. гл. XIV, разд. А, п. 20)	Не более 2 тысячных			
138	Проверка установки оптического прицела на орудии (см. гл. XIV, разд. Б, п. 1)	—			
139	Нулевая линия прицеливания панорамного и оптического прицелов (см. гл. XIV, разд. А, п. 21 и разд. Б, п. 2).	—			
140	Непараллельность линии прицеливания оси канала ствола при различных углах возвышения качающейся части орудия (ствола) (см. гл. XIV, разд. А, п. 22)	Не более 3 тысячных			

B. Defect of Weapon in Dismantled Form
Б. ДЕФЕКТАЦИЯ ОРУДИЯ В РАЗОБРАННОМ ВИДЕ

№ детали или сборки	Наименование детали или сборки	Из всего количества деталей на орудии: недостает	негодных	требует ремонта	Описание дефекта	Способ ремонта	Отметка о выполнении работ
	Пример заполнения						
	В затворе						
02-7	Стопор рукоятки	—	—	1	Смятие зубца	Восстановить зубец наплавкой	
02-29	Боевая пружина	—	1	—	Излом	Заменить	
	В тормозе отката						
08-12	Шток	—	—	1	Изгиб	Выправить	
08-16	Рубашка штока	—	1	—	Износ	Заменить	

Подпись _____ (дефектатор)

Подпись _____ (начальник ремонтной мастерской или артиллерийского цеха)

Instructions for Filling Out Defect Report
УКАЗАНИЯ ПО ЗАПОЛНЕНИЮ ДЕФЕКТАЦИОННОЙ ВЕДОМОСТИ

1. Ведомость дефектов должна полностью отражать техническое состояние ремонтируемого орудия, его агрегатов и механизмов.

2. Ведомость дефектов составляется общая на собранное ремонтируемое орудие и на его агрегаты (сборки): ствол, затвор, люльку, тормоз отката, накатник и т. д.

3. В процессе дефектации в ведомость дефектов заносить вначале все данные в раздел А о неисправностях агрегатов и механизмов, выявленных на собранном орудии, затем заносить данные в раздел Б о дефектах в механизмах и деталях, выявленных в процессе разборки.

4. В графу четвертую слева раздела А заносятся фактические результаты дефектации (проверки), а графа пятая слева заполняется согласно указаниям соответствующих разделов Руководства.

5. При заполнении ведомости дефектов (раздел Б) в нее нужно вносить данные как о неисправных, так и о негодных и недостающих деталях.

6. Неисправности, порядковые номера которых имеют знак (*), в ремонтной мастерской (ПМ) устранять необязательно, их следует устранять в вышестоящих ремонтных мастерских.

7. Если в графе третьей слева раздела А не указана характеристика, при которой разрешается выпускать орудие из ремонта, руководствоваться указаниями соответствующих разделов первой части Руководства, на которые дается

Instructions on Checking and Drawing Lines for Cross Hairs on the Face of the Muzzle Brake

Appendix 4
Приложение 4

ИНСТРУКЦИЯ ПО ПРОВЕРКЕ И НАНЕСЕНИЮ РИСОК ДЛЯ ПЕРЕКРЕСТИЯ НА СРЕЗЕ ДУЛЬНОГО ТОРМОЗА

Проверка правильности положения рисок для перекрестия на дульном тормозе, а также нанесение рисок на срезе вновь поставленного дульного тормоза производятся специальным приспособлением.

Описание приспособления

Приспособление (эскиз 310) состоит из пустотелого корпуса *1*, штанги *2*, контрольного диска 3, двух гаек *4*, рукоятки *5* и шайбы *6*.

Наружная поверхность корпуса, кроме цилиндрической части, имеет конусность 1 : 50, что обеспечивает центрирование приспособления в канале ствола. На штанге есть цилиндрическая шейка для контрольного диска. Контрольный диск имеет четыре выреза, образующие четыре площадки для нанесения рисок, и четыре прорези для проверки правильности положения нанесенных рисок.

Площадки противоположных вырезов, так же как и прорези в диске, лежат в одной плоскости, проходящей через центр диска.

На штанге за шейкой для контрольного диска имеется резьба для гайки *4*, при навинчивании которой заклинивающееся в канале ствола приспособление легко может быть сдвинуто с места.

Для удобства установки и снятия приспособления штанга заканчивается ввинтной рукояткой *5*.

Проверка рисок

1. По контрольному уровню, установленному на контрольной площадке ствола, установить ствол горизонтально в продольном и поперечном направлениях.

2. Вставить приспособление в дульную часть ствола и в дульный тормоз.

3. Подвести контрольный диск *3* приспособления вплотную к срезу тормоза.

4. На площадке *А* контрольного диска установить контрольный уровень и, поворачивая диск вокруг своей оси, вывести пузырек уровня на середину, после чего гайкой *4* закрепить диск.

Правильно нанесенные риски должны находиться в прорезях диска.

5. Неправильно нанесенные риски спилить и нанести новые.

Нанесение рисок

1. По контрольному уровню, установленному на контрольной площадке ствола, установить ствол горизонтально в продольном и поперечном направлениях.

2. Вставить приспособление в дульную часть ствола и в дульный тормоз.

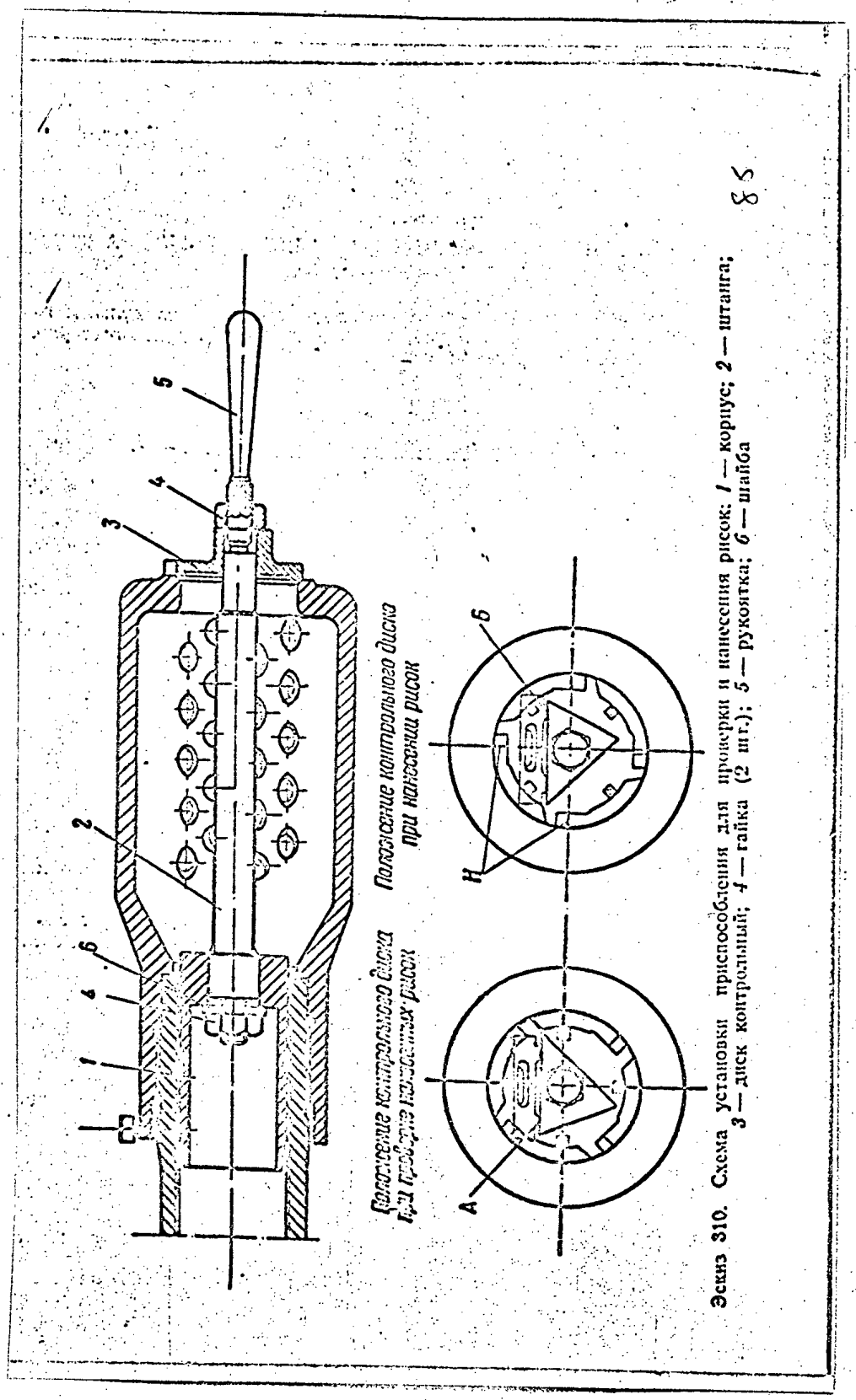
3. Подвести контрольный диск *3* приспособления вплотную к срезу тормоза.

4. На площадке *Б* контрольного диска установить контрольный уровень и, поворачивая диск вокруг своей оси, вывести пузырек уровня на середину, после чего гайкой *4* закрепить диск.

5. Прочертить чертилкой вдоль срезов *II* контрольного диска на срезе дульного тормоза риски. Снять приспособление.

Наложить на срез дульного тормоза линейку по намеченным рискам и чертилкой продлить риски на всю толщину стенки тормоза.

6. Углубить намеченные риски до 0,5 *мм*, причем ширина риски должна



Эскиз 310. Схема установки приспособления для проверки и нанесения рисок: *1* — корпус; *2* — штанга; *3* — диск контрольный; *4* — гайка (2 шт.); *5* — рукоятка; *6* — шайба

Testing the Gun by Firing and Moving
ИСПЫТАНИЕ ОРУДИЯ СТРЕЛЬБОЙ И ВОЗКОЙ

I. Подготовка орудия к испытанию

1. На отремонтированном орудии перед испытанием проверить:
— действие механизмов при переводе орудия в боевое положение;
— надежно ли соединены шток тормоза со стволом и шток накатника с бутелем люльки;
— количество жидкости в тормозе отката и давление в накатнике;
— работу подъемного и поворотного механизмов;
— действие механизмов затвора и спускового механизма;
— расстояние между кернами на рычагах механизма изменения длины отката при угле возвышения качающейся части пушки 40—45° (расстояние между кернами должно быть 140 мм);
— нулевые установки прицела и нулевую линию прицеливания.
Обнаруженные при проверке неисправности должны быть устранены.
2. Тщательно промыть и протереть насухо канал ствола.

II. Испытание орудия стрельбой

1. Испытание стрельбой производить лафетопробными снарядами, приведенными к весу штатных осколочно-фугасных гранат.
2. При испытании орудие должно быть установлено на бетонном основании (или на твердом грунте) с упором зимних сошников в деревянные брусья, уложенные в углубления для сошников в бетонном основании (или в грунте), при полностью разведенных станинах. Колеса должны быть заторможены ручным тормозом.

Применение подкладок под колеса не допускается.

Примечание. Разрешается испытание стрельбой производить при установленном орудии на грунте средней твердости; в этом случае на станины должны быть установлены летние сошники.

3. При испытании стрельбой расчет должен находиться в укрытии.
4. Перед стрельбой снаряды и гильзы должны быть протерты ветошью.
5. Стрельбу производить в следующем порядке:

№ выстрела	Угол возвышения в градусах	Положение качающейся части относительно станин	Количество выстрелов	Заряд
1	От 0 до 5	Среднее	1	Уменьшенный (второй штатный)
2	От 0 до 5	"	1	Полный, штатный
3—4	45	"	2	Полный, штатный

Примечание. После ремонта станин способом постановки [illegible] часть орудия устанавливается 50X1-HUM

6. При испытании орудие должно удовлетворять следующим требованиям:

— длина отката при стрельбе на полном заряде должна быть при угле возвышения от —2°30′ до +20° в пределах 1150—1320 *мм*, а при углах возвышения от +34° до +45° — в пределах 735—815 *мм*.

Примечание. При удлиненном откате на угле возвышения 45° (более 815 *мм*) необходимо ослабить контргайки на толкачах и повернуть регулирующую гайку *09-73* (рис. 3) настолько, чтобы керны на рычагах механизма изменения длины отката, определяющие размер 140 *мм*, сблизились между собой на 3—4 *мм*.

Произвести выстрел при угле возвышения ствола 45° и отметить новое показание указателя отката. По величине изменения длины отката при уменьшенном расстоянии между кернами определить, насколько нужно уменьшить расстояние между кернами, чтобы получить нормальную длину отката. Отрегулировать окончательно механизм регулирующей гайкой и снова произвести один выстрел при угле возвышения ствола 45°. Длина отката должна быть в пределах 735—815 *мм*.

После этого произвести один выстрел при угле возвышения ствола 5—10°; длина отката должна быть не менее 1150 *мм*. Если при указанном испытании короткие откаты при угле возвышения 45° и длинные откаты при угле возвышения 5—10° будут нормальными, то старый керн на верхнем рычаге *09-100А* (рис. 3) удалить и нанести новый керн на расстоянии 140 *мм* от керна на двуплечем рычаге *09-105* при угле возвышения ствола 40—45°.

— после каждого выстрела все механизмы должны работать плавно и безотказно;

— накат должен происходить плавно; резкий и неравномерный накат, стук при откате и накате и недокаты не допускаются;

— течь жидкости из противооткатных устройств не допускается. При течи жидкости через сальниковые уплотнения в процессе стрельбы разрешается производить поджатие уплотнений;

— затвор и спусковой механизм должны работать безотказно, выбрасывание гильзы должно быть полным; осечки не допускаются;

— подъемный и поворотный механизмы орудия после каждого выстрела должны работать плавно; сбивание подъемного механизма не допускается. Сбивание поворотного механизма за счет проворота фрикциона допускается до 2 оборотов маховика.

Проворот маховиков наводки допускается в пределах мертвого хода маховиков;

— сбивание установок шкал механизма углов прицеливания и механизма углов места цели у панорамного прицела С-71 допускается не более 0-01 после каждого выстрела;

— выкат орудия должен быть не более 300 *мм*.

7. В процессе испытания орудия стрельбой допускается устранение неисправностей путем регулировки механизмов, предусмотренной Руководством службы при эксплуатации орудия на огневой позиции.

8. При испытании стрельбой допускаются осечки, если причиной не являются механизмы затвора. Если осечка произошла по вине боеприпасов, то испытание продолжать на годных капсюльных втулках.

В случае осечки после выдержки в 3 *мин* (на случай затяжного выстрела) открывается затвор и осматривается капсюльная втулка. При отсутствии на ней отпечатка или при слабом отпечатке проверить выход бойка штатным шаблоном. При ненормальном выходе бойка вынуть и прочистить стреляющий механизм.

Если осечки происходят при нормальном отпечатке, капсюльная втулка заменяется.

9. После испытаний орудие не должно иметь повреждений отремонтированных деталей. Мелкие дефекты (задиры на втулках, ослабление болтов, гаек,

10. После стрельбы проверить давление в накатнике. Падение давления не допускается.

11. В случае неудовлетворительных результатов испытания орудие подлежит тщательному осмотру и проверке для выявления и устранения причин выявленных неисправностей.

12. После устранения неисправностей орудие подлежит повторному испытанию стрельбой в полном объеме.

III. Испытание орудия возкой

1. Испытание орудия возкой производить на расстоянии 5—10 *км* для проверки работы системы пневмоторможения и ручного управления колесного тормоза.

Допускается совмещение испытания орудия возкой с доставкой орудия на полигон.

2. Проверить, нагреваются ли тормозные барабаны, диски и ступицы колес лафета и передка. Проверку производить после пробега 2—3 *км* без торможений при скорости движения 20—30 *км/час*.

Нагревание тормозных барабанов, дисков и ступиц колес лафета и передка не допускается.

3. Проверить работу пневматического торможения.

Тормозную магистраль орудия присоединить к замку воздухопровода тягача или автомашины. Давление в тормозной магистрали должно быть в пределах 4,8—5,3 *ат*.

Дать разгон тягачу и при достижении скорости 20 *км/час* произвести полное одновременное торможение тягача и орудия путем ударного нажатия на педаль (аварийное торможение). Тормозной путь артиллерийского поезда (тягач — орудие) при этом не должен превышать 5—7 *м* на асфальтовой или грунтовой дорогах.

При плавном нажатии на тормозную педаль (притормаживание) и спаде давления в тормозной магистрали пушки до 2—3 *ат* скорость артиллерийского поезда должна заметно падать.

4. Проверить ручное торможение. При полном ручном торможении при скорости движения артиллерийского поезда 6—10 *км/час* колеса пушки должны затормозиться — скользить «юзом».

5. Проверку работы пневматического и ручного торможения производить не менее трех раз.

Means of Repairing Parts Having Stripped Threads

Appendix 6
Приложение 6

СПОСОБЫ РЕМОНТА ДЕТАЛЕЙ, ИМЕЮЩИХ СРЫВ РЕЗЬБЫ

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
		По стволу	
01-8	Шпилька	М20×2,5 для гайки *A51011-7*	ДАРМ. У орудий, где шпилька приварена к захвату, удалить старую шпильку; при этом разрешается перенарезать резьбу *А* в захвате на М22×2,5 (эскиз 312). Изготовить новую шпильку (эскизы 313 и 314) и штифт *A51041-27* № 1 (эскиз 315), поставить шпильку в захват и застопорить ее штифтом *A51041-27* № 1 (эскиз 312). У пушек, где шпилька застопорена штифтом *A51011-27*, высверлить штифт и удалить шпильку. Изготовить новую шпильку (эскиз 313) и штифт *A51041-27* № 2 (эскиз 315), поставить шпильку в захват и застопорить ее штифтом *A51011-27* № 2 (эскиз 312). Примечание. Шпильку с резьбой М22×2,5 (см. эскиз 314) ставить при перенарезке резьбы *А* в захвате
01-51 и *01-45*	Тормоз дульный	1М120×1,5 для болта *01-46*	ПМ. Перенарезать резьбу на 1М122×1,5. Изготовить болт *01-46* по резьбе в дульном тормозе (эскиз 311)
		По тормозу отката	
08-1	Цилиндр тормоза	2М175×3 для гайки *08-10*	ААРМ. Поврежденную резьбу *Б* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 175 *мм* (эскиз 316). Изготовить гайку *08-10* по резьбе *Б* цилиндра тормоза (эскиз 317)
		2М195×3 для гайки *08-46*	ААРМ. Поврежденную резьбу *В* углубить до получения

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
			резьбы допускается до 195 *мм* (эскиз 316). Резьбу на гайке *08-46* сточить, наплавить электродом Э50А слой металла и обработать по резьбе *В* цилиндра тормоза (эскиз 318)
08-2	Корпус сальника	3М140×2 для гайки *08-7* сальника	ААРМ. Поврежденную резьбу *А* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 140 *мм* (эскиз 319). Резьбу на гайке *08-7* сальника сточить, наплавить электродом Э50А слой металла и обработать по резьбе *А* корпуса сальника (эскиз 320)
		2М160×3 для гайки *08-11*	ААРМ. Поврежденную резьбу *Б* углубить до получения полного профиля резьбы. Уменьшение наружного диаметра резьбы допускается до 156,5 *мм* (эскиз 319). Резьбу на гайке *08-11* сточить, наплавить электродом Э50А слой металла и обработать по резьбе *Б* корпуса сальника (эскиз 321)
08-17	Стержень модератора	1М12×1,25 для гайки *08-20* клапана	ДАРМ. Поврежденную резьбу углубить до получения полного профиля резьбы. Уменьшение наружного диаметра резьбы допускается до 10,5 *мм*. Изготовить гайку *08-20* клапана по резьбе стержня модератора (эскиз 322)
08-23	Крышка передняя	3М76×2 для гайки *08-27*	ААРМ. Поврежденную резьбу *А* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 76 *мм* (эскиз 323). Изготовить гайку *08-27* по резьбе *А* передней крышки (эскиз 324)
		1М16×1,5 для вентиля *08-48*	ДАРМ. Перенарезать резьбу *Б* на 1М18×1,5. Изготовить вентиль *08-48* по резьбе передней крышки (приложение

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
		3М90×2 для гайки *08-29*	ААРМ. Поврежденную резьбу *В* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 90 *мм* (эскиз 323). Резьбу на гайке *08-29* сточить, наплавить электродом Э50А слой металла и обработать по резьбе *В* передней крышки (эскиз 325). В сборке передней крышки *08-23* с контрштоком и гайкой *08-29* просверлить в гайке *08-29* отверстие ⌀ 8,4 +0,2 *мм* (для стопорного винта *08-30*) по имеющемуся отверстию в передней крышке *08-23* на глубину 51 +0,8 *мм* от образующей *а* передней крышки (см. эскиз 323)
08-28	Контршток	М27×3 для гайки *А51011-40*	ААРМ. Поврежденную резьбу *В* углубить до получения полного профиля резьбы. Уменьшение наружного диаметра резьбы допускается до 24 *мм* (эскиз 326). Изготовить гайку *А51011-40* по резьбе *В* контрштока (эскиз 327).
		1М16×1,5 для винта *08-72*	ААРМ. Поврежденную резьбу *Г* углубить до получения полного профиля резьбы, при этом расточить выточку *Д*. Увеличение внутреннего диаметра резьбы допускается до 16 *мм* (эскиз 326). Изготовить винт *08-72* по резьбе *Г* контрштока (эскиз 328) и уплотняющее кольцо *08-73* (приложение 1, эскиз 209)
		2М36×2 для гайки *08-42*	ААРМ. Поврежденную резьбу *Ж* углубить до получения полного профиля резьбы, при этом проточить шейку *Е*. Уменьшение наружного диаметра резьбы допускается до 33,5 *мм* (эскиз 326). Изготовить гайку *08-42* по резьбе *Ж* контрштока (эскиз 329)

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
08-53	Гайка штока	1М60×4 для стержня *08-13* штока	ААРМ. Поврежденную резьбу углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 60 *мм*. Изготовить стержень *08-13* штока (эскиз 330), соединить его со штоком и обработать (эскиз 331). Отверстие в стержне штока для стопорного винта *08-57* обработать в сборке по имеющемуся резьбовому отверстию в гайке *08-53* штока согласно эскизу 332. До сверления отверстия в стержне штока завинтить гайку *08-53* штока до отказа, при этом имеющиеся риски на торце стержня штока и на торце гайки *08-53* штока должны быть совмещены. Если риски не будут совмещены, то отвинтить гайку до совмещения рисок
С608-4	Шток	3М115×2 для гайки *08-31*	ААРМ. Поврежденную резьбу *Г* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 115 *мм* (эскиз 331). Изготовить гайку *08-31* по резьбе *Г* штока и контргайку *08-32* по резьбе *Г* гайки *08-31* (эскизы 333 и 334)
		По люльке	
С609-1	Люлька	М10× 1,5 для болта *12-8*	ДАРМ. Перенарезать резьбу на М12×1,75, при этом рассверлить четыре отверстия в вилке с цапфой *С612-1* или в цапфе (*12-1*) прицела на диаметр 14+0,5 *мм* и перенарезать два резьбовых отверстия на М12×1,75. Пружинную шайбу 10,5 *мм* заменить пружинной шайбой 12,5 *мм*, ГОСТ 6402—52. Изготовить болт *12-8* по резьбе левой цапфы люльки (эскиз 335)

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
		По накатнику	
10-9	Цилиндр промежуточный	3М130×2 для гайки *10-13* сальника	ААРМ. Поврежденную резьбу *Г* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 130 *мм* (эскиз 336). Изготовить гайку *10-13* сальника по резьбе *Г* промежуточного цилиндра (эскиз 337)
10-75	Корпус сальника	3М72×2 для гайки *10-81* сальника	ДАРМ. Поврежденную резьбу *А* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 72 *мм* (эскиз 338)). Резьбу на гайке *10-81* сальника сточить, наплавить электродом Э42 слой металла и обработать по резьбе *А* корпуса сальника (эскиз 339)
10-114	Крышка	1М30×2 для регулирующего болта *10-120*	ААРМ. Поврежденную резьбу *Б* углубить до получения полного профиля резьбы, при этом расточить выточку до диаметра $34^{+0,17}$ *мм*. Увеличение внутреннего диаметра резьбы допускается до 30 *мм* (эскиз 340), одновременно необходимо расточить отверстия кольца *10-118* и гайки *10-119* на размер $34^{+0,17}$ *мм*. Изготовить регулирующий болт *10-120* по резьбе *Б* крышки (эскиз 341)
		3М48×1,5 для гайки *10-119*	ДАРМ. Поврежденную резьбу *В* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 48 *мм* (эскиз 340). Изготовить гайку *10-119* по резьбе *В* крышки (эскиз 342)
С610-2	Цилиндр воздушный	1М24×2 для гайки *10-55*	ДАРМ. Поврежденную резьбу *А* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 24 *мм*

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
			10-55 по резьбе *А* воздушного цилиндра и контргайку *10-56* по резьбе *А* гайки *10-55* (эскизы 344 и 345)
		1М22×1,5 для пробки *10-58*	ДАРМ. Поврежденную резьбу *В* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 22 *мм* (эскиз 343). Изготовить ввертыш по резьбе *В* воздушного цилиндра (эскиз 346) и поставить ввертыш в воздушный цилиндр (эскиз 343)
С610-3	Цилиндр рабочий	2М120×3 для промежуточного цилиндра *10-9*	ААРМ. Поврежденную резьбу *Б* углубить до получения полного профиля резьбы. Уменьшение наружного диаметра резьбы допускается до 116,5 *мм* (эскиз 347). Резьбу *Б* на промежуточном цилиндре *10-9* сточить, наплавить электродом Э42 слой металла и обработать по резьбе *Б* рабочего цилиндра (см. эскиз 336)
С610-15	Шток с поршнем	1М33×2 для соединительной гайки *10-65*	ААРМ. Поврежденную резьбу *Д* углубить до получения полного профиля резьбы. Уменьшение наружного диаметра резьбы допускается до 28 *мм* (эскиз 348). Изготовить втулку и винт, запрессовать втулку в соединительную гайку *10-65* и застопорить винтом. Нарезать резьбу во втулке по резьбе *Д* штока с поршнем (эскиз 349)
		М6×1 для винтов *А51066-137* (у орудий последних выпусков)	ПМ. Перенарезать резьбу *В* на М8×1,25 (эскиз 348), одновременно необходимо рассверлить отверстие в стопоре *10-55* на диаметр $8{,}5^{+0{,}4}$ *мм*. Изготовить винт *А51066-137* (эскиз 350)

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
/		М8×1,25 для винта *А51060-13* (у орудий первых выпусков)	ПМ. Перенарезать резьбу *В* на М10×1,5 (эскиз 348), одновременно необходимо рассверлить отверстие в стопоре *10-85* на диаметр 10,5 $^{+0,5}$ *мм* и раззенковать отверстие под углом 90° до диаметра 17,5 *мм*. Изготовить винт (*А51060-13*) по резьбе *В* штока с поршнем (эскиз 351)
	По панорамному прицелу С-71		
12-20	Валик с ушком	1М10×1 для гайки *12-23* с буртиком	ПМ. При повреждении резьбы поставить концевую часть (эскиз 352)
12-30	Ось уровня	2М6×0,5 для болта *12-44*	ПМ. Перенарезать резьбу 2М7×0,5. Изготовить болт *12-44* по резьбе оси уровня (эскиз 353)
12-51	Червяк	2М6×0,5 для винта *12-54*	ПМ. Перенарезать резьбу *А* на 2М7×0,5 (эскиз 354). Изготовить винт *12-54* по резьбе *А* червяка (эскиз 355)
		2М6×0,5 для гайки *12-57*	ПМ. При повреждении резьбы поставить концевую часть, завинтив ее до отказа (эскиз 354)
12-84	Обод шестерни	1М10×1 для червяка *12-87*	ПМ. Поврежденную резьбу углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 10 *мм*. Поставить концевую часть в червяк *12-87* (эскиз 356)
С612-1	Коробка прицела	1М8×1 для болта *12-82*	ПМ. Перенарезать резьбу на 2М9×0,75. Изготовить болт *12-82* по резьбе коробки прицела и гайку *12-83* по резьбе болта *12-82* (эскизы 357 и 358)
	По верхнему станку		
17-22	Букса	1М27×2 для гайки *17-26*	ПМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом проточить канавку до диамет-

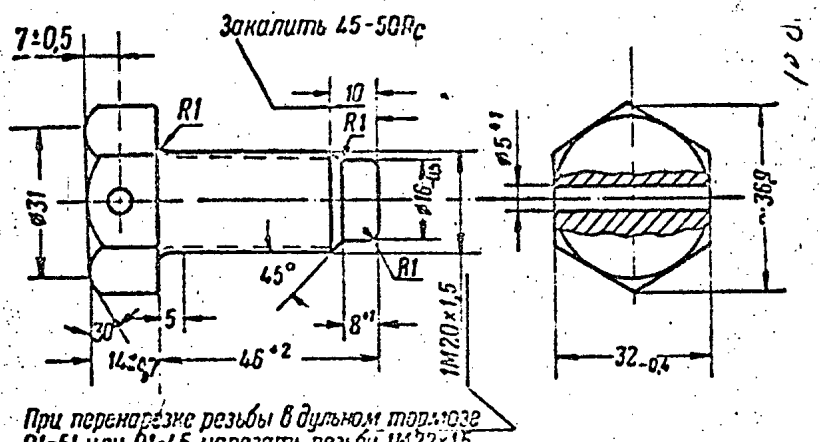
№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
			ра 21 *мм*. Уменьшение наружного диаметра резьбы допускается до 24 *мм*. Изготовить гайку *17-26* по резьбе буксы (эскиз 359)
17-42	Крышка штыря	1М42×3 для регулирующего болта *17-43*	ДАРМ. Поврежденную резьбу углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 42 *мм*. Изготовить регулирующий болт *17-43* по резьбе крышки штыря (эскиз 360)
17-50	Корпус буксы	3М90×2 для нажимной гайки *17-53*	ДАРМ. Поврежденную резьбу удалить, наплавить электродом Э42 слой металла и обработать (эскиз 361)
17-53	Гайка нажимная	3М90×2 для корпуса буксы *17-50*	ДАРМ. Поврежденную резьбу удалить, наплавить электродом Э42 слой металла и обработать (эскиз 362)
17-62	Штырь	2М110×3 для гайки *17-63*	ААРМ. Поврежденную резьбу *В* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 110 *мм* (эскиз 363). Резьбу на гайке *17-63* сточить, наплавить электродом Э42 слой металла и обработать по резьбе *В* штыря (эскиз 364)
	По станинам		
19-100	Болт шарнирный	1М68×4 для болта *19-103*	ДАРМ. Поврежденную резьбу *Б* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 68 *мм* (эскиз 365). При этом изготовить шайбу (эскиз 366). Резьбу на болте *19-103* сточить, наплавить электродом Э42 слой металла и обработать по резьбе *Б* шарнирного болта (эскиз 367)

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
		По лебедке	
20-3	Вал с шестерней	2М30×1,5 для круглой гайки *А51970-9*	ДАРМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом проточить канавку до диаметра 26 *мм*. Уменьшение наружного диаметра резьбы допускается до 28 *мм*. Изготовить круглую гайку *А51970-9* по резьбе вала с шестерней (эскиз 369)
20-5	Эксцентрик	1М20×1,5 для круглой гайки *А51970-5*	ДАРМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом проточить канавку до диаметра 15,8 *мм*. Уменьшение наружного диаметра резьбы допускается до 18 *мм*. Изготовить круглую гайку *А51970-5* по резьбе эксцентрика (эскиз 368)
		По подъемному механизму	
21-1	Вал коренной	3М76×2 для гайки *21-9*	ААРМ. Поврежденную резьбу *Б* углубить до получения полного профиля резьбы. Уменьшение наружного диаметра резьбы допускается до 73,4 *мм* (эскиз 370). Изготовить гайку *21-9* по резьбе *Б* коренного вала (эскиз 371)
		3М68×2 для стопорной гайки *21-18*	ААРМ. Поврежденную резьбу *Е* углубить до получения полного профиля резьбы. Уменьшение наружного диаметра резьбы допускается до 65 *мм* (эскиз 370). Изготовить стопорную гайку *21-18* по резьбе *Е* коренного вала (эскиз 372)
21-22	Валик червячный	2М33×1,5 для гайки *21-84*	ААРМ. Поврежденную резьбу *А* углубить до получения полного профиля резьбы, при этом проточить шейку *Б* (эскиз 373). Уменьшение наружного диаметра резьбы допускается до 29 *мм*. Изготовить гайку *21-84* по резьбе *А* червячного валика (эскиз 374)

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
21-85	Диск тормозной	2М27×1,5 для гайки *21-97*	ДАРМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом проточить канавку до диаметра 22,8 *мм*. Уменьшение наружного диаметра резьбы допускается до 25 *мм*. Изготовить гайку *21-97* по резьбе тормозного диска (эскиз 375)
	По поворотному механизму		
22-1	Вал с шестерней	1М27×2 для гайки *22-13*	ДАРМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом проточить канавку до диаметра 21 *мм*. Уменьшение наружного диаметра резьбы допускается до 24 *мм*. Изготовить гайку *22-13* по резьбе вала с шестерней (эскиз 376)
	По уравновешивающему механизму		
Сб23-1 или *Сб23-2*	Поршень правый и поршень левый	1М24×2 для гайки *23-55*	ДАРМ. Поврежденную резьбу *Б* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 24 *мм* (эскиз 377). Изготовить гайку *23-55* по резьбе *Б* головки правого или левого поршня (эскиз 378)
		1М22×1,5 для нажимной гайки *23-27*	ДАРМ. Поврежденную резьбу *В* углубить до получения полного профиля резьбы. Увеличение внутреннего диаметра резьбы допускается до 22 *мм* (эскиз 377). Изготовить ввертыш по резьбе *В* головки поршня (см. эскиз 346) и поставить ввертыш в головку поршня (эскиз 377)
Сб23-3	Цилиндр наружный	2М155×3 для втулки *23-6*	ААРМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом расточить канавку до диаметра 160 *мм*. Увеличение внутрен-

№ детали или сборки	Наименование детали или сборки	Характеристика резьбы	Способы ремонта
			него диаметра резьбы допускается до 155 *мм*. Резьбу на втулке *23-6* сточить, наплавить электродом Э42 слой металла и обработать по резьбе наружного цилиндра (эскиз 379)
		По передку	
46-54	Ось	2М39×2 для гайки *46-59*	ДАРМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом проточить канавку до диаметра 33,5 *мм*. Уменьшение наружного диаметра резьбы допускается до 36,5 *мм*. Изготовить гайку *46-59* по резьбе оси (эскиз 380)
46-58А	Шворень	1М42×3 для винта с фланцем *46-209* (у орудий последних выпусков)	ААРМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом расточить канавку до диаметра 47 *мм*. Увеличение внутреннего диаметра резьбы допускается до 42 *мм*. Изготовить винт с фланцем *46-209* по резьбе шворня (эскиз 381)
(*46-58*)	Шворень	2М52×2 для гайки (*46-201*) (у орудий первых выпусков)	ААРМ. Поврежденную резьбу углубить до получения полного профиля резьбы, при этом проточить канавку до диаметра 46,5 *мм*. Уменьшение наружного диаметра резьбы допускается до 49,5 *мм*. Изготовить гайку (*46-201*) по резьбе шворня (эскиз 382)
46-214 (*46-113*)	Петля сцепная	1М48×3 для гайки *46-114*	ААРМ. Поврежденную резьбу углубить до получения полного профиля резьбы. Уменьшение наружного диаметра резьбы допускается до 40 *мм*. Изготовить гайку *46-114* по резьбе сцепной петли (эскиз 383)

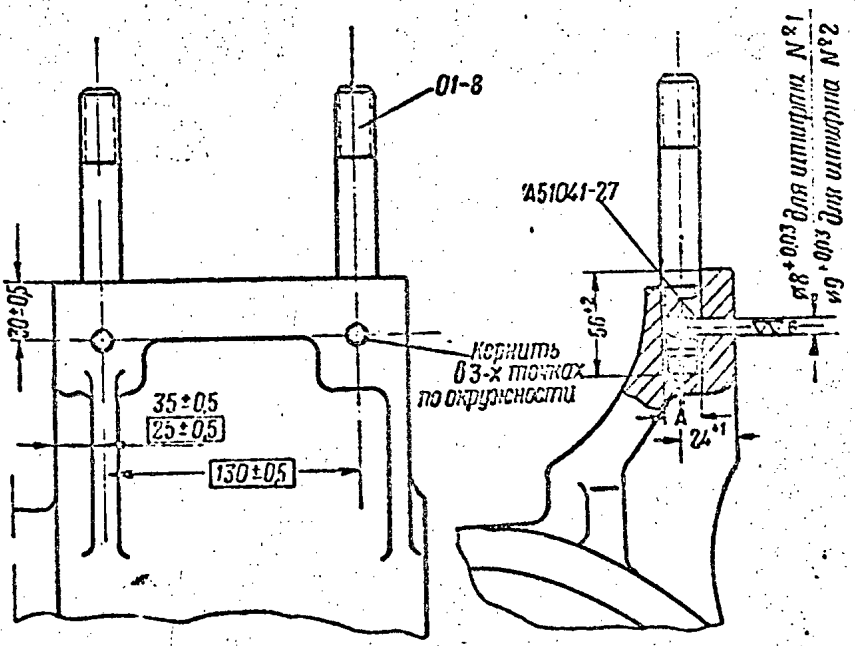
▽ 2 КРУГОМ



При перенарезке резьбы в дульном тормозе 01-51 или 01-45 нарезать резьбу 1М22×1,5

Материал: сталь КТ 60-40Х
Острые ребра притупить
Оксидировать

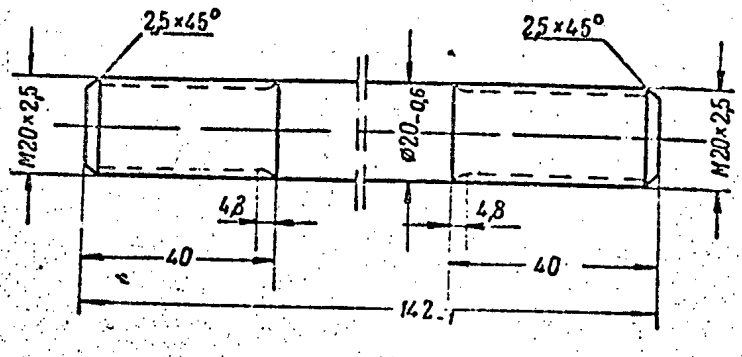
Эскиз 311. *01-15* — болт дульного тормоза



Размеры, взятые 0 ▭, относятся только к заднему захвату С601-2
Остальные размеры относятся к заднему захвату и переднему захвату С601-3

Эскиз 312. *С601-2* — захват задний: *01-8* — шпилька; *А51041-27* — шти

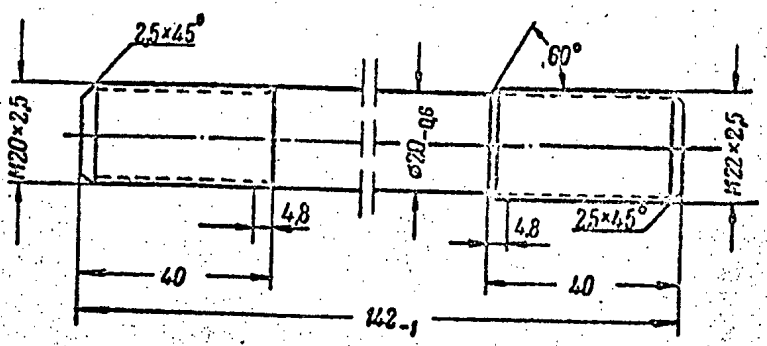
▽2 кругом



Материал: сталь К30-40
Острые ребра притупить
Оксидировать

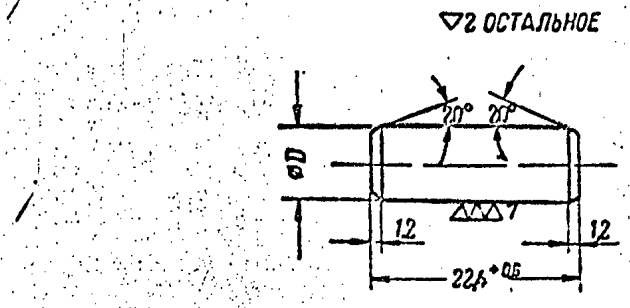
Эскиз 313. *01-8* — шпилька

▽2 кругом



Материал: сталь К30-40
Острые ребра притупить
Оксидировать

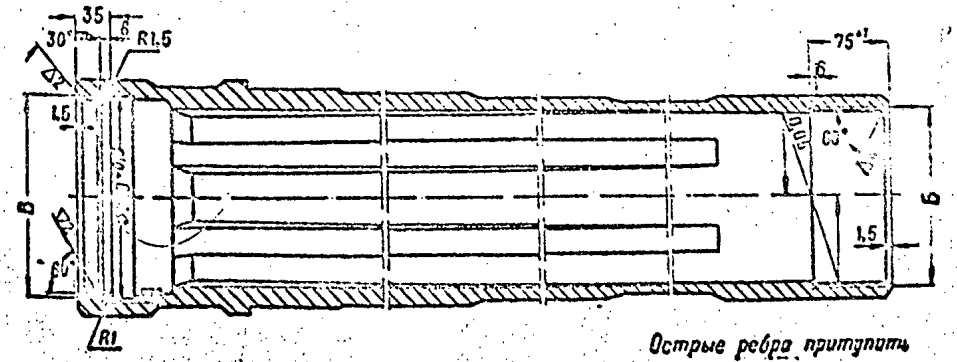
Эскиз 314. *01-8* — шпилька



Номер штифта	D мм
1	$\varnothing 8^{+0.07}_{+0.04}$
2	$\varnothing 9^{+0.07}_{+0.04}$

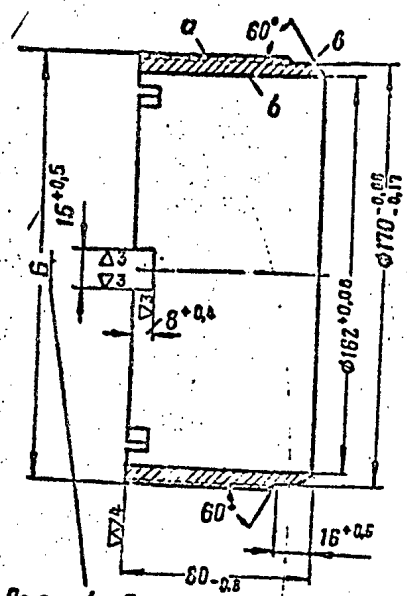
Материал: сталь Ст 6
Острые ребра притупить

Эскиз 315. *A5104-27* — штифт цилиндрический

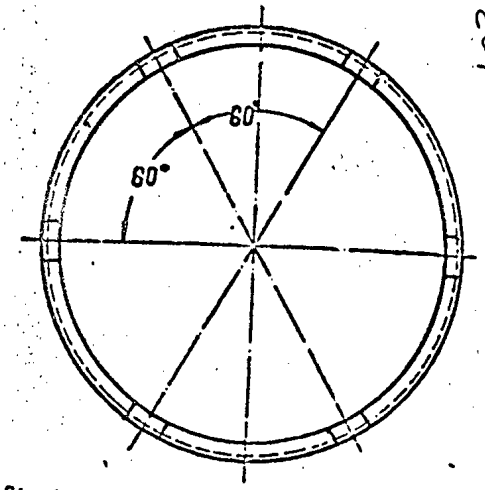


Острые ребра притупить

Эскиз 316. *08-1* — цилиндр тормоза



По резьбе Б цилиндра С8-1 тормоза без шаткости



Обработку поверхностей а, б и в производить с одной установки. Допускается эллиптичность до 0,2 мм

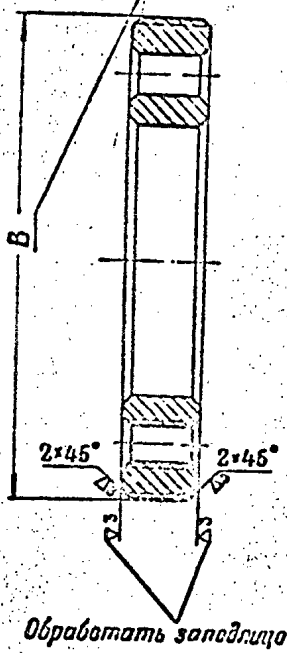
Материал сталь КТ55-40Х

Острые ребра притупить

Оксидировать

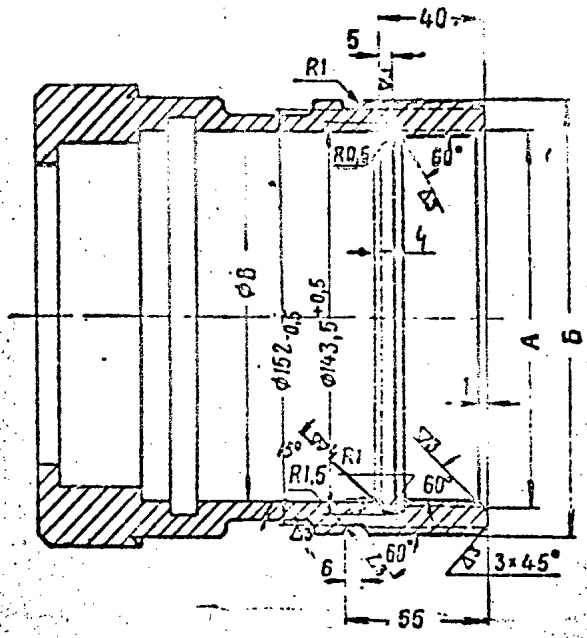
Эскиз 317. 08-10 — гайка

По резьбе В цилиндра С8-1 тормоза без шаткости



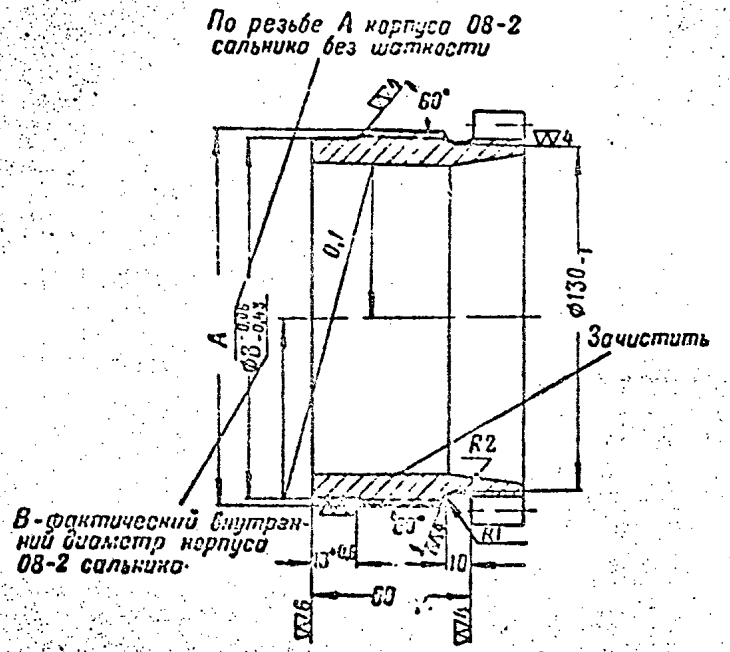
Обработать заплавлено

Острые ребра притупить



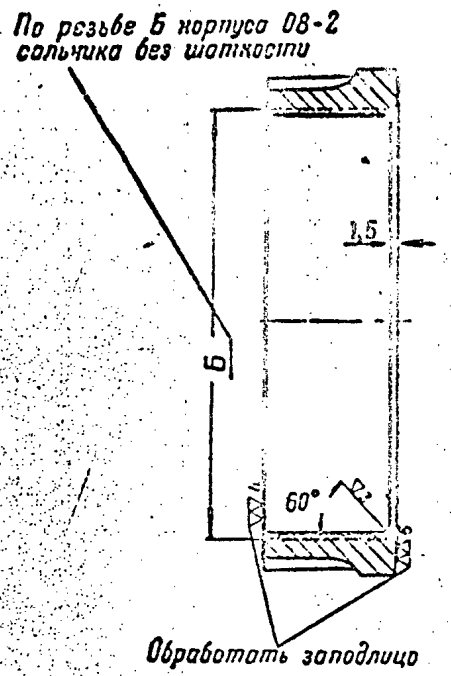
Острые ребра притупить
Оксидировать

Эскиз 319. 08-2 — корпус сальника

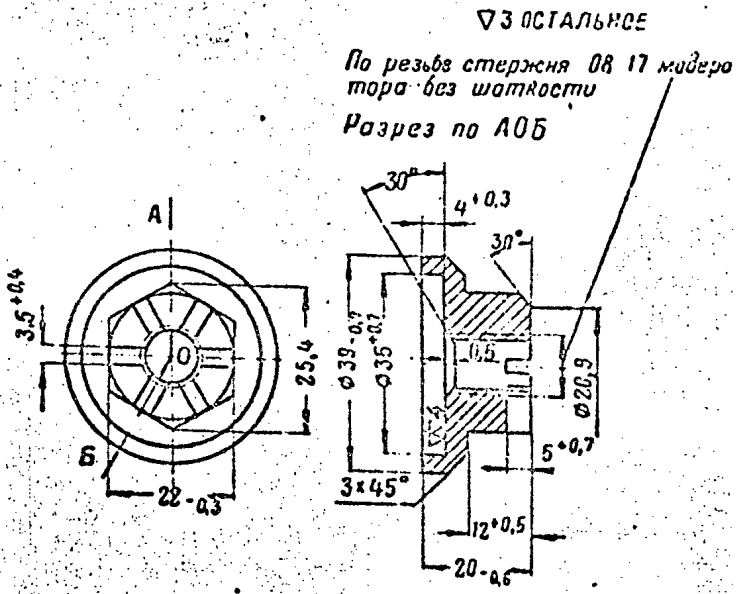


Острые ребра притупить
Оксидировать

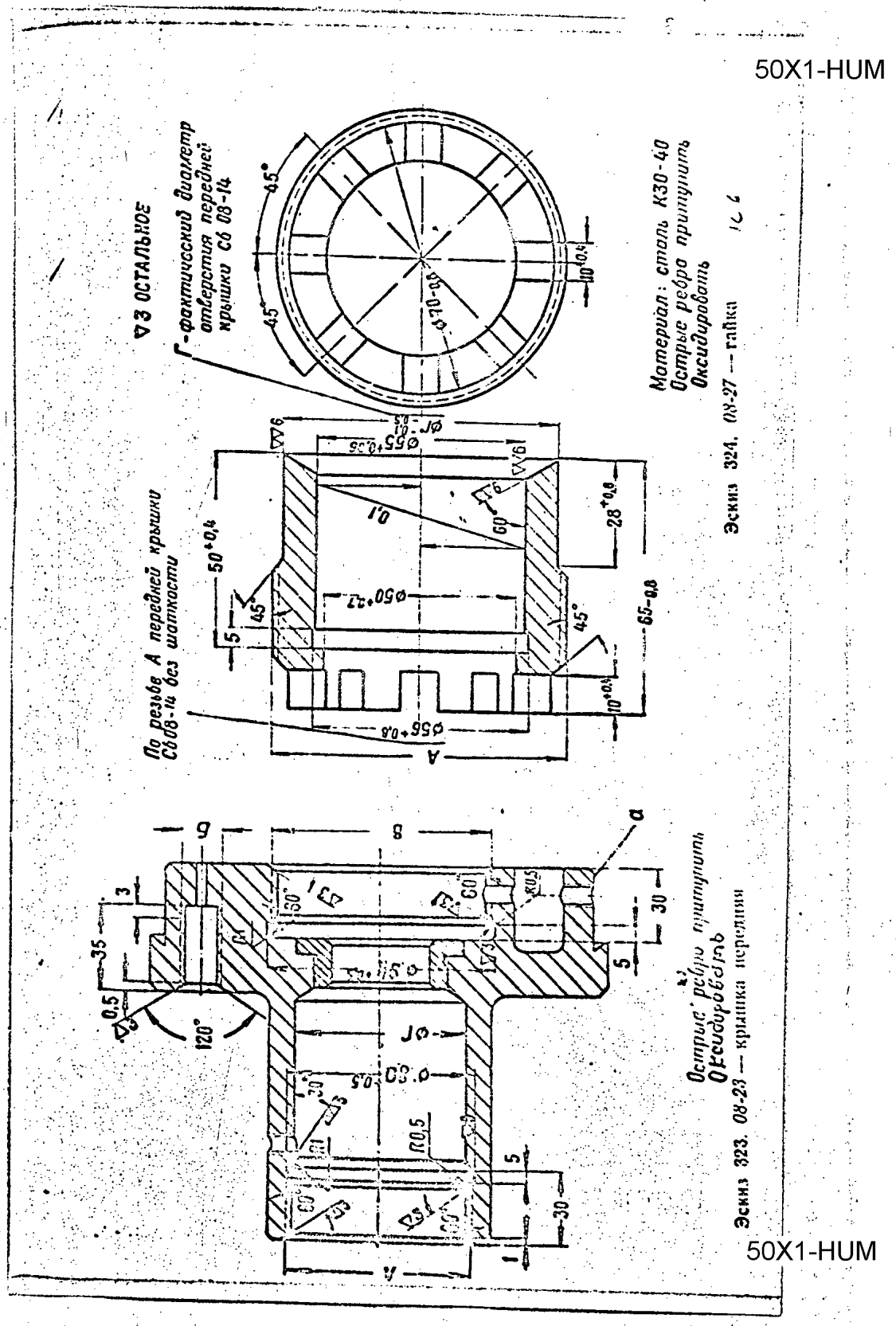
105

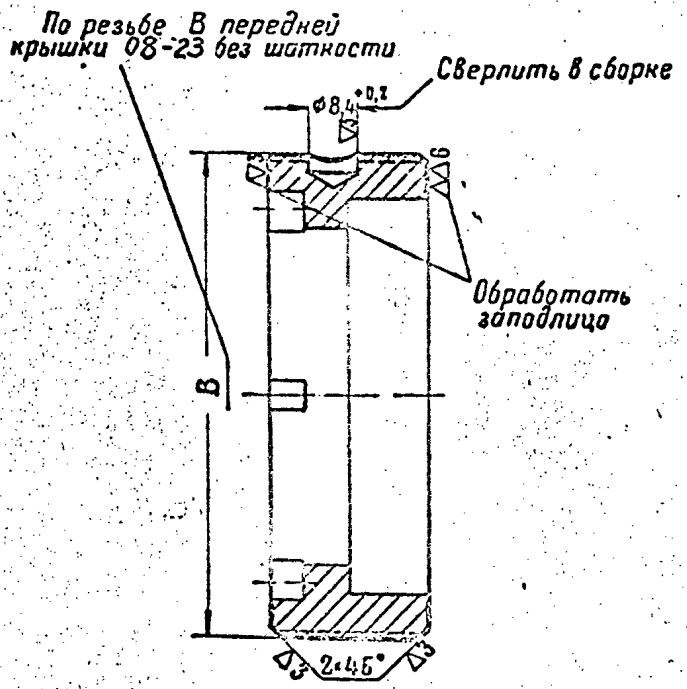


Эскиз 321. 08-11 — гайка

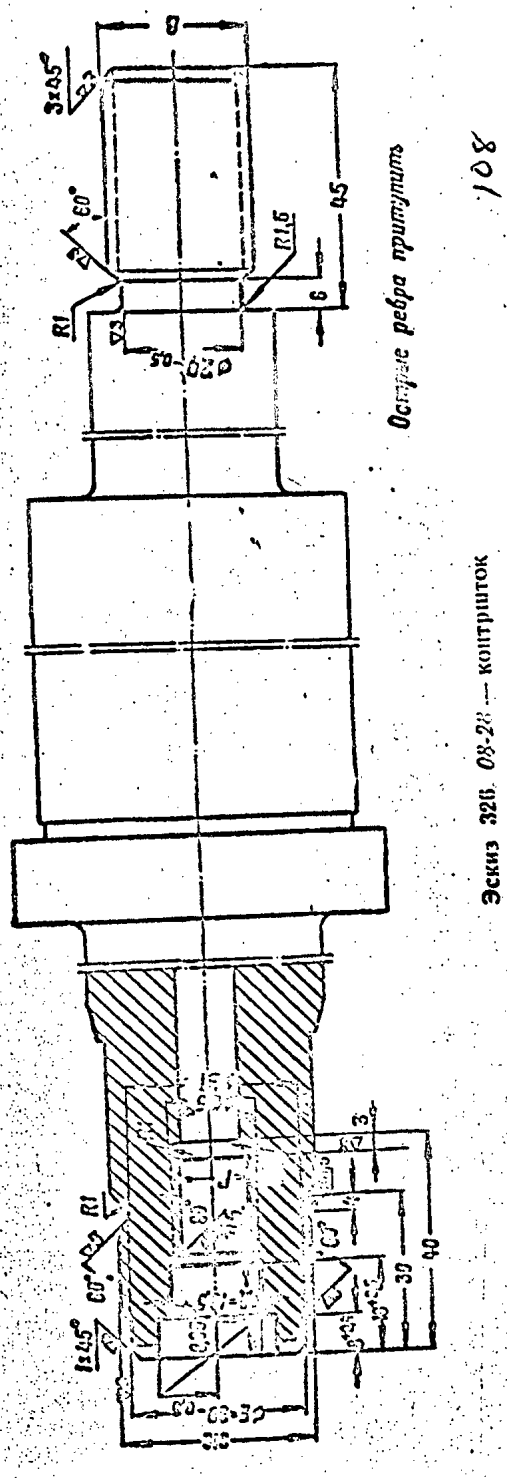


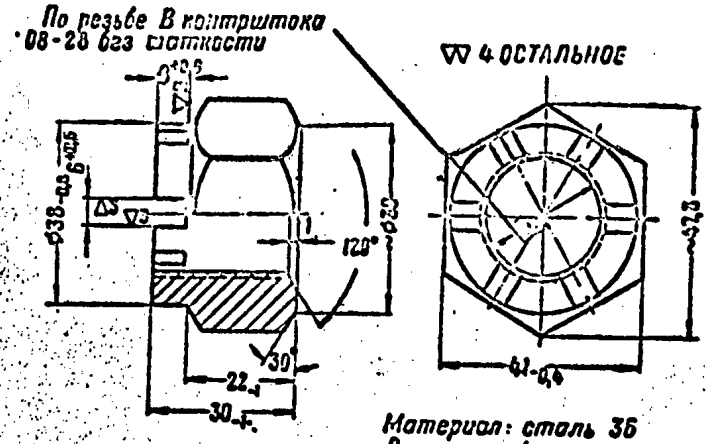
Материал сталь К30-40
Острые ребра притупить





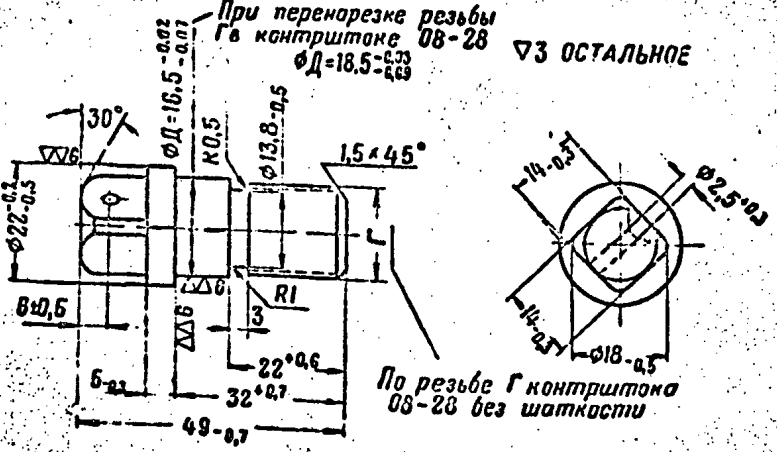
Эскиз 325. 08-29 — гайка





Материал: сталь 35
Острые ребра притупить
Оксидировать

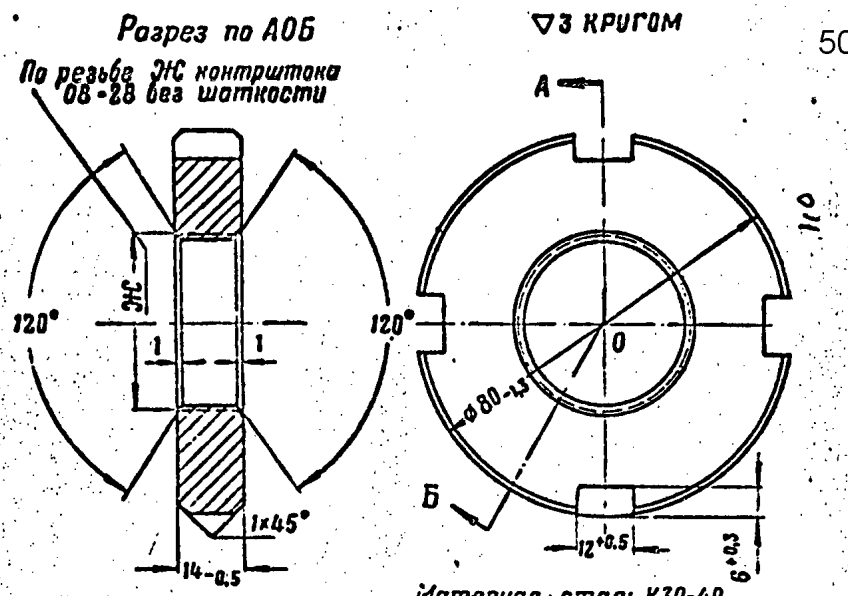
Эскиз 327. А51011-40 — гайка



По резьбе Г контргайки 08-28 без шаткости

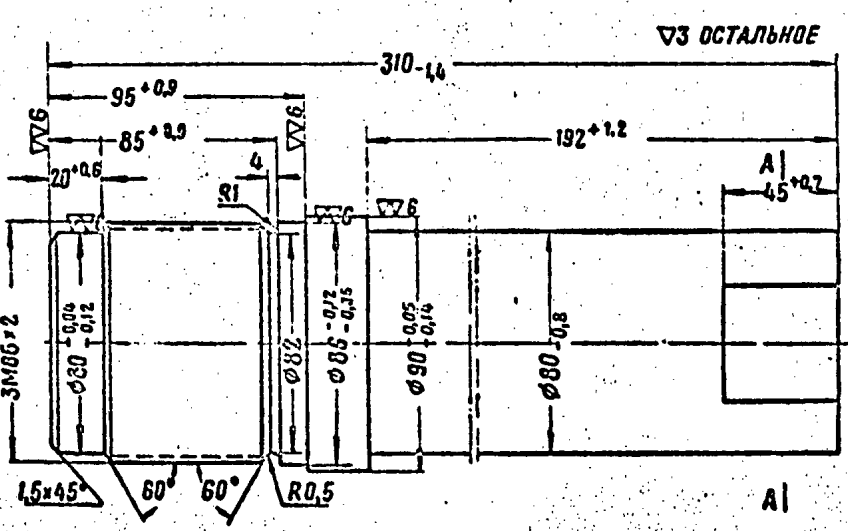
Материал: сталь К30-40
Острые ребра притупить
Оксидировать

Эскиз 328. 08-72 — винт

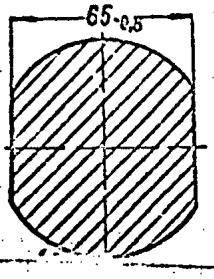


Эскиз 329. *08-12* — гайка

Материал: сталь К30-40
Острые ребра притупить
Оксидировать

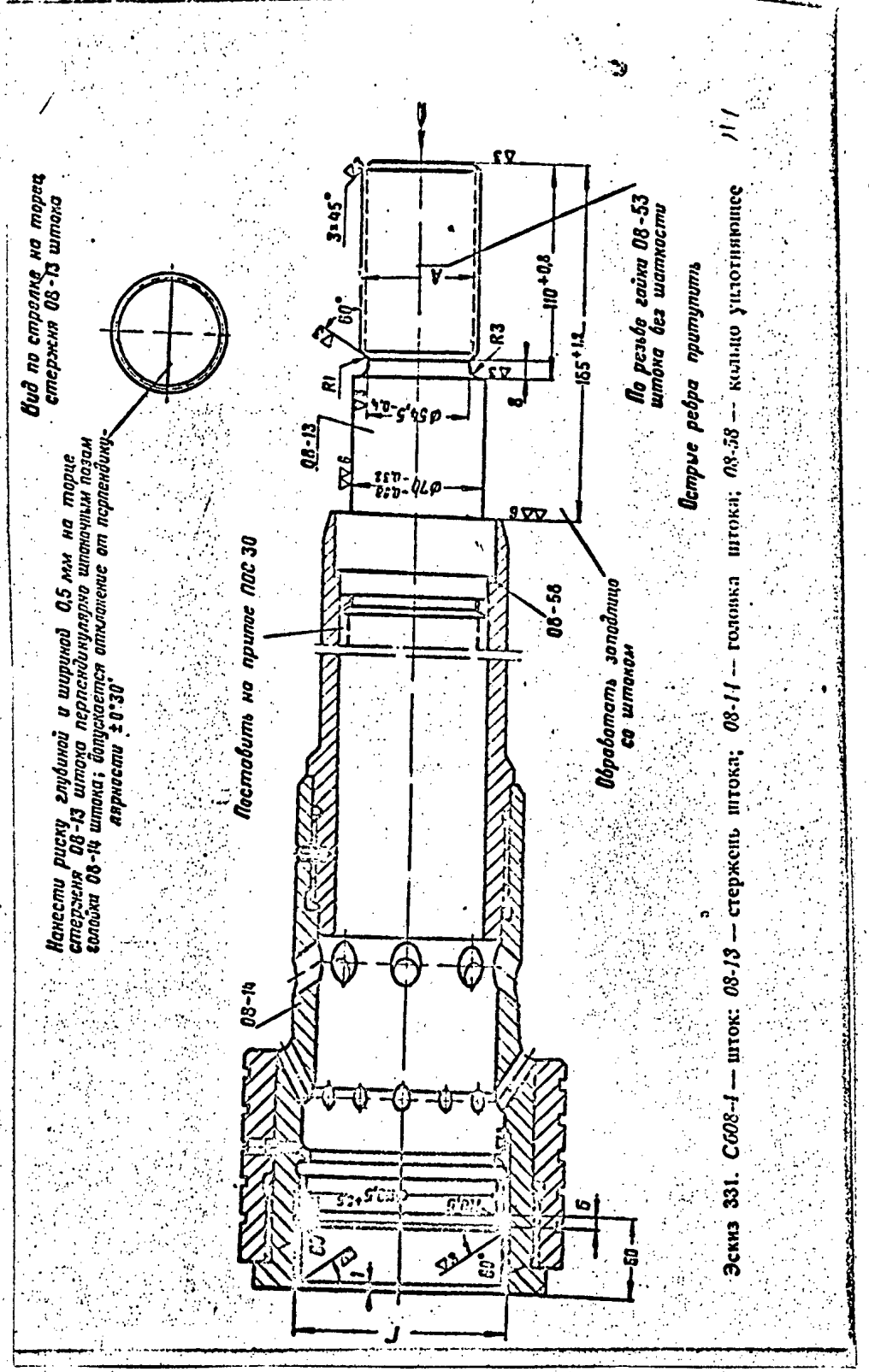


Сечение по АА

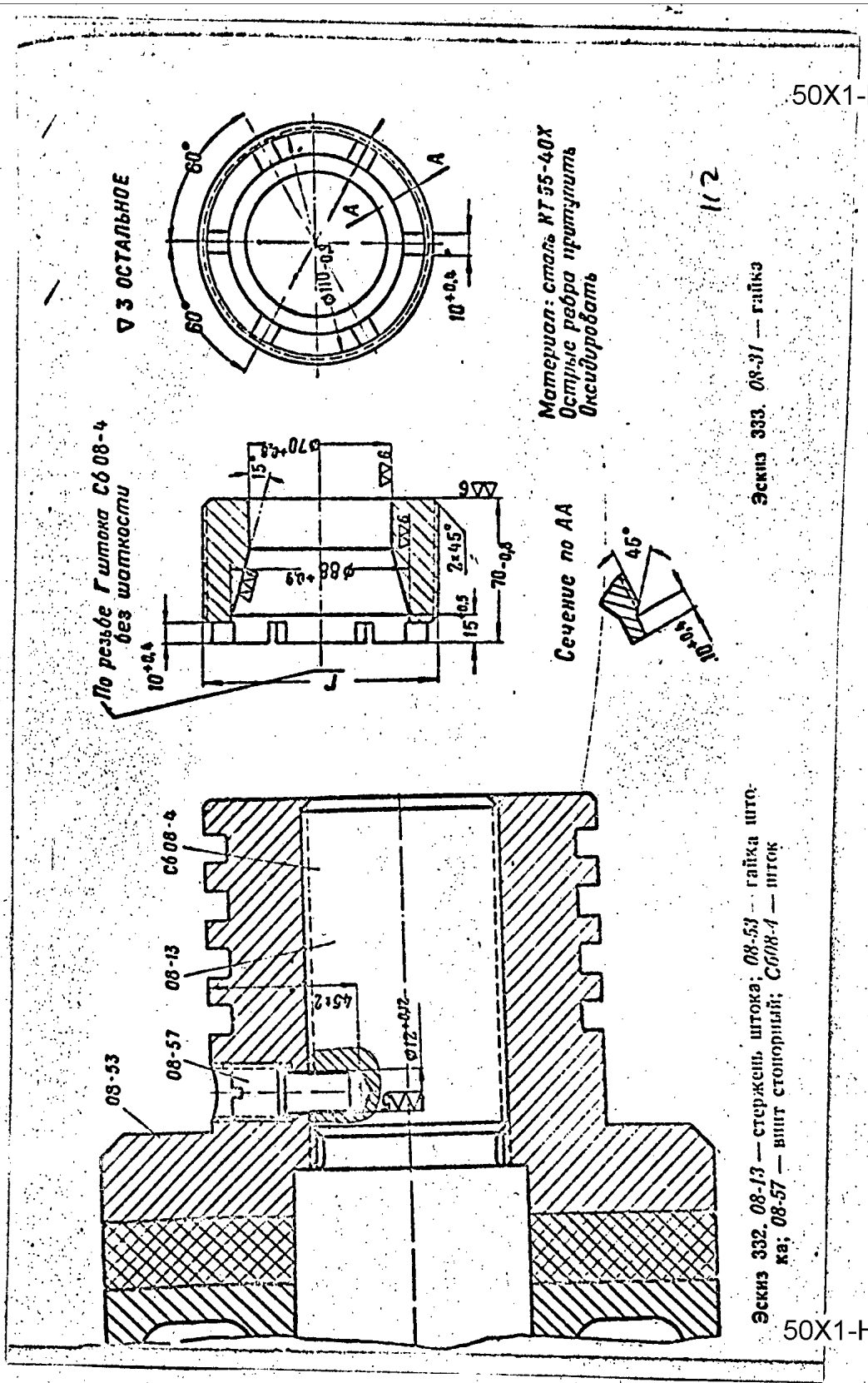


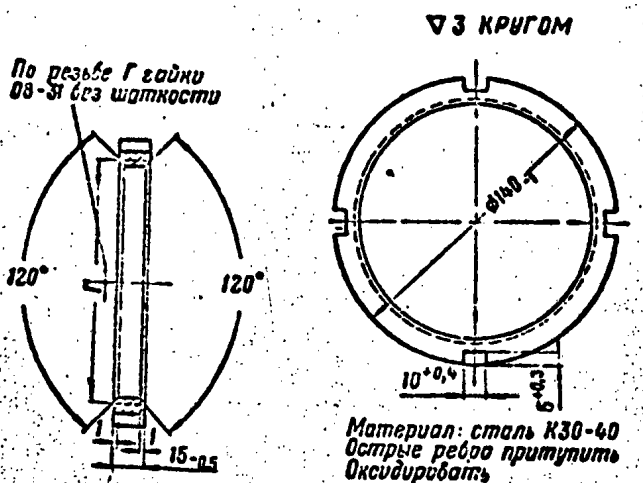
Эскиз 330. *08-13* — стержень штока

Материал: сталь КТ55-40Х
Острые ребра притупить



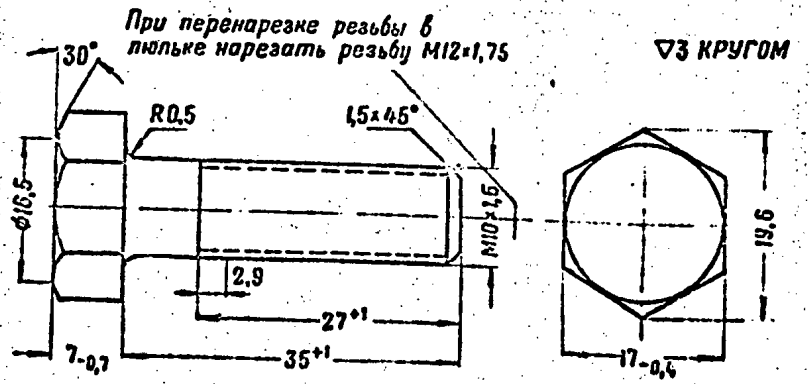
Эскиз 331. *С608-1* — шток: *08-13* — стержень штока; *08-11* — головка штока; *08-58* — кольцо уплотнительное





Материал: сталь К30-40
Острые ребра притупить
Оксидировать

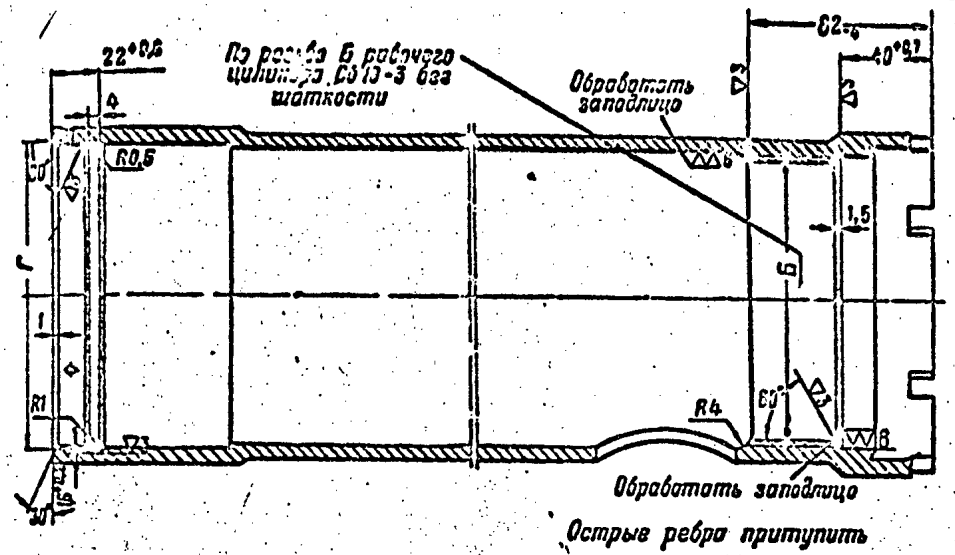
Эскиз 334. 08-32 — контргайка



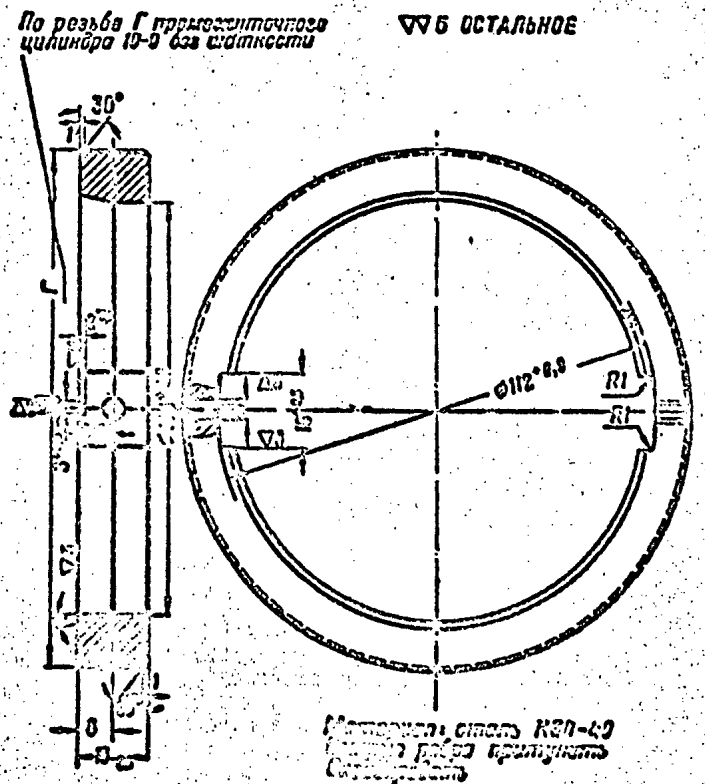
Примечание: четыре болта для приспособления (приложение 16) изготовлять из стали 40

Материал: сталь КТ70-40Х
Острые ребра притупить
Оксидировать

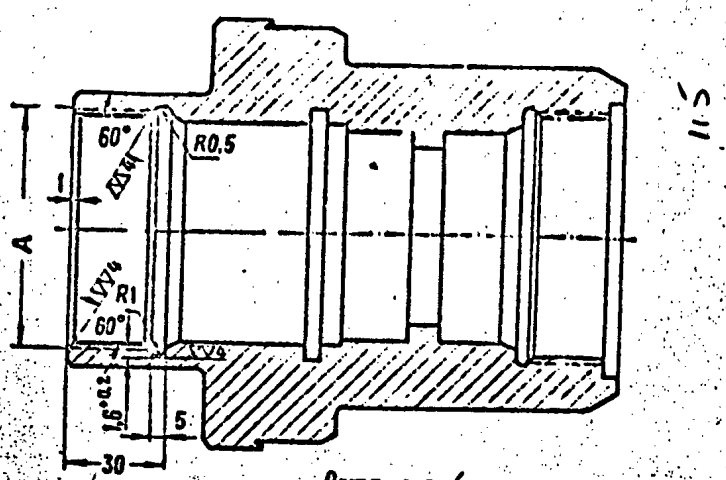
Эскиз 335. 12-8 — болт



Эскиз 336. *10-9* — цилиндр промежуточный

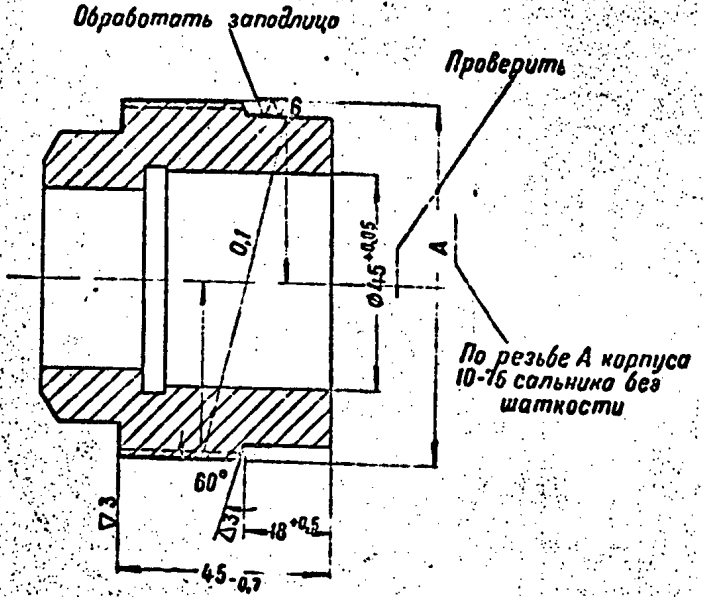


Эскиз 337. *10-13* — гайка сальника



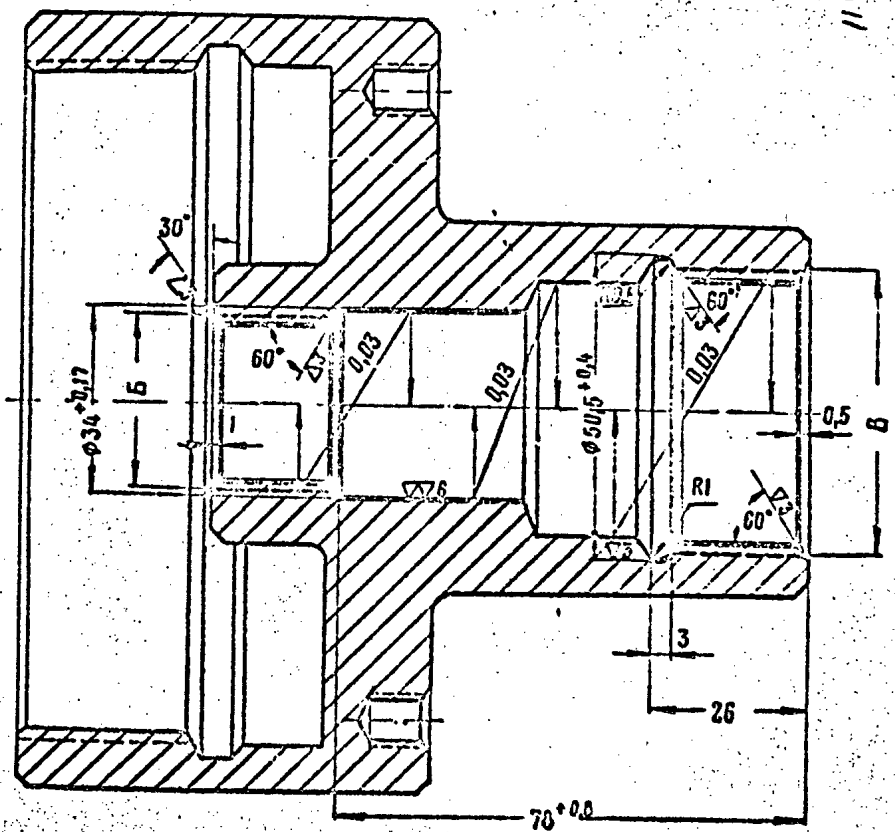
Острые ребра притупить

Эскиз 338. *10-75* — корпус сальника



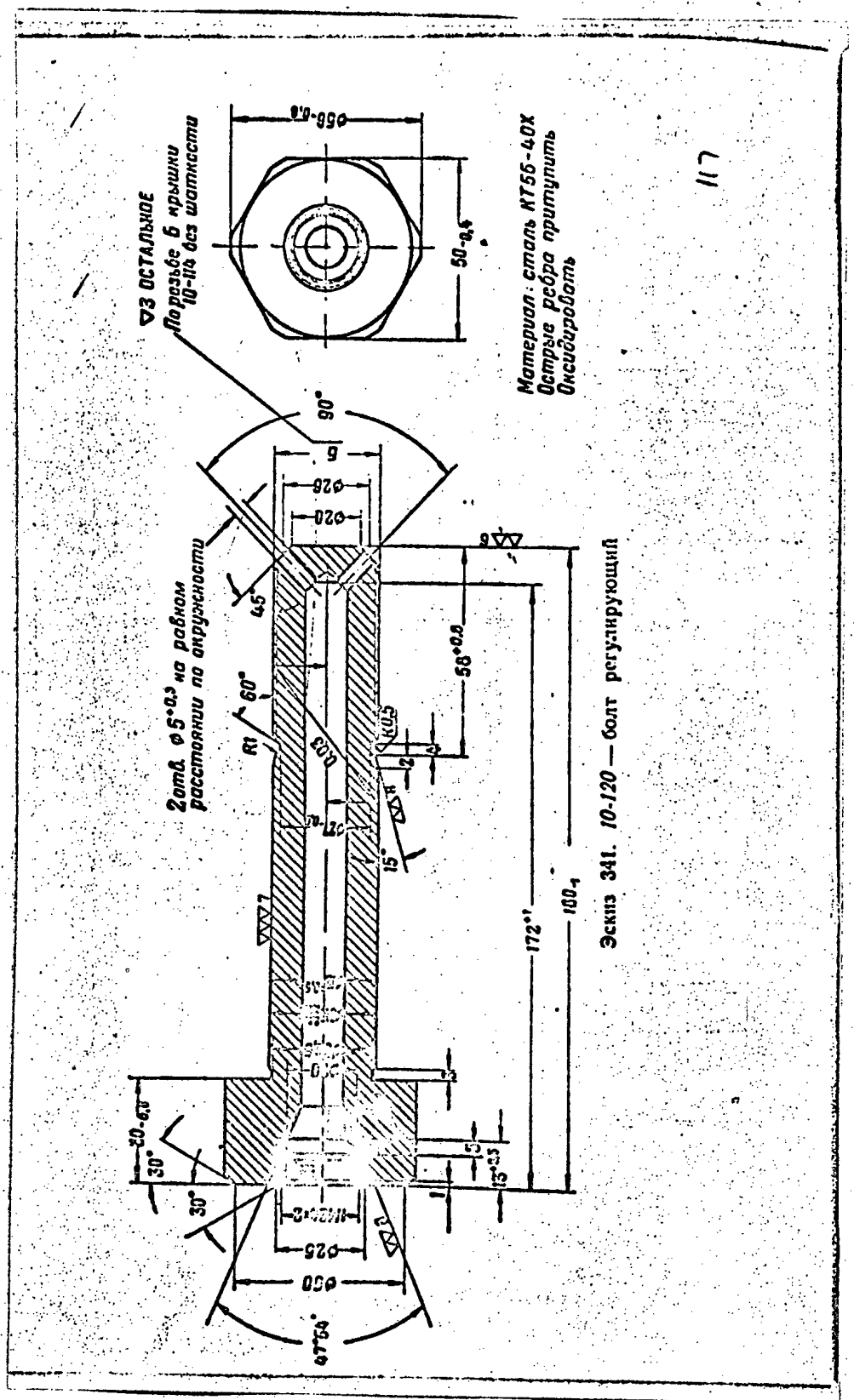
Острые ребра притупить
Оксидировать

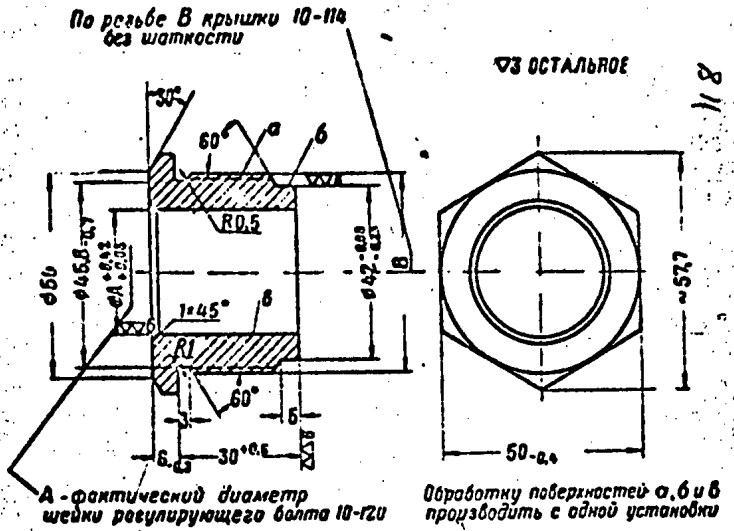
Эскиз 339. *10-81* — гайка сальника



Острые ребра притупить
Оксидировать

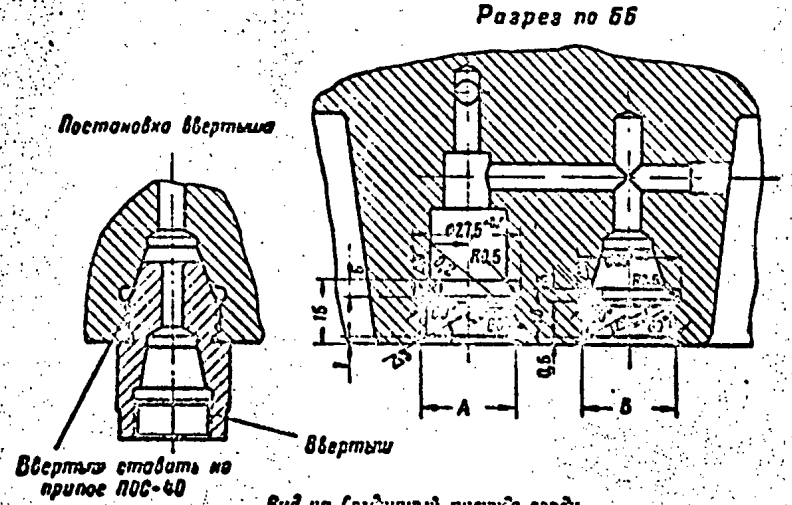
Эскиз 340. *10-114* — крышка



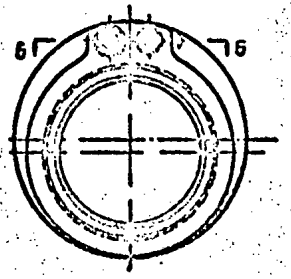


Материал сталь К30-40
Острые ребра притупить
Оксидировать

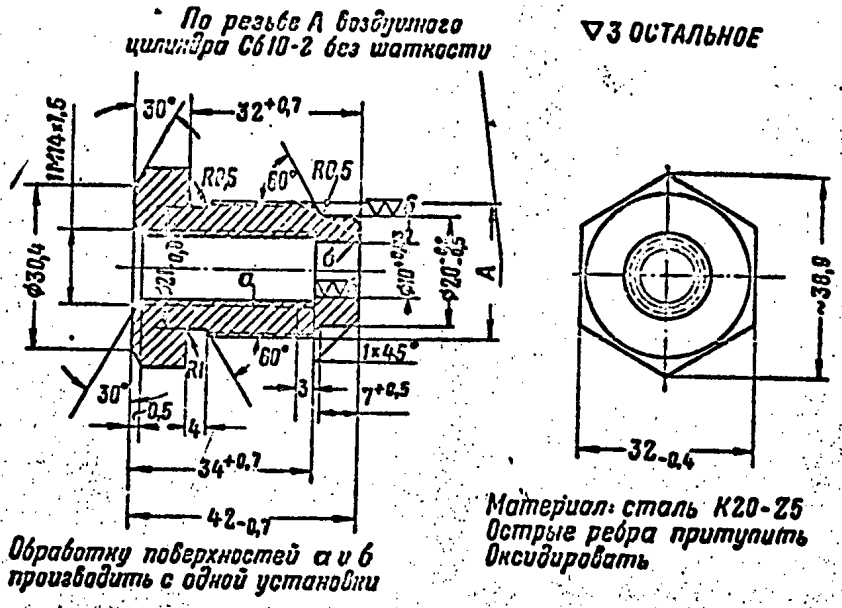
Эскиз 342. *10-119* — гайка



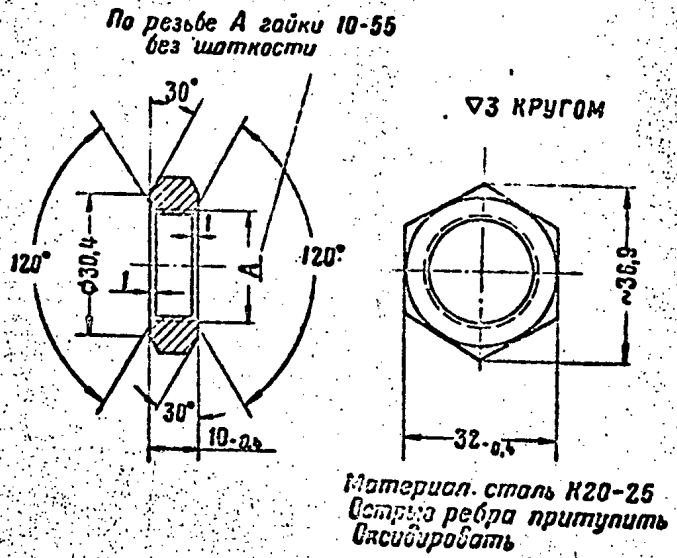
Вид на воздушный цилиндр сзади



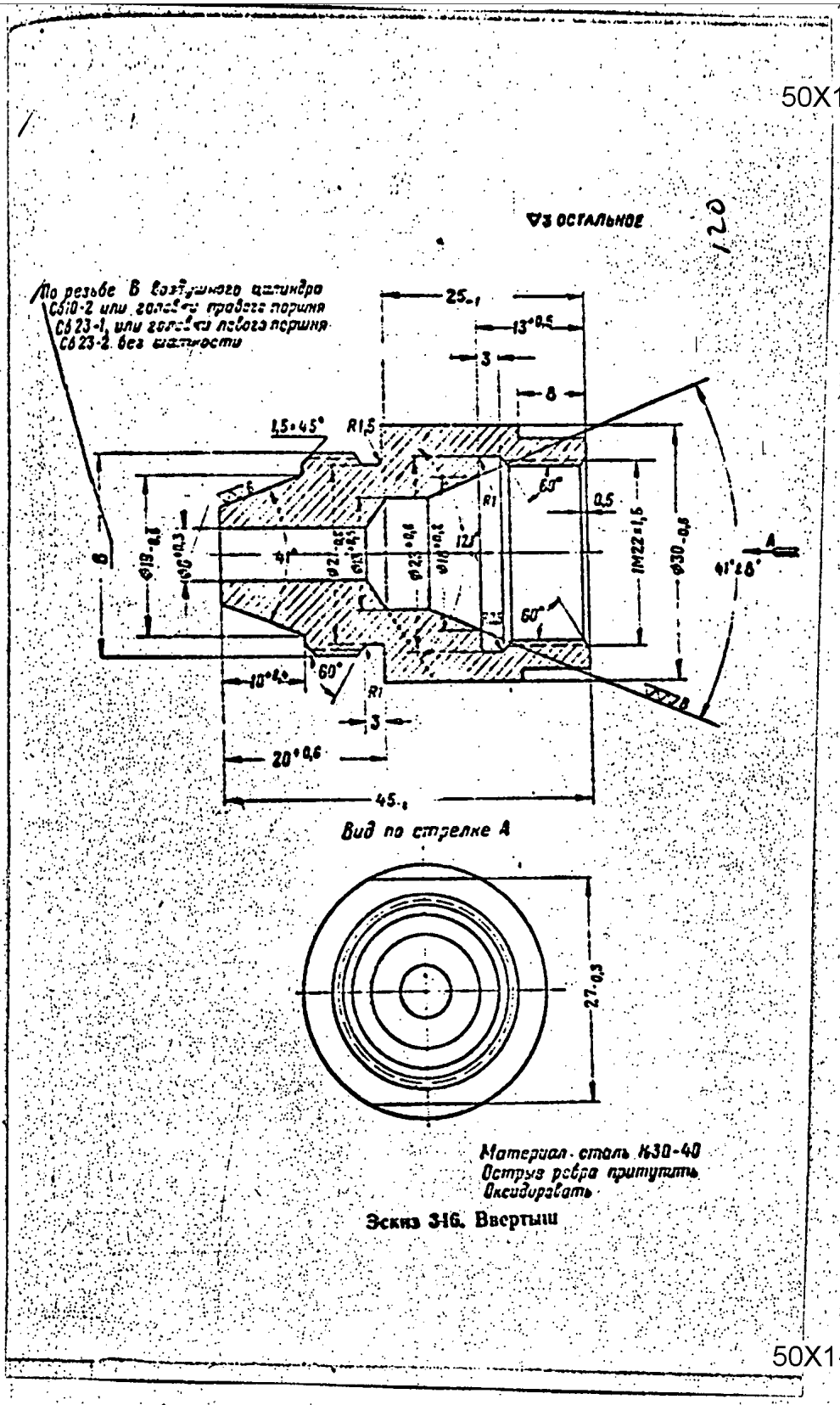
Рама 813, 0610.0 — цилиндр воздушный



Эскиз 344. *10-55* — гайка

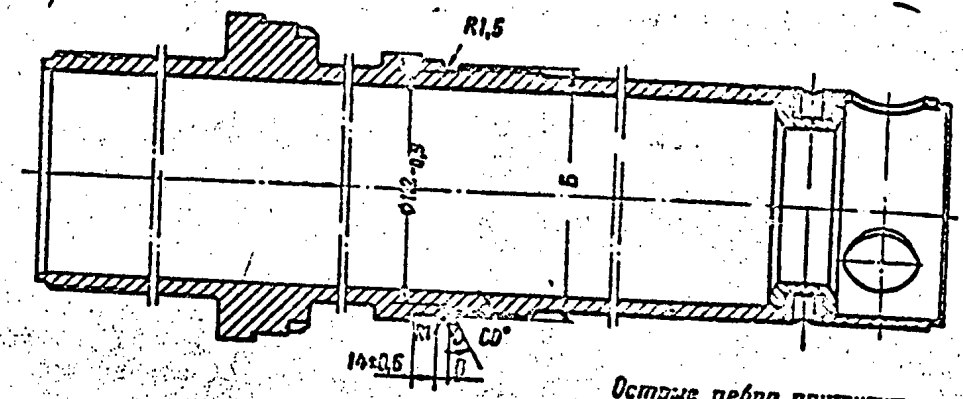


Эскиз 345. *10-56* — контргайка



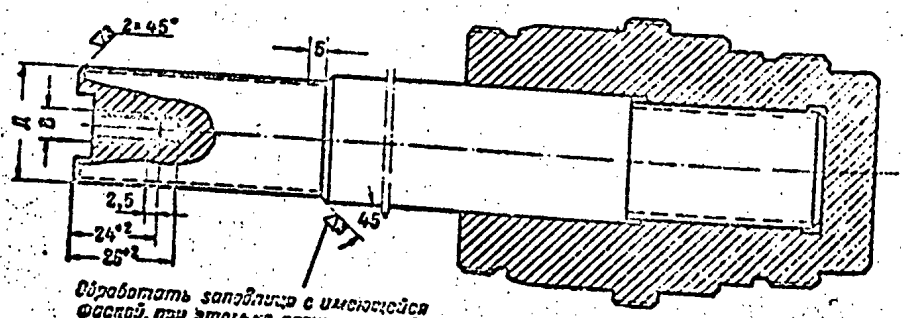
Материал - сталь К30-40
Острые ребра притупить
Оксидировать

Эскиз 316. Вертыш



Острые ребра притупить

Эскиз 347. *С610-3* — цилиндр рабочий

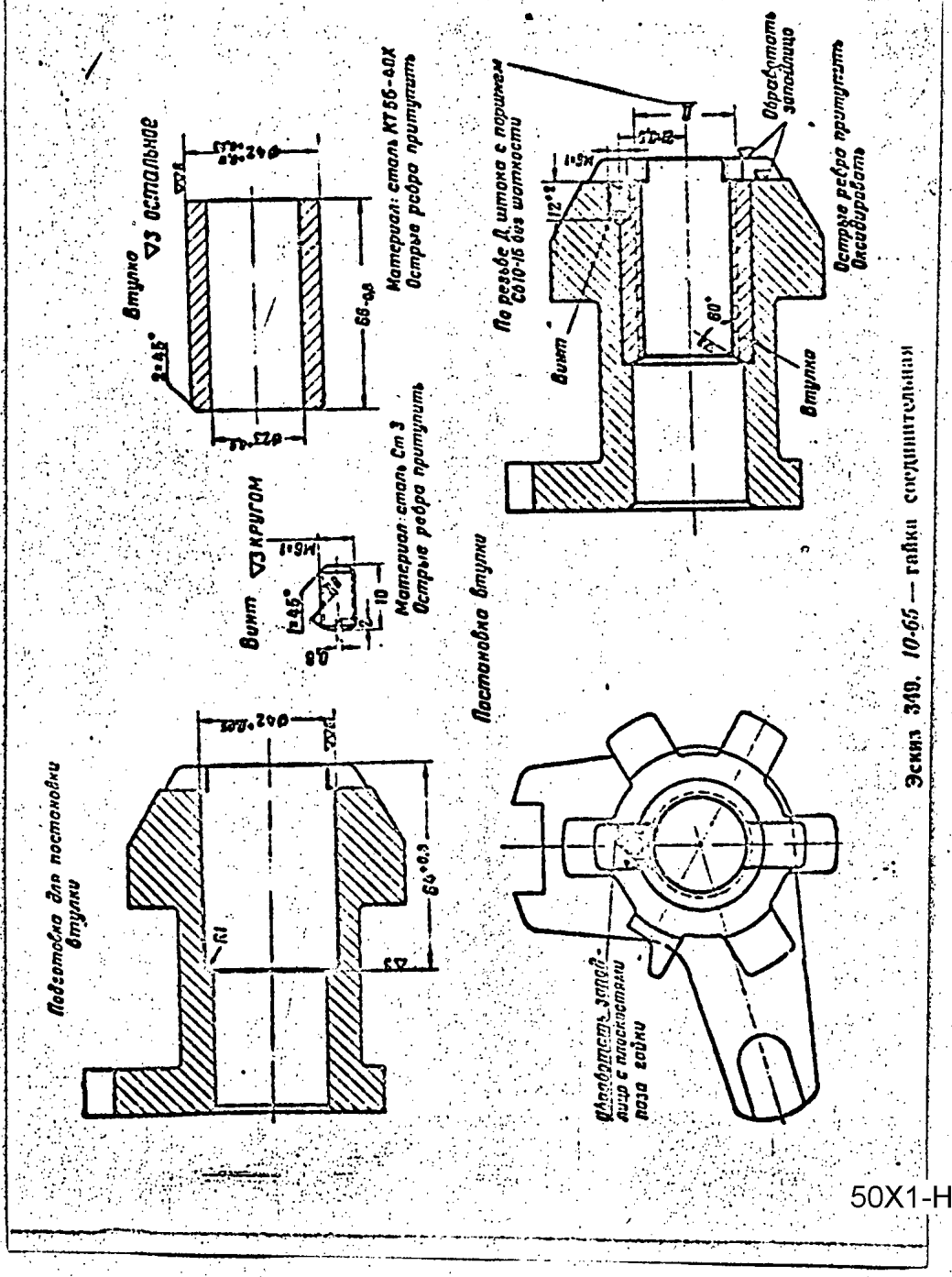


Обработать запрессовку с имеющейся фаской, при этом не нарушить слой хрома

Острые ребра притупить

Эскиз 348. *С610-15* — шток с поршнем

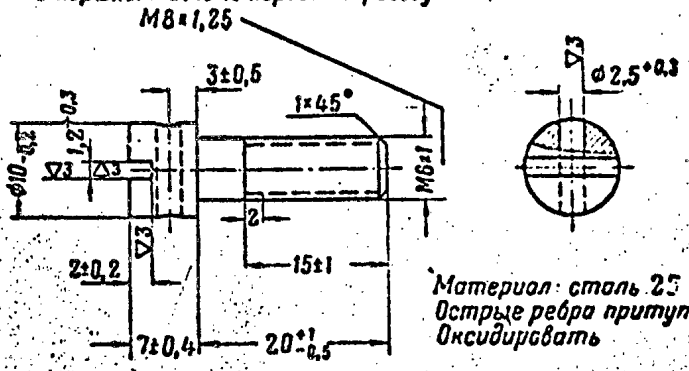
12



123

При перенарезке резьбы в штоке с поршнем С610-15 нарезать резьбу М8×1,25

▽4 ОСТАЛЬНОЕ

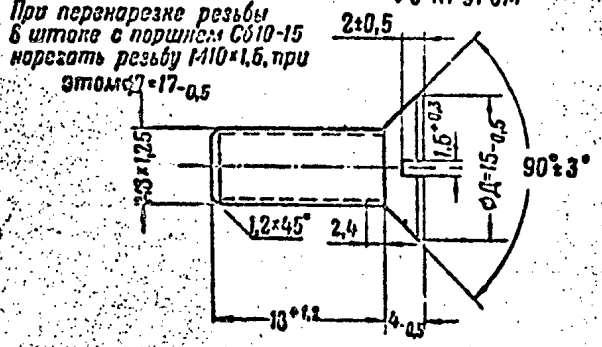


Материал: сталь 25
Острые ребра притупить
Оксидировать

Эскиз 350. *A51066-137* — винт

▽3 КРУГОМ

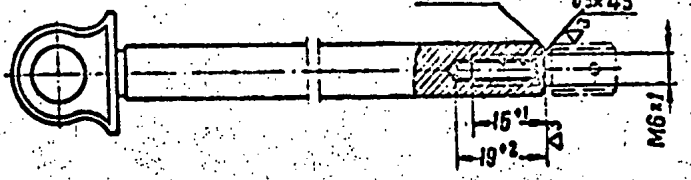
При перенарезке резьбы в штоке с поршнем С610-15 нарезать резьбу М10×1,5, при этом Ø17 -0,5



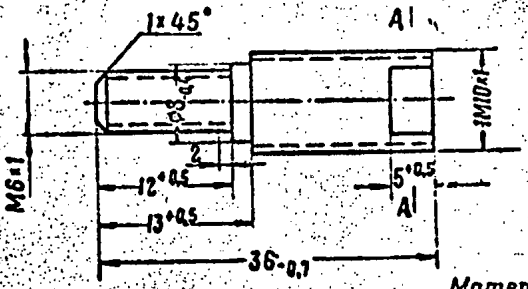
Материал: сталь 25
Острые ребра притупить

Эскиз 351. (*A51060-13*) — винт

Подготовка для постановки концевой части

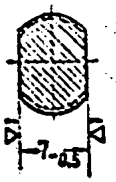


Концевая часть



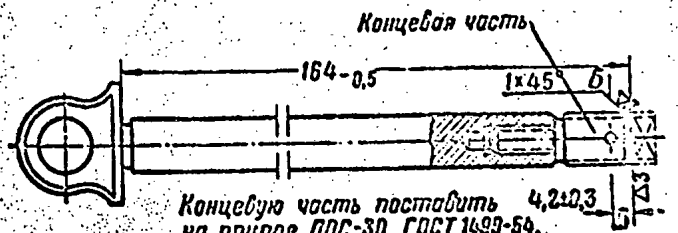
▽3 ОСТАЛЬНОЕ

Сечение по АА



Материал: сталь КТ50-35Х
Острые ребра притупить

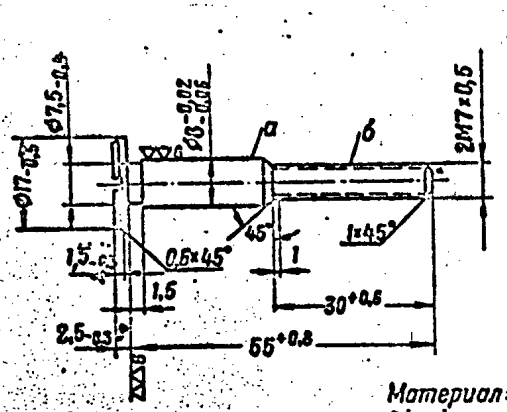
Постановка концевой части



Концевую часть поставить на припое ПОС-30 ГОСТ 1499-54, завинтив ее до отказа
Оксидировать

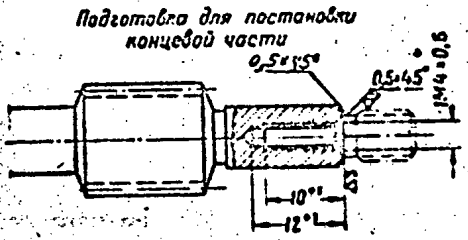
Сечение по ББ

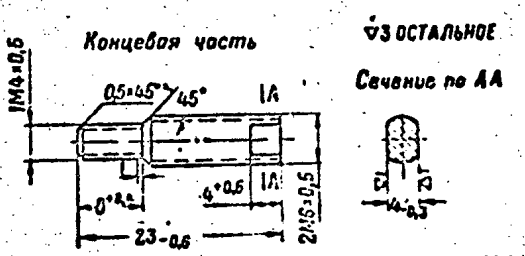
Эскиз 352. 12-20 — валик с ушком



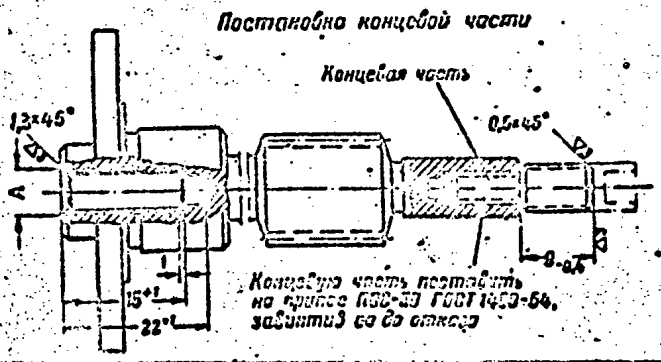
Материал: сталь К30-40
Обработку поверхностей а и б производить с одной установки
Острые ребра притупить
Оксидировать

Эскиз 353. 12-44 — Болт

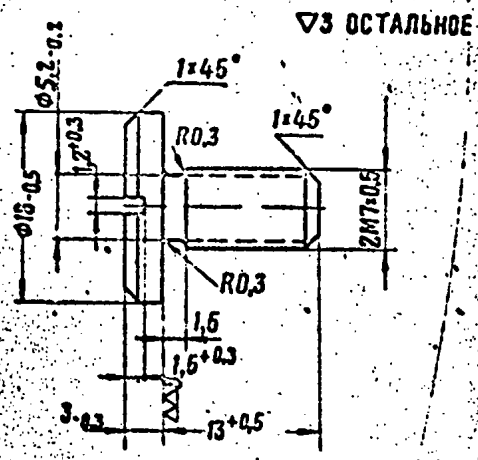




Материал: сталь КТ60-35Х
Острые ребра притупить

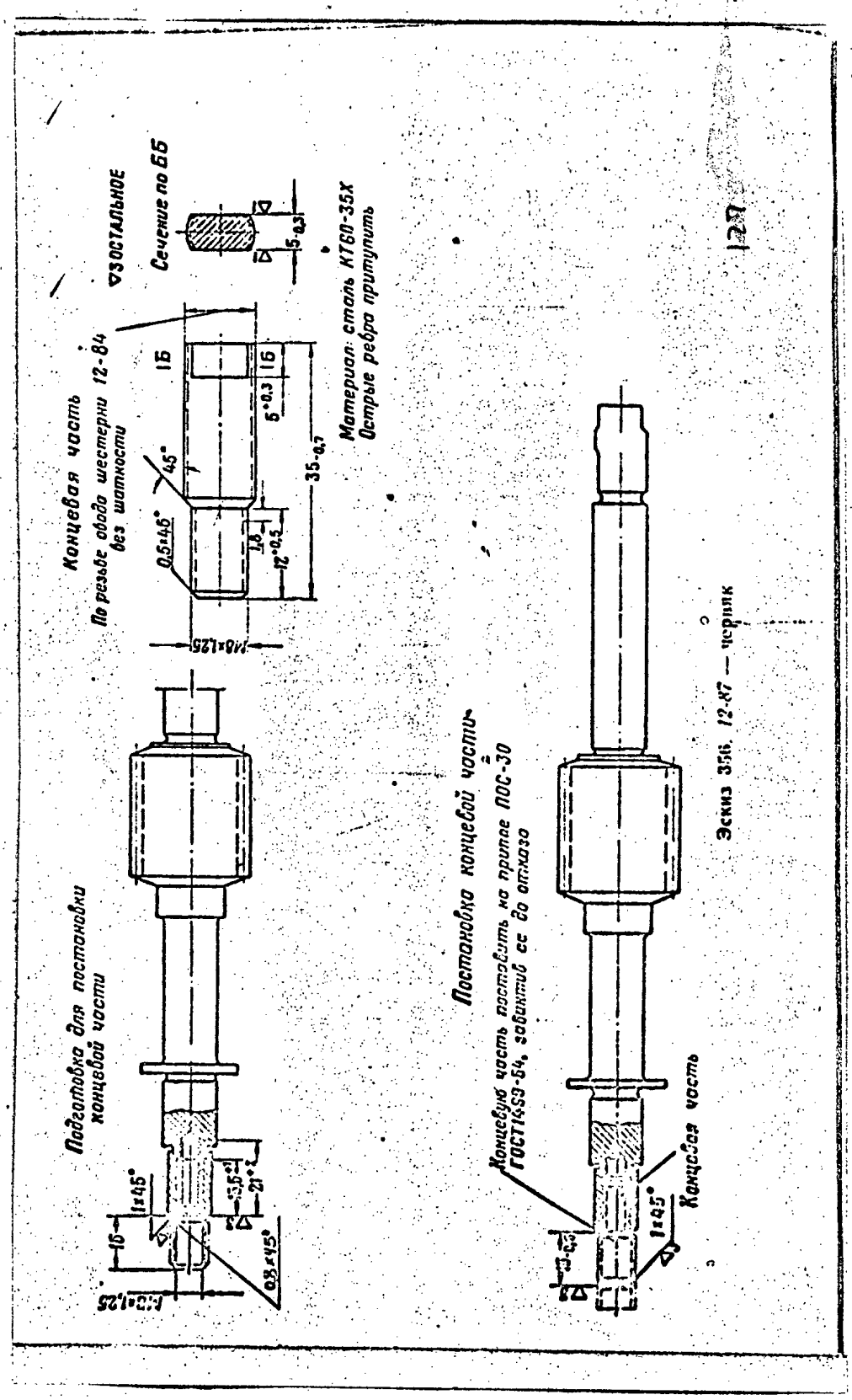


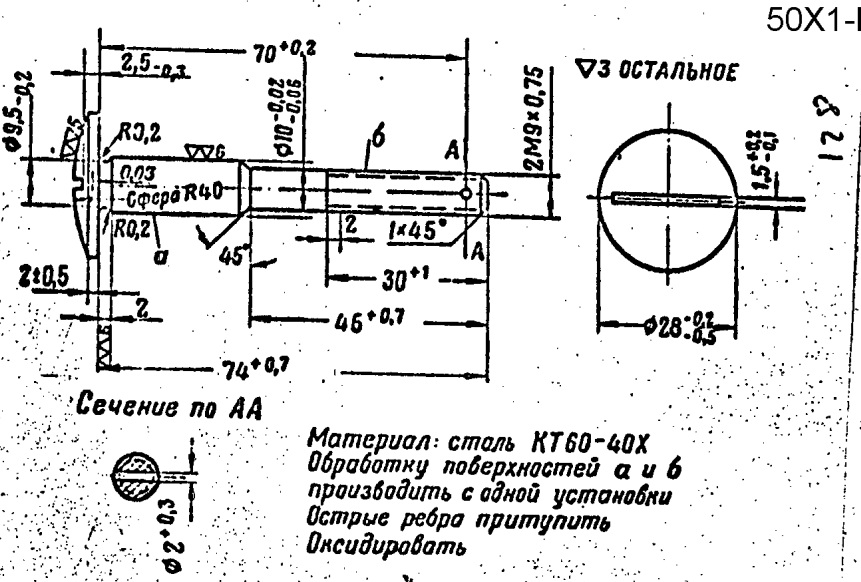
12.6



Материал: сталь Х30-40
Острые ребра притупить
Оксидировать

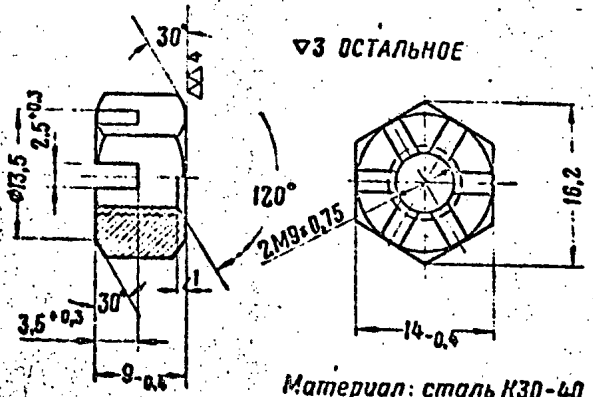
Эскиз 355. 12-54 — винт





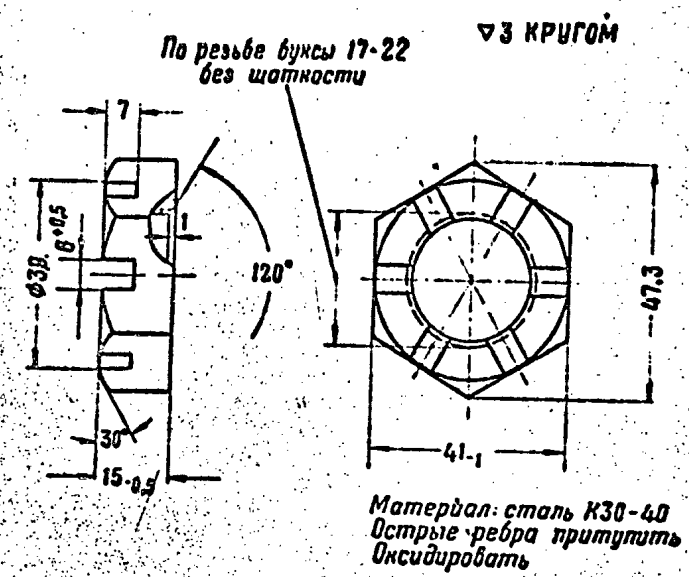
Материал: сталь КТ60-40Х
Обработку поверхностей а и б производить с одной установки
Острые ребра притупить
Оксидировать

Эскиз 357. 12-82 — болт

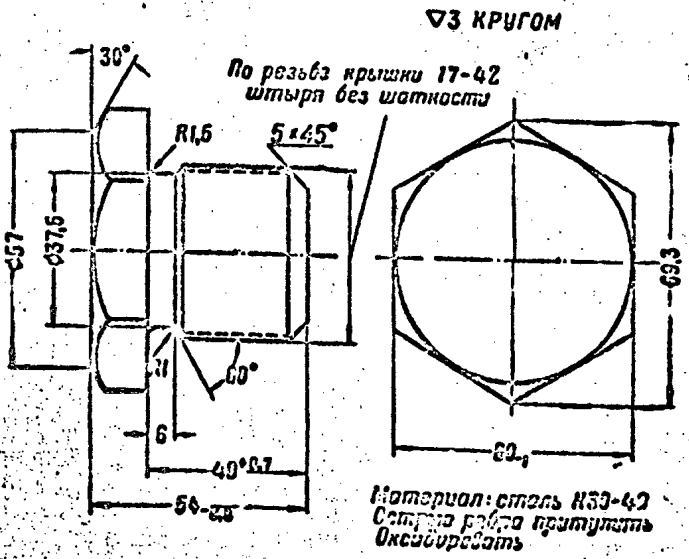


Материал: сталь К30-40
Острые ребра притупить
Оксидировать

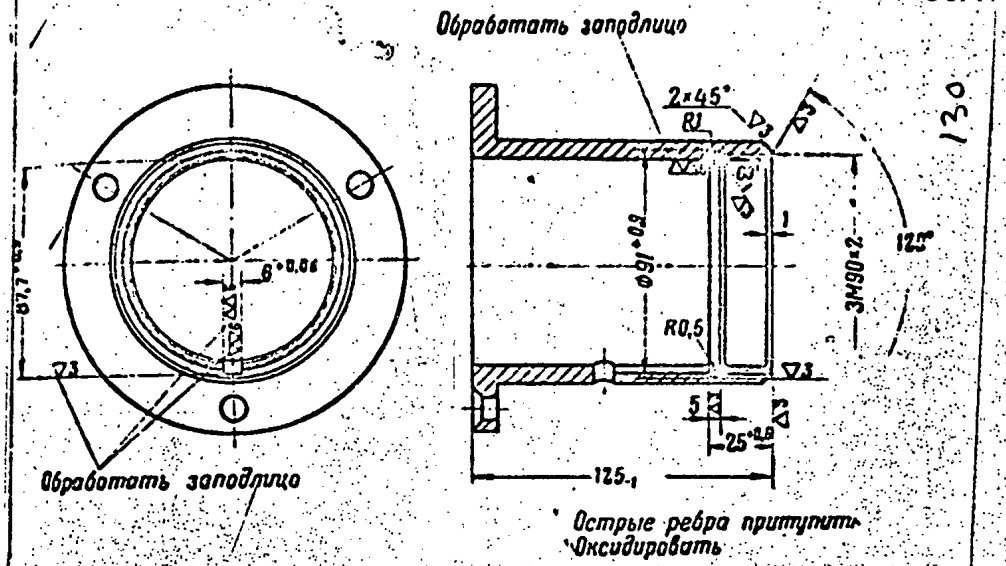
Эскиз 358. 12-83 — гайка



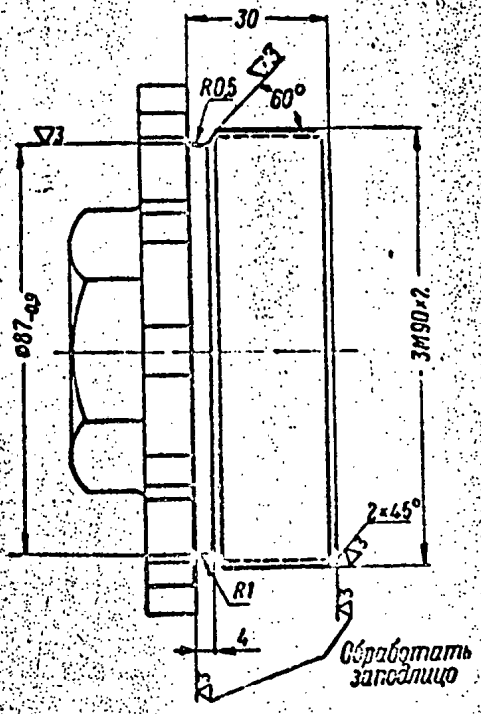
Эскиз 359. *17-26* — гайка



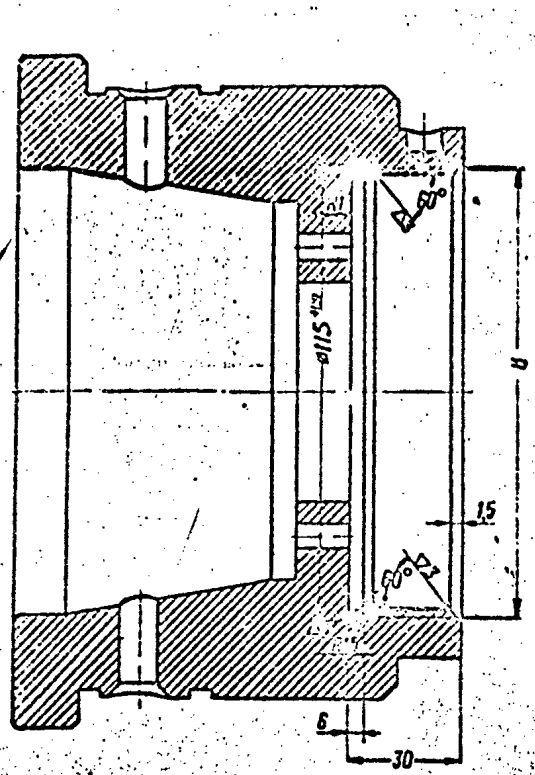
Эскиз 360. *17-43* — болт регулирующий



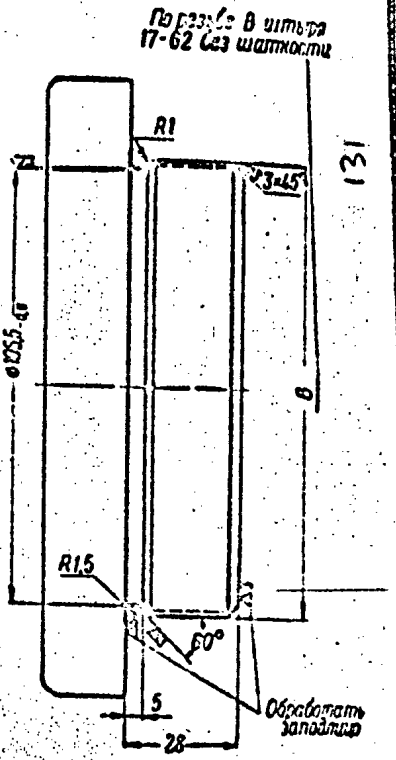
Эскиз 361. *17-50* — корпус буксы



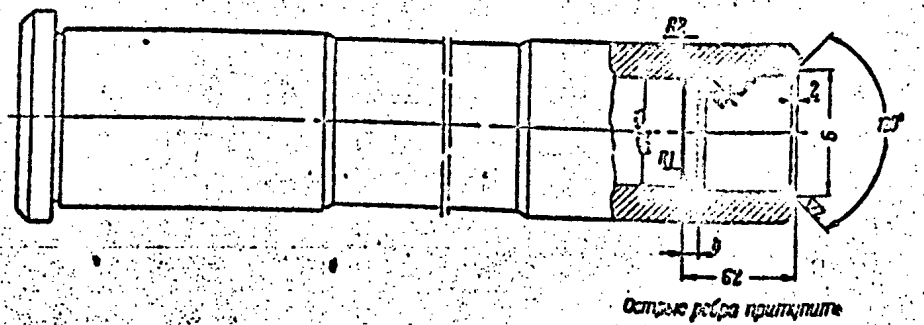
Эскиз 362. *17-53* — гайка нажимная



Эскиз 363. *17-62* — штырь

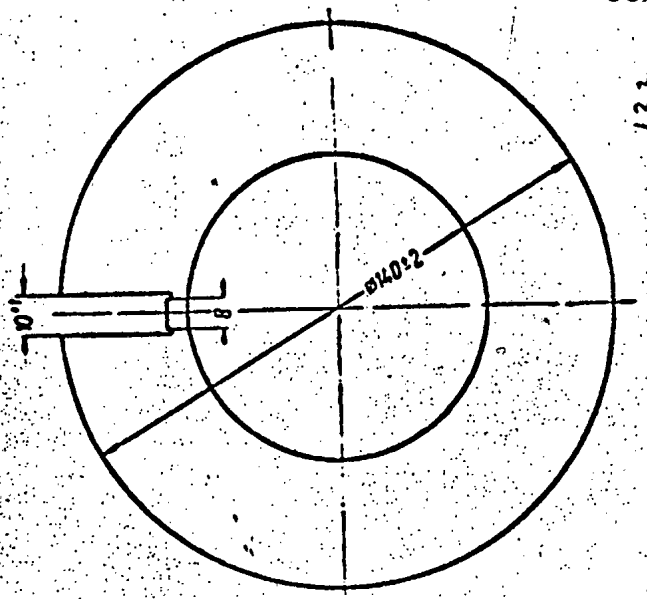


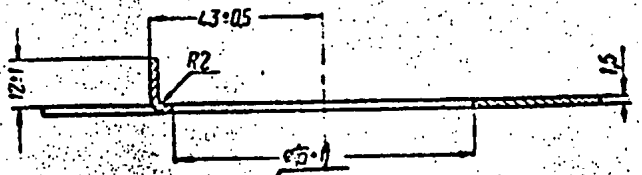
Эскиз 364. *17-63* — гайка



Эскиз 365. *19-100* — болт шарнирный

2 кругом

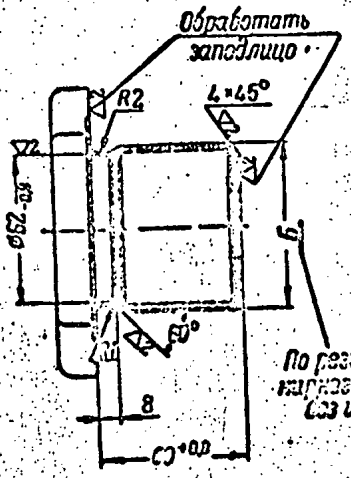




Б-фактический наружный диаметр резьбы болта 19-103

Материал сталь К20-25
Острые ребра притупить
Оксидировать

Эскиз 366. *19-102* — шайба стопорная

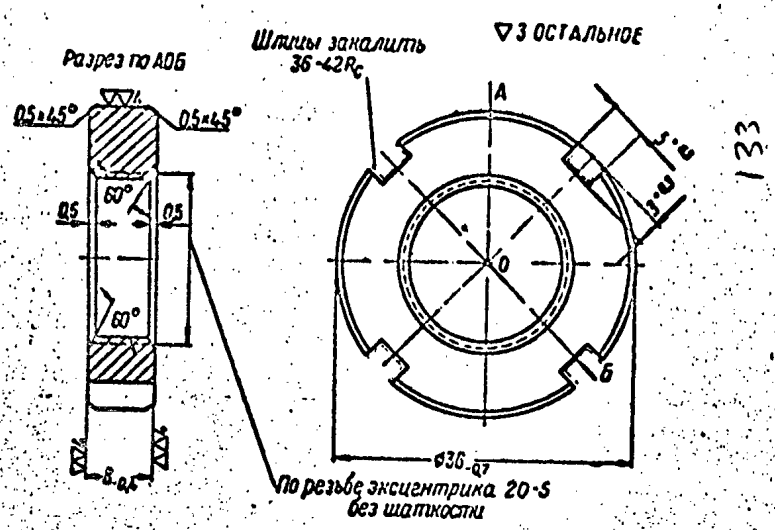


По резьбе Б шарнирного болта 19-100 без шайбочки

Острые ребра притупить
Оксидировать

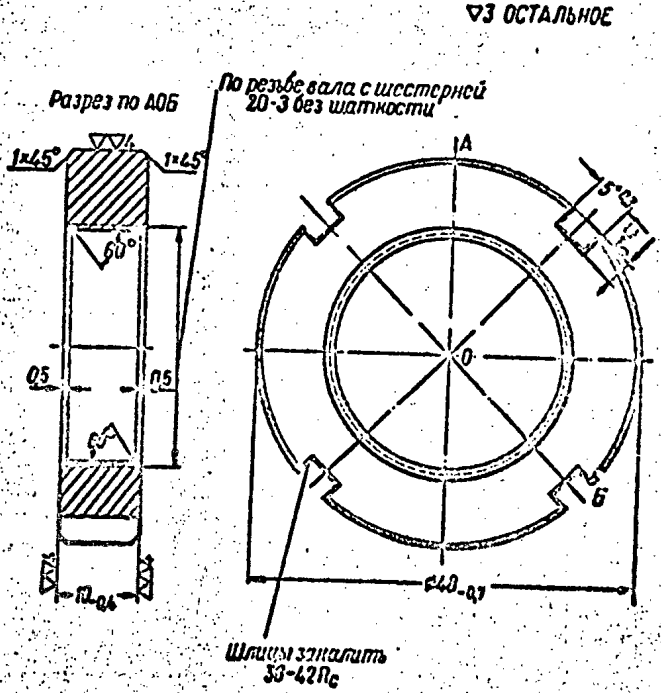
Эскиз 367. *19-103* — болт

1—320



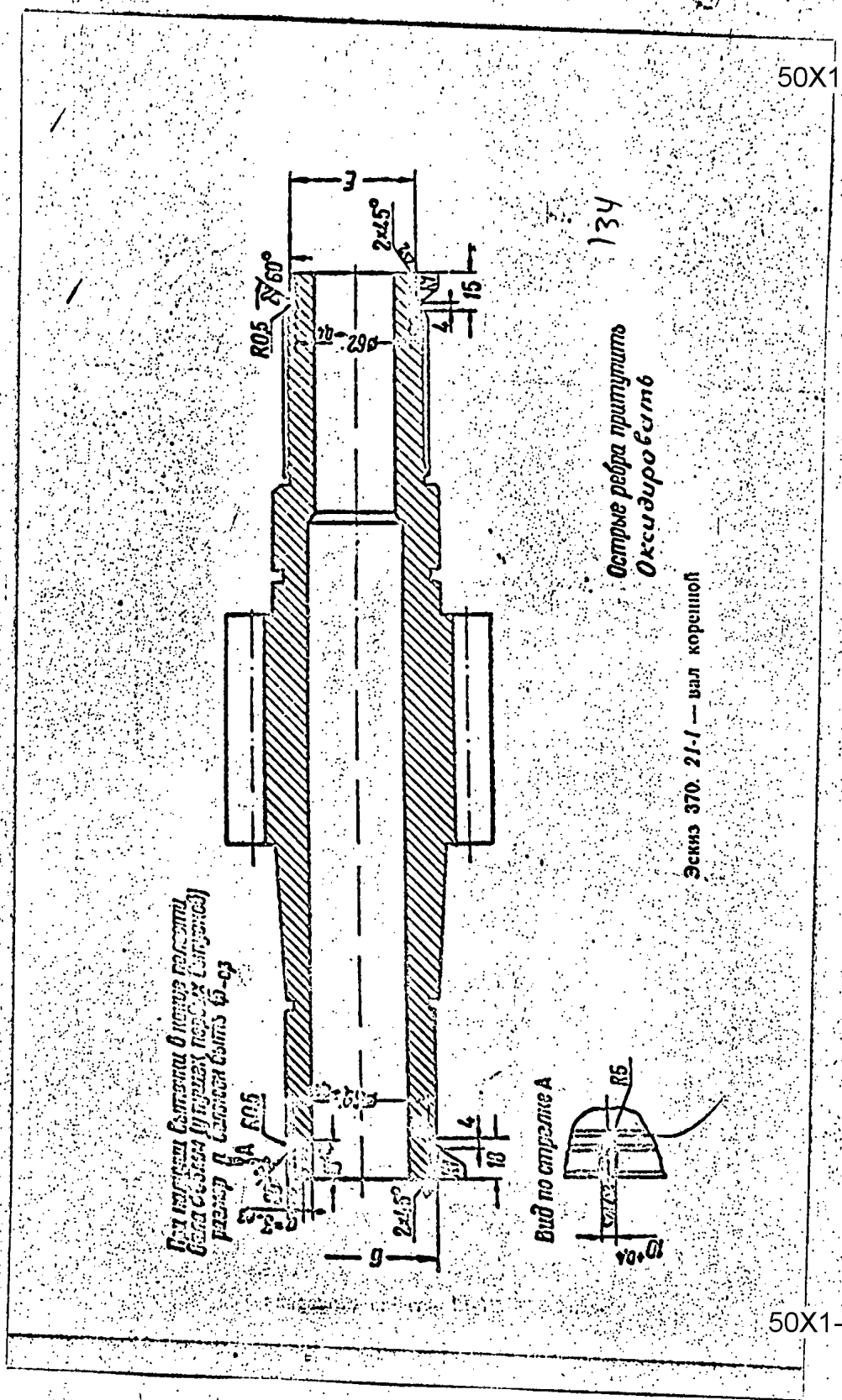
Материал: сталь 45
Острые ребра притупить
Оксидировать

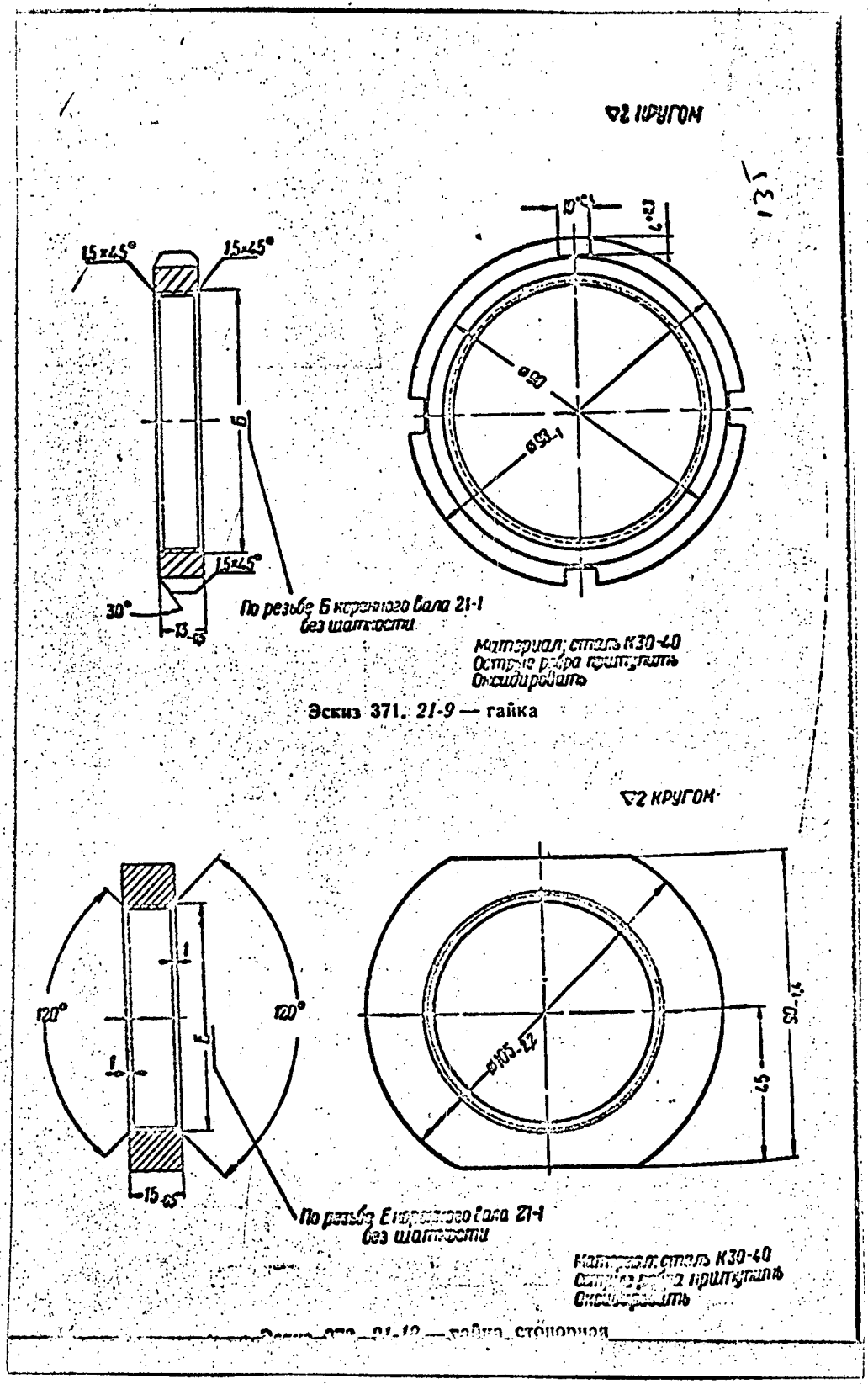
Эскиз 368. *A51970-5* — гайка круглая



Материал: сталь 45
Острые ребра притупить
Оксидировать

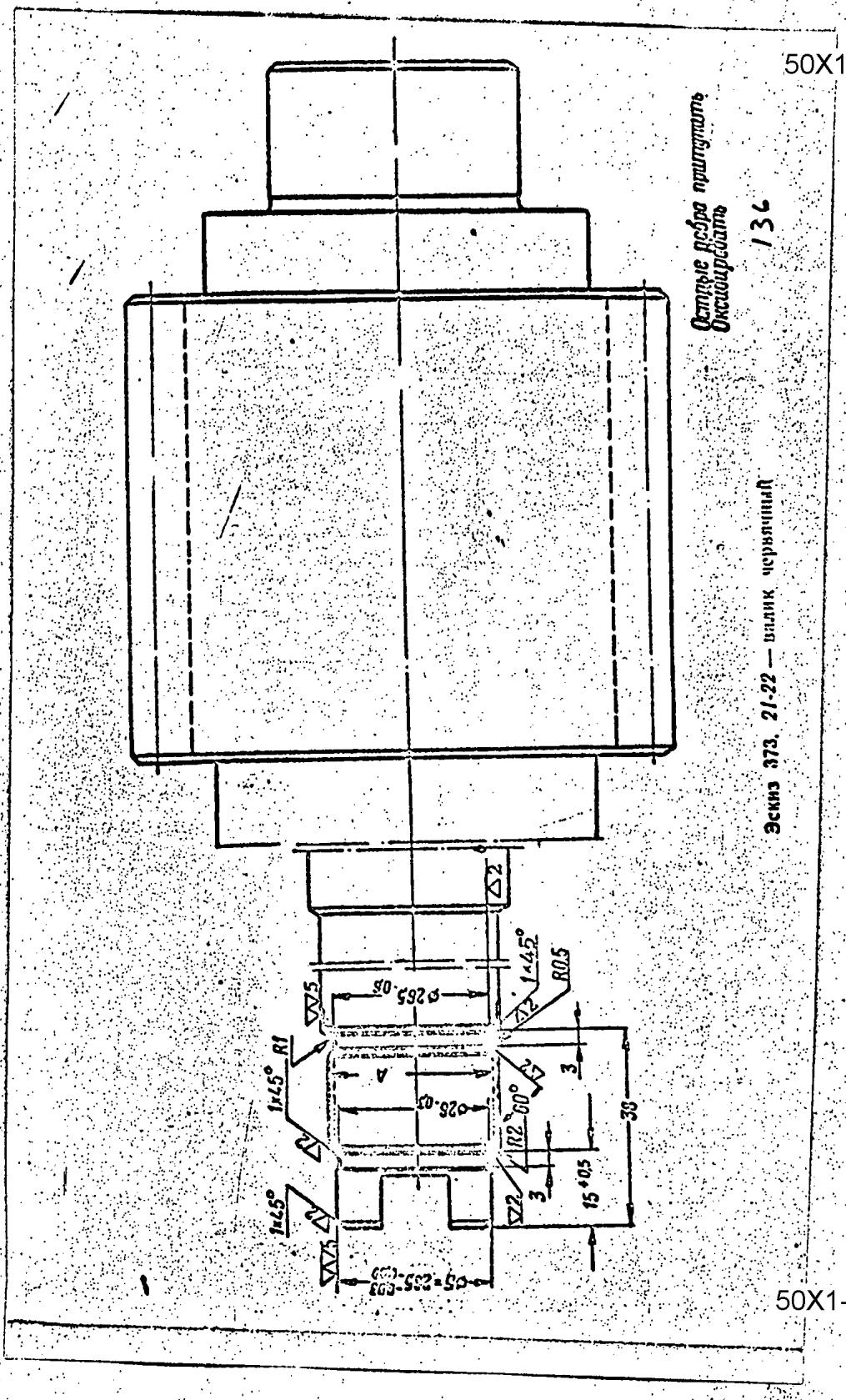
Эскиз 369. *A51970-9* — гайка круглая

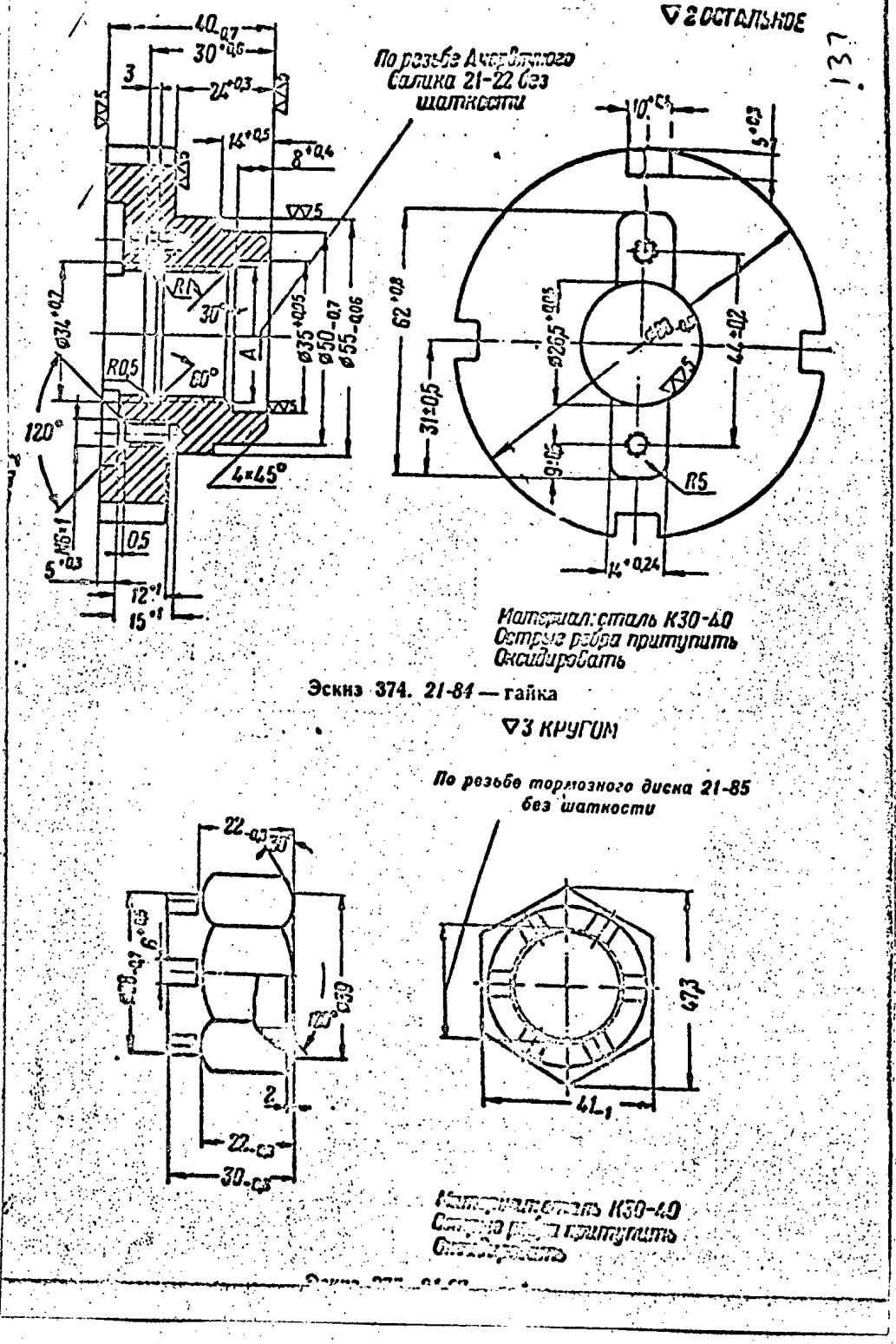




Эскиз 371. *21-9* — гайка

Эскиз 372. *21-12* — гайка стопорная





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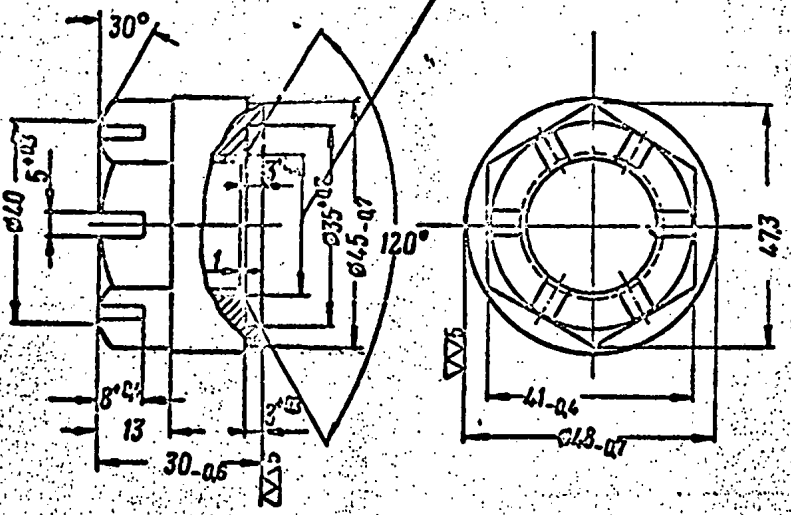
По резьбе вала с шестерней 22-1 без шаткости

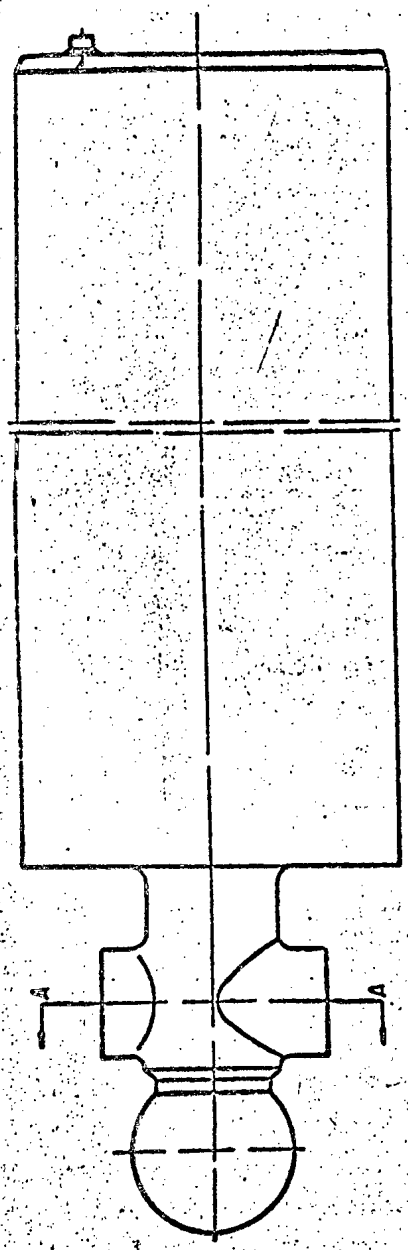
▽2 ОСТАЛЬНОЕ

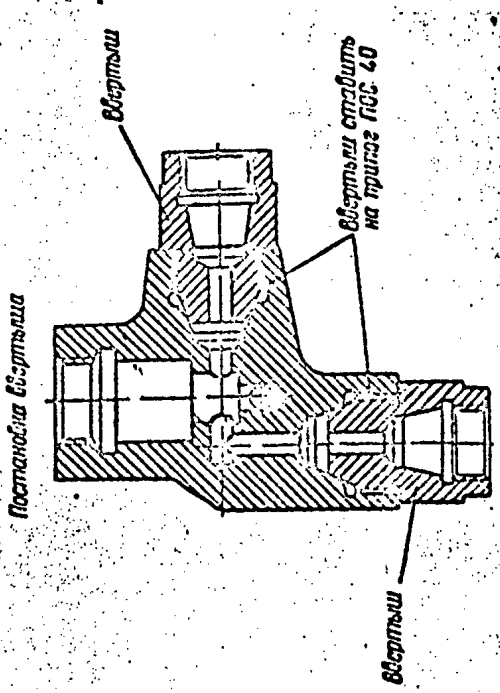


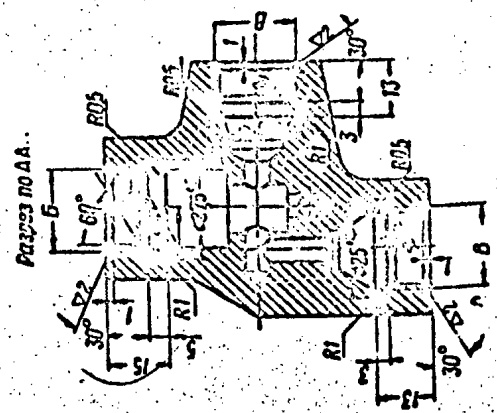
Материал: сталь К30-40
Острые края притупить
Оксидировать

Эскиз 376. 22-13 — гайка

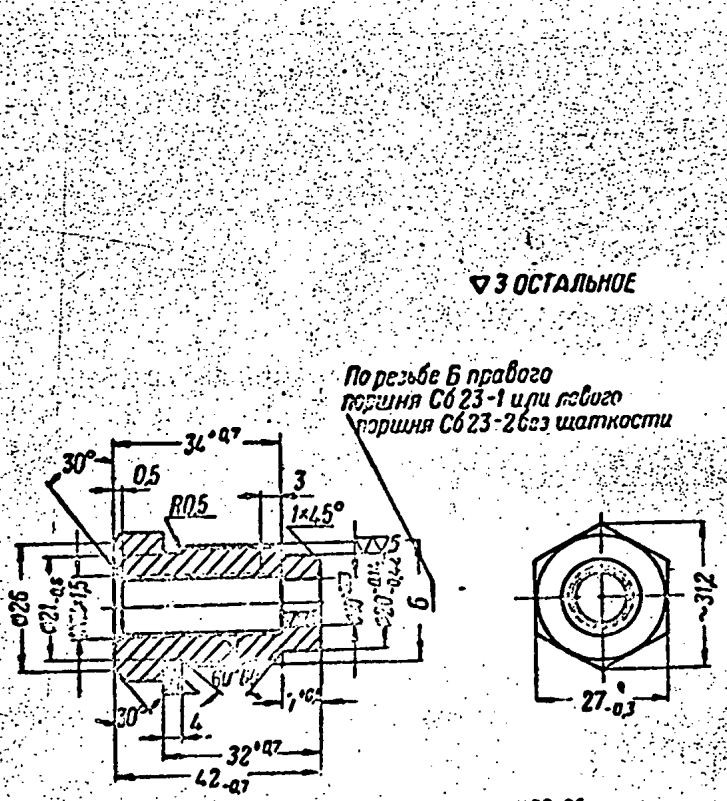
139





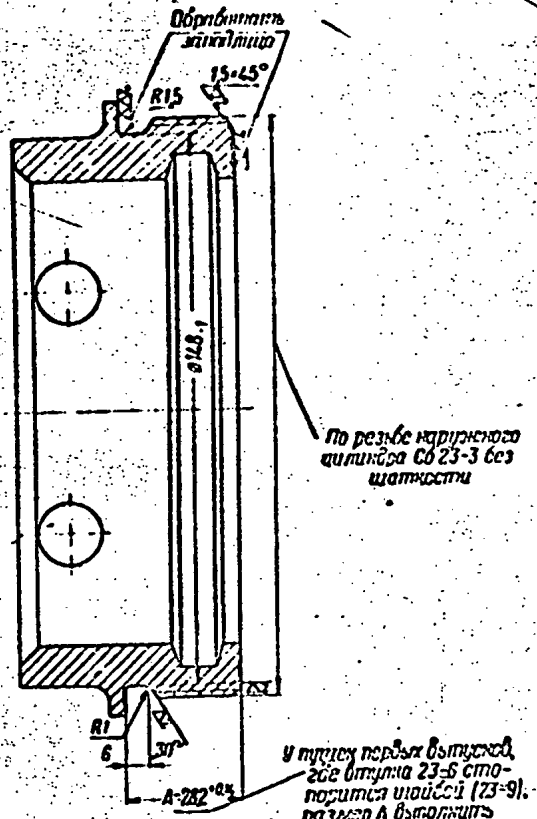


Эскиз 377. С623-1 — поршень правый



Материал: сталь К20-25
Обрабатку отверстия ø10 +0,03 и нарезку резьбы М14×1,5 производить с одной установки
Острые ребра притупить
Оксидировать

Эскиз 378. 23-55 — гайка



Острые ребра притупить
Оксидировать

Эскиз 379. 23-6 — втулка

50X1-HUM

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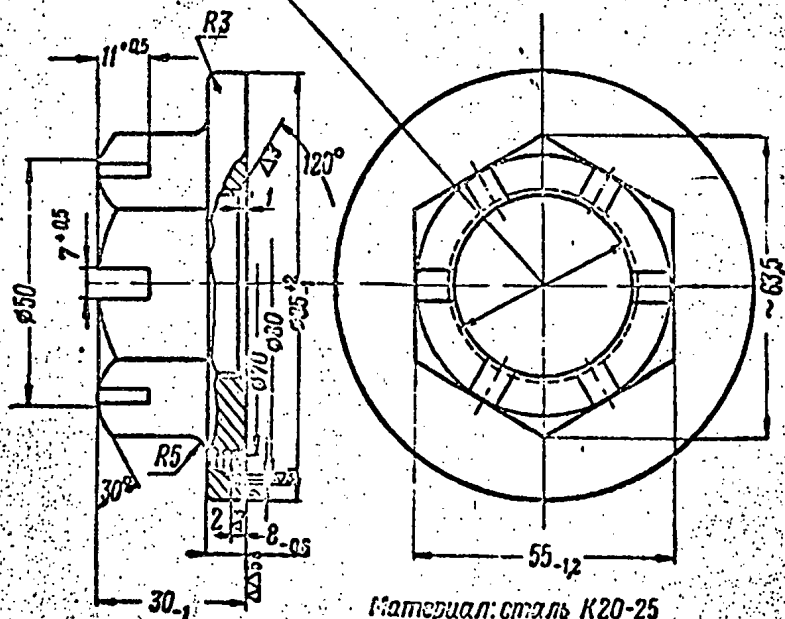
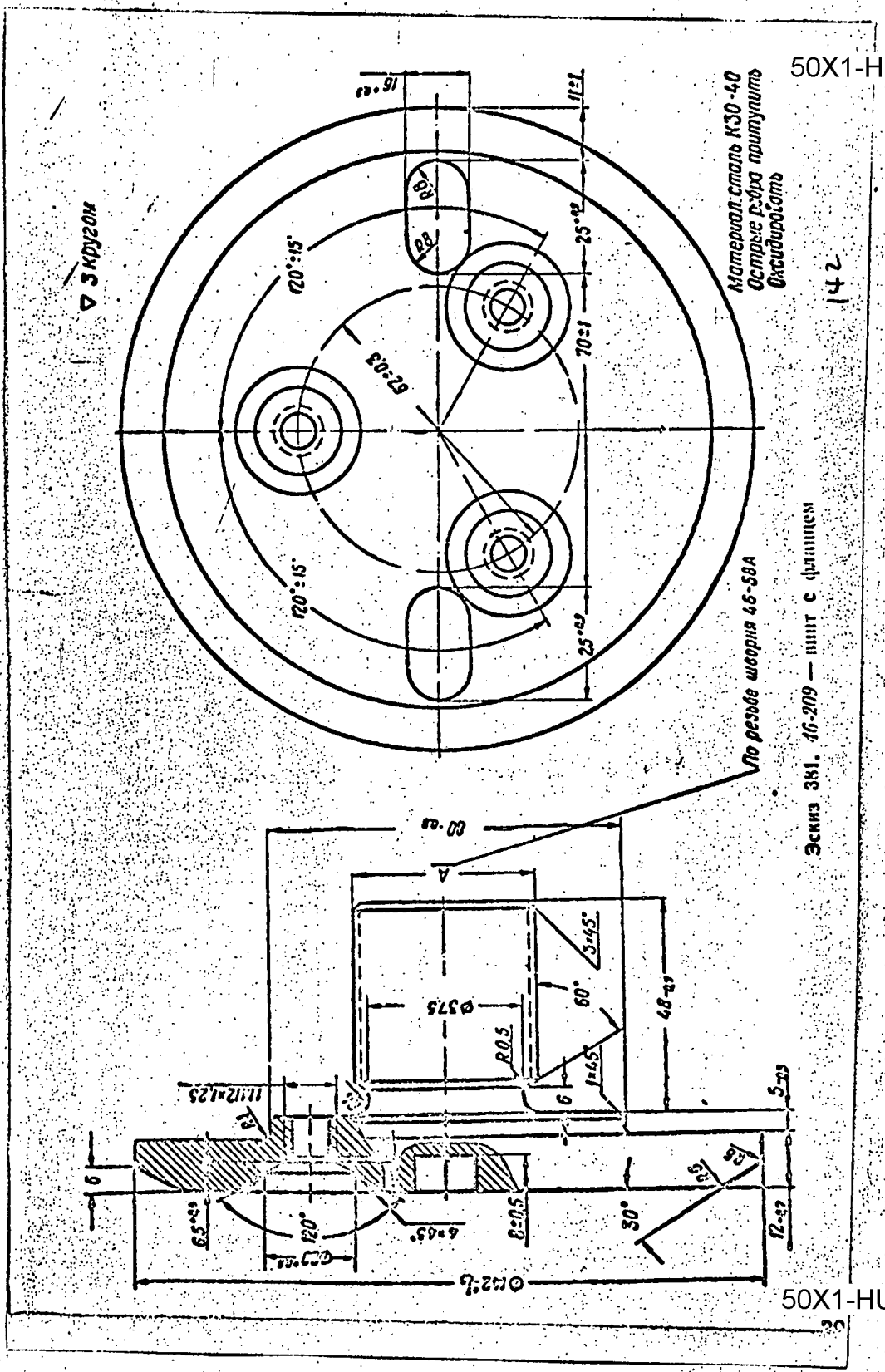
▽ 2 ОСТАЛЬНОЕ

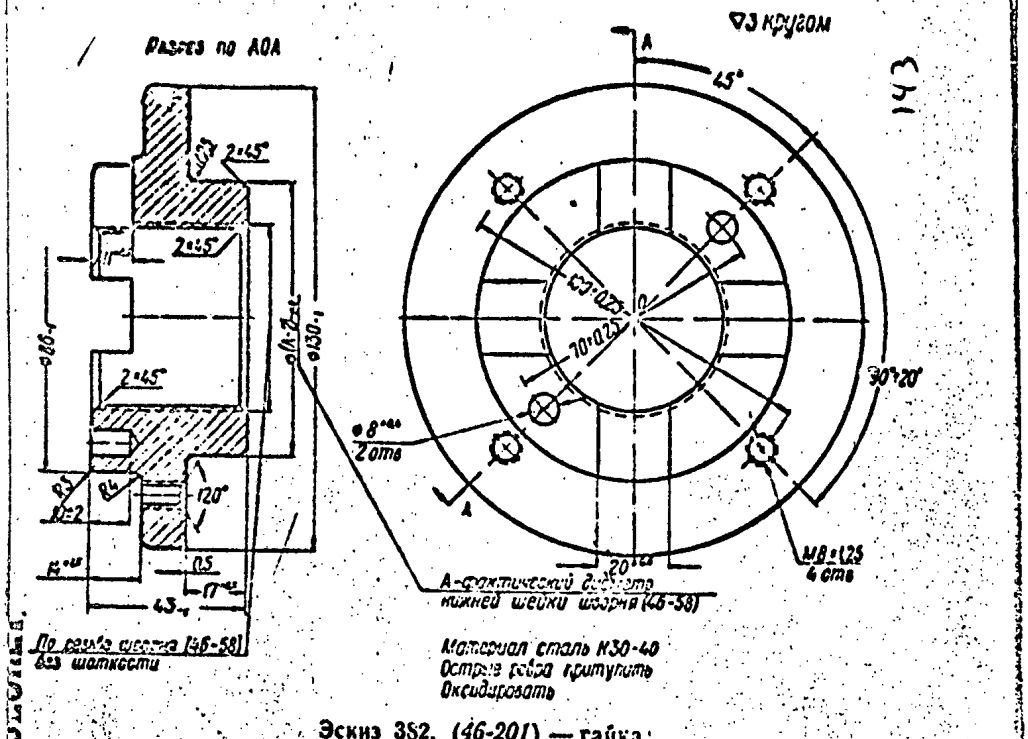
По резьбе оси 46-54 без шаткости



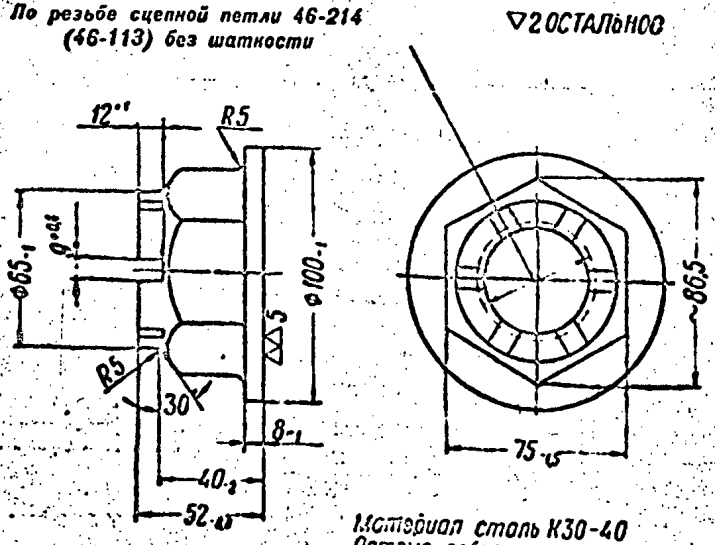
Материал: сталь К20-25
Острые ребра притупить
Оксидировать

Эскиз 380. 46-59 — гайка





Эскиз 382. (46-201) — гайка



Эскиз 383. 46-114 — гайка

Appendix 7
Приложение 7

Device for Measuring the Diameter of the Bore Between the Grooves in the Place of Expansion

ПРИСПОСОБЛЕНИЕ ДЛЯ ОБМЕРА КАНАЛА СТВОЛА ПО НАРЕЗАМ В МЕСТЕ РАЗДУТИЯ

Приспособление для обмера канала ствола изготовлять по эскизу 384.

Пользование приспособлением

Натянуть шнур *3* так, чтобы штихмасс *2* занял некоторое наклонное положение (показано пунктиром). Ввести приспособление в канал ствола, направив штихмасс по нарезам.

Передвигая приспособление по каналу ствола, примерно через каждые 50 *мм* останавливать приспособление и натягивать шнур *3*; поворот штихмасса в этом месте укажет на наличие раздутия более допустимой величины.

В случае заедания штихмасса оттянуть его за шнур в обратную сторону или сдвинуть приспособление легким толчком шеста.

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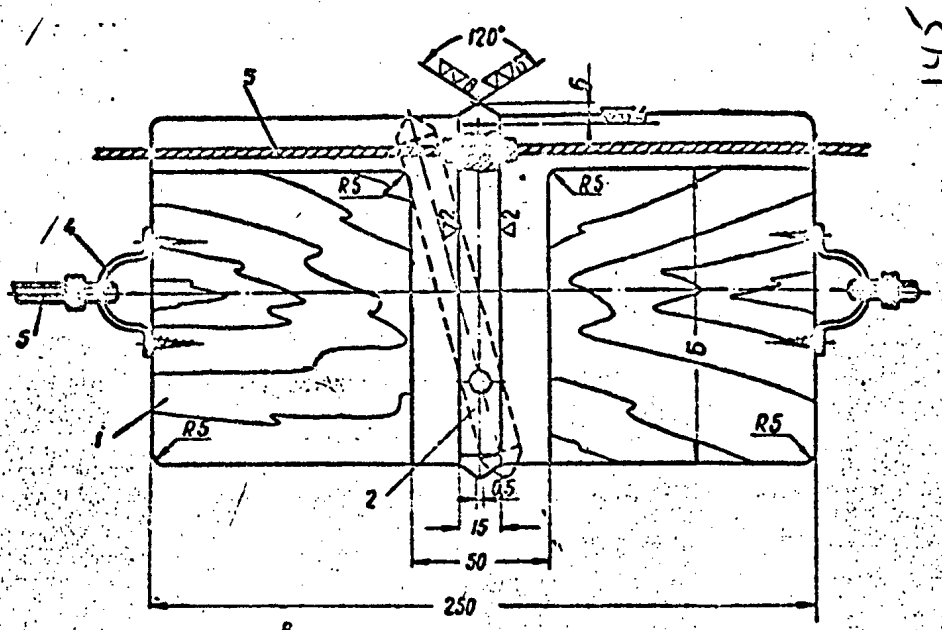
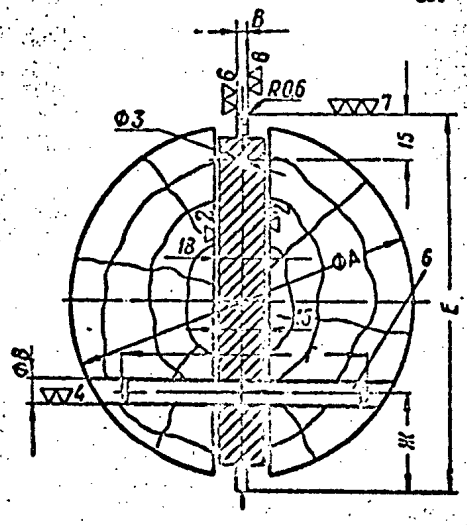
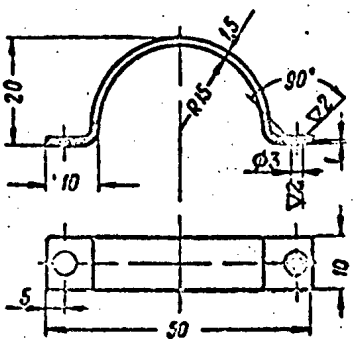


Дет 4

5 остальное





Д – номинальный диаметр по полям (калибр) канала трубы ствола оружия М-46

D – то же для оружия М-47

Материал:
Дет 1 – бронза
Дет 2 – сталь 50
Дет 4 – сталь 15
Дет 6 – сталь 15
Концы дет 2 – золотить

Индекс оружия	Размеры в мм					
	А	Б	В	Г	Е	Ж
М-46	(Д 1)	110	$4_{-0,1}$	95	$(Д+0,9)_{-0,3}$	35
М-47	(D-14)	130	$4_{-0,1}$	115	$(D+0,9)_{-0,3}$	40

Appendix 8
Приложение 8

Graph of Permissible Depth of Dents in the Outer Surface of the Barrel of Gun M-46 (if there are no cracks)

ГРАФИК ДОПУСТИМЫХ ГЛУБИН ВМЯТИН НА НАРУЖНОЙ ПОВЕРХНОСТИ СТВОЛА ОРУДИЯ М-46 (ПРИ УСЛОВИИ ОТСУТСТВИЯ ТРЕЩИН)

Graph of Permissible Depth of Dents in the Outer Surface of the Barrel of Gun M-47 (if there are no cracks)

ГРАФИК ДОПУСТИМЫХ ГЛУБИН ВМЯТИН НА НАРУЖНОЙ ПОВЕРХНОСТИ СТВОЛА ОРУДИЯ М-47 (ПРИ УСЛОВИИ ОТСУТСТВИЯ ТРЕЩИН)

Приложение 9

Appendix 9

147

$y = 0{,}55d$

2d3 d-номинальный диаметр канала ствола по полям орудия М-47

Допустимая глубина вмятин

Δ (мм) 25 23 21 19 17 15 13 11 9 7 5 3 2 1 0

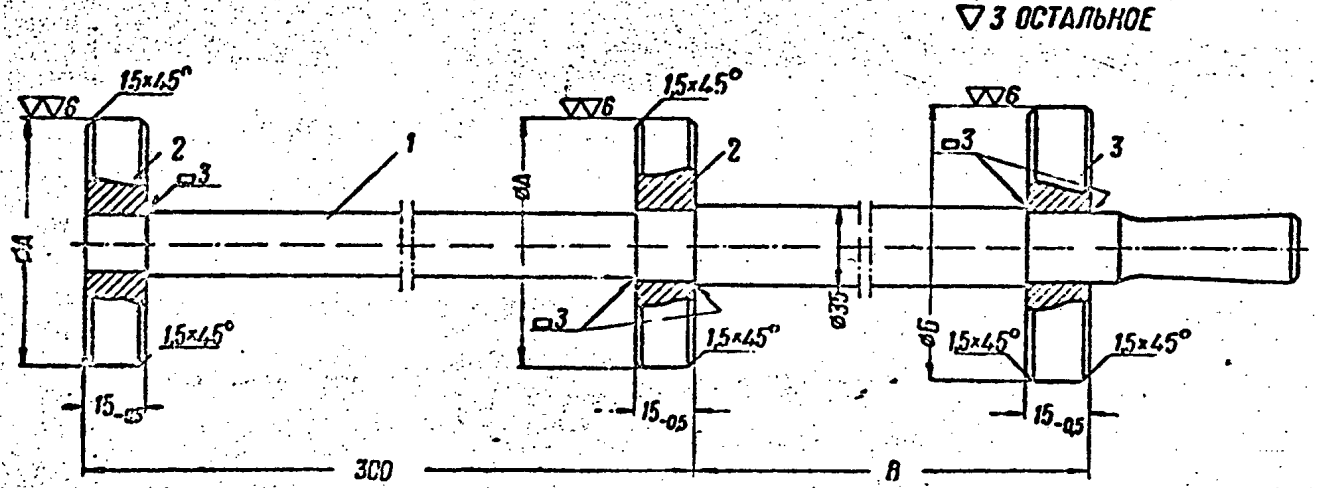
Конус

Труба

Gage for Checking the Axial Alignment of the Muzzle Brake and Bore

Appendix 10
Приложение 10

КАЛИБР ДЛЯ ПРОВЕРКИ СООСНОСТИ ВЫХОДНОГО ОТВЕРСТИЯ ДУЛЬНОГО ТОРМОЗА И КАНАЛА СТВОЛА



Индекс орудия	Размеры в мм		
	А	Б	В
М-46	$Д^{-0,05}_{-0,17}$	$(Д+12,1)^{-0,05}_{-0,32}$	560±5
М-47	$D^{-0,05}_{-0,17}$	$(D+10,1)^{-0,05}_{-0,32}$	570±5

Д - номинальный диаметр по полям (калибр) канала трубы ствола орудия М-46
D - то же для орудия М-47

Материал: сталь 40
Приварку дисков производить электродом 342
Острые ребра притупить

148

1 — оправка; *2* — диск (2 шт.); *3* — диск контрольный

50X1-HUM

50X1-HUM

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Appendix 11
Приложение 11

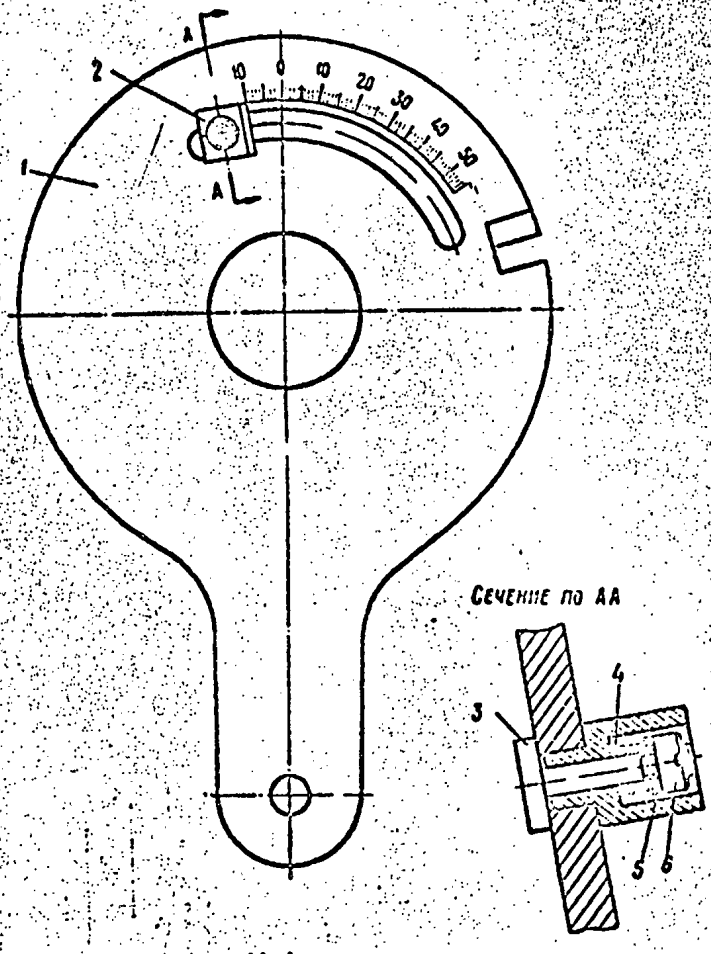
Templates for Checking the Angle of Turn of the Throttling Rod

ШАБЛОНЫ ДЛЯ ПРОВЕРКИ УГЛА ПОВОРОТА КОНТРШТОКА

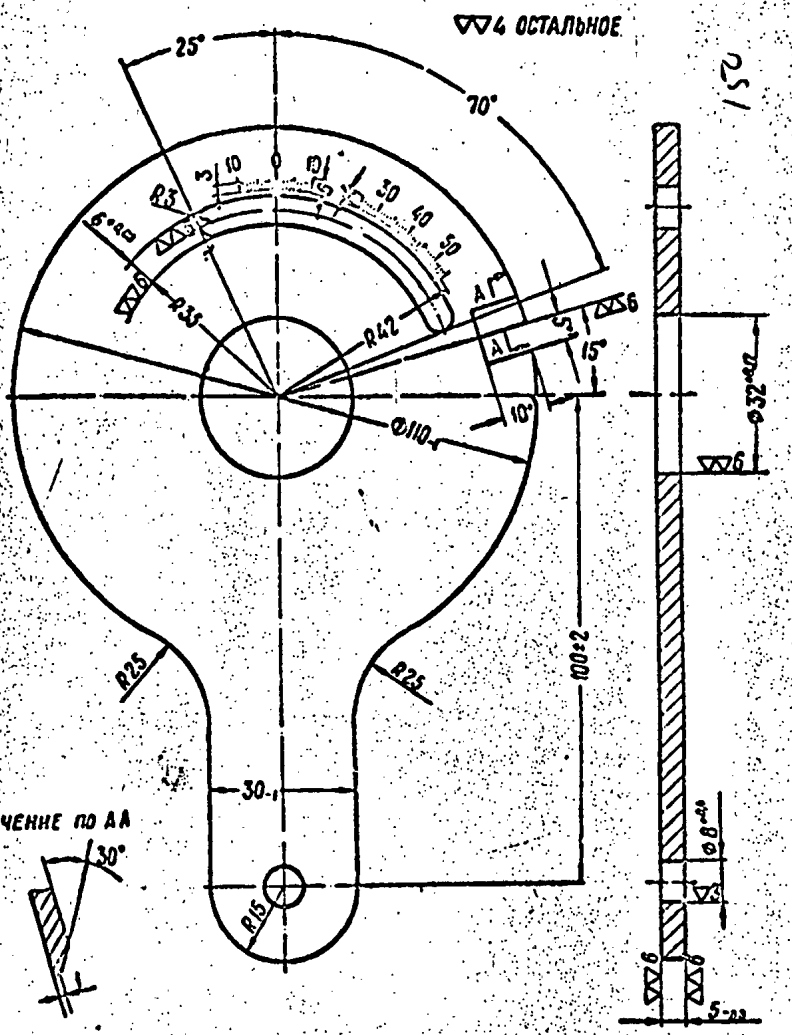
Для проверки угла поворота контршток применяются два шаблона: шаблон № 1 (эскиз 385) и шаблон № 2 (эскиз 392).

Шаблон № 1 состоит из шаблона *1*, ползушки *2*, стержня *3*, пружины *4*, шайбы *5* и гайки *6*.

Изготавливать шаблон № 1 по эскизам 385—391.



Эскиз 385. Шаблон № 1 для проверки угла поворота контрштока: *1* — шаблон; *2* — ползушка; *3* — стержень; *4* — пружина; *5* — шайба; *6* — гайка

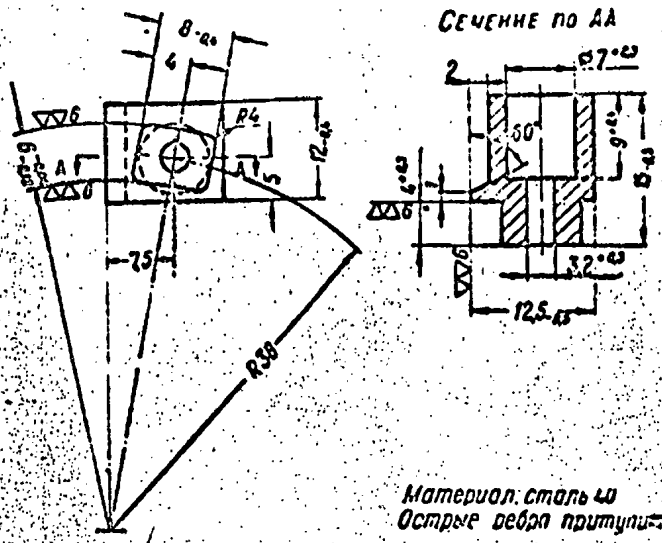


Цена деления шкалы-1°; при этом погрешность показаний угломера допускается ±15°
Ширина штрихов не более 0,15 мм, глубина-0,2 мм
Высота цифр 2,5 мм, шрифт 2,5 ГОСТ 3454-52
Цифры гравировать на глубину 0,3 мм

Материал: сталь 40
Острые ребра притупить

Эскиз 386. 1 — шаблон

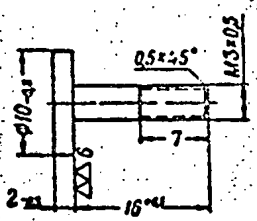
▽▽4 ОСТАЛЬНОЕ



Материал: сталь 40
Острые ребра притупить

Эскиз 387. 2 — ползушка

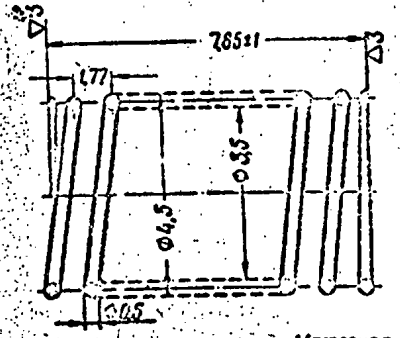
▽▽4 ОСТАЛЬНОЕ



Материал: сталь 40
Острые ребра притупить

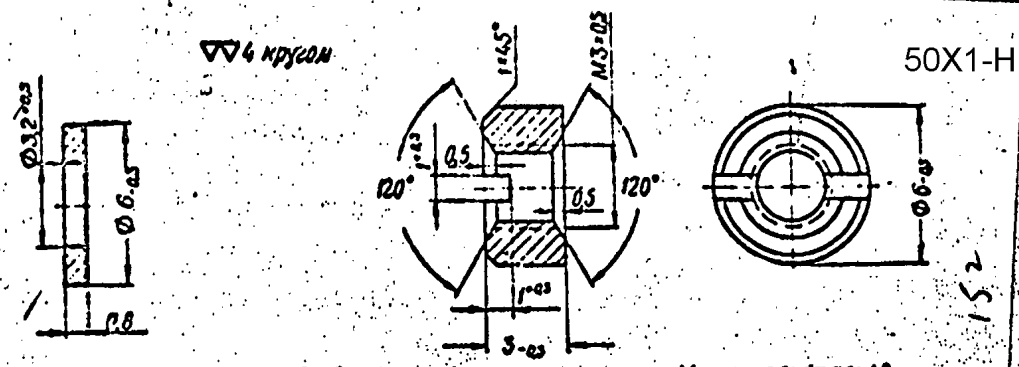
Эскиз 388. 3 — стержень

∽ ОСТАЛЬНОЕ



Материал проволока П-I
Навивка правая
Число витков полное-6
Число витков рабочих-4
Концы пружины притупить

Эскиз 389. 4 — пружина

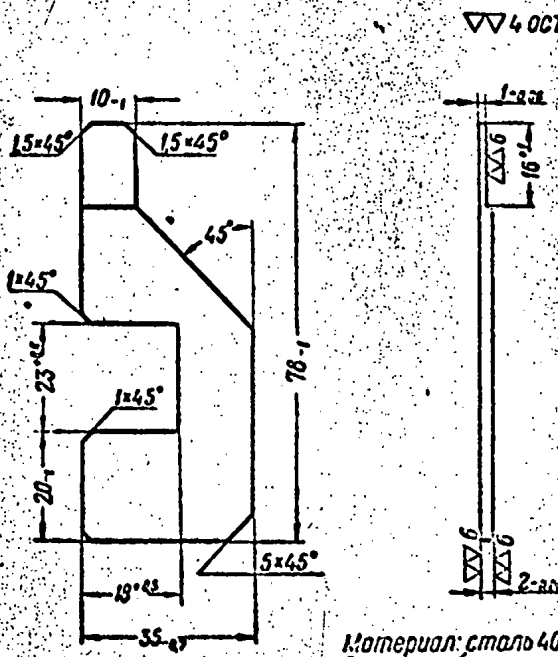


Материал: сталь Ст 2
Острые ребра притупить

Эскиз 390. 5 — шайба

Материал: сталь 40
Острые ребра притупить

Эскиз 391. 6 — гайка



Материал: сталь 40
Острые ребра притупить

Эскиз 392. Шаблон № 2

Appendix 12
Приложение 12

Device for Bracing Panoramic Sight S-71

ПРИСПОСОБЛЕНИЕ ДЛЯ КРЕПЛЕНИЯ ПАНОРАМНОГО ПРИЦЕЛА С-71

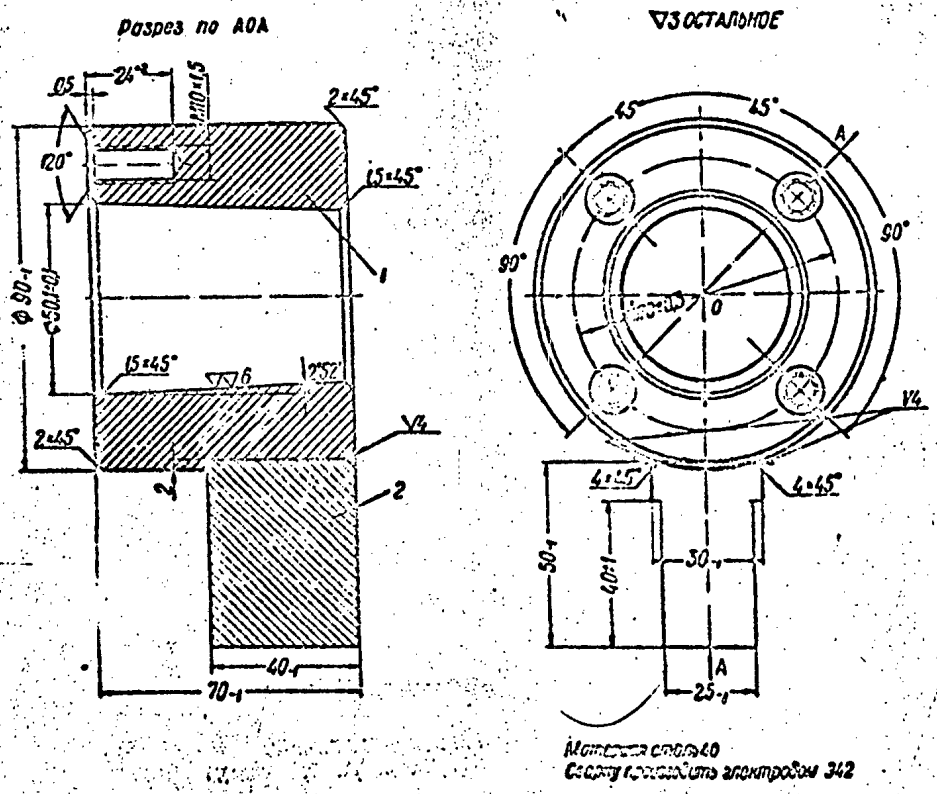
Приспособление состоит из корпуса *1*, планки *2* и четырех болтов *12-8* (эскиз 393 и приложение 6, эскиз 335).

Пользование приспособлением:

— закрепить приспособление в тисках;

— вставить прицел цапфой в корпус *1* и закрепить его болтами *12-8*.

После закрепления прицела в приспособлении проверить работу механизмов и выявить неисправности, отмеченные (*) (см. гл. XIV «Ремонт прицельных приспособлений»).



Эскиз 393. *1* — корпус; *2* — планка

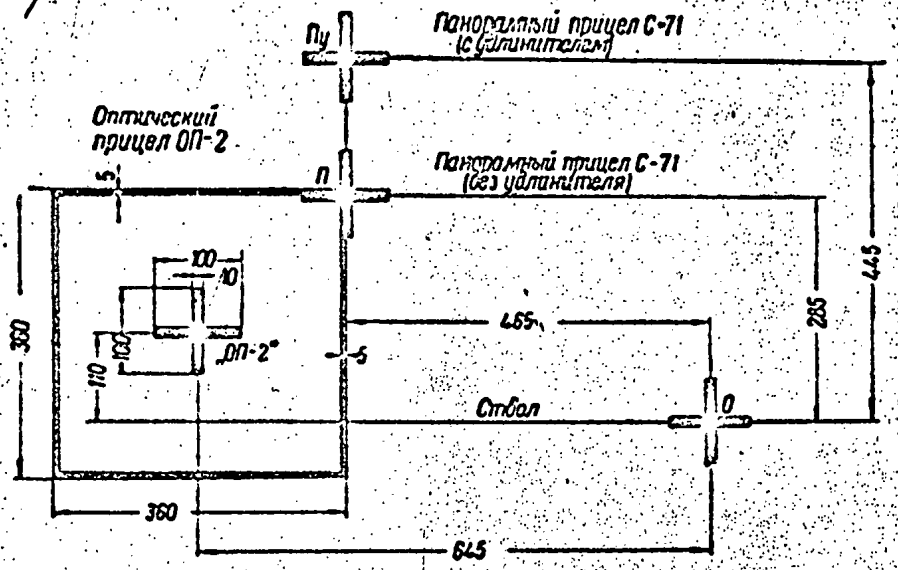
Приложение 13

Appendix 1

154

Device for Checking the Parallelism of the Bore and Sighting Devices

СХЕМА ЩИТА ДЛЯ ПРОВЕРКИ ПАРАЛЛЕЛЬНОСТИ ОСИ КАНАЛА СТВОЛА И ПРИЦЕЛЬНЫХ ПРИСПОСОБЛЕНИЙ



Примечания.

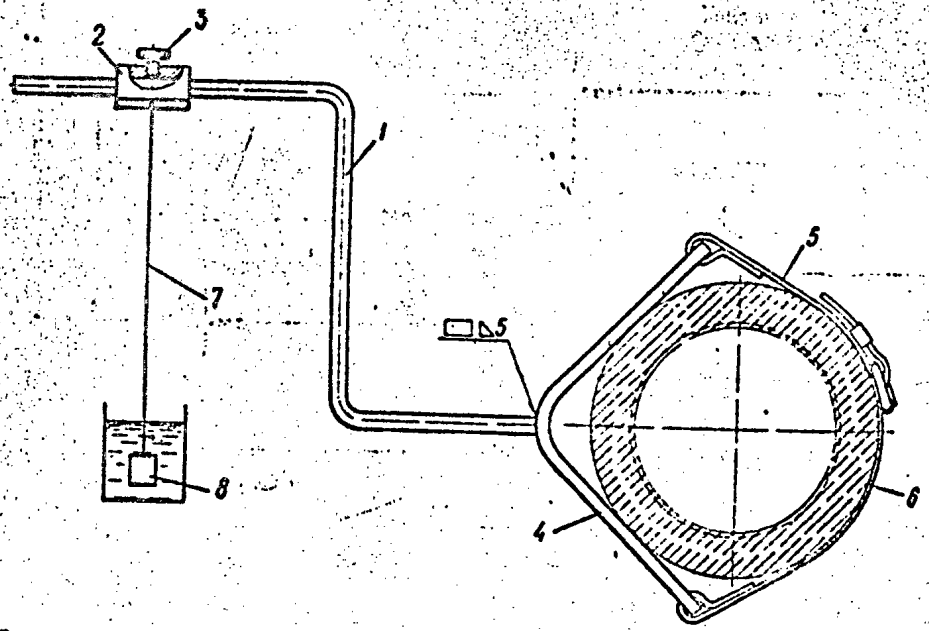
1. Щит окрасить в белый цвет, перпендикулярно и посередине нанести черной краской
2. Щит устанавливается на расстоянии не более 10 м от пушки

Appendix 14
Приложение 14

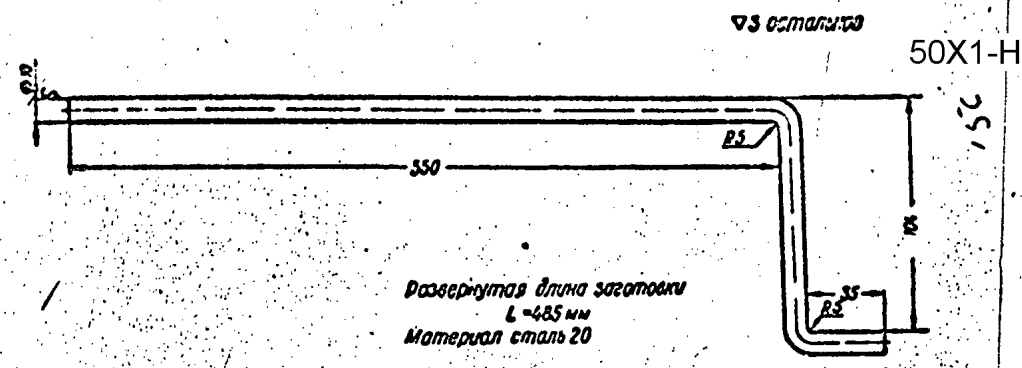
The Plumb
ОТВЕС

Отвес (эскиз 394) состоит из штанги *1*, ползушки *2*, установочного винта *3*, скобы *4*, ремня с пряжкой *5*, ремня *6*, нити *7* отвеса, груза *8*.

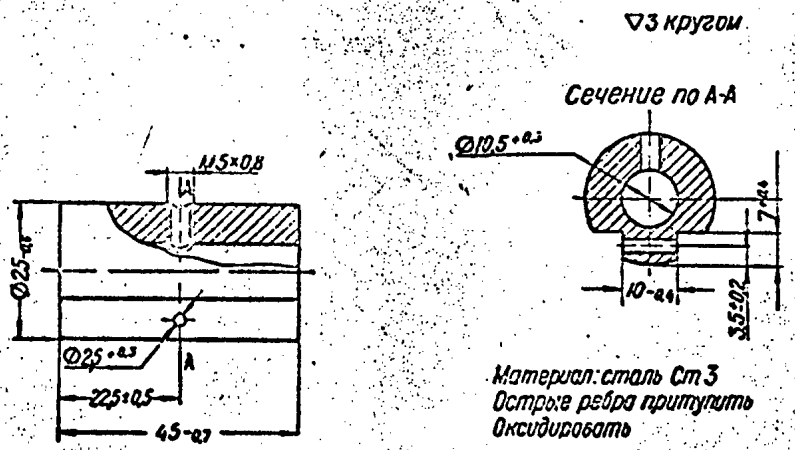
Изготовление отвеса производить по эскизам 394—398.



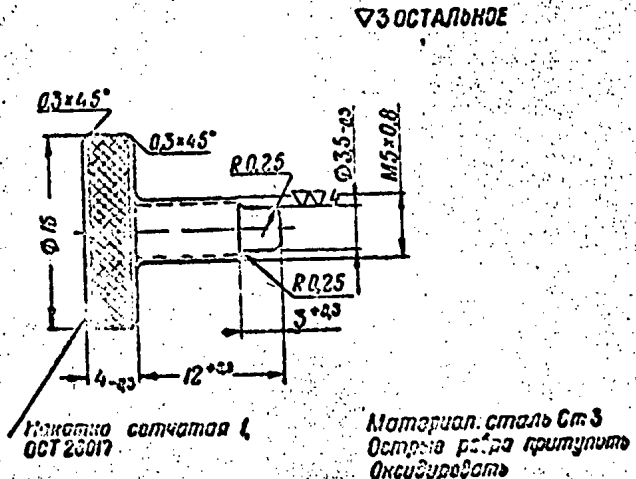
Эскиз 394. Отвес: *1* — штанга; *2* — ползушка; *3* — винт установочный; *4* — скоба; *5* — ремень с пряжкой; *6* — ремень; *7* — нить отвеса; *8* — груз



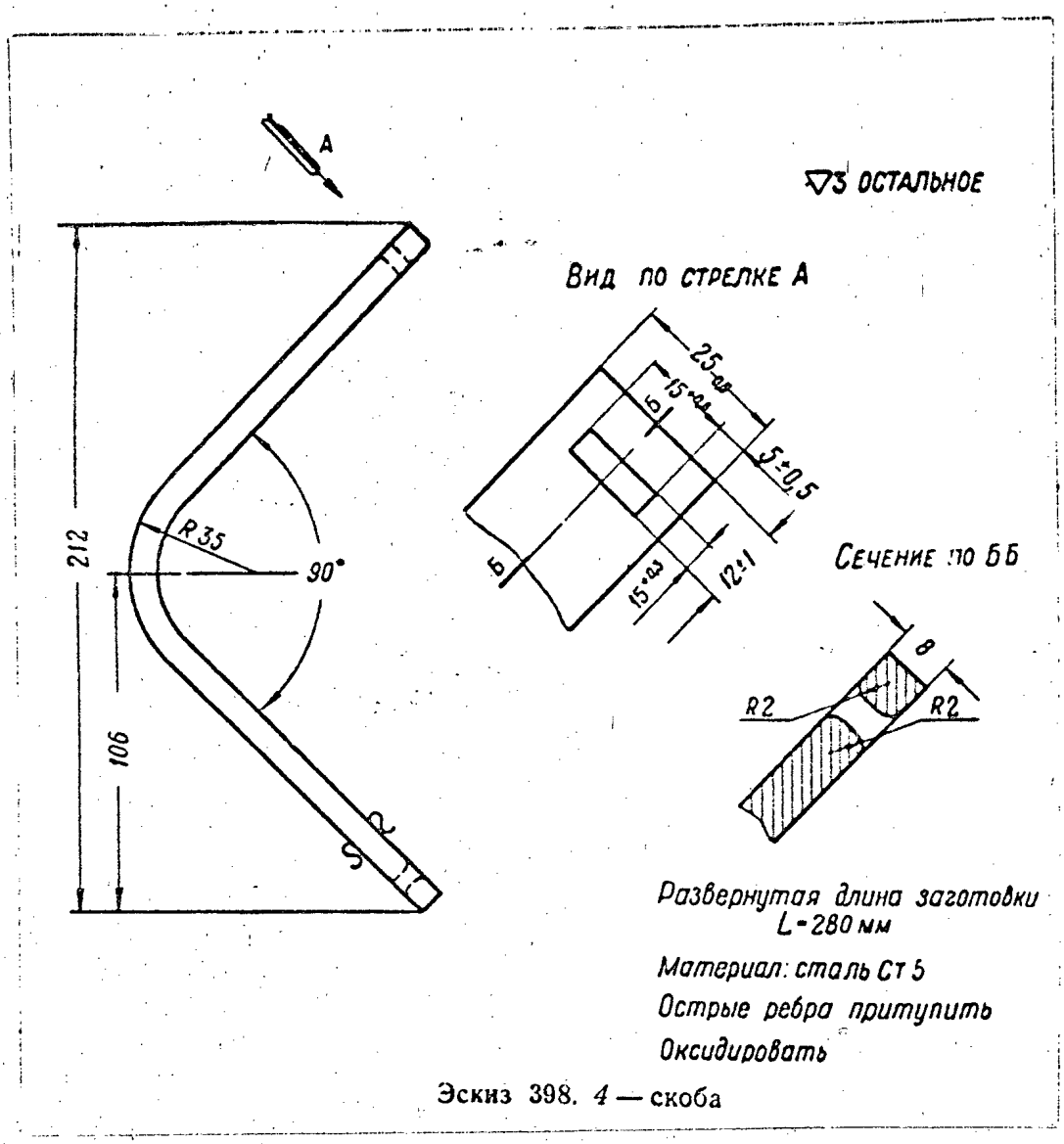
Эскиз 395. *1* — штанга



Эскиз 396. *2* — ползушка



Эскиз 397. *3* — винт установочный



Эскиз 398. *4* — скоба

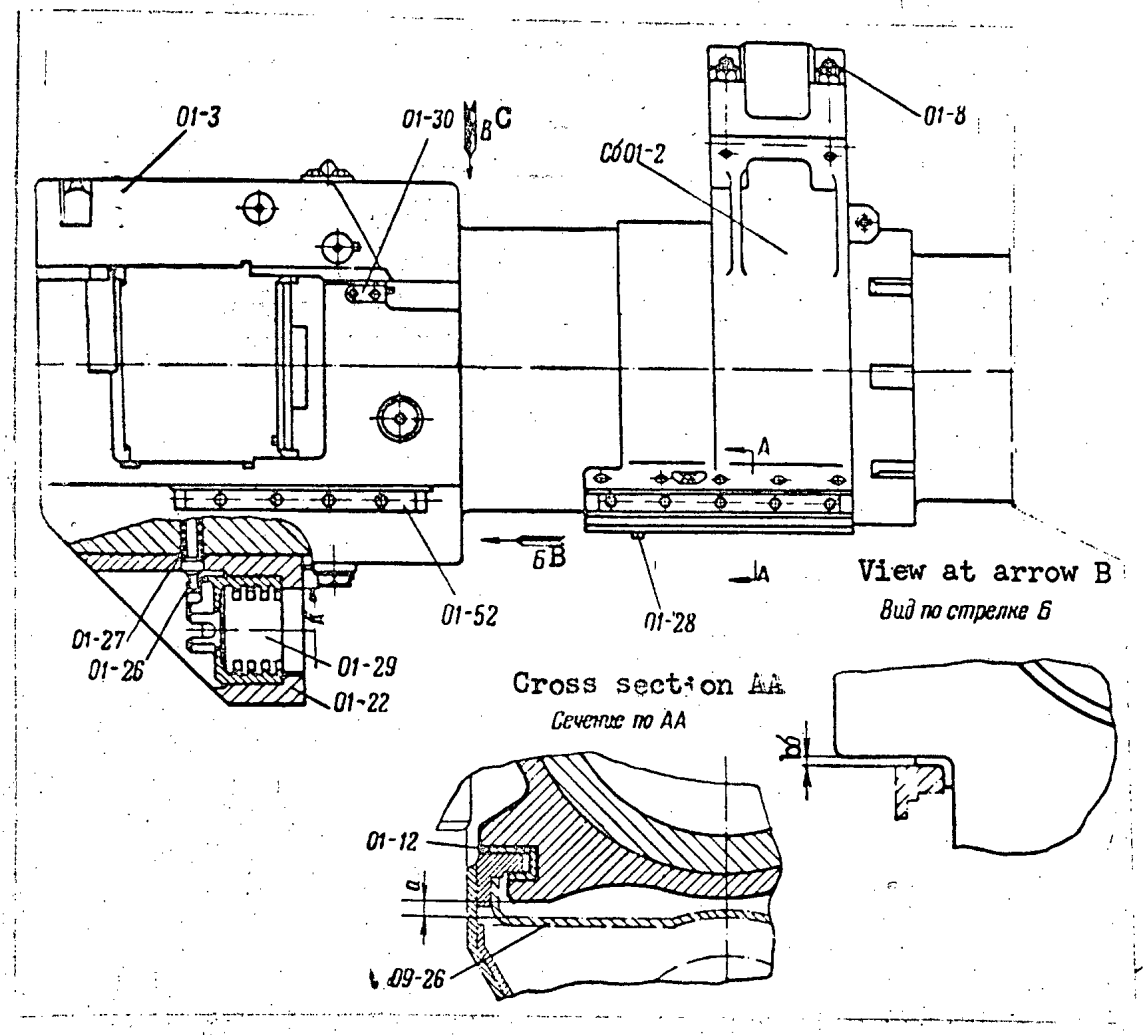


Figure 1. Barrel (Part I)

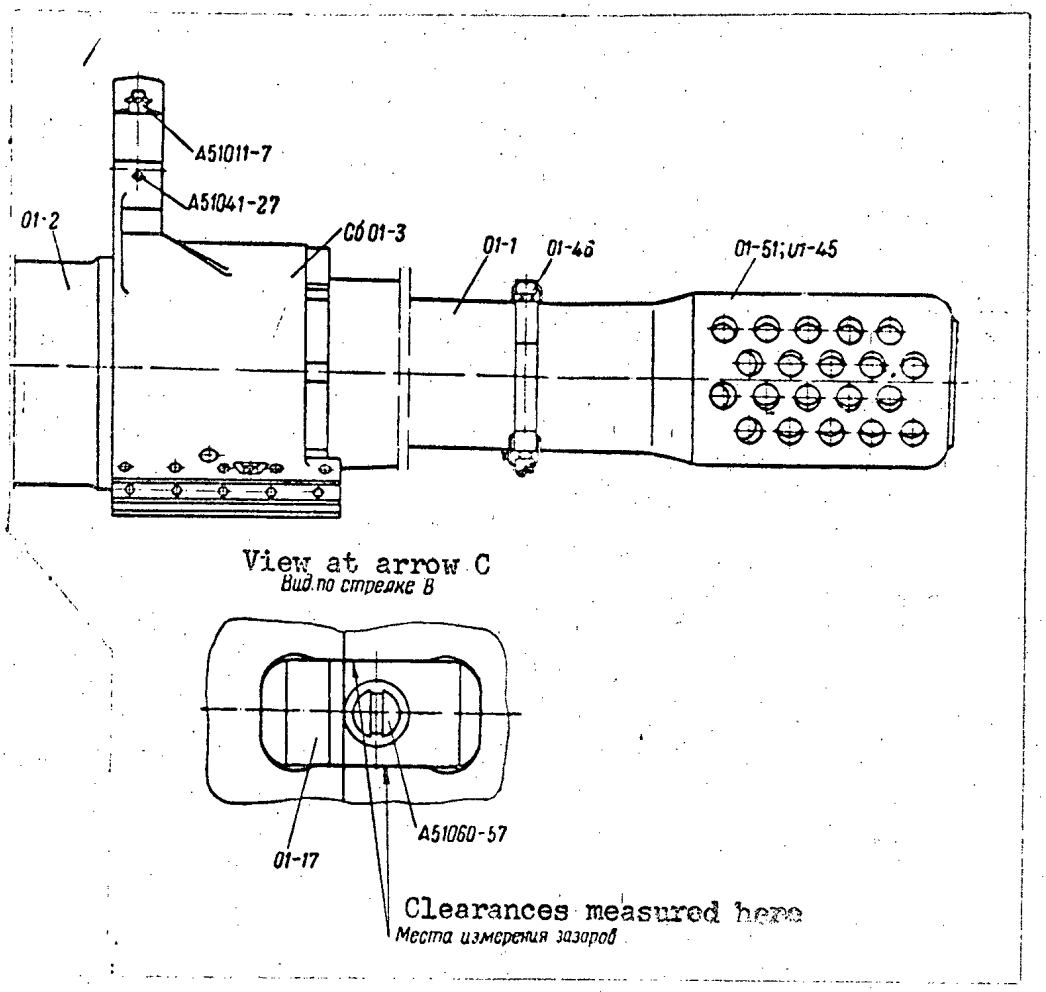


Figure 1. Barrel (Part II)

01-1 -- tube; 01-2 -- jacket; 01-3 -- breech ring; 01-8 -- pin; 01-12 -- cradle guide; 01-17 -- breech ring stop; 01-22 -- breech lug; 01-26 -- wedge stop; 01-27 -- spring; 01-28 -- recoil indicator guide; 01-29 -- wafer type lock; 01-30 -- lever catch; 01-46 -- muzzle brake bolt; 01-51 -- M-46 cannon muzzle brake (01-45 -- M-47 cannon muzzle brake); 01-52 -- cradle guide; Sb01-2 -- rear clamping piece; Sb01-3 -- front clamping piece; 09-26 -- reinforcing plate; A51011-7 -- nut; A51041-27 -- cylindrical pin; A51060-57 -- screw

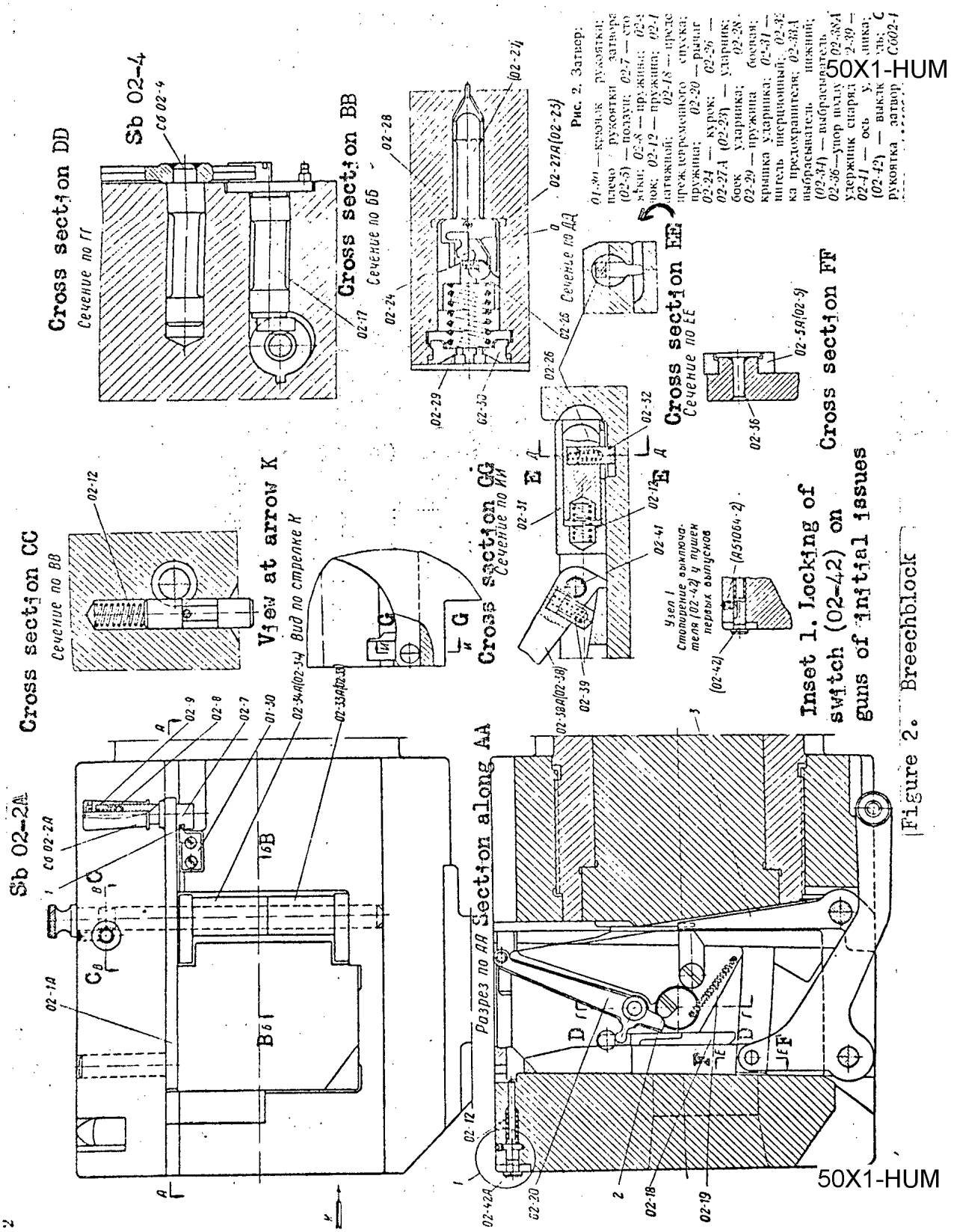


Figure 2. Breechblock

Figure 2. Breechblock

01-30 -- lever catch; 02-1A -- breechblock lever arm; 02-5A (02-5) -- slide; 02-7 -- lever stop; 02-8 -- spring; 02-9 -- grip; 02-12 -- spring; 02-17 -- tension shaft; 02-18 -- intermediate safety catch; 02-19 -- spring; 02-20 -- cocking lever; 02-24 -- cocking piece; 02-26 -- spring; 02-27A (02-23) -- firing pin; 02-27 -- striker pin; 02-28 -- key; 02-29 -- firing pin spring; 02-30 -- firing pin cover; 02-31 -- inertial safety catch; 02-32 -- safety latch; 02-33A (02-33) -- lower extractor; 02-34A (02-34) -- upper extractor; 02-36 -- slide catch; 02-38A (02-38) -- projectile retainer; 02-39 -- spring; 02-41 -- retainer pivot; 02-42A (02-42) -- switch; Sb02-2A -- breechblock lever; Sb02-4 -- cocking lever; A51064-2 -- set screw

50X1-HUM

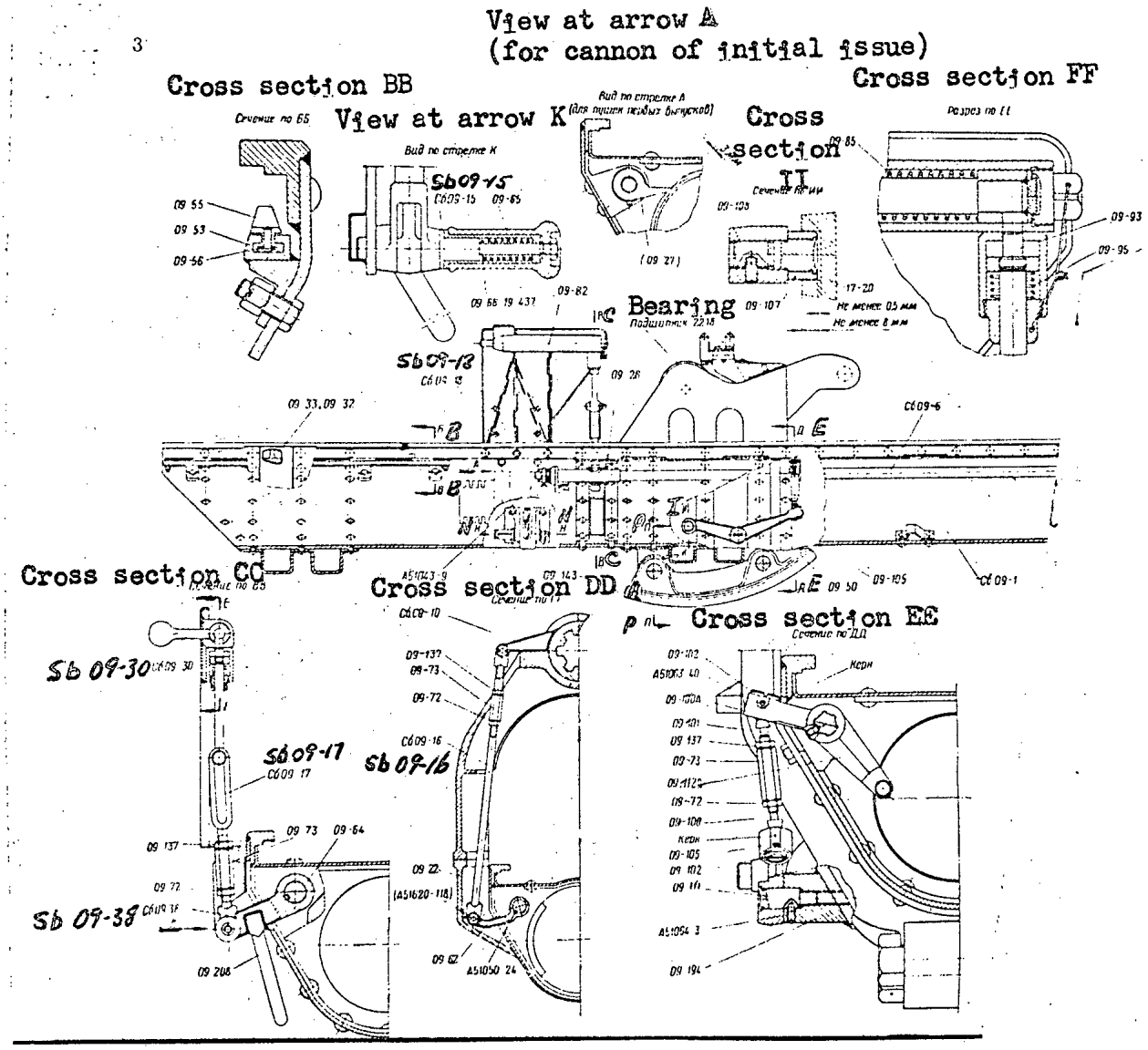


Figure 3. Cradle (Part I)

50X1-HUM

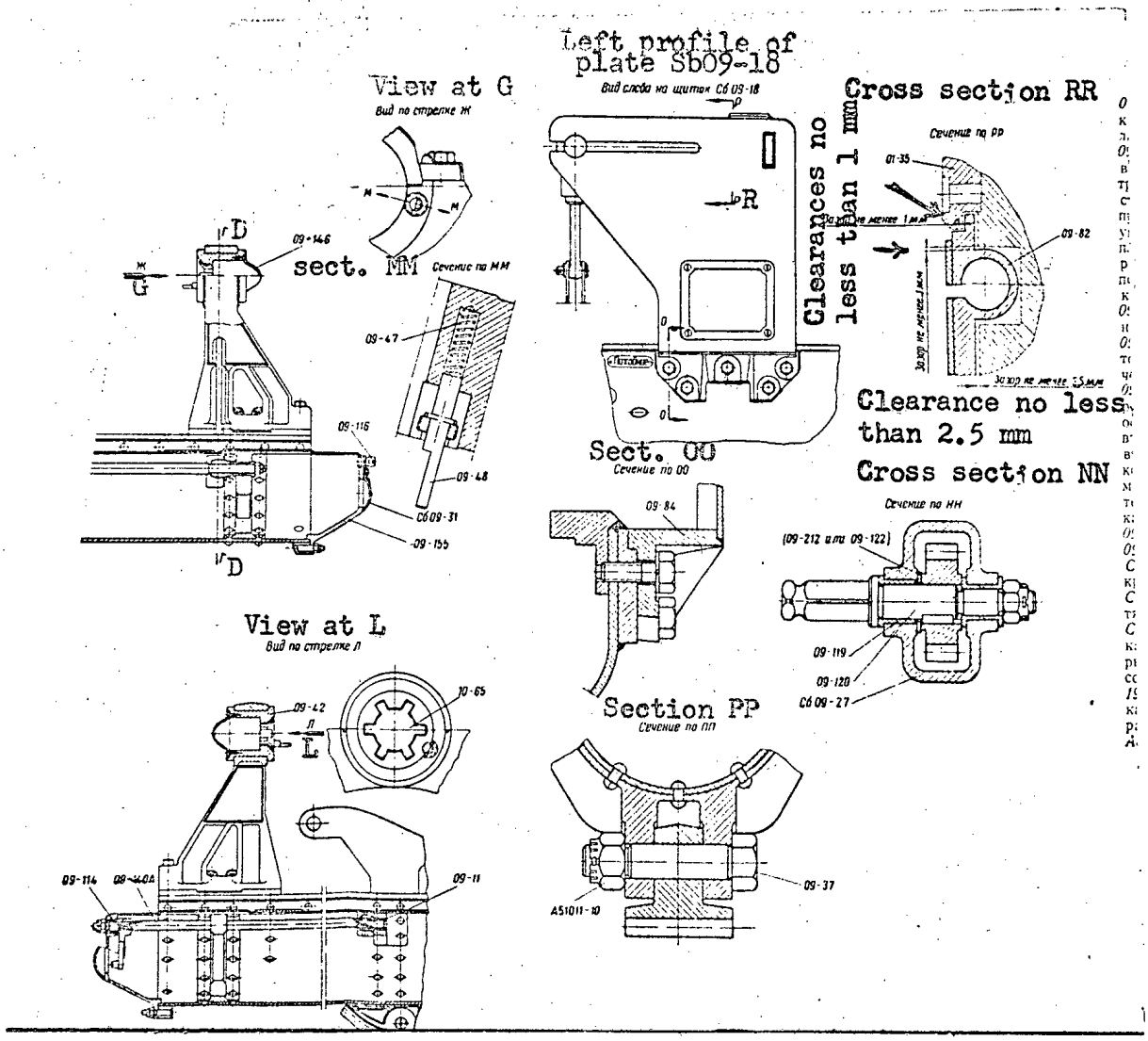


Figure 3. Cradle (Part II)

Figure 3. Cradle

09-35 -- detainer; 09-11 -- bushing; 09-22 -- left bracket; 09-26 -- reinforcing plate; (09-27) -- rod stop; 09-32 -- left latch; 09-33 -- right latch; 09-37 -- bolt; 09-42 -- bushing with wobblers; 09-47 -- spring; 09-48 -- stop; 09-50 -- arc; 09-53 -- recoil indicator guide; 09-55 -- recoil indicator; 09-56 -- flat spring; 09-62 -- lever; 09-64 -- lever; 09-65 -- cap; 09-68 -- stop; 09-72 -- lock nut; 09-73 -- regulating nut; 09-82 -- pivot; 09-84 -- bracket; 09-85 -- spring; 09-93 -- stop; 09-95 -- spring; 09-100A -- upper lever; 09-101 -- upper tappet; 09-102 -- spherical pivot; 09-105 -- double-arm lever; 09-106 -- lower tappet; 09-107 -- roller; 09-108 -- roller pin; 09-111 -- lever pin; 09-112A -- lever; 09-114 -- bushing; 09-116 -- plug; 09-119 -- bushing; 09-120 -- cylinder; 09-137 -- lock nut; 09-140A -- variable recoil roller; 09-143 -- limiter; 09-146 -- cap; 09-155 -- forward cap; 09-194 -- lug; 09-208 -- handle; (09-212 or 09-122) -- washer; Sb09-1 -- cradle; Sb09-5 -- cylinder; Sb09-10 -- bushing with bracket; Sb09-15 -- stop; Sb09-16 -- forward rod; Sb09-17 -- rear rod; Sb09-18 -- plate; Sb09-27 -- casing; Sb09-30 -- tappet; Sb09-31 -- cap; Sb09-38 -- lever arm mechanism; 10-65 -- flange nut; 17-20 -- cam guide; 19-437 -- spring; A51011-10 -- nut; A51043-9 -- cotter pin; A51050-24 -- key; A51063-40 -- screw; A51064-3 -- screw; (A51620-118) -- pin $12X_3$ x 30

50X1-HUM

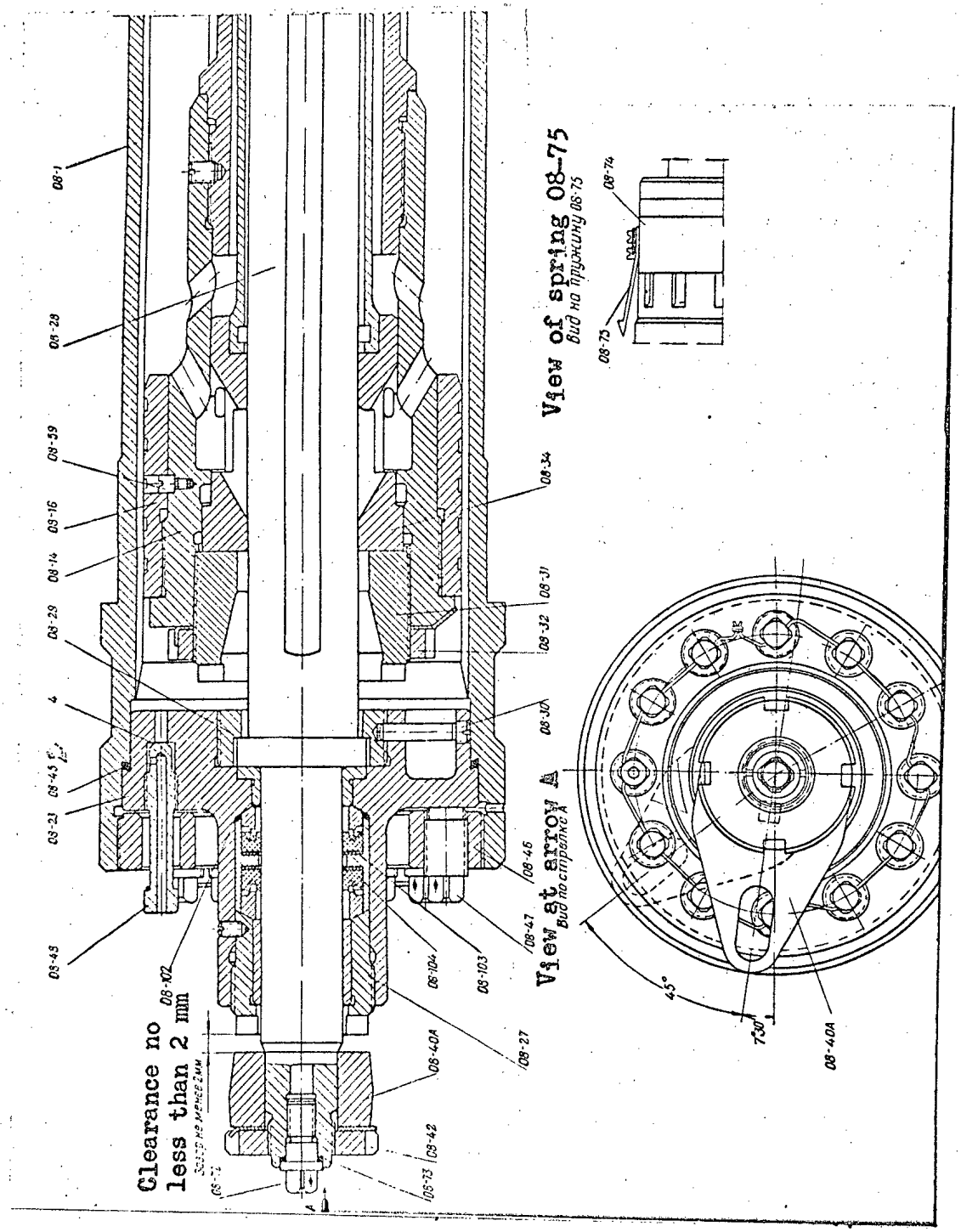


Figure 4. Recoil Brake (Part I)

50X1-HUM

50X1-HUM

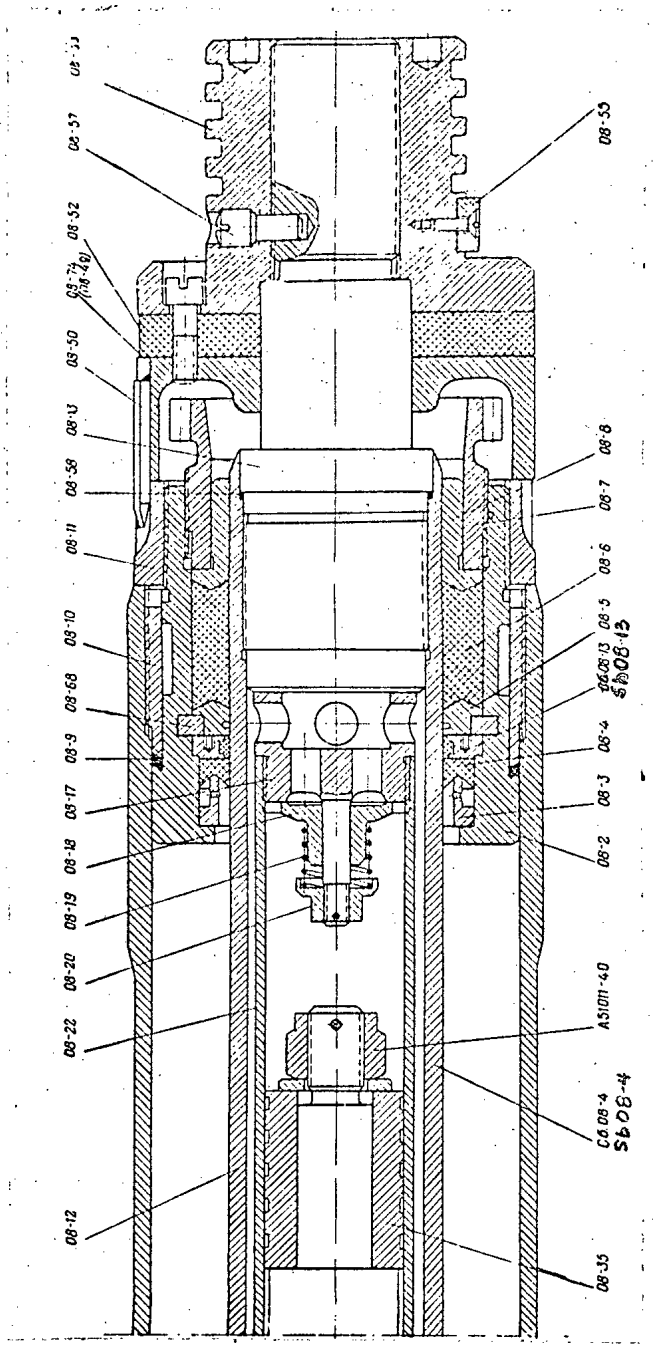


Figure 4. Recoil Brake (Part II)

50X1-HUM

Figure 4. Recoil Brake

08-1 -- recoil cylinder; 08-2 -- stuffing box; 08-3 -- collar ring; 08-4 -- collar; 08-5 -- ring; 08-6 -- stuffing; 08-7 -- stuffing nut; 08-8 -- nut bushing; 08-9 -- sealing ring; 08-10 -- nut; 08-11 -- nut; 08-12 -- rod; 08-13 -- rod stem; 08-14 -- head; 08-16 -- rod; 08-17 -- moderator stem; 08-18 -- moderator valve; 08-19 -- spring; 08-20 -- valve nut; 08-22 -- inner tube; 08-23 -- forward cap; 08-27 -- nut; 08-28 -- throttling rod; 08-29 -- nut; 08-30 -- locking screw; 08-31 -- nut; 08-32 -- lock nut; 08-34 -- insert; 08-35 -- casing; 08-40A -- lever; 08-42 -- nut; 08-45 -- sealing ring; 08-46 -- nut; 08-47 -- screw; 08-48 -- valve; 08-74 (08-49) -- buffer plate; 08-50 -- key; 08-52 -- buffer; 08-53 -- rod nut; 08-55 -- key; 08-57 -- locking screw; 08-58 -- sealing ring; 08-59 -- screw; 08-68 -- section; 08-72 -- screw; 08-73 -- sealing ring; 08-75 -- spring; 08-102 -- rubber ring; 08-103 -- leather ring; 08-104 -- collar; Sb08-4 -- rod; Sb08-13 -- washer; A51011-40 -- nut

50X1-HUM

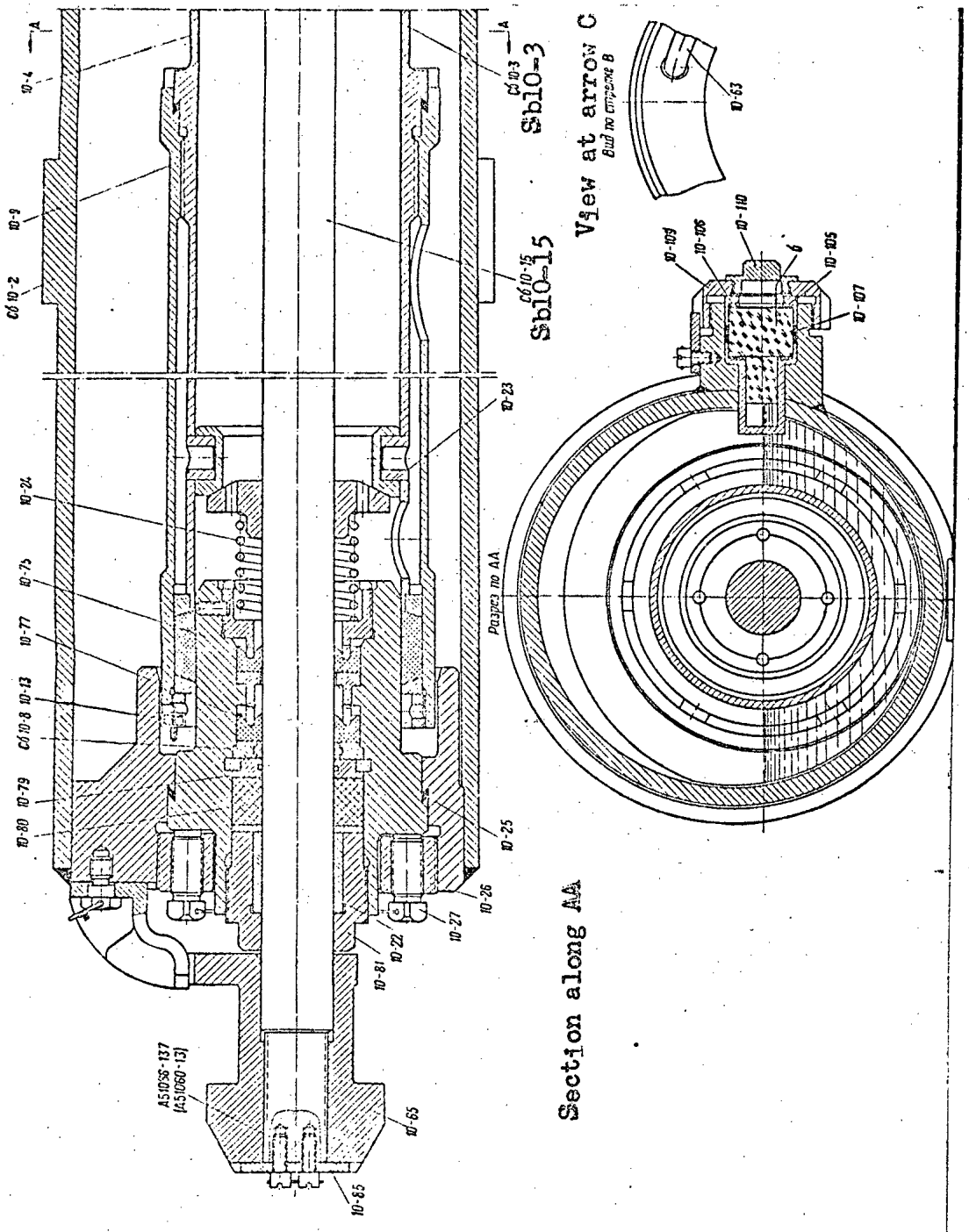


Figure 5. Recuperator (Part I)

50X1-HUM

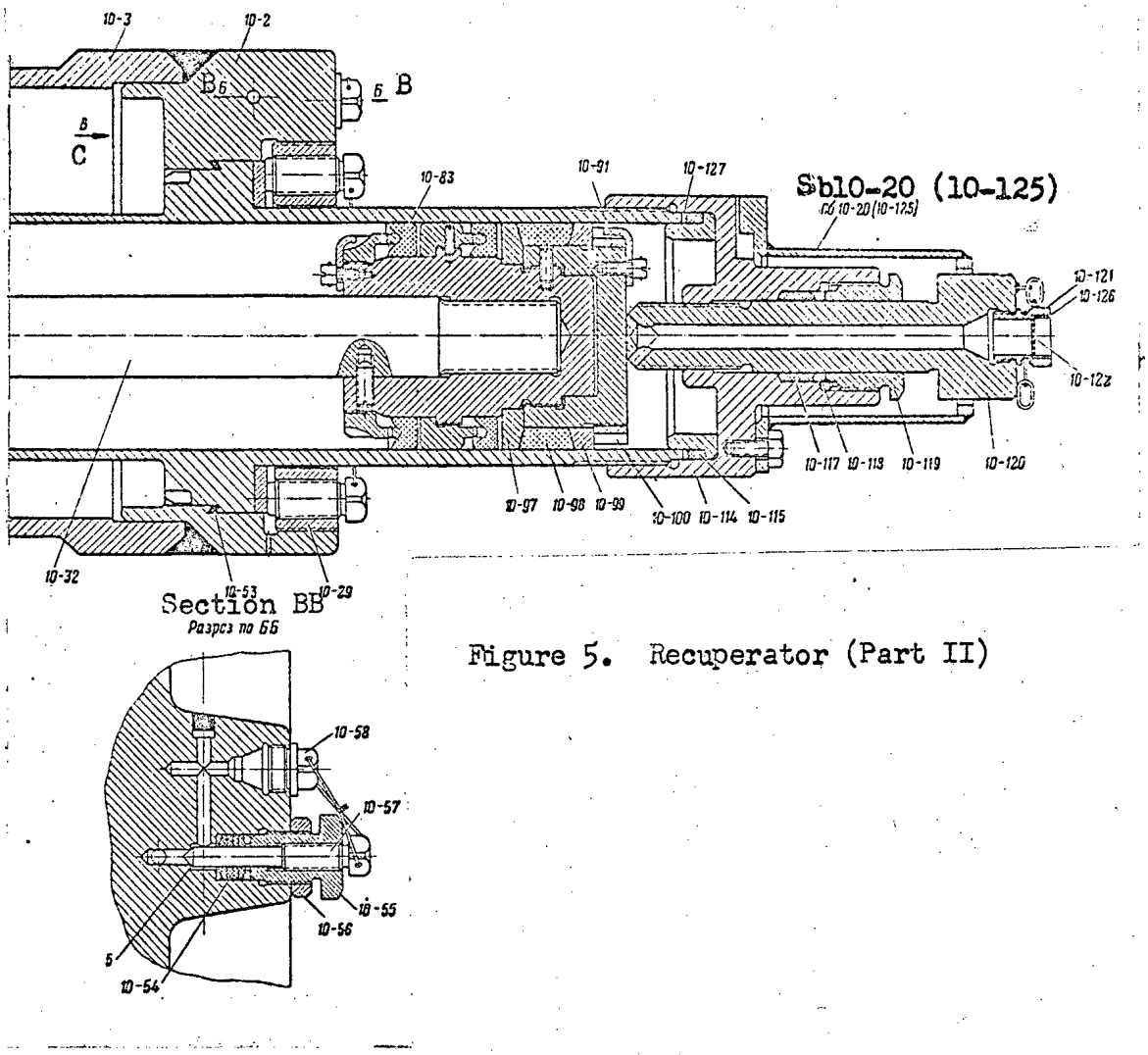


Figure 5. Recuperator (Part II)

Figure 5. Recuperator

10-2 -- rear cap; 10-3 -- air cylinder; 10-4 -- operating cylinder; 10-9 -- intermediate cylinder; 10-13 -- stuffing nut; 10-22 -- nut bushing; 10-23 -- valve; 10-24 -- valve spring; 10-25 -- sealing ring; 10-26 -- nut; 10-27 -- screw; 10-29 -- nut; 10-32 -- rod; 10-53 -- sealing ring; 10-54 -- leather ring; 10-55 -- nut; 10-56 -- lock nut; 10-57 -- valve; 10-58 -- plug; 10-63 -- tube; 10-65 -- flange nut; 10-75 -- stuffing box; 10-77 -- collar; 10-79 -- ring; 10-80 -- stuffing; 10-81 -- stuffing nut; 10-83 -- collar; 10-85 -- stop; 10-91 -- stop; 10-97 -- ring; 10-98 -- stuffing; 10-99 -- ring; 10-100 -- nut; 10-105 -- gasket; 10-106 -- sighting glass; 10-107 -- sealing ring; 10-109 -- nut; 10-110 -- plug; 10-114 -- cap; 10-115 -- sealing ring; 10-117 -- packing; 10-118 -- ring; 10-119 -- nut; 10-120 -- regulating bolt; 10-121 -- plug; 10-122 -- grid; 10-126 -- bushing; 10-127 -- ring; Sb10-2 -- air cylinder; Sb10-3 -- operating cylinder; Sb10-8 -- washer; Sb10-15 -- piston rod; Sb10-20 (10-125) -- cover; (A51060-13) -- screw; A51066-137 -- screw

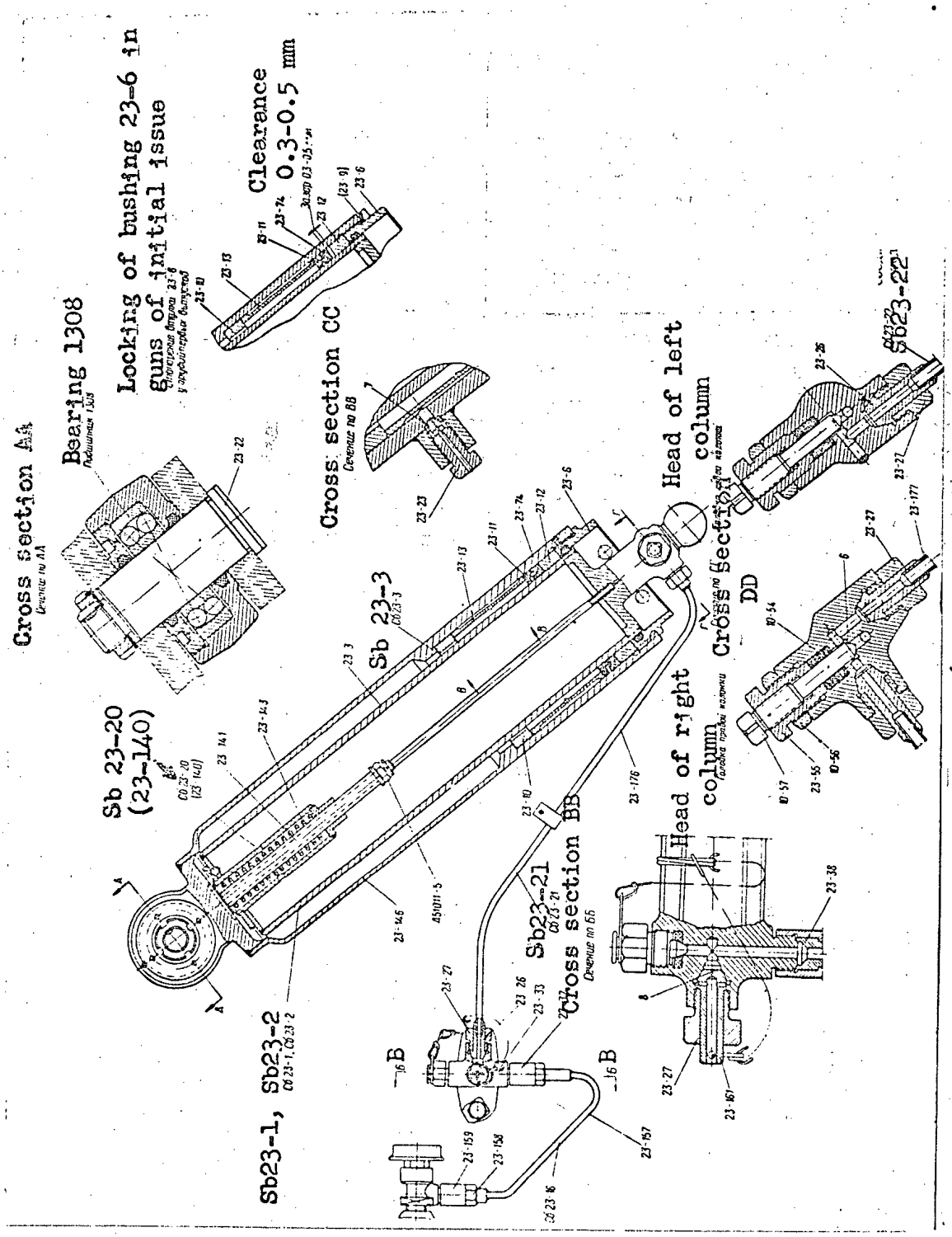


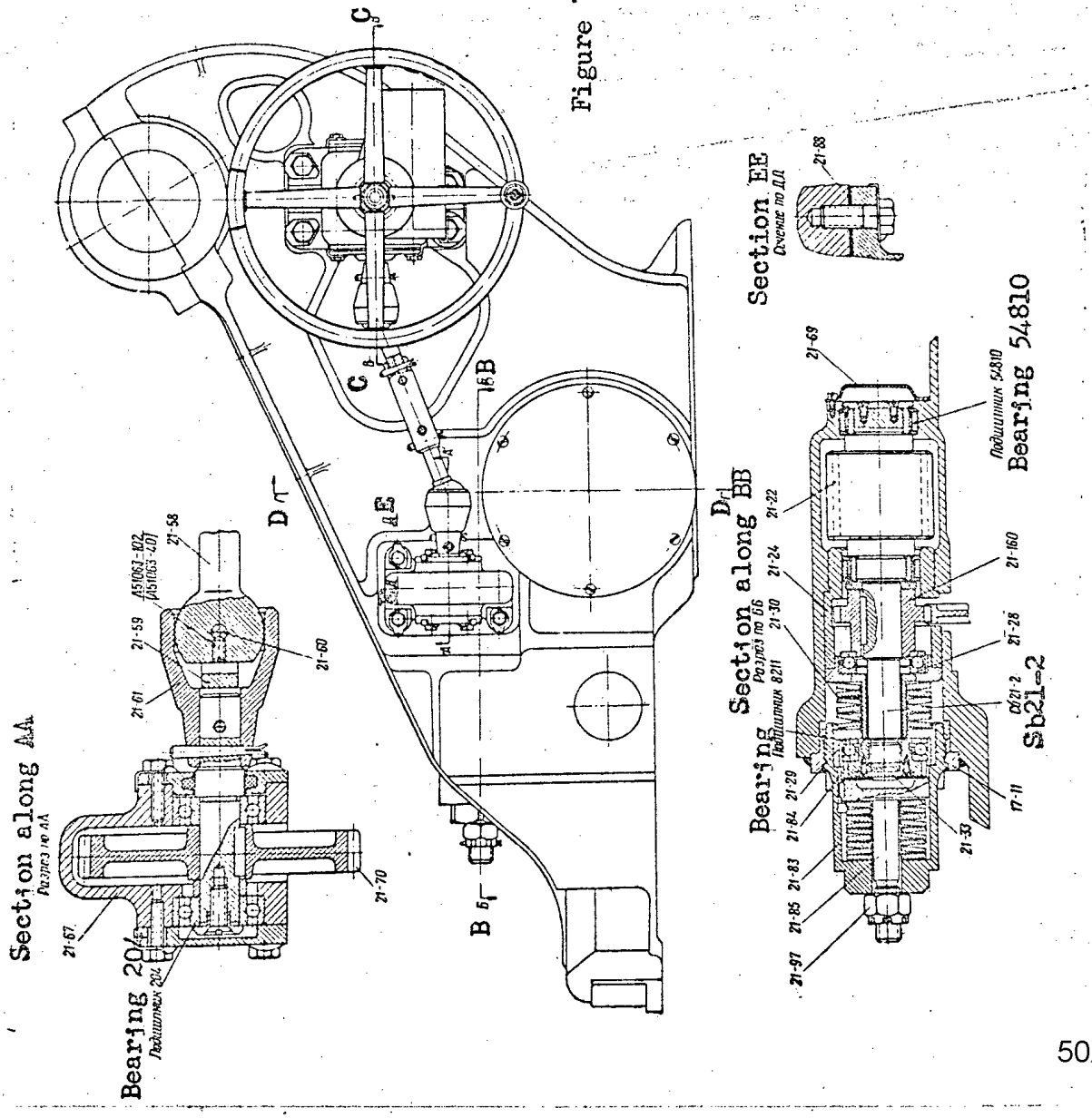
Figure 6. Equilibrator

Figure 6. Equilibrator

10-54 -- leather ring; 10-56 -- safety nut; 10-57 -- valve; 23-3 -- piston cylinder; 23-6 -- bushing; (23-9) -- washer; 23-10 -- bushing; 23-11 -- adjusting ring; 23-12 -- bushing; 23-13 -- bushing; 23-22 -- shaft; 23-23 -- plug; 23-26 -- clamping sleeve; 23-27 -- lock nut; 23-33 -- manifold; 23-37 -- lock nut; 23-38 -- nozzle; 23-55 -- nut; 23-74 -- collar; 23-141 -- pin; 23-143 -- spring; 23-146 -- external cylinder; 23-157 -- tubing; 23-158 -- nozzle; 23-159 -- lock nut; 23-161 -- nozzle; 23-176 -- tubing; 23-177 -- tubing; Sb23-1 -- right piston; Sb23-2 -- left piston; Sb23-3 -- external cylinder; Sb23-16 -- tube; Sb23-20 (23-140) -- spring housing; Sb23-21 -- connecting tube; Sb23-22 -- connecting tube; A51011-5 -- nut

50X1-HUM

Figure 7. Elevating Mechanism (Part I)



50X1-HUM

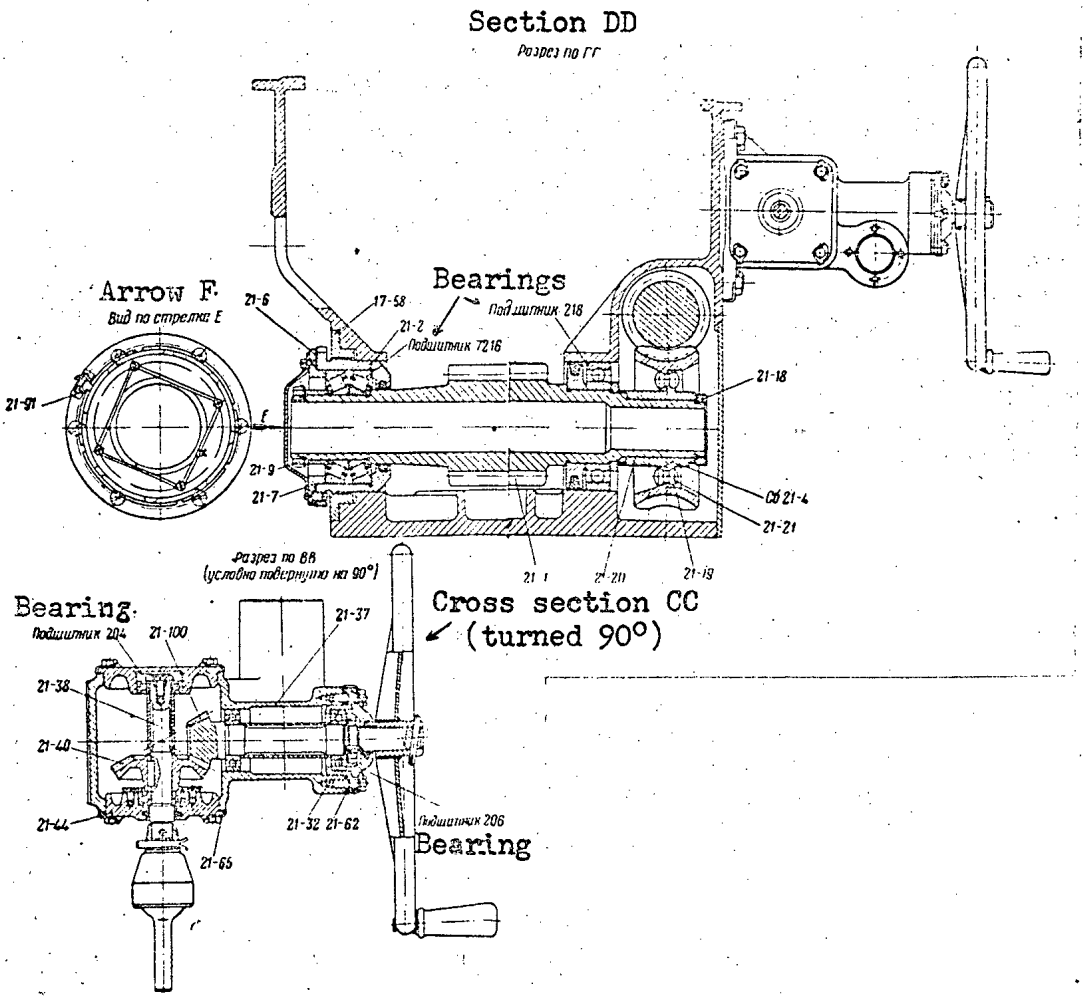


Figure 7. Elevating Mechanism (Part II)

Figure 7. Elevating Mechanism

17-11 -- adapter bushing; 17-58 -- adapter bushing; 21-1 -- crankshaft; 21-2 -- adjuster bushing; 21-6 -- spacing ring; 21-7 -- hub; 21-9 -- nut; 21-18 -- lock nut; 21-19 -- worm wheel thread; 21-20 -- worm wheel nave; 21-21 -- rivet; 21-22 -- worm fitting; 21-24 -- barrel bushing; 21-28 -- thrust bearing; 21-29 -- stop washer; 21-30 -- dished-disk spring; 21-32 -- split casing; 21-33 -- retainer; 21-37 -- housing; 21-38 -- shaft; 21-40 -- pinion; 21-44 -- cap; 21-58 -- ball-and-socket ball; 21-59 -- socket ring; 21-60 -- ball-and-socket pin; 21-61 -- ball-and-socket socket; 21-62 -- spacing ring; 21-65 -- spacing ring; 21-67 -- housing; 21-69 -- cap; 21-70 -- pinion; 21-83 -- cap; 21-84 -- nut; 21-85 -- brake disk; 21-88 -- spacer; 21-91 -- catch; 21-97 -- nut; 21-100 -- pinion; 21-160 -- pinion; Sb21-2 -- worm shaft; Sb21-4 -- worm wheel; A51063-102 -- screw

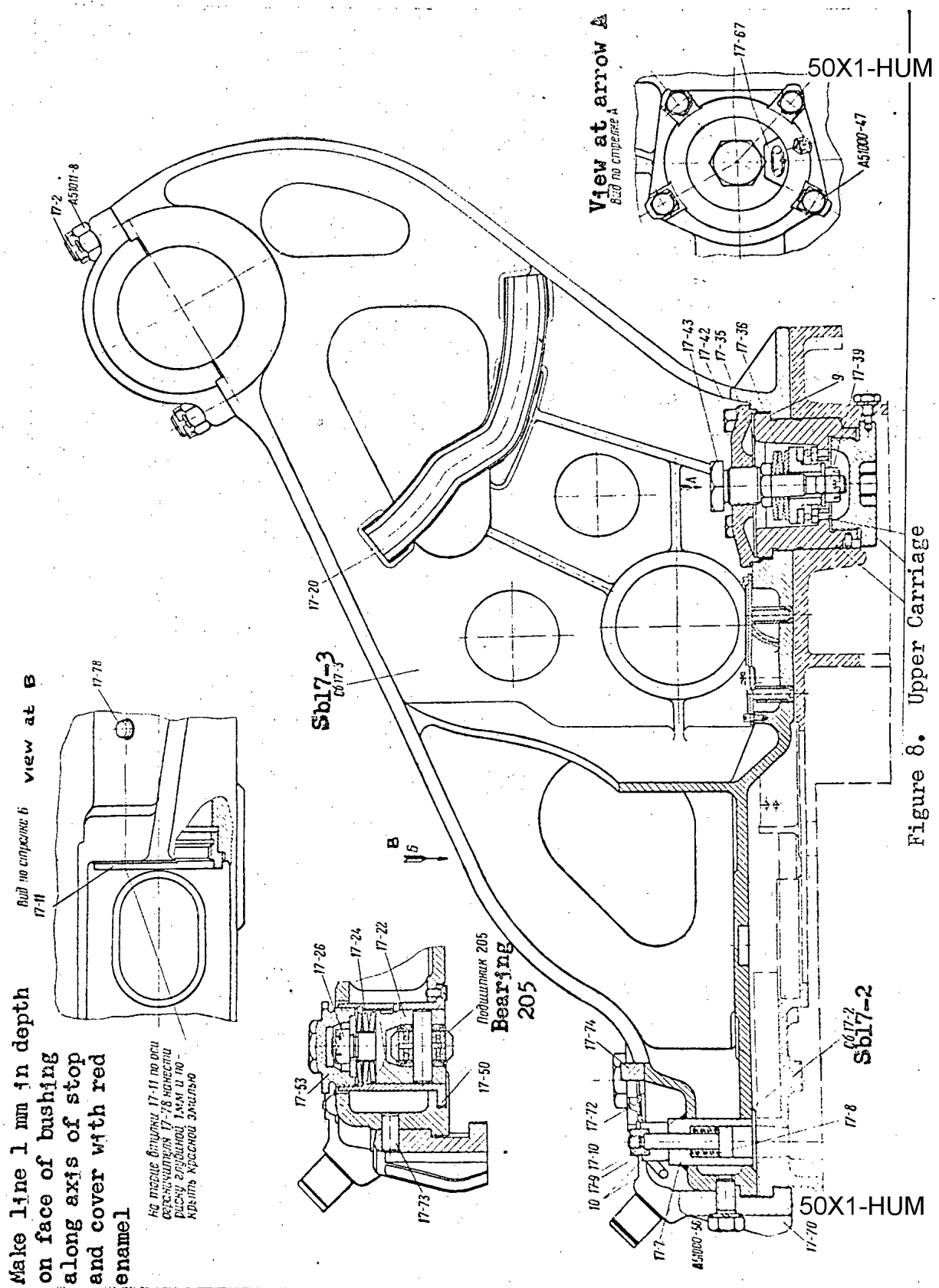


Figure 8. Upper Carriage

Figure 8. Upper Carriage

17-2 -- cotter pin for cap square; 17-7 -- cylinder; 17-8 -- spring; 17-9 -- stop; 17-10 -- lever pin; 17611 -- adapter; 17-20 -- cam guide; 17-22 -- bushing; 17-24 -- dished-disk spring; 17-26 -- nut; 17-35 -- bolt; 17-36 -- dished-disk spring; 17-39 -- nut; 17-42 -- pivot cover; 17-43 -- regulating bolt; 17-50 -- bushing housing; 17-53 -- lock nut; 17-62 -- pivot; 17-63 -- nut; 17-67 -- locking gib; 17-70 -- front clamp; 17-72 -- locking gib; 17-73 -- adjusting pin; 17-74 -- elevation stop; 17-78 -- stop; Sb17-2 -- travel lock; Sb17-3 -- upper carriage; A51000-47 -- bolt; A51000-56 -- bolt; A51011-8 -- nut

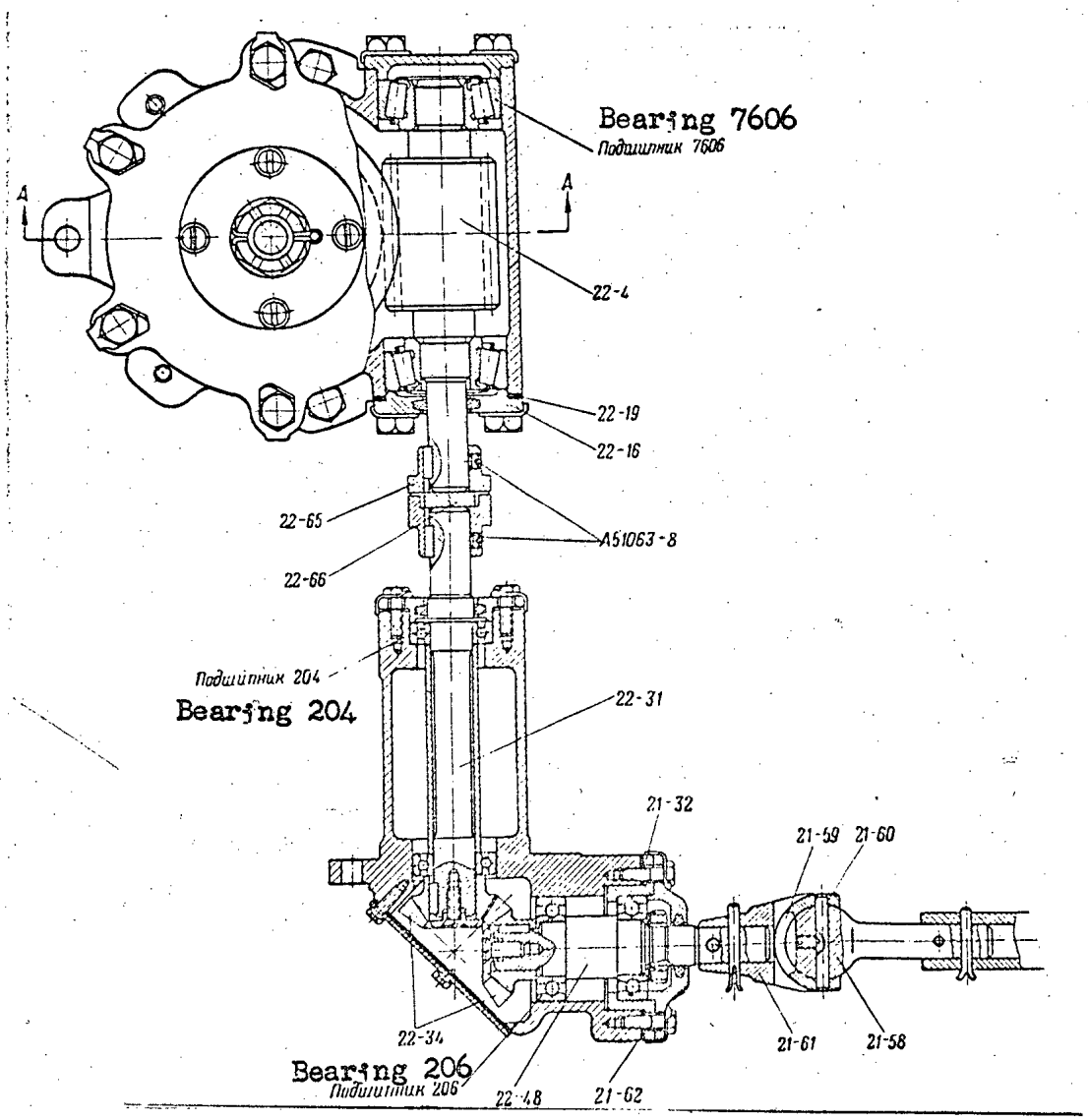


Figure 9. Traversing Mechanism (Part I)

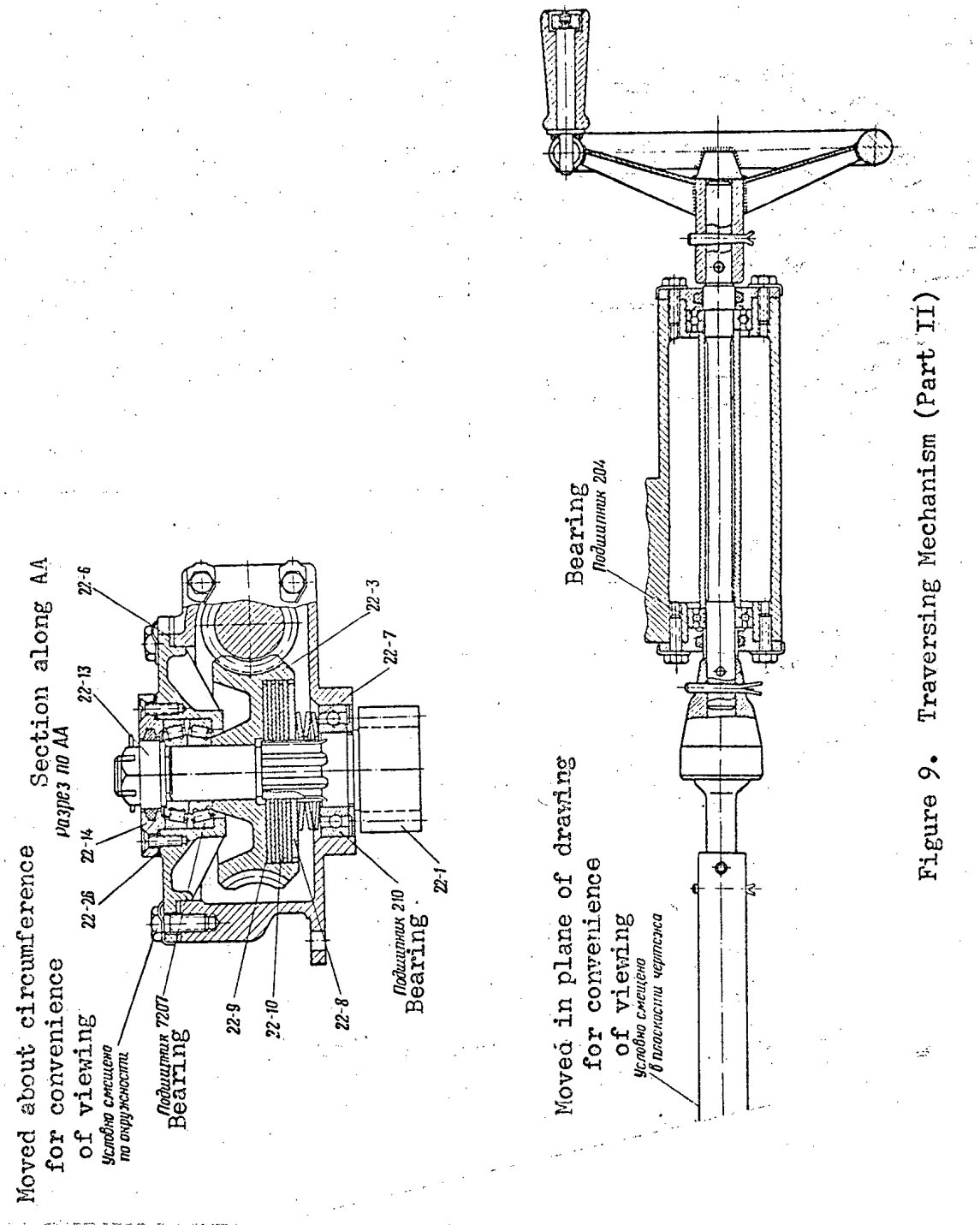


Figure 9. Traversing Mechanism (Part II)

Figure 9. Traversing Mechanism

21-32 -- bushing; 21-58 -- ball of joint; 21-59 -- ring of joint; 21-60 -- pin of joint; 21-61 -- socket; 21-62 -- spacer; 22-1 -- gear shaft; 22-3 -- worm wheel; 22-4 -- worm; 22-6 -- spacer; 22-7 -- dished-disk spring; 22-8 -- upper clutch plate; 22-9 -- intermediate clutch plate; 22-10 -- clutch plate; 22-13 -- nut; 22-14 -- cover; 22-16 -- cover; 22-19 -- spacer; 22-26 -- spacer; 22-31 -- shaft; 22-34 -- gear; 22-48 -- shaft; 22-65 -- guide sleeve; 22-66 -- connecting piece; A51063-8 -- screw

50X1-HUM

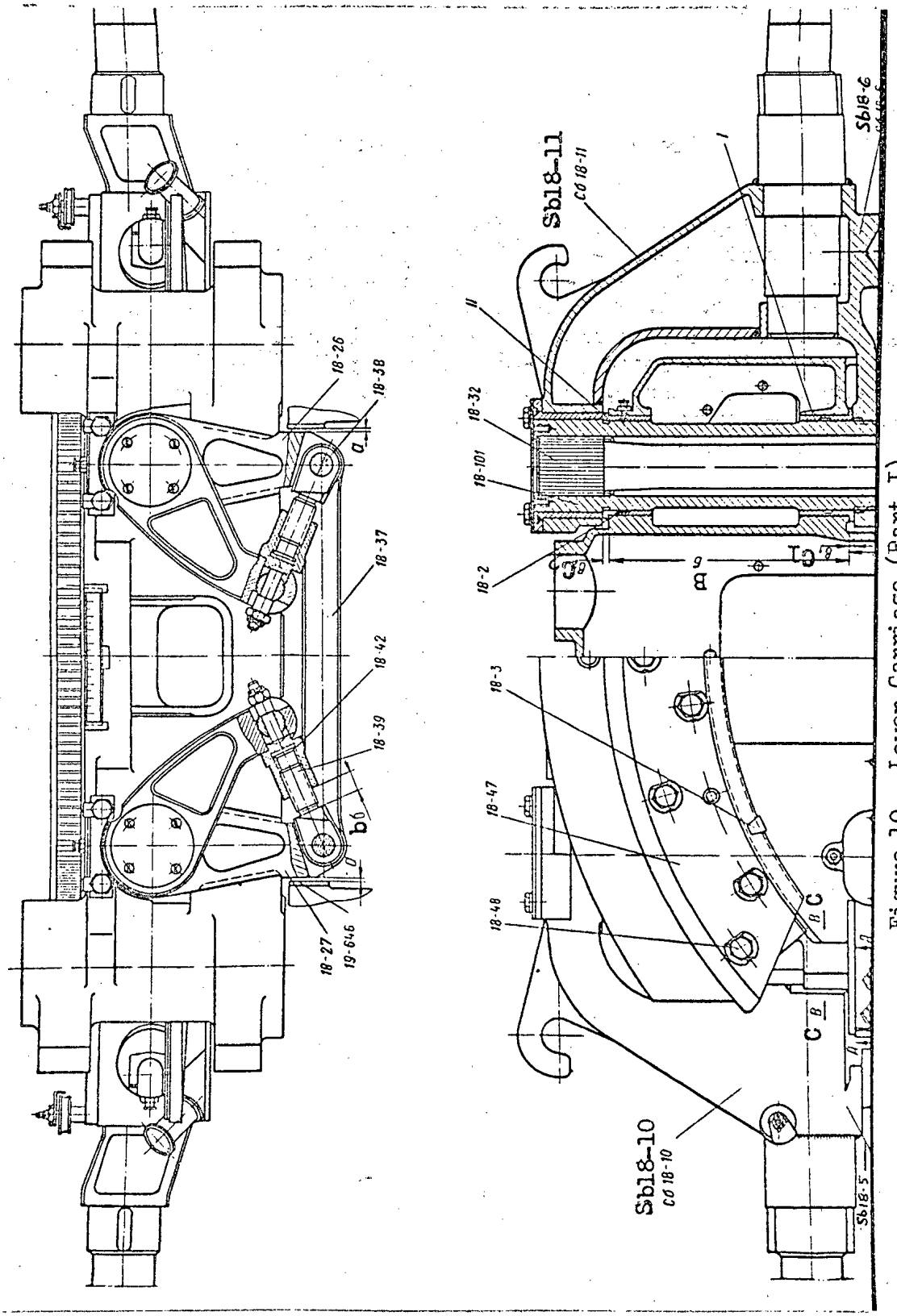


Figure 10. Lower Carriage (Part I)

50X1-HUM

50X1-HUM

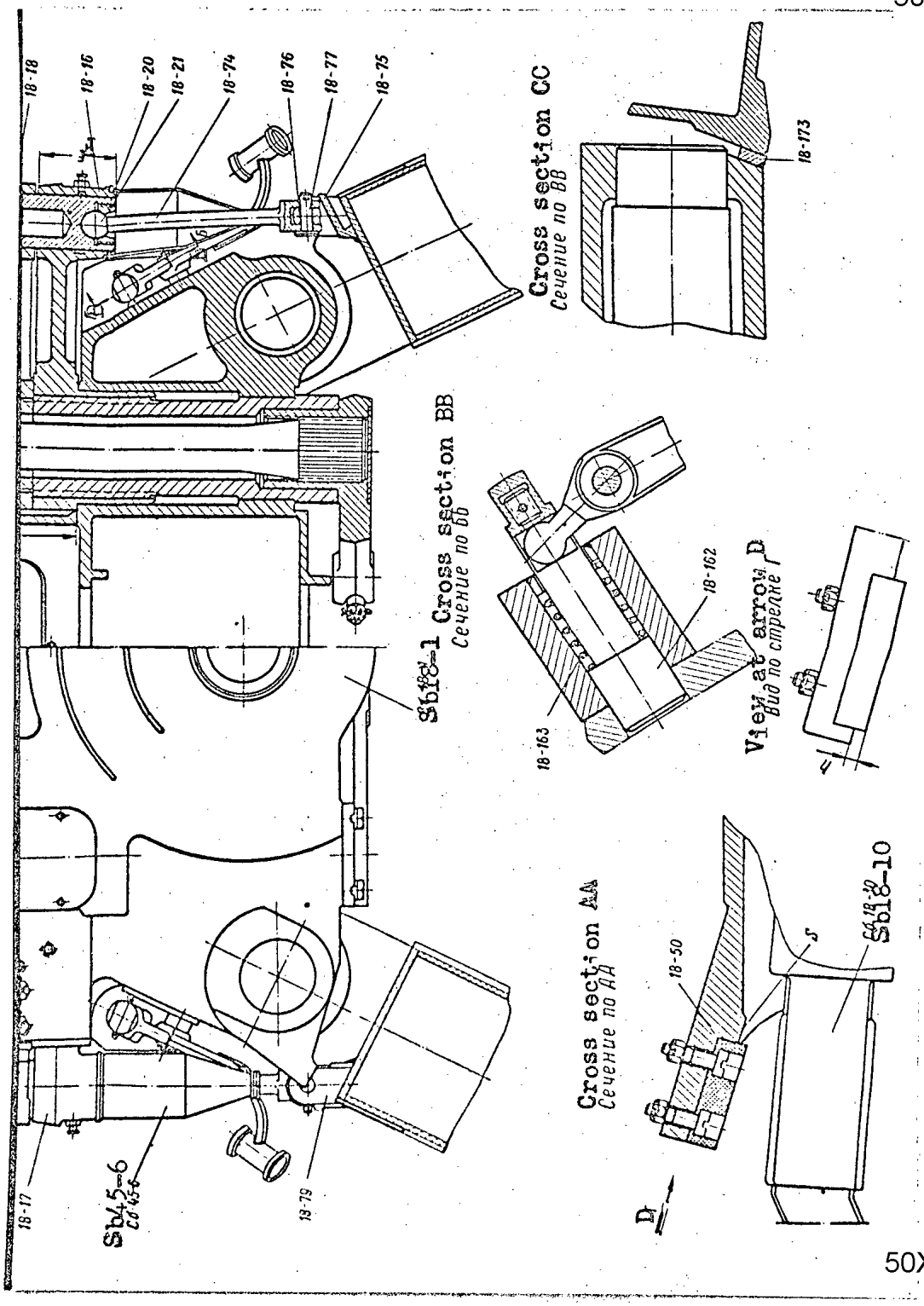


Figure 10. Lower Carriage (Part II)

50X1-HUM

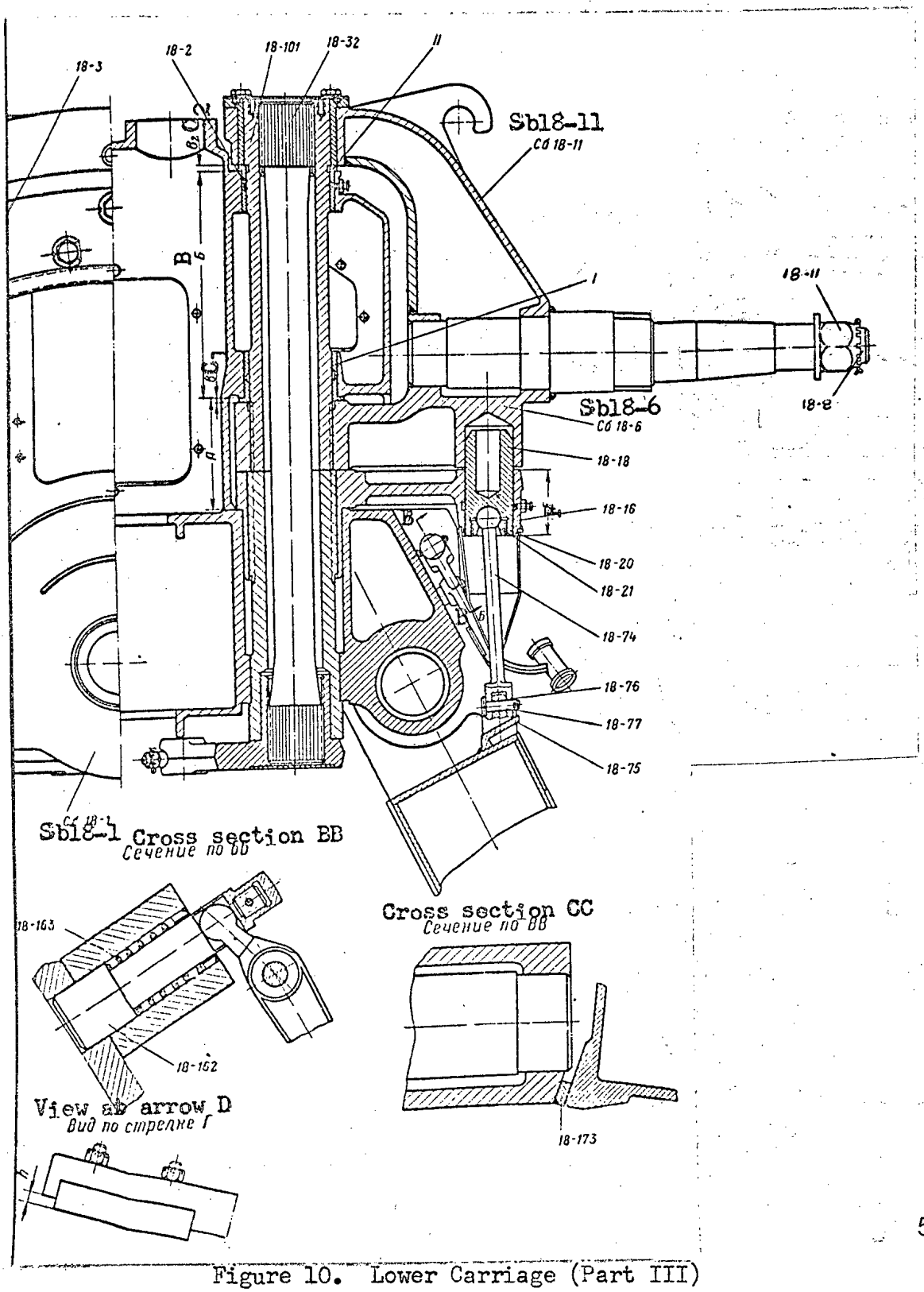


Figure 10. Lower Carriage (Part III)

Figure 10. Lower Carriage

18-2 -- bushing; 18-3 -- catch; 18-8 -- pin; 18-11 -- nut; 18-16 -- right combat locking device; 18-17 -- left combat locking device; 18-18 -- pintle; 18-20 -- nut; 18-21 -- ball bearing; 18-26 -- right rear bushing; 18-27 -- left rear bushing; 18-32 -- torsion bar; 18-37 -- parallel motion link; 18-38 -- parallel motion link pin; 18-39 -- coupling screw; 18-42 -- coupling housing; 18-47 -- arc; 18-48 -- special bolt; 18-50 -- buffer; 18-74 -- rod; 18-75 -- right bracket; 18-76 -- pin; 18-77 -- pin; 18-79 -- left bracket; 18-101 -- forward sleeve; 18-162 -- stop; 18-163 -- spring; 18-173 -- rocker arm catch; Sb18-1 -- lower carriage; Sb18-5 -- left rocker arm; Sb18-6 -- right rocker arm; Sb18-10 -- left rocker arm with lug; Sb18-11 -- right rocker arm with lug; 19-646 -- catch; Sb45-6 -- lower carriage pintle casing

50X1-HUM

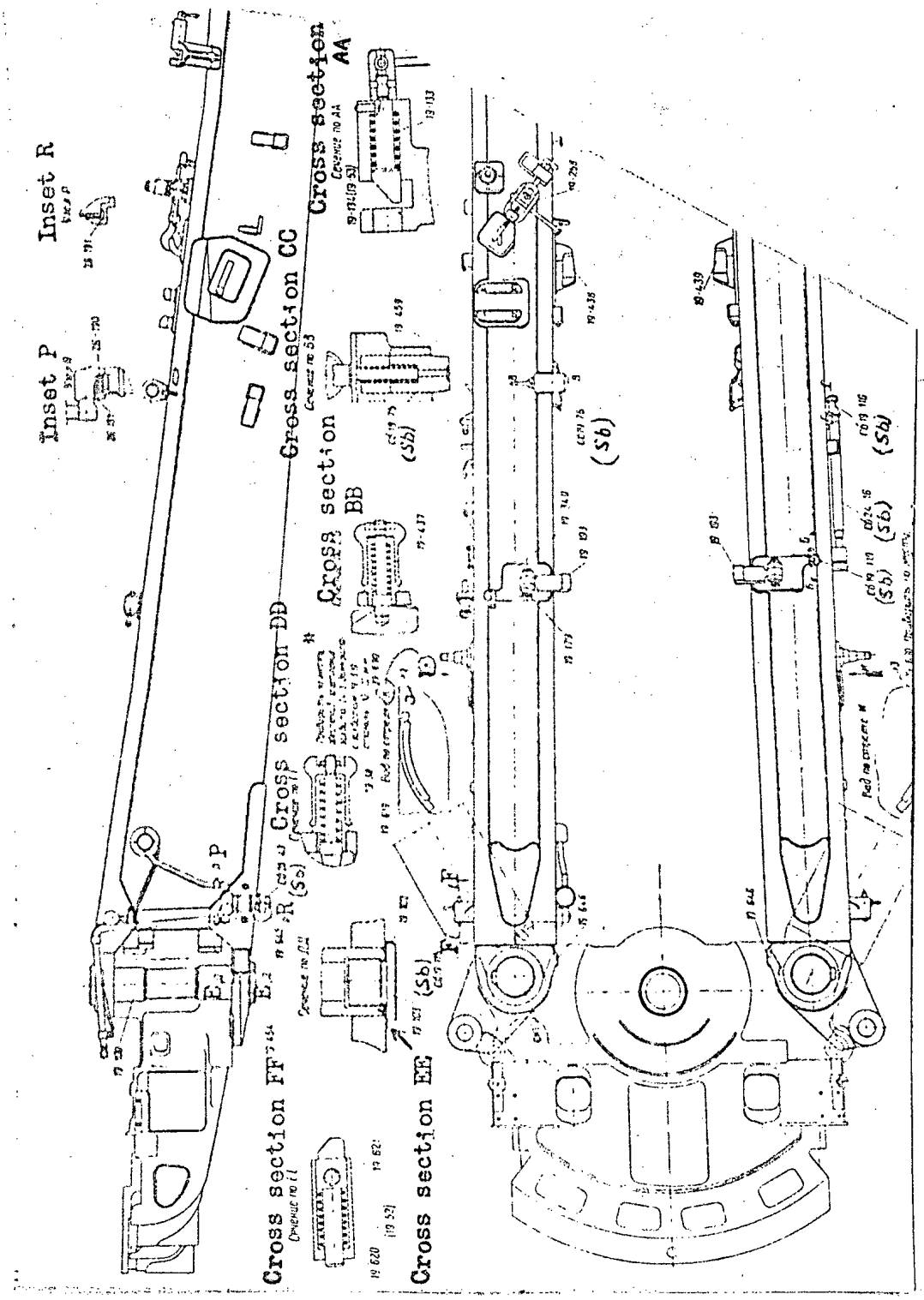


Figure 11. Trails (Part I)

50X1-HUM

50X1-HUM

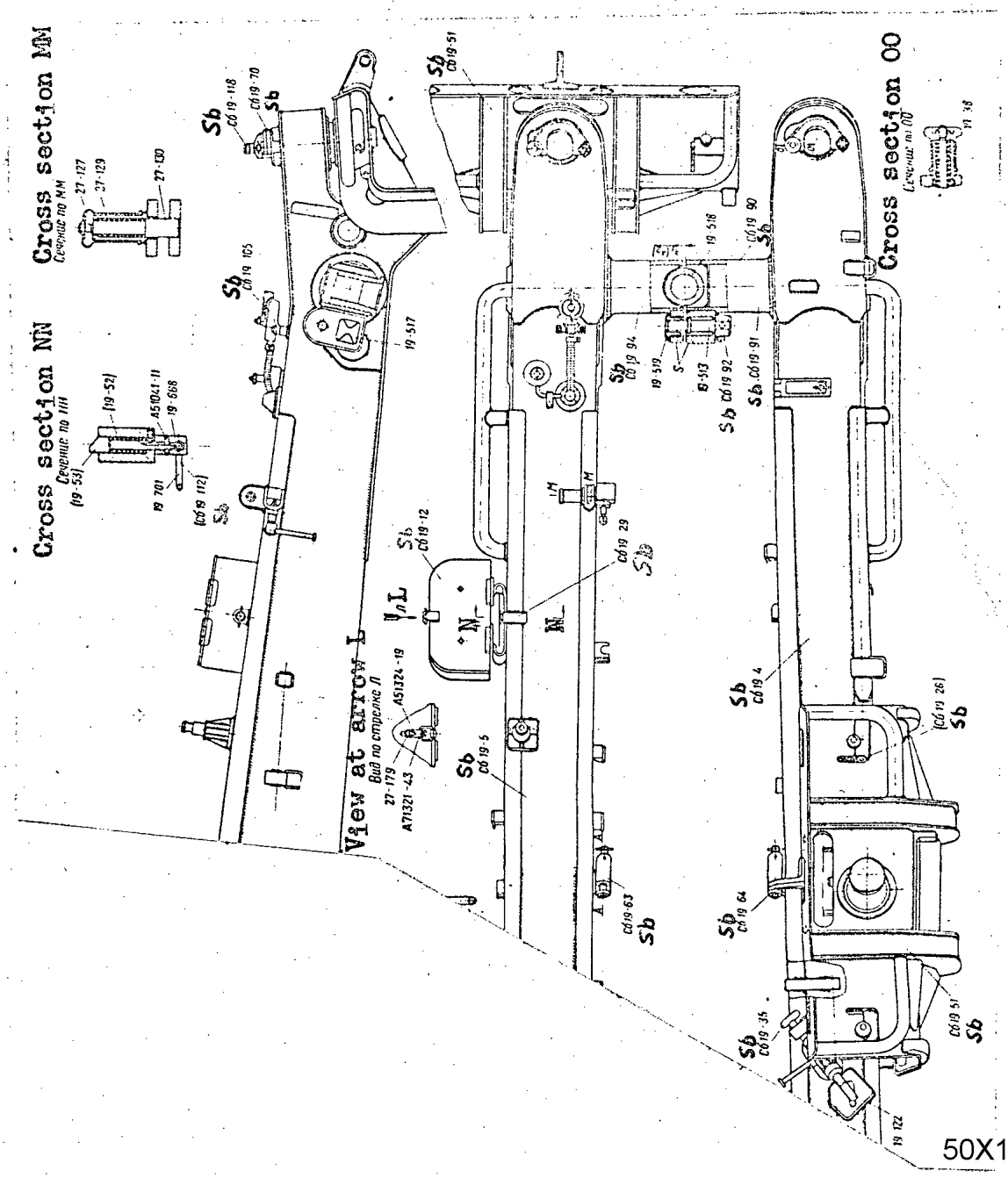


Figure 11. Trails (Part II)

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Figure 11. Trails

19-38 -- spring; (19-52) -- spring; (19-53) -- stop; 19-100 -- link bolt; 19-102 -- stop washer; 19-103 -- bolt; 19-122 -- tie bolt; 19-133 -- spring; 19-134 (19-53) -- stop; 19-179 -- pin; 19-193 -- clamp; 19-258 -- clamp nut; 19-340 -- bracket; 19-437 -- spring; 19-438 -- right support; 19-439 -- left support; 19-454 -- plate; 19-459 -- spring; 19-513 -- tie bolt; 19-517 -- guide pin; 19-518 -- bushing; 19-519 -- sleeve; 19-619 -- catch; 19-620 -- stop; 19-621 -- arm; 19-645 -- plate; 19-646 -- stud; 19-668 -- nut; 19-690 -- stop; 19-701 -- arm; Sb19-4 -- left trail; Sb19-5 -- right trail; Sb19-12 -- cleaning rod storage box; (Sb19-26) -- latch; Sb19-29 -- stop housing; Sb19-35 -- tightening device; Sb19-51 -- spade; Sb19-63 -- right latch; Sb19-64 -- left latch; Sb19-70 -- clamp ring; Sb19-75 -- stop with cylinder; Sb19-76 -- stop; Sb19-90 -- left bracket; Sb19-105 -- lock; (Sb19-112) -- arm; Sb19-115 -- stop; Sb19-116 -- stop; Sb19-118 -- stop; Sb19-119 -- stop; Sb24-16 -- handle; 26-190 -- filter; 26-191 -- spacer; Sb26-43 -- air filter; 27-127 -- cap; 27-129 -- spring; 27-130 -- stop; 27-179 -- separating ring; A51041-11 -- cotter pin; A51324-19 -- bracket; A71321-43 -- lock

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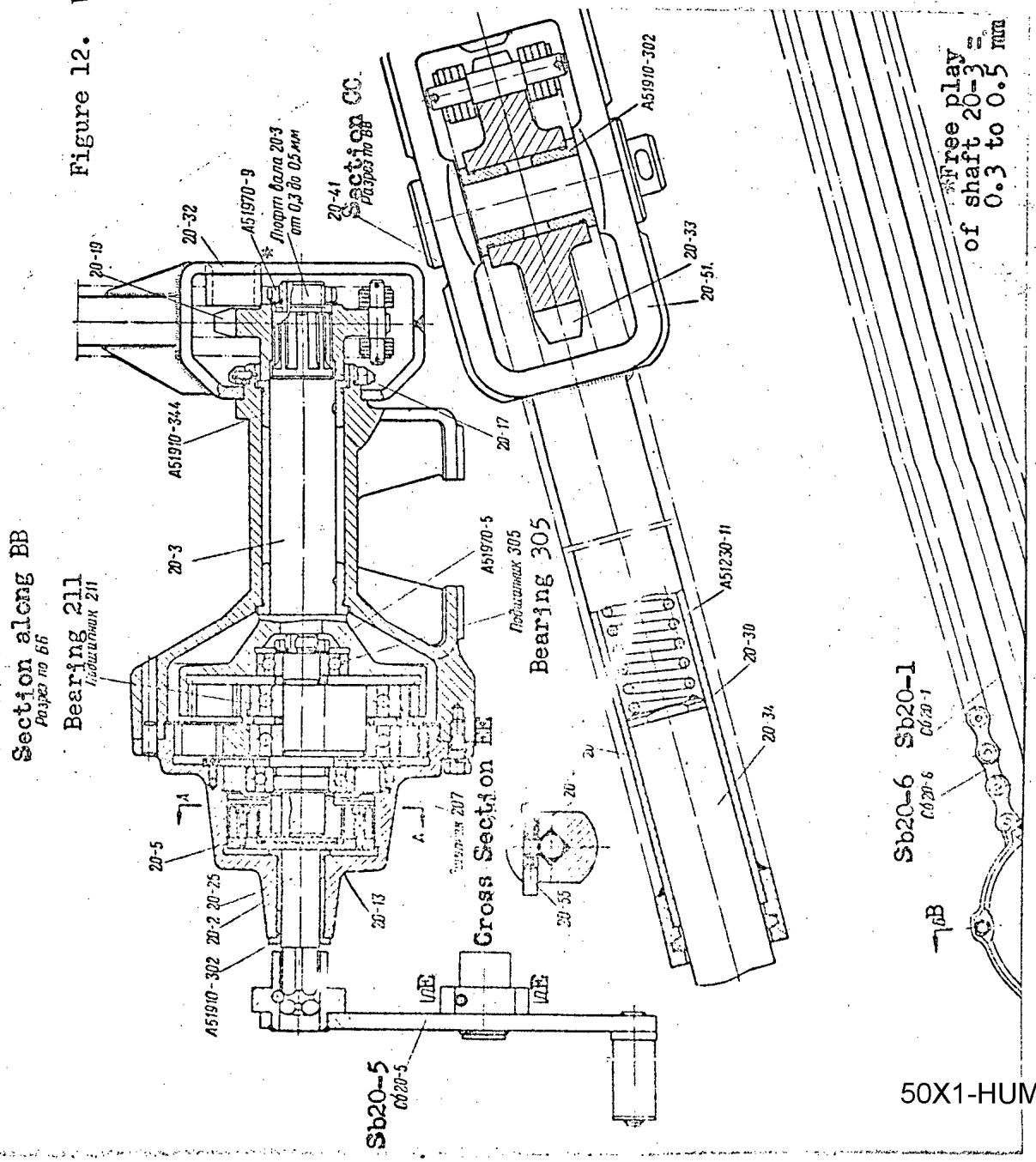
Figure 12. Winch (Part I)



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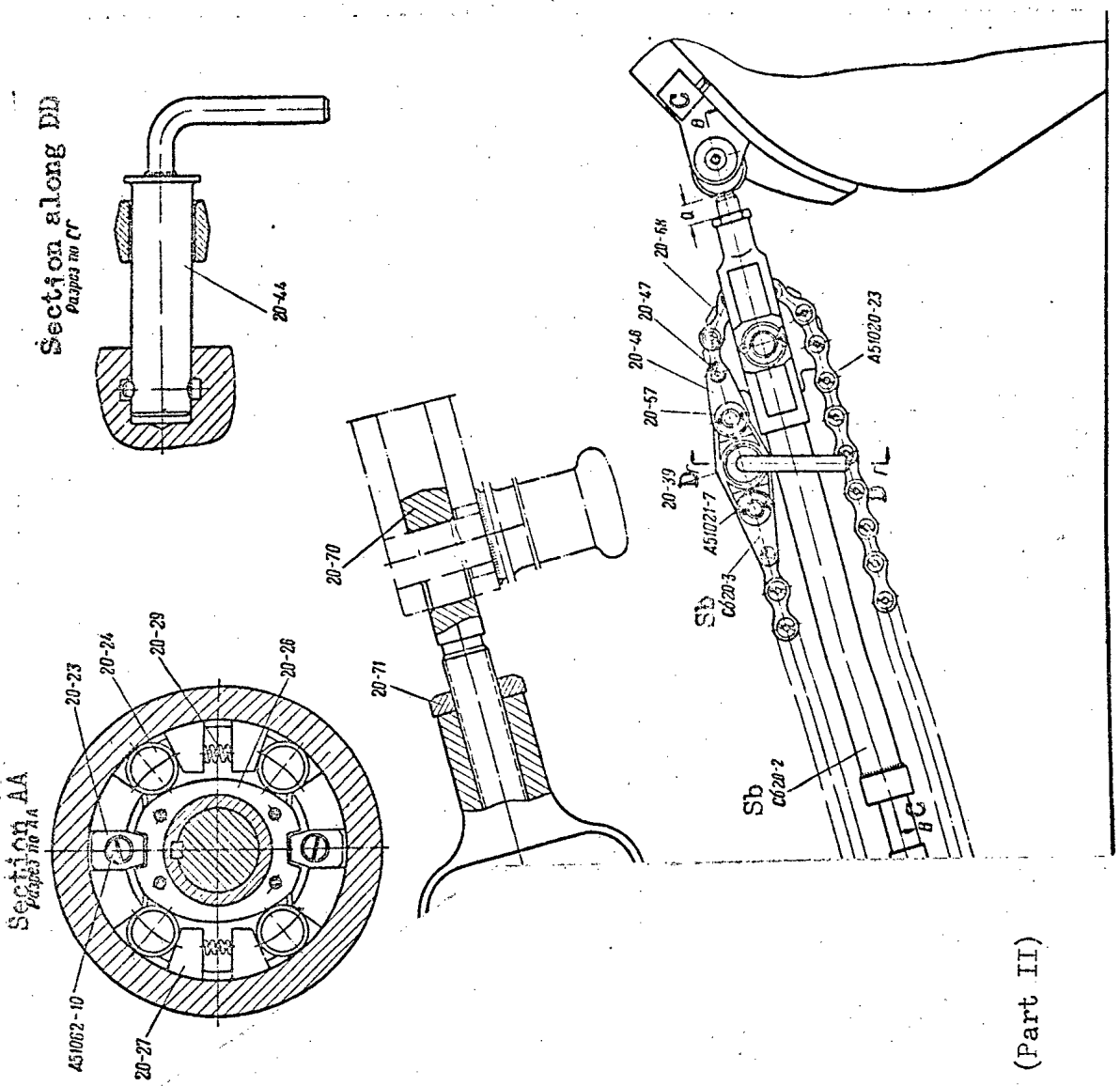

Figure 12. Winch (Part II)

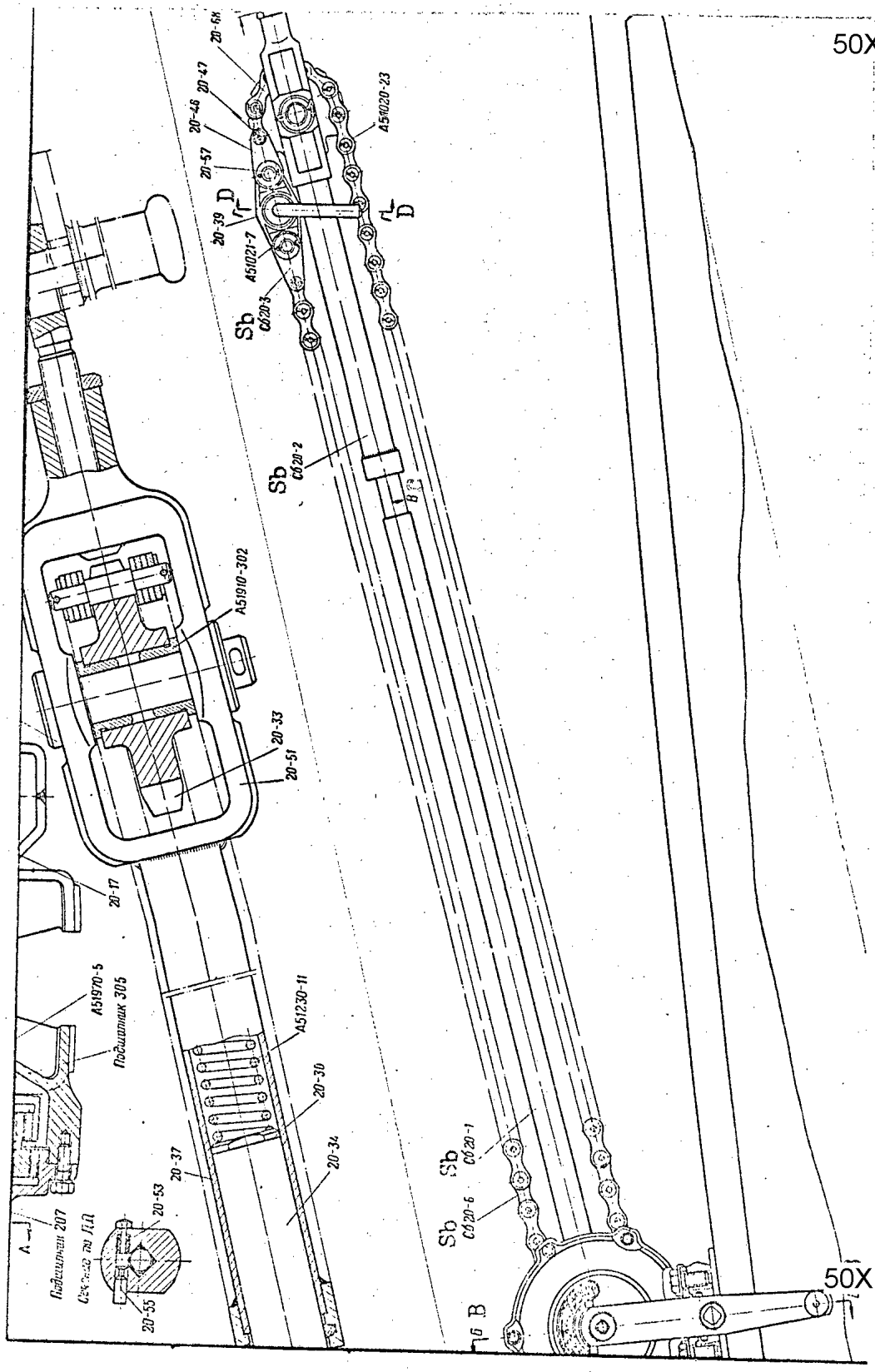

Figure 12. Winch (Part III)

Figure 12. Winch

20-2 -- cap; 20-3 -- gear shaft; 20-5 -- cam; 20-13 -- plate; 20-17 -- nut; 20-19 -- sprocket; 20-23 -- slide block; 20-24 -- roller; 20-25 -- left carrier; 20-26 -- right carrier; 20-27 -- jaw; 20-29 -- spring; 20-30 -- stopper; 20-32 -- bracket; 20-33 -- sprocket; 20-34 -- tube; 20-37 -- tube; 20-39 -- stirrup; 20-41 -- spindle; 20-44 -- pin; 20-46 -- end plate; 20-47 -- pintle; 20-51 -- yoke; 20-53 -- spring; 20-55 -- stop; 20-57 -- pin; 20-68 -- plate; 20-70 -- eye fitting; 20-71 -- safety nut; Sb20-1 -- elevating beam; Sb20-2 -- suspension shackle; Sb20-3 -- chain; Sb20-5 -- handle; Sb20-6 -- chain; A51020-23 -- washer; A51021-7 -- washer; A51062-10 -- screw; A51230-11 -- spring; A51910-302 -- bushing; A51910-344 -- bushing; A51970-5 -- round nut; A51970-9 -- round nut

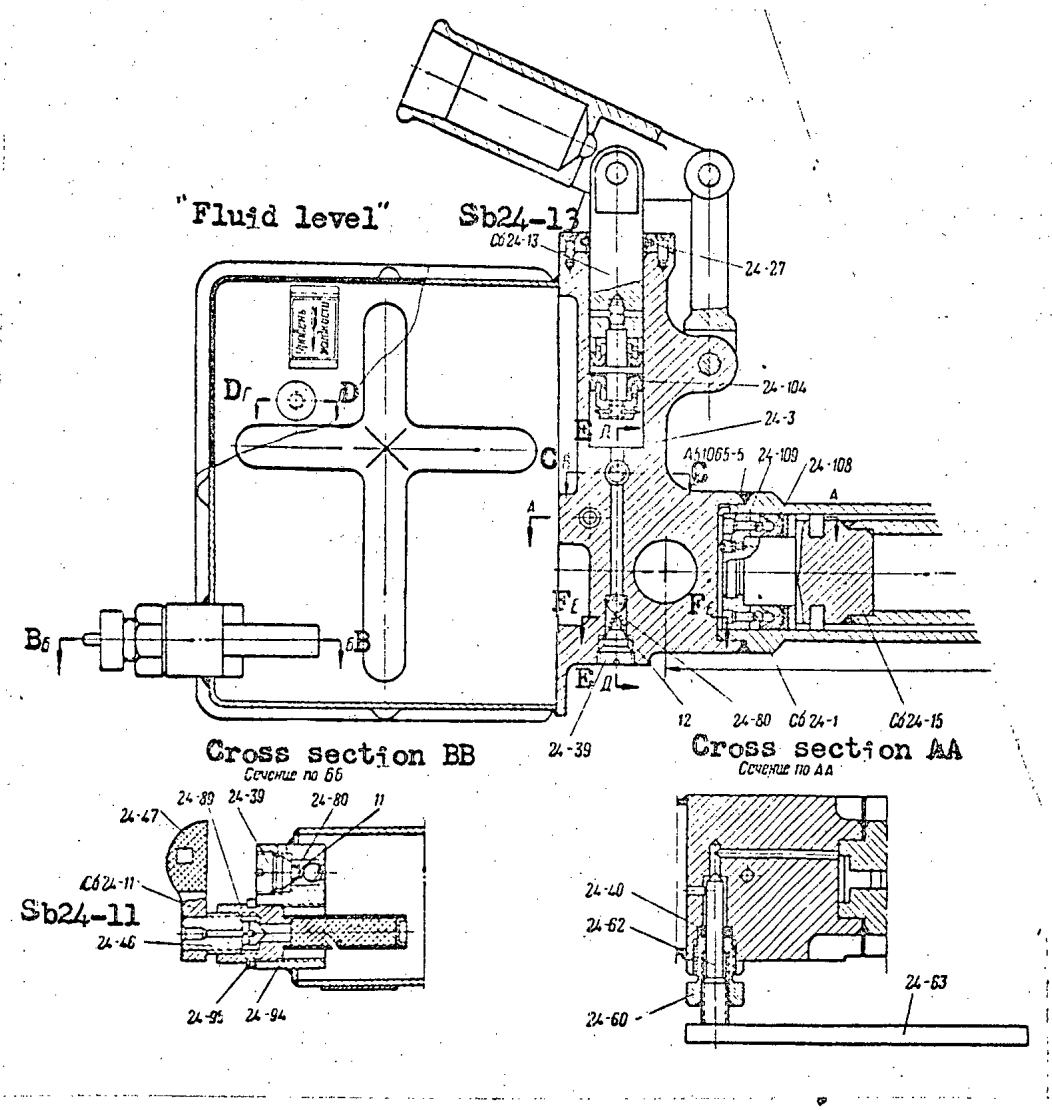

Figure 13. Jack (Part I)

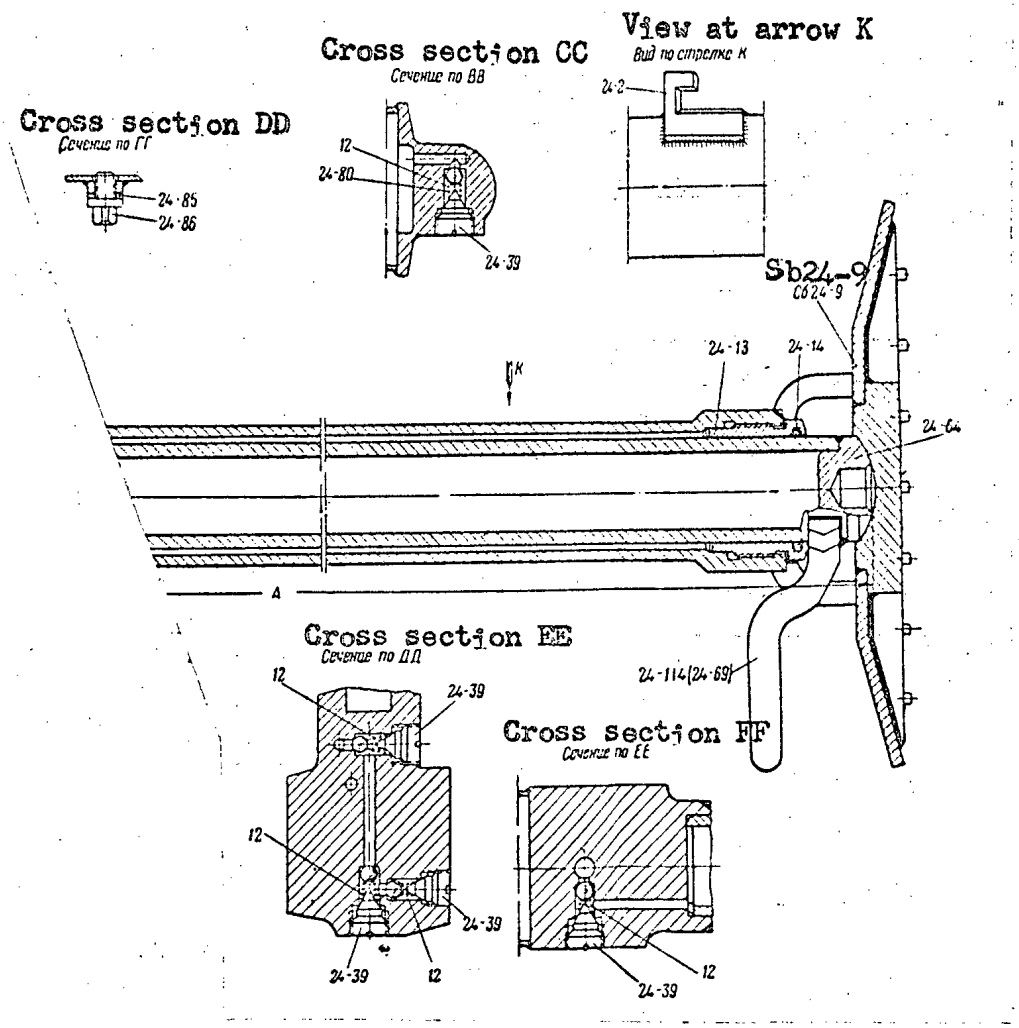

Figure 13. Jack (Part II)

Figure 13. Jack

24-2 -- catch; 24-3 -- jack frame; 24-13 -- bushing; 24-14 -- ring; 24-27 -- stuffing box; 24-39 -- plug; 24-40 -- ring; 24-46 -- valve; 24-47 -- valve arm; 24-60 -- flange nut; 24-62 -- valve; 24-63 -- handle; 24-64 -- pivot; 24-80 -- conical spring; 24-85 -- ring; 24-86 -- plug; 24-89 -- cup housing; 24-94 -- plug; 24-95 -- sealing ring; 24-104 -- collar; 24-108 -- collar; 24-109 -- collar ring; 24-114 (24-69) -- handle; Sb24-1 -- exterior cylinder; Sb24-9 -- plate; Sb24-11 -- valve; Sb24-13 -- plunger; Sb24-15 -- rod with piston; A51065-5 -- screw

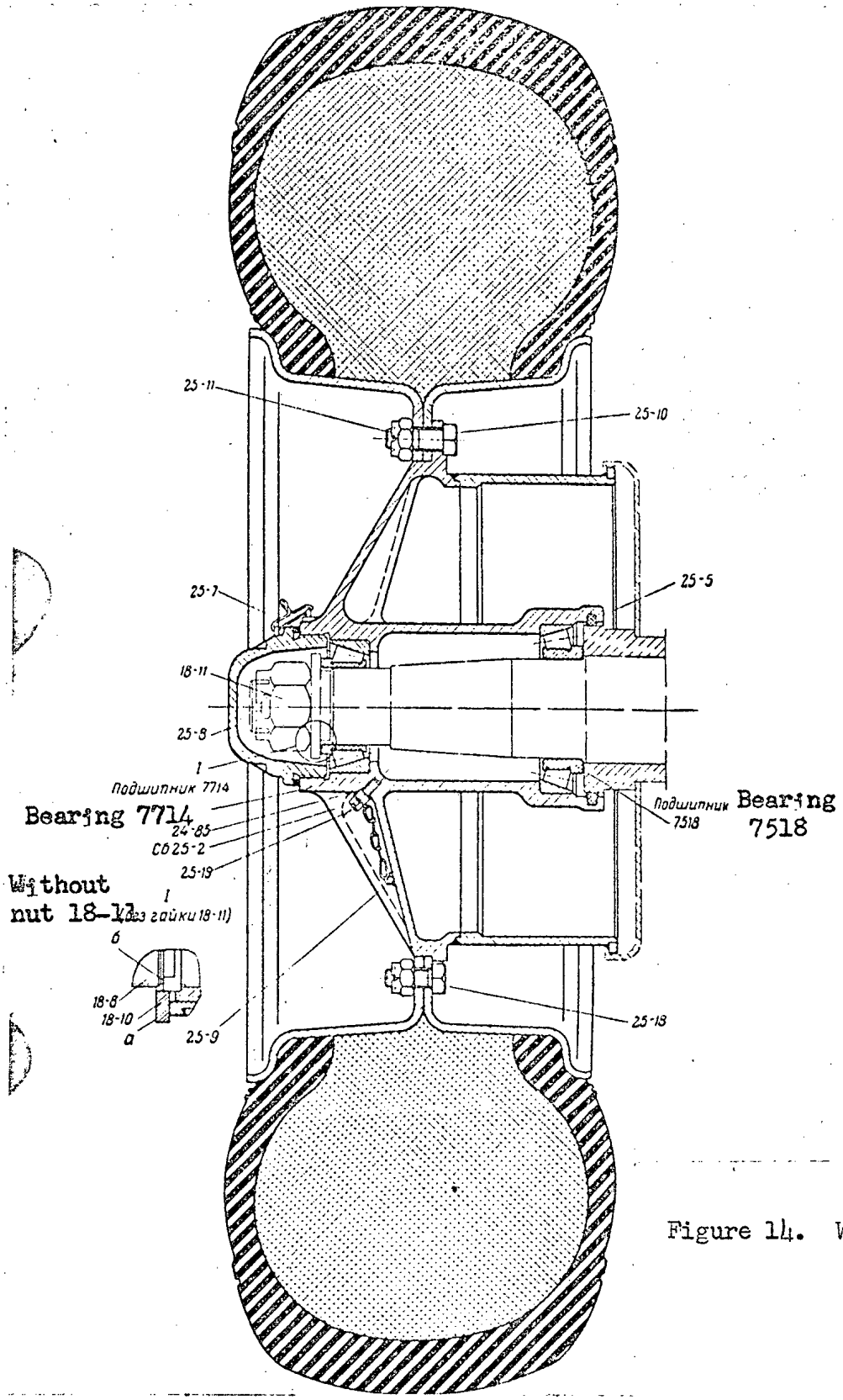

Figure 14. Wheel

Figure 14. Wheel

18-8 -- dowel; 18-10 -- washer; 18-11 -- nut; 24-85 -- ring; 25-5 -- stuffing box; 25-7 -- gasket ring; 25-8 -- hub cap; 25-9 -- fastening device; 25-10 -- bolt; 25-11 -- nut; 25-18 -- bolt; 25-19 -- plug; Sb25-2 -- nave with brake drum

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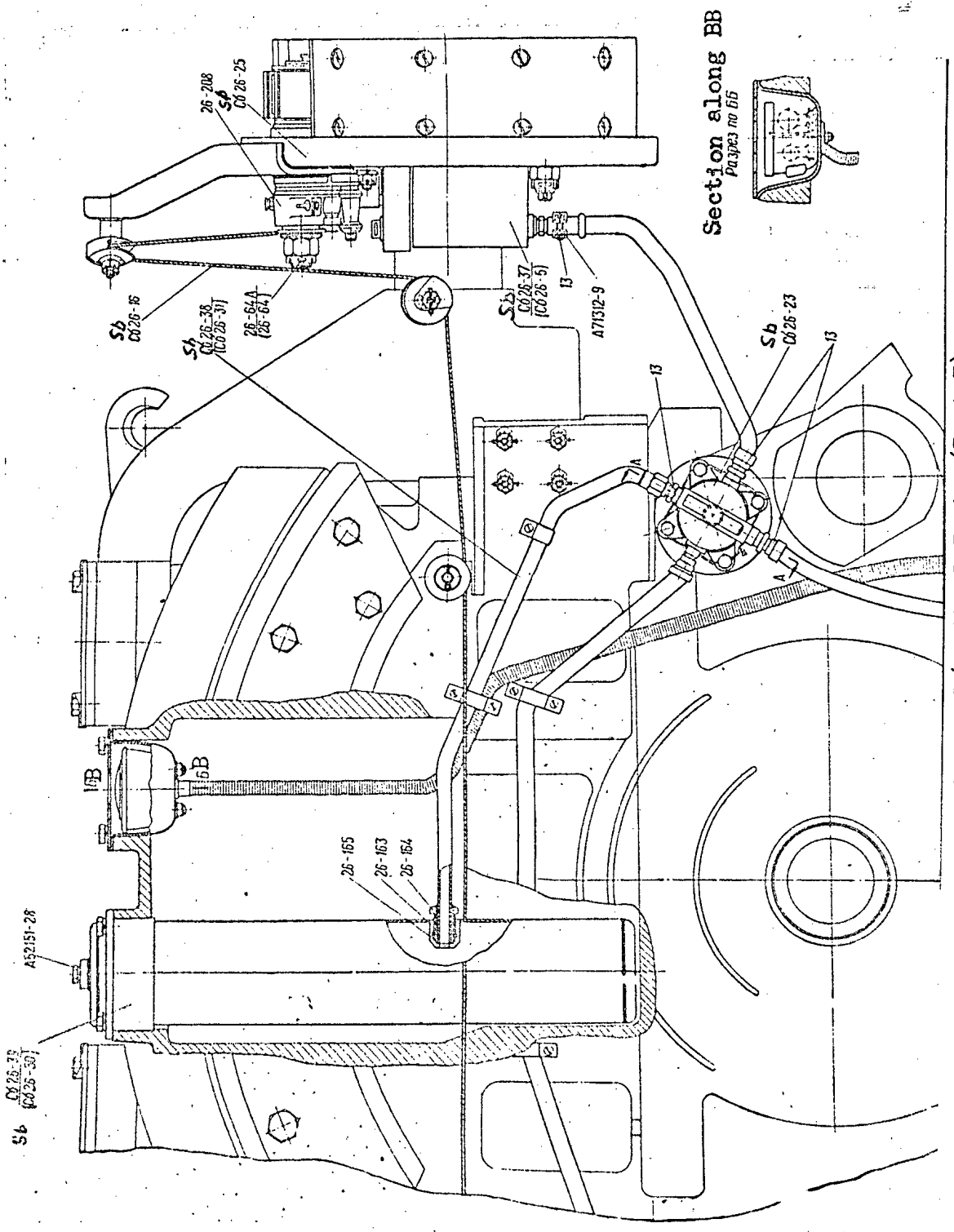

Figure 15. Wheel Brake (Part I)

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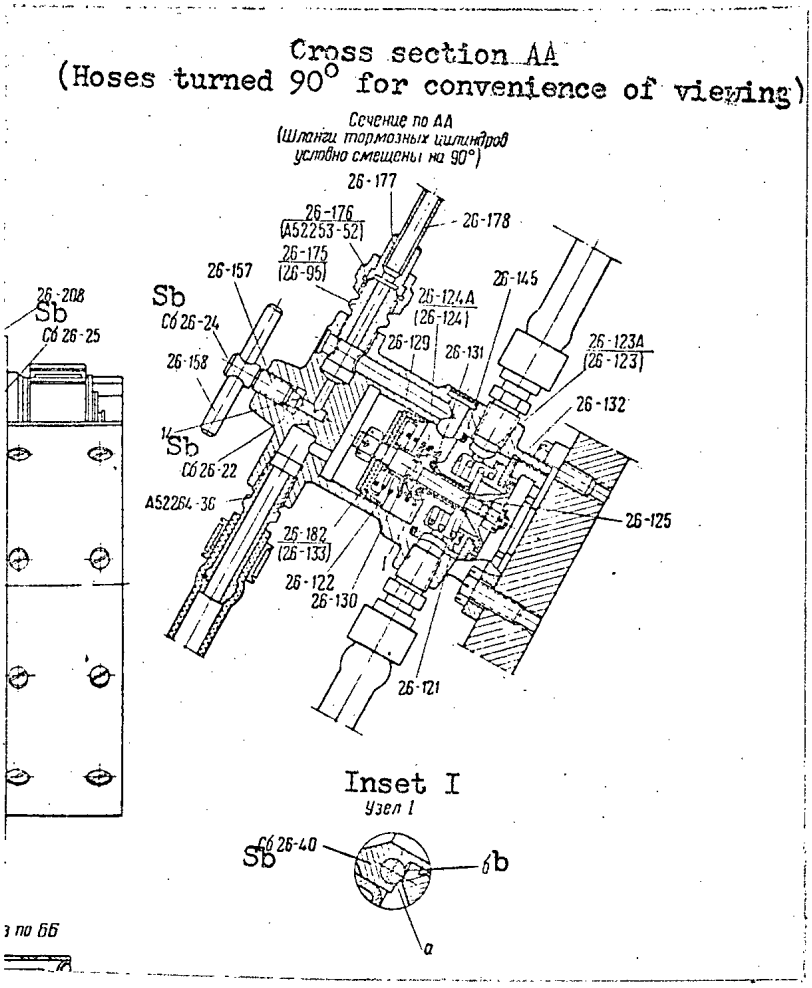


Figure 15. Wheel Brake (Part II)

Figure 15. Wheel Brake

26-64A (26-64) -- right shaft; 26-121 -- washer; 26-122 -- spring; 26-123A (26-123) -- spring; 26-124A (26-124) -- slide valve; 26-125 -- pin; 26-129 -- ring; 26-130 -- ring; 26-131 -- ring; 26-132 -- washer; 26-145 -- gasket; 26-157 -- valve; 26-158 -- tap wrench; 26-163 -- clamping sleeve; 26-164 -- connecting fitting; 26-165 -- sealing ring; 26-175 (26-95) -- end nipple; 26-176 -- sleeve; 26-177 insert; 26-178 -- tubing; 26-182 (26-133) -- cup; 26-208 -- right arm housing; Sb26-16 -- cable; Sb26-22 -- valve housing; Sb26-23 -- control valve; Sb26-24 -- valve; Sb26-25 -- right wheel brake disk; (Sb26-31) -- tube; Sb26-37 (Sb26-5) -- right cylinder; Sb26-38 -- connecting tube; Sb26-39 (Sb26-30) -- receiver; Sb26-40 -- slide valve with ring; A52151-28 -- plug; (A52253-52) -- nut; A52264-36 -- nipple; A71312-9 -- clamp

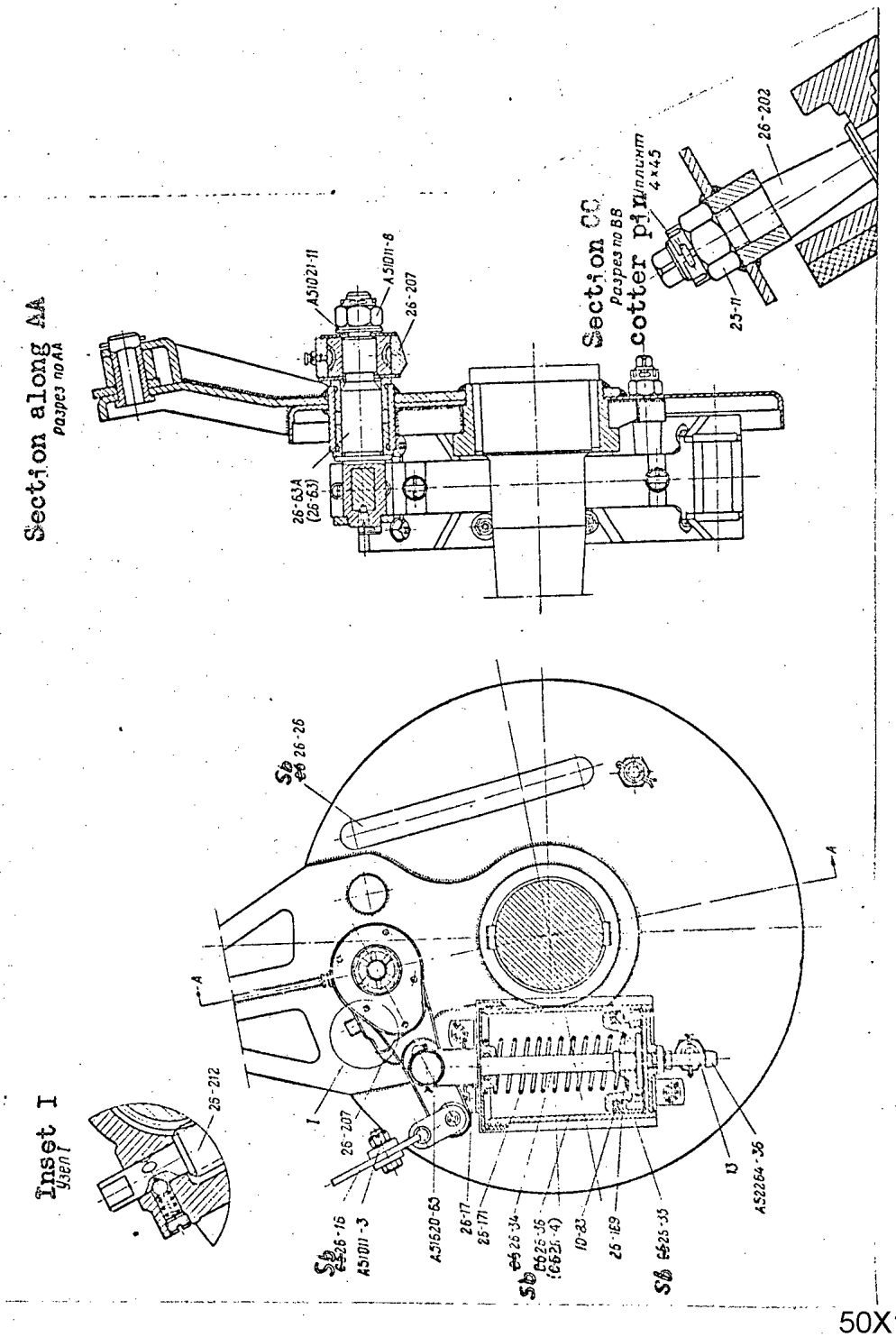
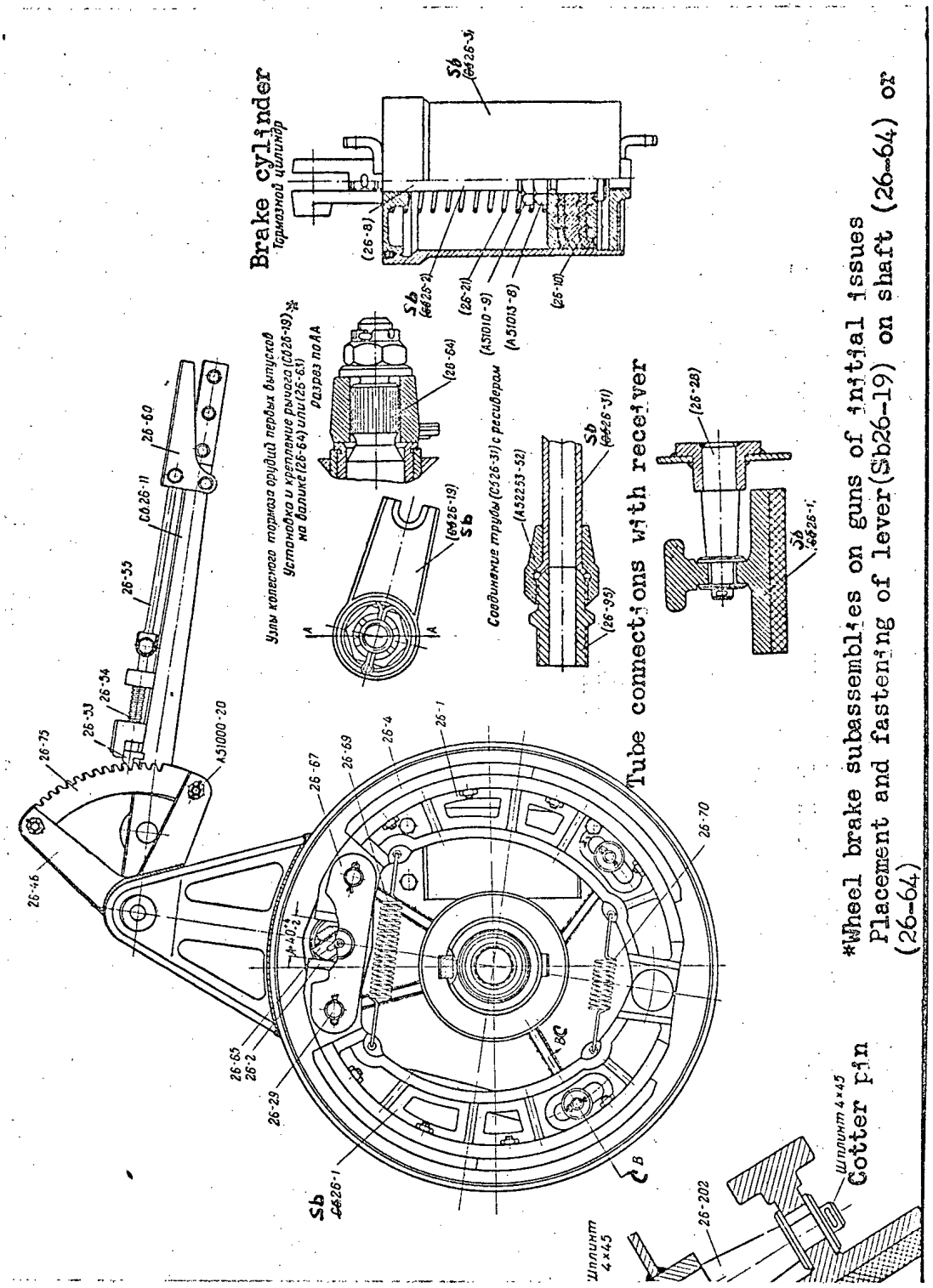


Figure 16. Wheel Brake (Part I)



*Wheel brake subassemblies on guns of initial issues
Placement and fastening of lever(Sb26-19) on shaft (26-64) or (26-64)

Figure 16. Wheel Brake (Part II)

Figure 16. Wheel Brake

10-83 (26-10) -- collar; 25-11 -- nut; 26-1 -- brake shoe; 26-2 -- slide block; 26-4 -- brake shoe lining; (26-10) -- collar; 26-17 -- piston head; 26-29 -- shoe pin; 26-46 -- arm; 26-53 -- pawl; 26-54 -- spring; 26-55 -- pawl pull rod; 26-60 -- trigger; 26-63A (26-63) -- left shaft; (26-64) -- right shaft; 26-65 -- cam; 26-67 -- lap; 26-69 -- spring; 26-70 -- spring; 26-75 -- notched segment; (26-95) -- end nipple; 26-169 (26-8) -- piston connecting rod; 26-171 (26-21) -- spring; 26-202 (26-28) -- eccentric shaft; 26-207 -- left arm housing; 26-212 -- worm; Sb26-1 -- brake shoe; (Sb26-2) -- piston; (Sb26-3) -- cylinder; Sb26-11 -- lever; Sb26-16 -- cable; (Sb26-19) -- arm; Sb26-26 -- left wheel brake disk; (Sb26-31) -- tube; Sb26-34 (Sb26-2) -- piston; Sb26-35 (Sb26-3) -- cylinder; Sb26-36 (Sb26-4) -- left cylinder; A51000-20 -- bolt; (A51010-9) -- nut; A51011-3 -- nut; A51011-8 -- nut; (A51013-8) -- nut; A51021-11 -- washer; A51620-65 -- pin; (A552253-52) -- nut; A52264-36 -- nipple

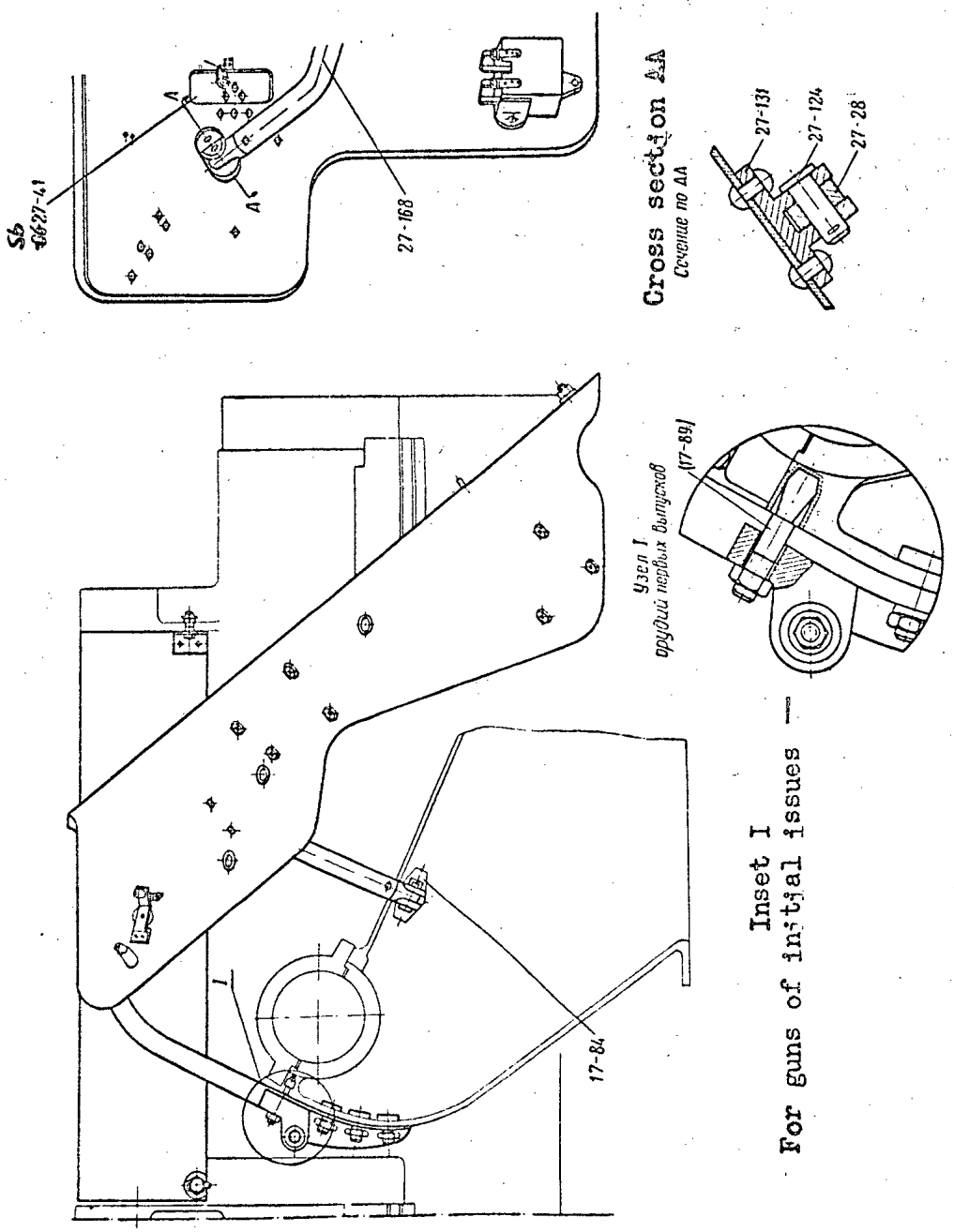


Figure 17. Shield Assembly (Part I)

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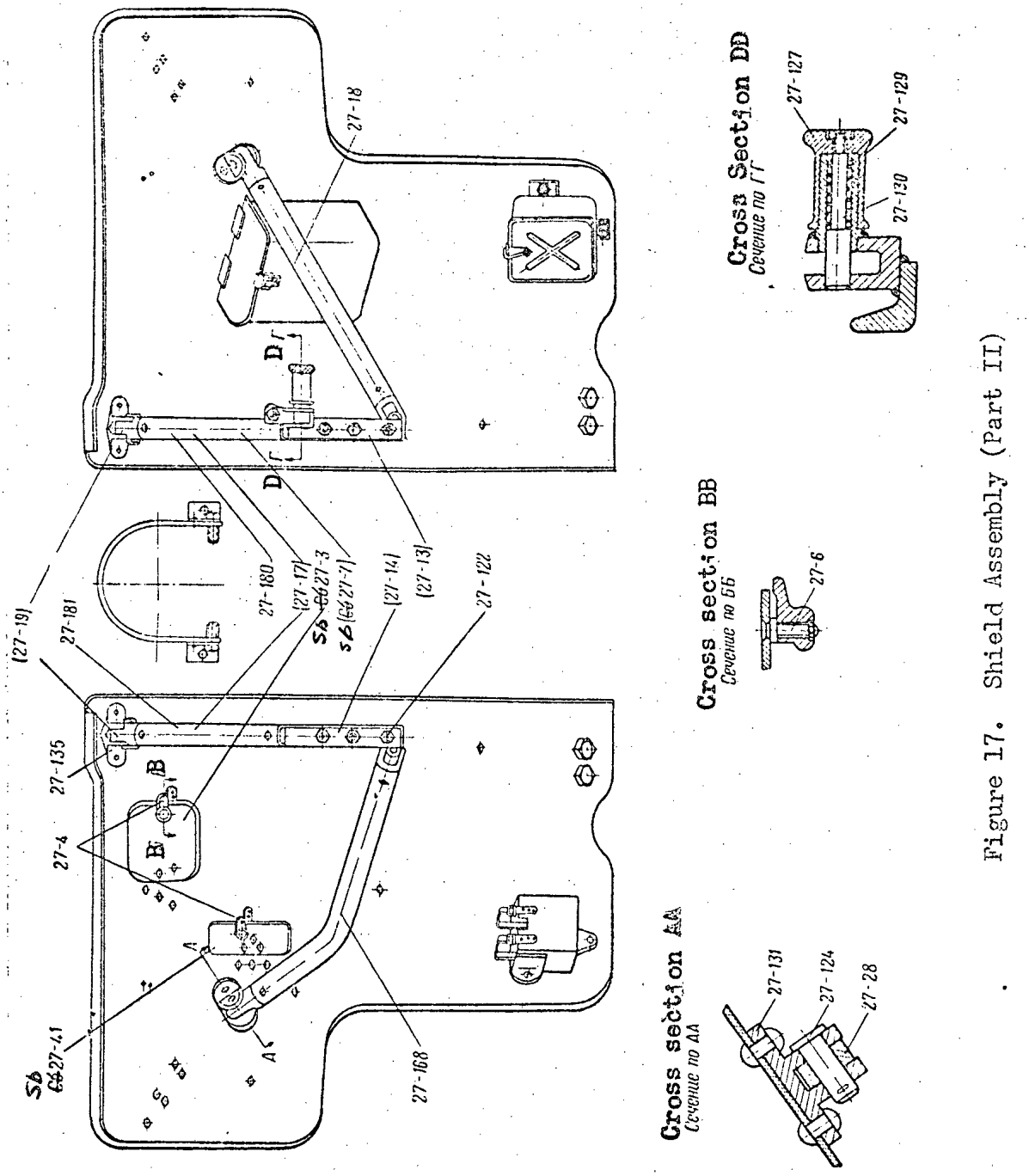

Figure 17. Shield Assembly (Part II)

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Figure 17. Shield Assembly

17-84 -- base; (17-89) -- bolt; 27-4 -- latch; 27-6 -- latch pin; (27-13) -- right bracket; (27-14) -- left bracket; (27-17) -- tube; 27-18 -- tube; (27-19) -- ear; 27-28 -- ear; 27-122 -- bolt; 27-124 -- pin; 27-127 -- cap; 27-129 -- spring; 27-130 -- stop; 27-131 -- base; 27-135 -- base; 27-168 -- tube; 27-180 -- right bracket; 27-181 -- left bracket; Sb27-3 -- shield aperture cover; (Sb27-7) -- right bracket; Sb27-41 -- shield aperture cover

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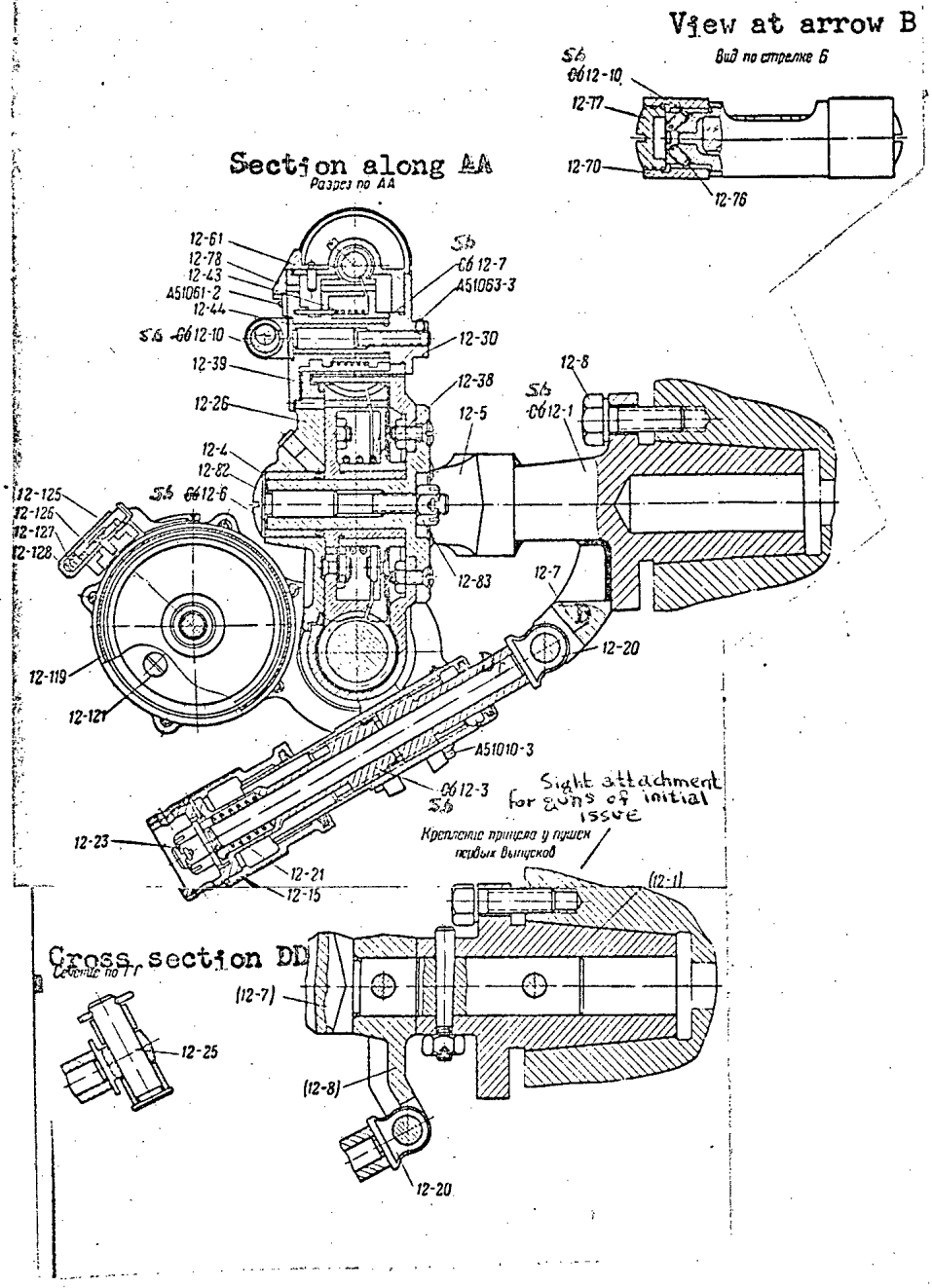

Figure 18. Panoramic Sight S-71 (Part I)

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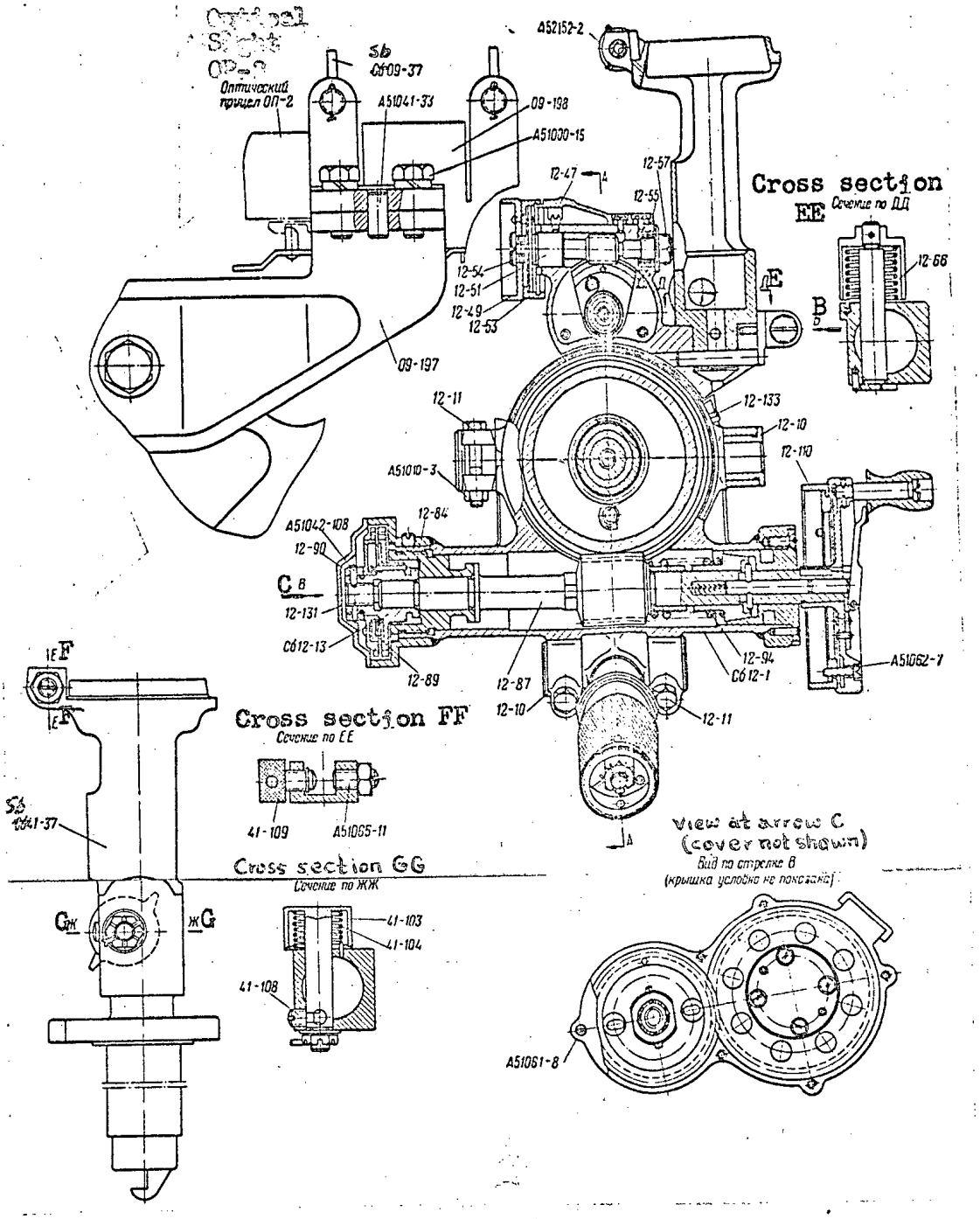
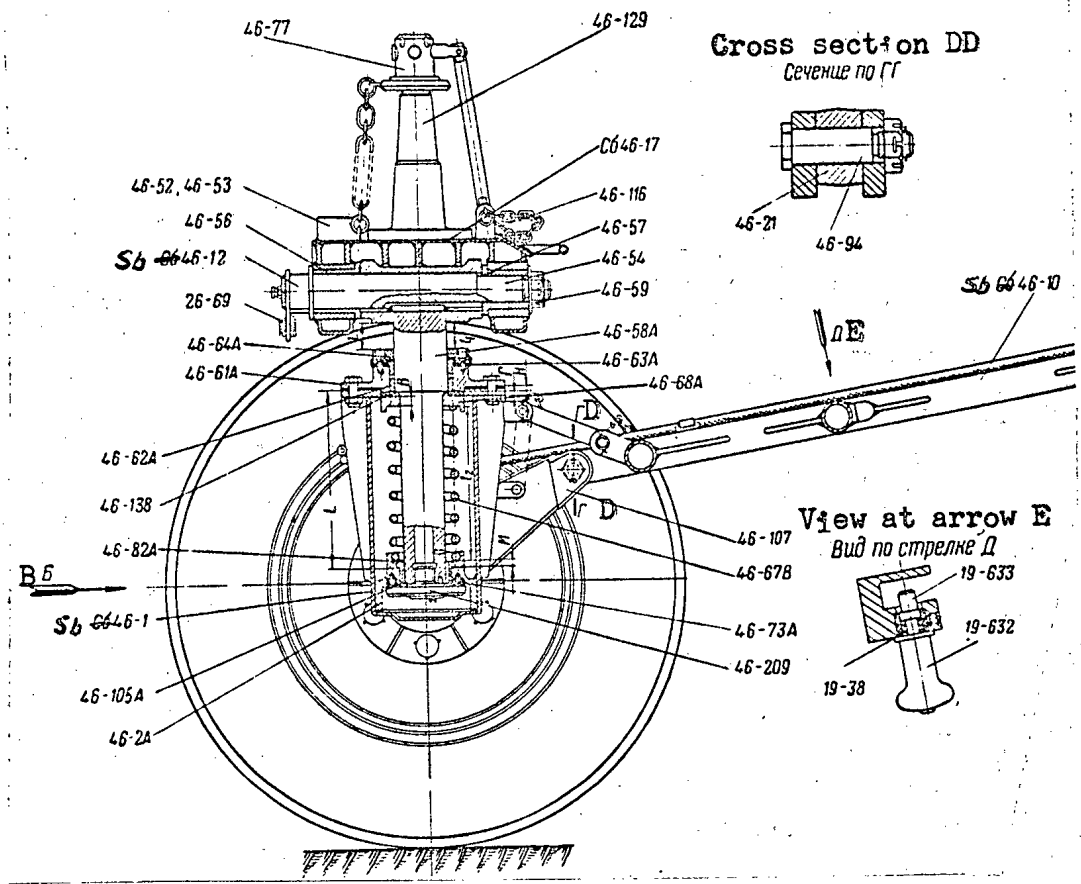


Figure 18. Panoramic Sight S-71 (Part II)

Figure 18. Panoramic Sight S-71

09-197 -- bracket; 09-198 -- coupling; Sb09-37 -- wing nut; (12-1) -- sight trunnion; 12-4 -- eccentric pin; 12-5 -- fork; 12-7 -- bracket; (12-7) -- fork with bracket; 12-8 -- bolt; (12-8) -- arm; 12-10 -- bushing; 12-11 -- bolt; 12-15 -- handle; 12-20 -- bar with lug; 12-21 -- spring; 12-23 -- nut with collar; 12-25 -- pin; 12-26 -- base of panoramic sight socket; 12-30 -- level pin; 12-38 -- spring; 12-39 -- segment base; 12-43 -- spring; 12-44 -- bolt; 12-47 -- limiter; 12-49 -- knob; 12-51 -- worm; 12-53 -- mil ring; 12-54 -- screw; 12-55 -- spring; 12-57 -- adjusting nut; 12-61 -- index; 12-66 -- spring; 12-70 -- level bracket; 12-76 -- screw; 12-77 -- plug; 12-78 -- coarse scale; 12-82 -- bolt; 12-83 -- nut; 12-84 -- pinion rim; 12-87 -- worm; 12-89 -- spring; 12-90 -- nut; 12-94 -- spring; 12-110 -- mil scale; 12-119 -- range drum; 12-121 -- screw; 12-125 -- guide; 12-126 -- limiter; 12-127 -- spring; 12-128 -- index; 12-131 -- cap; 12-133 -- index; Sb12-1 -- sight box; Sb12-1 -- yoke with trunnion; Sb12-3 -- adjusting screw; Sb12-6 -- worm wheel; Sb12-7 -- segment; Sb12-10 -- vial housing; Sb12-13 -- worm gear; 41-103 -- wing knob; 41-104 -- spring; 41-108 -- screw; 41-109 -- clamping screw; Sb41-37 -- extension; A51000-15 -- bolt; A51010-3 -- nut; A51041-33 -- pin; A51042-108 -- conical pin; A51061-2 -- screw; A51065-11 -- screw; A52152-2 -- clamp screw



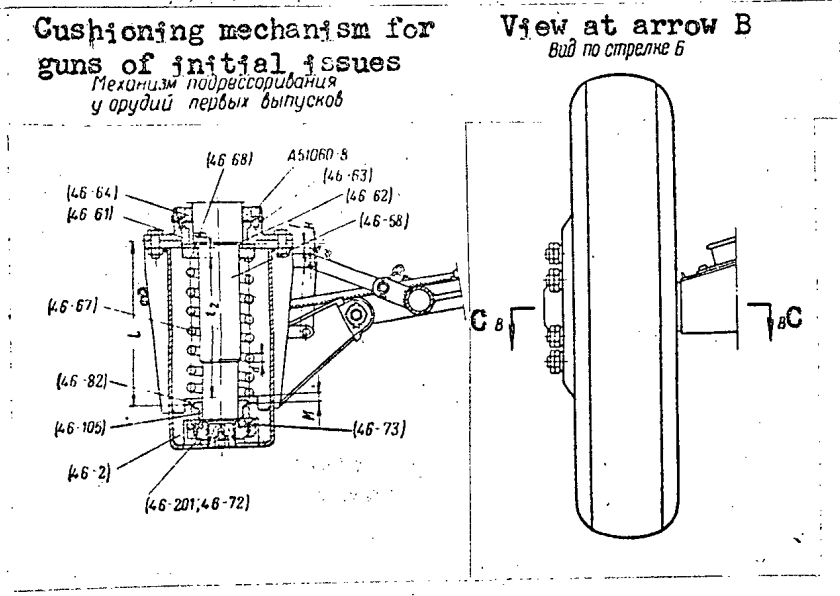


Figure 19. Limber (Part I)

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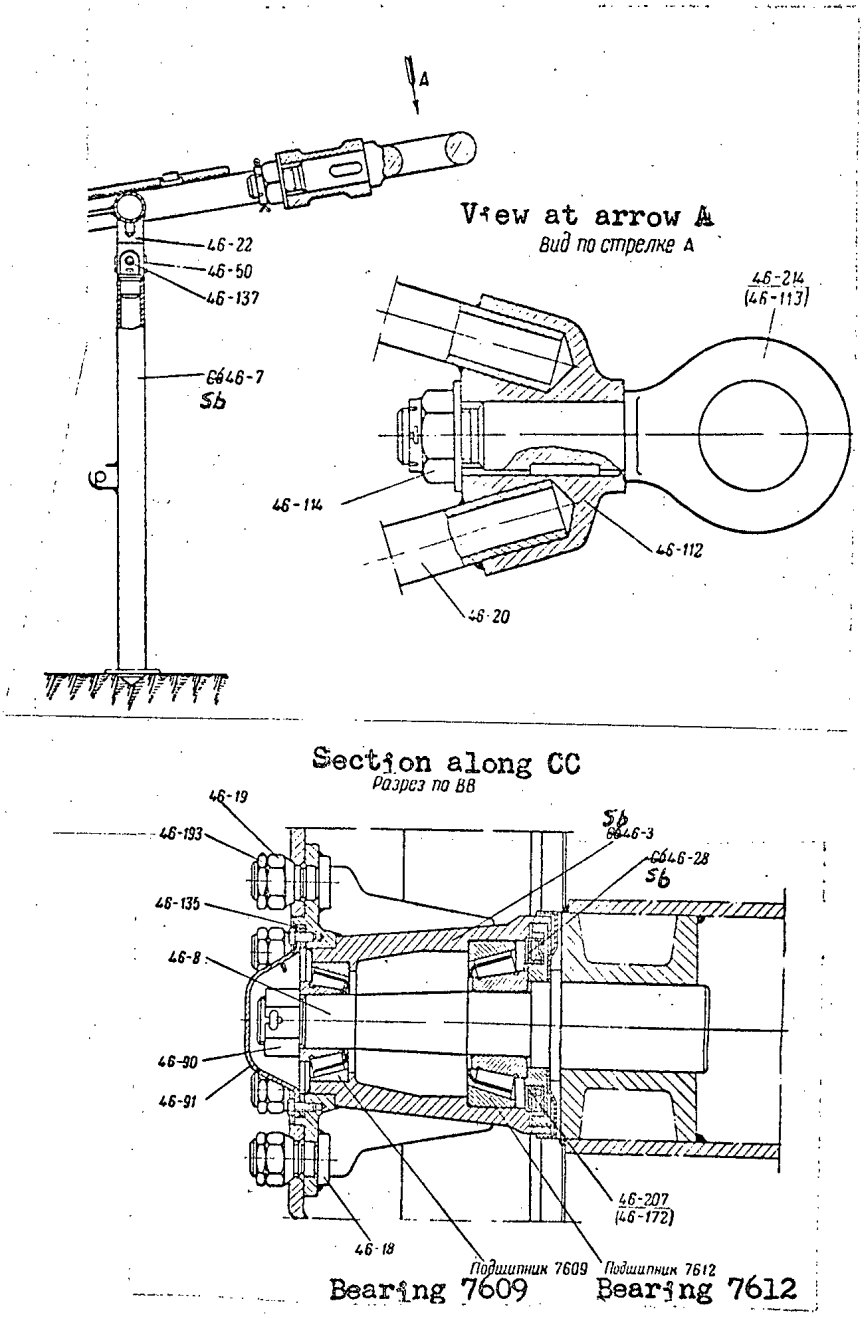

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Figure 19. Limber (Part II)

Figure 19. Limber

19-38 -- spring; 19-632 -- cap; 19-633 -- stop; 26-69 -- spring; 46-2A (46-2) -- lower block; 46-8 -- axle; 46-18 -- bolt; 46-19 -- nut; 46-20 -- pipe; 46-21 -- ear; 46-22 -- lug; 46-50 -- ring; 46-52 -- right brace; 46-53 -- left brace; 46-54 -- pintle; 46-56 -- bushing; 46-57 -- bushing; 46-58A (46-58) -- pintle; 46-59 -- nut; 46-61A (46-61) -- cover plate; 46-62A (46-62) -- bushing; 46-63A (46-63) -- covering; 46-64A (46-64) -- upper buffer; 46-67B (46-67) -- spring; 46-68A (46-68) -- washer; (46-72) -- nut; 46-73A (46-73) -- lower buffer; 46-77 -- nut; 46-82A (46-82) -- washer; 46-90 -- nut; 46-91 -- hub cap; 46-94 -- pin; 46-105A (46-105) -- bushing -- 46-107 -- lug; 46-112 -- pintle plate; 46-114 -- nut; 46-116 -- gib; 46-129 -- chassis pintle; 46-135 -- gasket; 46-137 -- pin; 46-138 -- ring; 46-193 -- nut; (46-201; 46-72) -- nut; 46-207 (46-172) -- collar; 46-209 -- flange screw; 46-214 (46-113) -- coupling eye; Sb46-1 -- limber pintle; Sb46-3 -- nave; Sb46-7 -- stand; Sb46-10 -- coupling bar; Sb46-12 -- pintle; Sb46-17 -- limber body; Sb46-28 -- collar seal; A51060-8 -- screw

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