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The Soviet Army Artillery Instructions, "Rules for Ground Artillery Firing" set forth the basic conditions for firing ground artillery and rocket artillery, recoilless weapons and mortars as well (including the 82-mm). The Instructions include the rules for preliminary preparation of firing, preparation of initial firing data, calculating the installations for fire for effect and fire for effect by a battery, platoon, and gun (mortars, combat vehicles).

With the publication of this Instructions, the following are voided: Soviet Army Artillery Instructions - Ground artillery battery firing rules, published in 1954 and 1955; Changes in the Rules for Ground Artillery Battery Firing, published 1956; Soviet Army Artillery Instructions - Direct laying ground artillery firing rules, published 1956; Soviet Army Artillery Instructions - Rocket artillery battery firing rules, published 1956.

BASIC INSTRUCTIONS

1. The basic requirement levied upon artillery firing is that of a timely execution of the fire missions.

Each artillery commander is required to be always ready to execute the fire missions at the order of the senior commander or when requested ~~at~~ by the commander of the supported podrazdeleniye, as well as by independently designating and executing fire missions in accordance with the situation.

2. Depending on the situation, the artillery podrazdeleniye executes missions of the annihilation or suppression of personnel, fire means, artillery and mortar batteries and enemy combat equipment, the destruction of his defensive installations, interdicting enemy possibilities for maneuvering, conduct defensive operations, as well as the reconstruction of destroyed installations.

Target annihilation is that of inflicting such a blow against it that it loses all of its combat capabilities.

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Target suppression is that of inflicting such a blow against it that it temporarily loses its combat capability, limits or prevents maneuvering and disrupts control.

The destruction of enemy defensive installations and other targets which have important significance (bridges, depots, etc.), and means bringing them into a state of unavailability for further use.

Depending upon the availability of time, the character and size of the targets, the fire mission is executed by several batteries, a battery, platoon, or gun (mortar, combat vehicle). (Subsequently, to cut down on words, "mortar, combat vehicle" will not be repeated; what is said about a gun, unless there is something special stated, also refers to a mortar and a combat vehicle; that which is stated about a shell, also referes to a mortar shell).

3. The one firing is required:

- to utilize those means and methods of preparing and conducting fire which, in the given situation, supports a timely execution of the fire mission with the least expenditure of ammunition;

- to utilize the most accurate method of preparing the initial firing data permitted by the situation;

- to utilize fire adjustment data by the firing registration (targets);

- to elaborate the initial data by means of obtaining more accurate information on the position of the firing position, the observation point, and target, as well as on the firing conditions.

4. The application of the methods and means presented in the Instructions do not exclude the use of other methods and means supporting, in the given situation, a more rapid execution of the fire mission or increasing the reality of firing.

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Chapter I

PRELIMINARY FIRING PREPARATION

5. The following refers to preliminary firing preparation:

- the reconnaissance and determination of target location and the enemy's position by observation, from the map, or from aerial photography;
- clarification or selection of landmarks and the basic direction of fire;
- readying the instruments, guns, and ammunition;
- determination of the locations of the observation point and the firing position;
- orienting the guns and instruments along the basic direction;
- determining (clarifying) the ballistic and meteorological conditions of firing and readying the dispersion error graph for these conditions from their table values;
- determining and making more precise the initial firing data by landmarks, check points, and other terrain points.

When there is insufficient time for preliminary preparation and there is a need to open fire immediately, the work is limited to a clarification of the target location and position of the firing position.

6. The battery commander is provided with the basic direction ahead of time and is informed of the grid azimuth rounded off to 1-00. If the basic direction is not indicated, the battery commander selects it independently.

7. Without waiting to tie in the position of the observation point and the firing position by the topographic <u>podrazdeleniye</u>, the battery does this with their own means tying them in on the map or aerial photograph by means of instruments. When the tying in cannot be done by instruments, it is done by means of visual survey.

8. The position of the target or check point in the polar or rectangular coordinates (direction, distance, and altitude, or x, y, and altitude) is determined with the help of a map, aerial photograph, range finder (time-interval recorder), or visually.

The position of the target or check point can also be indicated by the senior commander (Attachment 1) or determined by the artillery reconnaissance podrazdeleniye-s.

9. A check of the sighting devices is made at the firing position prior to firing.

An accounting of each gun's individual corrections is mandatory for all forms of firing.

10. With the purpose of recording the ballistic conditions of the firing, the ballistic corrections are determined ahead of time for the charges designated for the firing, the type of trajectory, and range for which the meteorological corrections are also determined, for deviation:

- the initial velocity of the basic piece of the battery (for rifled guns);
- the initial velocity (range for the rocket artillery) for the charge loads on hand;
- the weight of the shells;
- other ballistic characteristics of the ammunition as indicated in the Firing Tables (placement of the fuze with or without the cap, the presence or lack of flame arresters, paints on the shells, etc.).

Furthermore, corrections are made for the type of powder with the rocket artillery.

If there is not any information available on initial velocity deviation (range in the case of rocket artillery) from the tabulated ones for the charge loads on hand, then the senior artillery commander can order an ostrel or sostrel of the charge loads (Attachment 2).

11. Meteorological conditions for firing are taken into account by using the meteorological corrections received from the senior artillery commander, or are calculated independently from the data in the weather bulletin.

If the meteorological corrections and the weather bulletins have not been received, the meteorological firing conditions are calculated by the results of previous firing from both your own battery, as well as from other batteries of similar caliber and model; if such data are lacking, the corrections are calculated for the deviation of the ground air temperature as well as for the charge temperatures from the table of values; and also the approximate corrections for windage; drift corrections are also calculated for the shells of rifled guns and for the non-finned /neoperennykh/ shells of the rocket artillery.

Furthermore, corrections are calculated in the rocekt artillery podrazdeleniye-s for ground wind from the results of wind direction and speed measurements at the firing position and these are taken into account in any method of preparation.

12. The following is indicated in the transmission of meteorological corrections to the battery:

- the date and hour of the weather bulletin compilation used in calculating the corrections;
- shell index (if necessary);
- trajectory type (for mortar firing of rifled artillery):
- directional drift angles for which the corrections have been calculated;
- calculating the range in kilometers for each direction and charge number for which the corrections were calculated at these ranges;
- range corrections (with their marks) in meters;
- directional corrections (with their marks) in gradations of the azimuth scale.

13. The meteorological range corrections are added (considering the marks) to the earlier calculated ballistic corrections for the corresponding ranges and charges. According to the total range corrections obtained, a calculated corrections graph is built for the directional and topographical range corrections on the rule (special plate) of the fire control device or one graphed paper. The topographic ranges are calculated, subtracting from the calculated ranges the total range corrections (Attachment 3).

14. For calculation of the meteorological corrections:

- the trajectory forms, shell, and charges are selected (not more than three) whose use facilitates the execution of the fire missions;

- in addition to the basic firing directions, one or two other directions are designated which differ from the basic one in each direction by up to 6-00; at target area widths of 6-00 or less, it is limited to the basic directions;

- a series of ranges are indicated for each of these directions with a consideration for the firing range limits: at 1-2 km intervals for rifled and rocket artillery, and at 0.5-1 km intervals for mortars.

The meteorological corrections are calculated upon receipt of the weather bulletin along each designated direction for every selected range and charge:

- for deviations in atmospheric pressure;
- for the ballistic deviations in air temperature;
- for deviations in the temperatures of the charges;
- for the longitudinal component of the ballistic wind;
- for the flank component of the ballistic wind;
- for the drift (for the shells of rifled guns and non-finned /neoperennykh/ rocket shells).

After the indicated corrections have been calculated, they are added up (with a consideration of the marks) and the total meteorological corrections for range and direction are obtained.

For each selected charge, the corrections must be calculated for not less than two ranges.

The atmospheric pressure deviations given in the bulletin are reduced to the altitude of the battery for which a correction is made for deviation of 1 mm for each 10 meters that the artillery weather station sits above the battery: with the plus (+) sign if the battery is below the weather station, and with the minus (-) sign if it is higher.

For an analysis of the ballistic wind, the wind angle is calculated on the component; to do this, the wind drift angle is subtracted from the firing direction drift angle; if the drift angle of the firing direction is less than the wind drift angle, then 60-00 is added to it prior to subtraction and the result rounded off to 1-00. The longitudinal and lateral wind components are found by the wind angle and its speed and the signs of correction are determined.

In calculating the meteorological corrections by the Firing Tables, the value for each one is found by multiplying one-tenth of the table correction value by the amount of deviation. The correction signs for the temperature deviations of the charges and the ballistic air temperature deviations are opposite to the sign of the deviation; the corrections for pressure deviation have the same sign of the deviation. Drift corrections have a minus sign for shells for rifled guns; the correction signs for rocket shells are indicated in the Firing Tables.

Meteorological corrections may also be calculated by means of graphic Firing Tables or correction tables.

When the new bulletin is received, the corrections are calculated once again.

CHAPTER II

PREPARATION OF INITIAL FIRING DATA

General Conditions

15. In the preparation of the initial firing data:

- a podrazdeleniye is designated which will execute the firing mission (battery, platoon, gun);
- the type of trajectory, shell, fuze setting are selected;
- the topographical data are determined for the primary gun: target range Db, angle of position (over-target for mortars), target direction;
- the charge is selected;
- corrections are made for the deviations of the ballistic and meteorological firing conditions from the tables and the initial position is determined for the primary gun; sight (for mortars - taking into account the corrections for over-target), fuze (tube), level, shift from the primary direction (base firing, azimuth scale, angle of transfer fire from the check point or registration target);
- the sheaf is designated.

In addition, the distance coefficient Ky and the deflection shift Shy are calculated for fire adjustment (while at a great displacement -- the range scale Md and the deflection shift Shy); the values of Vd, X, and the narrow bracket are with the aid of the Firing Tables by the calculated range.

For fire adjustment by measurements of dispersion error, a fire control instrument, a fire adjustment device (computer) are readied, or the necessary coefficients are determined (page 48).

The operating sequence in preparing the initial firing data is determined by the arrival of the information necessary for this.

16. The selection of the shell is based on the type of target and the fire mission.

Fragmentation, fragmentation-demolition, and demolition shells (grenades) are used for firing against personnel and enemy fire means, against batteries, tanks, armored cars, and armored personnel carriers, for conducting barrage fire, a rolling barrage; furthermore, the fragmentation-demolition and demolition shells (grenades) are used for fire of destruction and for breaking concrete.

A high explosive grenade is used for the development of aerial check points, fire adjustment, and target designation, for the destruction of observed deep live targets and personnel at observed crossings, as well as in those instances when riccochet fire and fuze fragmentation fire is little effective (personnel and fire means in swampy terrain; observation points on heights, in trees, etc.).

Concrete-piercing projectiles are used for the destruction of reinforced concrete and concrete, and especially durable stone and brick installations, buildings, and basements, and, if concrete-piercing projectiles are unavailable, for the destruction of armored cupolas.

Armor-piercing and shaped charge projectiles are used in direct laying against armored targets.

Incendiary, smoke, and illuminating projectiles are used for their specific requirements; furthermore, the smoke shells may be used for adjustment of fire, designation of targets, development of check points and for creating fires if easily combustible materials are located in the area of the target.

17. The fuze setting is so done that the effect of the projectile against the given target would be most advantageous.

~~the fuze of the fragmentation shell~~

The point detonation fuze is used in firing against personnel situated in the open or in open trenches, against batteries out in the open if ricochet fire is not possible; against armored cars and armored personnel carriers; against surface targets when conducting barrage fire and a rolling barrage, as well as in fire adjustment against the embrasures of field defensive installations.

Delay action fuzes are used in firing against personnel situated in dugouts (trenches) with covering, against tanks, against batteries in earth-and-wooden installations, as well as in firing for the destruction of field defensive installations, buildings, and strong bridges.

Point and delay action fuzes (approximately even) are designated for firing against personnel and fire means located in a sector where, together with open emplacements, there are trenches with coverings or earthen-wooden defensive installations, as well as for firing against wooden bridges.

Delay fuzes are designated for the destruction of field and long-term defensive installations, durable buildings, basements, to uncover concrete, as well as for ricochet fire and in firing against the defensive embankments of lont-term defensive installations.

For fire adjustment (creation) of check points, a fuze is designated for subsequent firing against the targets. If, by the conditions of observation, it is necessary to designate another fuze, then in shifting fire, the correction is noted on the fuze cap.

18. Charge and form of trajectory are selected in accordance with the firing range and in such a manner that the effect of the projectile would be maximum depending on the target character and its location and, that at the same time, there would be a reserve range in either direction necessary to conclude fire adjustment or transfer of fire on a topographic basis without changing the charge.

The least charge is selected for the suppression of personnel and fire means , for the destruction of emplacements, trenches, and the military cover of earthen-wooden defensive installations.

The greatest and the charge closest to it are selected for direct laying fire, for distance firing (in such a manner that Vrv would not be greater than 15 m), as well as in flat trajectory fire against durable vertical targets (stone and brick buildings, filled walls of long-term defensive installations, etc.).

For high-angle fire against the combat covering of defensive installations and in firing against its protective embankment, a charge is used which supports the least dispersion and the required angle of impact.

In ricochet fire against ground suffrace targets, the selected charge must support getting an angle of impact from 2^{o} to 20^{o}, and from 2^{o} to 10^{o} against water surface targets.

19. A concentrated sheaf or sheaf by target width is designated for fire of adjustment.

The following sheafs are designated for fire of destruction:

- concentrated -- for battery (platoon) firing from rifled guns and mortars against fire means, observation points, dugout shelters and other targets with a width of up to 50 m, as well as in mortar fire against open targets with a width of up to 100 m;

- by target width -- when firing against concealed and open personnel positions, batteries, and other broad targets.

In calculating the sheaf interval, the target front is divided by the number of guns designated for firing, while in battery firing, the actions taken are in accordance with article 166.

Rocket artillery conducts battery firing at a concentrated sheaf, by a target width sheaf against the remaining targets, and with a parallel sheaf (articles 142 and 239) in individual cases.

20. The range factor is calculated with an accuracy to 0.1 by the formula

$$Ku = \frac{Dk}{Db}$$

in which Dk is the distance from the commander to the target calculated from the map, by range finders, or (with vision training) by eye;

Db is the distance from the battery to the target calculated in accordance with art. 23 and 30-32.

If Ku is less than 0.3, then it is calculated with an accuracy up to 0.05.

21. The deflection shift corresponding to a change in the range of 100 m is calculated with an accuracy of up to 0-01 by the formula

$$Shy = \frac{PS}{0.01Db}$$

in which PS is the correction for displacement calculated by measurements on the map (fire control device, plane table of the angle at the target between the directions to the observation points and the firing position or by the formula given in art. 31.

With another change in the firing range (more or less than 100 m) the calculated deflection shift is changed proportionally.

Complete Preparation

22. In fulfilling complete preparation, it is necessary to have:

- the coordinates of the primary gun, specific tie-ins on a topographic basis or by means of dependably identified terrain counters with maps or aerial photo points at a scale of not less than 1:50,000, by means of auto-mechanical means or radar sets;

- the guns and observation means are oriented as accurately as possible in the primary direction;

- corrections for all ballistic firing conditions;

- meteorological corrections corrected by the bulletin of the artillery weather station;

- target coordinates determined by means of the range finder, by aerial photographs, intersection with points of bilateral spotting, or by the means of the artillery reconnaissance podrazdeleniye.

23. The topographic range to the target (with an accuracy to 10 m) and the shift from the primary firing direction on the target (with an accuracy of 1 graduation of the azimuth setting) is calculated graphically (on the fire control device, map, plane table with a scale of not less than 1 : 50,000) or by the analytical method (table 1* and attachment 4) (Note*: Table 1 is given in a separate attachment); in an analytical method, to avoid gross errors, it is expedient to check the results graphically.

For rifled guns and rocket artillery, the angle of position is determined for which the difference in target and battery altitudes in meters is divided by 0.001 of the topographic range to the target, and the absolute value of the result is decreased by 1/20 (5%).

24. The calculation of the placements for firing is made in the following order:

- by the topographic range and the shift from the primary direction, by means of the graph of calculated corrections the range and direction corrections are determined for the selected charge, interpolating them between the lines of the graph:

- the range correction is added, with a consideration of its sign, to the topographic range and the computed range is obtained;

- the directional correction is added (with a consideration of its sign) to the topographic shift (azimuth setting) and the computed shift from the primary direction (azimuth setting) is obtained.

The sight setting is obtained in the Firing Tables by the computed range and the selected charge.

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The angle of elevation for rifled guns and rocket artillery expressed in thousandths and with the corresponding computed range, and the angle of site are used, with the help of the Firing Tables, to calculate the correction in the angle of elevation on the angle of site; the angle of site and the correction for the angle of elevation on the angle of site (with a consideration of their signs), ~~are used, with the help of the Firing Tables~~ are added to the primary piece at a level of 30-00 if the target is higher than the battery, or subtract 30-00 if the target is lower than the battery, and the computed level setting is obtained. When firing at a thousandth scale, a level of 30-00 may be ordered, while the angle of site and correction for angle of elevation on the angle of site (with their signs) are considered in the changes of the range setting.

For mortars, the computed range and (target height) (over-target) /prevyshe-niyu tseli/ above the firing position, the sight correction is determined from the Firing Tables for the higher height of the target and it is accounted for (with a consideration of the sign) in the setting of the sight.

An example of calculating the settings is given in Attachment 5.

25. If the target area has a fire adjustment check point (target), the time for adjustment of fire which is close to the time that the weather bulletin has been made up, then the difference in range and direction of the fire adjustment and those computed by the check point (target) are determined for rifled guns and mortars.

Accepting these differences as more precise [precisional] corrections, they are entered (with a consideration of their signs) into the preparation of the settings for the targets calculated with the use of a graph of calculated corrections under conditions that the difference between the grid azimuths and the check point is

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not greater than 6-00, while the difference between the topographic range to the target and the check point is not greater than 4 km.

The precisional corrections, calculated by a given battery, cannot be utilized by other batteries.

Shortened Preparation

26. The preparation of initial firing data is considered to be shortened if the conditions listed in art. 22 are not completely taken into account.

With a shortened preparation, the topographic data are calculated with the use of a map (fire control device, plane table), while the correction for the ballistic and meteorological firing conditions are taken from the graph of calculated corrections (article 13).

If the full information on the meteorological firing conditions and fire adjustment corrections are lacking, then the firing conditions are approximated (article 11).

27. With a shortened preparation, the firing position points, observation points, and targets are located on the map (fire control device, plane table) even if through a visual survey, the height of the firing position and the target are determined from the map as are the primary installations in the order indicated in articles 23 and 24. With this it is permitted not to introduce the corrections for the angle of elevation to the angle of site with the exception of mortar fire and mountain firing), also the computed range is rounded off to 100 m or, the sight setting to even graduations (for mortars -- ~~from~~ to tenths of a sight graduation), and the shift from the primary direction -- to 0.05.

If it is impossible to utilize the map for data preparation (fire control device), the construction is made on a sheet of paper using the range finder or other instruments for measuring the bases, Dk, and angles NKO and NKTs (Figure 1), and the greater height of the target is calculated by means of instruments (article 184); for the rest, the order of work is similar to that indicated above.

28. When shifting fire from a previously adjusted target on the map (fire control device, plane table), the adjusted range correction is entered into the topographic range to the new target as obtained from the previous target, the site angle of the new target is determined (correction for higher height of target for mortars), and a correction for drift difference is entered into the angle of shift.

Visual Preparation

and Visual Transfer of Fire

29. The visual preparation of initial firing data is used when it is impossible to use the map or the range finder for determining target location or if there is a lack of sufficient data on the position of the firing position.

30. Visual preparation is executed by the computed (article 31) or graphic method applicable to article 27 with Dk being rounded off to hundreds of meters. Corrections for ballistic and meteorological firing conditions are not considered (with the exceptions for corrections for ground wind during rocket artillery fire) or they are considered approximately; the angle of site (higher target height for mortars) is considered by eye or not considered at all; the final result may be rounded off to hundreds of meters or to the even graduations of the sight (to full tenths of the sight graduations for mortars), and to full tenths of the azimuth setting graduations.

If it becomes necessary to open fire immediately, when there is insufficient information about the location of the firing position, the range is estimated by eye and the sight is set so as to safeguard own troops against destruction; the direction is commanded by the target aiming circle calculated from the observation point without accounting for displacement correction or with its approximated determination; Ku and Shu are calculated approximately and subsequently made precise by firing.

31. Visual preparation by the computation method is made at small and average displacement. The following are calculated in this (Figure 2):

- base size B rounded off to hundreds of meters (measured on the terrain by means of instruments or visually);
- orientation mark in the primary direction of the instrument found at the observation point by the primary gun;
- commander to target range (Dk);
- the angle between the primary direction from the observation point and the direction to the target (∠ HKTs);
- the mark along the primary gun in directing the instrument on the target; for this purpose, the angle between the primary direction and the direction to the target is added to the earlier established mark if the target is located to the right of the primary direction, and subtracted if the target is located to the left of it; the mark is rounded off to 1-00;
- angle α is equal to the acute angle between the directions to the target and to the battery;
- angle β is equal to 15-00 minus α;
- visual projection d or by the formula

$$d = B\frac{\beta}{1000}$$

rounded off to hundreds of meters;

- the range, battery - target, Db, by the formula

$$Db = Dk \pm d;$$

- correction for displacement, PS, rounded off to 0-10 by the formula

$$PS = \frac{B \cdot \alpha}{Db};$$

at this, if angle α or β is greater than 10-00, then it is taken as equal to 10-00;

- the shift from the primary direction d, for the battery; PS, with a consideration of its sign (PS is taken towards the observation point) is added to the angle NKTs taken with the plus sign if the target is to the right of the primary direction or with the minus sign if the target is to the left.

32. If even one target/or check point has had adjusted fire, and it is necessary to open fire rapidly against the newly appearing target which has been visually determined in relation to the adjusted target, visual transfer of fire is employed.

In visual transfer of fire (Figure 3):

- a visual calculation is made as to how much closer (or further) the new target is than the adjusted one and, consequently, a corresponding change is made in the adjustment of the sighting device obtained for the previous target obtaining thereby the initial sight setting for the new target;
- the distance coefficient is calculated on the new target;
- the shift angle is calculated for which purpose a measurement is made from the observation point of the angle between the direction to the new and the adjusted target, it is multiplied by the distance coefficient of the new target and change it to the deflection shift obtained by the adjusted target and taken in accordance to the difference in the distances to the new and the adjusted target; the deflection shift for the new target is subsequently made precise by firing.

If the shift angle is greater than 3-00, the range to the new target is determined graphically as is the angle of shift (see article 27 and Figure 1).

Chapter III

FIRE OF ADJUSTMENT

General Conditions

33. As a general rule, firing against an observed target includes fire of adjustment and fire for effect; in so doing, during the course of fire of adjustment the target may be destroyed, while in fire for effect, it is necessary to enter corrections for making the installation more precise.

34. Fire of adjustment is made to locate by means of fire, installations suitable for the destruction of targets. Depending on the situation and the conditions of observation, fire of adjustment is made directly against the target or the check point for a subsequent transfer of fire from it against the target.

Fire of adjustment, especially against personnel, is made in the shortest period of time; during fire of adjustment, the rate of fire must provide for its most rapid accomplishment.

Depending on the conditions of fire and the results of the observation of the bursts, during the course of the fire of adjustment it is possible to execute a transfer from one method of fire of adjustment to another.

35. Fire of adjustment is supported by a dependable and continuous observation of the bursts. Observation of the bursts includes the following:

- in evaluating the deviation of the bursts by range;
- in measuring the lateral deviation of the bursts;
- in measuring the altitude of the bursts (distance from the gun to the point of impact).

36. The deviation of the bursts by range is evaluated in meters in relation to the target; in so doing, it is possible to utilize local objects (terrain lines), whose position relative to the target is sufficiently well known. If it is impossible to evaluate the amount of deviation in meters, then only the burst mark relative to the target is determined; an over is designated by

a plus sign (+) and a short by a minus sign (-).

In cases when the observation point is higher than the target, as well as when the target is located on a slope slanting in the direction of the observation point, all bursts below the target are considered shorts, while ground bursts above the target are overs.

In firing against embrasures (building windows), hits against the installation (building) above the embrasure (window) are accepted as overs, while hits below the embrasure are shorts.

Bursts, during whose evaluation some doubt exists as to their signs, are not taken into consideration during fire for adjustment.

37. During time and ricochet fire, the bursts are divided into categories ofair, V, and ground, N.

During ricochet fire and high explosive grenades, the deviation of bursts by range are determined by the ground bursts and by the areas where the fragments land; the burst sign, moreover, is calculated by the air burst cloud.

In time fire, the height of the air burst is measured in divisions of the azimuth scale from the primary target to the center of the cloud (flash) burst.

38. The lateral deviation of the burst (flash) center from the target (check point) is measured in divisions of the azimuth scale. When firing against a broad target, the burst deviation is measured from the right edge or other point of the target.

39. The cloud burst should be observed at the moment of its appearance. The cloud can be tracked only laterally relative to the line of wind observation.

In shifting to battery (platoon) firing, it is expedient to open fire from the flank which is opposite to the lateral wind direction.

It is expedient to observe the first burst, at shortened and visual preparation, by the naked eye; the first thing, in doing this, is that of marking the place or the direction in which the burst took place, and then its deviation from the target is determined.

40. If the first burst has not been noticed and their is no basis to suppose that it occurred in our own troop dispositions then a second round is fired with the same settings. If the second burst also has not been noticed, then a change is made in the setting of the sight or the azimuth scale with the idea to bring the burst out into an observed terrain sector or change the fuze setting. A decrease in the sight setting is permissable only when their is no danger to friendly troops.

When firing on broken terrain, it is expedientto fire one or two high explosive grenade rounds with a table setting of the fuze and with the level setting increased by 10-20 divisions, or smoke shells, in order to facilitate observation of the initial bursts.

41. Fire of adjustment for range and direction is conducted simultaneously.

Corrections to 0-20 are brought in with an accuracy to 1 division of the azimuth scale; corrections over 0-20 may be rounded off to 5 divisions.

Fire of Adjustment by Measuring Deviation

Method of fire of adjustment

42. In fire of adjustment by measured deviations, one round by one gun is fired from computed settings against the target. According to the measured deviation of the burst, the range and direction corrections are determined. The same gun, with the corrected settings, is used to fire a group of four rounds. By the measured burst deviation of the center of the four-round group from the target, the correction is made and entered into the setting and the shift is made to fire of neutralization; fire of neutralization against observed targets from rifled guns and mortars is corrected by observing the signs of the bursts according

to article 140.

If the deviation of the first burst has not been determined or undependably determined, then the same or corrected settings are used to again fire one round and, after making the corrections, a group is designated.

43. Distance corrections are determined through the use of the fire control device or the device for fire of adjustment (computer), while for corrections in displacement of less than 5-00, by means of computation for which the amount of the lateral deviation of the burst from the target (in divisions of the azimuth scale) is multiplied by the distance factor and the obtained shift is added (with a consideration of the signs: right - plus, left - minus) to the deflection shift calculated by the amount of range correction (shift on the deflection shift is taken in accordance to article 58).

Fire of adjustment through the use of a
range finder and stop watch

44. Fire of adjustment with the use of a range finder is conducted within the limits of range observation which are supported by sufficiently accurate intersections.

Burst deviations by direction are measured by means of a battery commander's telescope (binoculars), while deviation by range is determined as the range difference between the burst and the target measured by means of the range finder.

Range correction is taken as equal to the amount of burst deviation from the target according to the range finder taken with the opposite sign.

With a large displacement (displacement correction of 5-00 and more), the range and direction corrections are calculated on the fire control device or with the use of the fire of adjustment instrument.

If a burst takes place outside of the field of vision of the range finder, the burst is brought out to the line of observation or the place is indicated to the range finder operator where the burst was observed and another shot is fired.

45. Fire of adjustment with the use of a stop watch is used for firing against batteries (individual guns, mortars) which have revealed themselves by the flash of their shots. The intersection of the sound target and the intersection of own bursts is made by the same individual. Fire of adjustment is conducted immediately after target intersection.

The correction, just like in fire of adjustment, is determined through the use of the range finder (article 44).

In order to determine the range from the observation point to the sounding target (Dk in meters), not less than four computations on the stop watch must be made from the moment the revealing sign of the shot is observed (starting the stop watch) to the moment that the sound of the shot is heard (stopping the stop watch); the average stop watch reading is then multiplied by 1000 and the result then divided by 3.

When using a stop watch to calculate the deviation of the bursts from the target by range in meters, then the stop watch reading of the target (DK expressed in seconds) is subtracted from the average computed stop watch reading; the difference in the stop watch readings is multiplied by 1000 and the obtained result is then divided by 3.

The directional deviations are measured by the battery commander's telescope or other means of observation.

If the terrain conditions in the target area permit observation of the bursts during percussion fire at the exact moment that they appear, the fire of adjustment is conducted with a fragmentation fuze, while in the rifled guns, additionally, with a delayed fuze as well in order to obtain ricochet fire.

In covered terrain, fire for adjustment from rifled guns is conducted with a high explosive grenade having an authorized fuze setting and with the level setting set at 10-20 divisions greater than the computed one; each change in the sight setting is accompanied by a corresponding change in the fuze setting. Prior to shifting to effect, the average burst point is lowered to the target horizontal by the amount of the average burst altitude multiplied by the range factor; as a general rule, fire for effect is conducted with fragmentation-demolition shells.

Fire of adjustment with combined observation and with the assistance of the sound ranging reconnaissance podrazdeleniye

46. Target fire of adjustment with combined observation is employed when the coordinates of the target, fire position, and observation points are available even if only through the application of visual survey, and is conducted on the basis of measuring the deviation of the bursts from the target from two observation points.

In the work of combined observation with battery commanders' telescopes and theodolites, the angle of burst intersection must not be less than 0-50. The target point to which the intersection of the optical instruments must be directed is indicated to the observers.

The commands given to the fire position and shot warnings are also transmitted to the combined observation points.

47. Fire of adjustment with the assistance of the sound ranging reconnaissance podrazdeleniye is conducted against sounding targets. If the target coordinates have been determined approximately, fire of adjustment is conducted with the assistance of the podrazdeleniye which calculated the approximate coordinates.

When the sound ranging reconnaissance podrazdeleniye has made an accurate determination of the burst coordinates, it is permissible to conduct fire of adjustment also against non-sounding targets whose coordinates have been determined by other means;

fire of adjustment on non-sounding targets with the assistance of a sound-ranging reconnaissance podrazdeleniye is conducted only in those instances when its fire of adjustment by other means is impossible.

Fire of adjustment is conducted with the fuze setting set for fragmentation effect.

In conducting fire of adjustment, the sound-ranging reconnaissance podrazdeleniye is provided with the target number and coordinates, gun caliber, and the projectile's flight time, while in fire of adjustment by the plane table of the sound-ranging reconnaissance podrazdeleniye, the coordinates of the firing position are also provided; the sound-ranging reconnaissance podrazdeleniye commander indicates the rate of fire to the firer.

The method of operation is given in attachment 6, section A.

48. During fire of adjustment with combined observation and with the assistance of sound-ranging reconnaissance podrazdeleniye and the corrections are calculated by the fire of adjustment device (computer) or by the computing method; by the plane table of the sound-ranging reconnaissance podrazdeleniye, in addition, during fire of adjustment with the assistance of the sound-ranging reconnaissance podrazdeleniye.

In calculating the corrections by the computation method, the range corrections are computed by the formula

$$D = \frac{D_l}{\gamma} L - \frac{D_p}{\gamma} P$$

in which L and P are the burst deviations (center of the burst group) from the target corresponding to the left and right observation posts respectively (centers of the extreme sound ranging bases), taken with their signs (plus for right, minus for left);

D_l and D_p are the ranges to the target in meters corresponding to the left and right observation posts respectively (from the centers of the extreme sound ranging bases);

γ is the intersection angle in divisions of the azimuth scale.

The coefficients $\frac{D_1}{\gamma}$ and $\frac{D_n}{\gamma}$ are taken rounded off to whole numbers.

The corrections for direction are calculated in accordance with article 43, determining the range factor and the azimuth scale shift for the point which is less displaced in relation to the plane of fire (combined observation, battery commander's post or the center of one of the extreme sound ranging bases).

In calculating the corrections by the plane table of the sound ranging reconnaissance podrazdeleniye, the commander of the podrazdeleniye informs the firer of the deviation of the average point of the bursts from the target relative to the fire position (in meters for the range and in divisions of the azimuth scale for direction); the firer changes the setting by the amount of deviation taken with the opposing signs.

Fire of Adjustment with the use of Radar

Fire of adjustment against non-moving targets

49. Fire of adjustment with the assistance of radar sets is conducted against targets whose coordinates were calculated by the set itself or by other means.

In fire of adjustment with the set having the decisive installation, the corrections are calculated by changing the signs of the deviations obtained from the set to the opposite ones.

In fire of adjustment with a station not having the decisive installation, the corrections are calculated similarly to that for fire of adjustment with a range finder.

50. In fire preparation with the assistance of a radar set having the decisive installation, the caliber and type of gun is

made known to the radar set commander as are the coordinates of the fire position; prior to the initiation of firing, information is provided on the fire mission, the topographic range and grid azimuth of the target, target elevation, charge, projectile flight time, trajectory height corresponding to the quadrant angle of elevation, grid azimuth α_A and horizontal range d_A from the position of the set to the beginning tracking point (point A, Figure 4).

To calculate the position of point A, one third of the distance to the target is marked off on the fire control device from the fire position in the direction of the target.

Prior to target fire of adjustment whose coordinates have been determined by other means, the topographic range and the grid azimuth to the target with a position of the radar set and the projectile flight time, are provided to the radar set commander who does not have the decisive installation.

Firing against moving targets

51. Radar sets are utilized to intersect moving ground targets (tanks, armored personnel carriers, vehicles, etc.) under conditions favorable for the intersection of ground bursts; furthermore, fire against the moving targets is corrected by the radar sets.

52. In preparing to fire against moving targets, the position of the radar set and the anticipated line of movement of the moving target are noted on the fire control device. Each route is given a prearranged designation ("Boa Constrictor", "Cobra", etc.). On each section of each line of movement observed by the station, the anticipated points of contact are marked at every 600-800 meters or more, and consecutive numbers assigned to them for each line of movement and their coordinates provided to the radar set commander. The projectile flight time is marked down for each contact point on the fire control device.

53. The firer, after receiving the radar set commander's report that a moving target has been contacted, its character (a single or group), size, grid azimuth and range to the target in relation to the position of the radar set, as well the target's direction of movement, gives the order to track the target. Target intersection by the radar set, is conducted continuously every 30 seconds until cessation of firing on the command "Stop" transmitted from the observation post of the firer by the timekeeper; by 3-5 seconds prior to the command "Stop", the command "Attention" is transmitted. At the first command of "Stop", both the firer and the timekeeper start their stop watches.

At each command of "Stop", the radar set chief provides the firer with the grid azimuth and the range to the target from the position of the radar set; these data are used to place the target on the fire control device.

The firer determines, from two consecutively occupied positions of the moving target on the fire control device, if the line of direction of the moving target corresponds with any of the designated lines of movement.

54. If the target moves along any of the predetermined lines of movement, then one of the designated points of contact on the line of march is selected and the command passed pertaining to the contact point number: the name of the line of movement, the number of the contact point, shift to the right for a superimposition of the sheaf center with the point of contact, sheaf, and number of rounds; the time at which to open fire is then calculated subtracting from the travel time of the target from position at observation to future position the projectile flight time to the selected point of contact; the result obtained indicates at what point on the stop watch (in seconds) is it necessary to give the command "Fire".

To calculate this travel time, it is necessary to compute the number of times the linear time scale (the distance between the points of two consecutive target intersects in 30 seconds) can be divided into the line of movement segments from the first target intersect point to the point of contact; multiplying the figure obtained by 30, the travel time (upreditel'noye vremya), expressed in seconds, is found.

55. If the target's direction of movement does not correspond to any of the designated lines of movement, then the target's line of movement is taken as a straight line drawn on the plane table of the data computer through 305 points of intersection. The straight line is drawn in such a manner so that the points of intersection would be evenly distributed on both sides of it; a point of contact is marked on the straight line for a travel time equal to 3-5 minutes. The grid azimuth and the range to the point of contact is reported by the firer to the radar set chief.

The moment at which fire is to be opened is determined as indicated in article 54. The method of operation is given in attachment 6, section B.

56. After the fire onslaught, the radar set chief reports to the firer on the actions taken by the target and its position with relation to the point of contact. If the target continues to move along its previous line of movement, then a new point of contact is designated, and the same actions taken as indicated in article 54.

With a sharp change in the target's direction of movement, its new line of movement is determined and new intersections are made as indicated in article 55.

If the radar set has observed the signals of the shell bursts, then the radar set chief reports to the firer on the deviation of the burst group center from the target; in this instance, when conducting fire against a new point of contact, consideration is given to the deviations received from the radar set chief.

Fire of Adjustment by Observing the Burst Marks

Fire of adjustment at small and medium displacement (displacement correction less than 5-00)

57. Fire of adjustment by observing the burst marks is conducted by bracketing the target with its subsequent halving, by a scale, or without bracketing the target.

58. Fire of adjustment by bracketing the target is conducted in the following manner. After receiving the lateral deviation, a burst is made on the line of observation, for which the measured deviation is multiplied by the range factor and a shift is ordered in the direction of the target; after receiving the range observation, the sight is changed in the direction of the target by the value of the first (broad) bracket (article 61). If, after the first shift in the sight the same sign is obtained, another identical shift in the sight is made.

After the target has been placed into a broad bracket, the narrow bracket is determined by means of halving (article 62); it is permissible to refrain from halving the bracket and to designate any other sighting which facilitates the greatest approximation to the average trajectory to the target or a considerable narrowing of the bracket.

In order to maintain the bursts on the line of observation, change in the sight setting is accompanied by a directional change in the amount of the deflection shift; the shift in the deflection shift is made in the direction of the firing position (from one's self) with an increase in the firing range and in the direction of of the observation point (to one's self) with a decrease.

At the initiation of fire of adjustment by observing the burst marks, it is advantageous to keep the bursts approximately opposite the center of the target front. During the course of the fire of adjustment, it is permissible not to introduce corrections for direction (including for the deflection shift) if this will facilitate obtaining observation for range.

59. If it is discovered during fire of adjustment that the computed or determined approximate range factor is too small or too great, it is increased or decreased by 0.1 (by 0.05 if Ku is less than 0.3).

When an error has been discovered in calculating the deflection shift, it is corrected by an amount equal to the deviation of the burst from the line of observation multiplied by the range factor.

60. In bringing the bursts out to the line of observation and in searching for a bracket (other than a narrow one), fire is conducted by individual rounds from a single gun. In making a sight jump in finding a narrow bracket (including the first bracket if its width is equal to the width of a narrow bracket), a platoon or battery volley is ordered during battery (platoon) fire, and by two rounds for single gun fire.

In executing the fire mission by a battery or a platoon, it is permitted to conduct fire of adjustment with a single gun.

A rocket artillery battery conducts fire of adjustment with a single combat vehicle; fire of adjustment is initiated with individual rounds; after introducing the directional (range) corrections, all subsequent fire of adjustment is conducted in groups of two rounds each.

61. The width of the first (broad) bracket is accepted as equal:

- during total preparation, utilization of the data of the fire of adjustment gun and shifting fire on a topographic basis (with the exception of rocket artillery /in these cases, rocket artillery shifts to effect without fire of adjustment/) -- to the width of one narrow bracket;

- during shortened preparation, shifting fire by the map and by visual shifting of fire -- to the width of two narrow brackets (by the width of one narrow bracket for rocket artillery fire and firing from 120-mm and smaller mortars);

- during visual preparation -- to the width of four narrow brackets (to the width of two narrow brackets for rocket artillery fire and firing from 120-mm and smaller mortars).

The width of the first bracket may be decreased or increased depending on the observed amount of burst deviation from the target.

62. The width of a narrow bracket when firing by a time sight scale is taken as equal to two divisions of the sight (100 meters), while at Vd equal to 40 meters and more, by four divisions of the sight (200 meters).

When firing with a sight scale in the thousandths, the width of the narrow bracket (4 Vd) is found in the Firing Tables by the calculated range to the target.

When firing from mortars, the width of the narrow bracket is taken as equal to 100 or 200 meters depending upon the value of 4 Vd; for the 82-mm mortars, it is permissible to take the width of the narrow bracket as equal to 20 divisions of the sight with charges of 0 and 1, and 30 divisions at charges of 2 and 3.

For the rocket artillery systems, the width of the narrow bracket is taken as equal to:

- 200 meters for large caliber projectiles;
- 400 meters for medium caliber and long range projectiles.

63. Fire of adjustment is considered terminated whan a narrow bracket has been obtained; fire of adjustment is also considered terminated if, during its course, a covering group has been achieved. It is sufficient to have a signle sign at each limit of a narrow bracket, while for a covering group, just one observation of each sign.

64. When firing against targets found in close proximity to one's own troops, the sight setting for the first shot is so

calculated that an over would be obtained, for which the computed sight for the target is increased by one or two broad brackets.

If an over is obtained, the fire of adjustment is conducted with the bursts coming closer to the target in jumps of 2, or 1, or 0.5 of a narrow bracket depending on the value of burst deviation from the target, and by 200-meter jumps when firing from rocket artillery. The range bounds must be decreased as the bursts begin to come closer to the target, and must be even less as the target is closer to friendly troops. If a short is obtained, then the firing is conducted by the regular rules.

65. Both limits of the narrow bracket must be obtained with the same charge. If, during fire of adjustment, the range limit of the charge does not permit bracketing the target, then a new charge must be used and a sight setting designated which answers the range of the last round with the previous charge.

If the same sign will be obtained in using the new charge, then a bracket is attempted under the normal rules; if an opposite sign is obtained, the sight is change in order to place the target into a narrow bracket.

66. If a target, whose destruction requires several hits, is hit during fire of adjustment, then the hit is considered as a plus and minus, and subsequent actions taken are in conformity with those indicated in article 68.

67. In the case when a sheaf in the width of the target is designated for firing, when shifting to the first platoon or battery volley (when shifting to fire for effect during scale fire of adjustment), the direction is corrected with the consideration of obtaining x bursts from the right gun to the left of the target's right flank by half of the sheaf interval.

68. Shifting to fire for effect is made:

- to its center when a narrow bracket is obtained;
- with the same sight if the relation of the signs in the

covering group is less than 3 : 1, when a covering group is obtained.

With any other ratio of signs in the covering group, the range is changed in the direction of the least number of signs in shifting to fire for effect:

- by 1 Vd when the ratio of signs is from 3 : 1 to 4 : 1;
- by 2 Vd when the ratio of signs is greater than 4 : 1.

69. When firing from rifled guns and mortars against moving infantry (infantry on vehicles, armored personnel carriers, etc.), either conduct fire of adjustment until the target is in the first (broad) bracket, or are limited to obtaining a short (an over when the target is retreating) volley along the target's line of movement.

Fire of adjustment commences with single rounds fired by a single gun.

A shift to battery firing is made when bursts are obtained on or close to the line of observation.

Depending on the results of observation and the target's speed of movement, a shift to effect is made:

- on the same limit of the broad ~~fark~~ bracket towards which the target is moving;
- moving back from it by one or two narrow brackets in the direction the target is moving;
- on one of the sightings within the bracket limits.

In addition, if the target is moving in an oblique or a flanking direction, a correction is made in the ~~grid~~ azimuth scale corresponding to the target's direction of movement and the amount of the sight jump.

In the case where only short volleys (overs if the target is retreating), a shift is made to effect on the settings obtained at the moment that the target comes up to the location of the fire of adjustment bursts; at this, a correction in the ~~grid~~ azimuth scale

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is introduced corresponding to the direction and speed of movement of the target. The instant at which fire for effect is opened is determined with a consideration for the projectile flight time.

70. Scale fire of adjustment is usually employed at a visual or shortened preparation of initial firing data under conditions of low or medium displacement during firing from mortars and rifled guns primarily against broad targets.

In the initial command, the right gun is provided with the computed sight setting; the sight setting for the remaining guns is decreased (if the battery stands to the right) or increased (if the battery stands to the left) in such a manner so that the differences in the neighboring guns would be equal to the width of a narrow bracket; the battery sheaf interval is designated as equal to the deflection shift of a narrow bracket (to maintain the bursts on the line of observation).

Fire of adjustment commences on the calculated settings by single rounds of the right gun and is continued until observation by range is obtained.

If an over is obtained, the sight settings of all guns are decreased: by the amount of a narrow bracket if the battery is deployed to the right; by the number of narrow brackets corresponding to the number of guns in the battery if the battery is deployed to the left.

If a short is obtained, the sight settings of all guns are increased: by the number of narrow brackets corresponding to the number of guns in the battery if the battery is deployed to the right; by the amount of a narrow bracket if the guns are deployed to the left.

The change in the sight settings is accompanied by a corresponding shift in the deflection shift in order to maintain the bursts on the line of observation.

A battery volley is then fired with the changed settings beginning with the gun whose sight setting corresponds to the greatest range.

Depending upon the firing conditions, another method of building the scale is permitted.

After bracketing the target in a narrow bracket, a shift to fire for effect is made in accordance with article 68; in so doing a directional change is made with a consideration of the deflection shift by one jump of the sight of the right gun (article 58) and a shift for burst deviation from the right flank of the target (Figure 5), and a sheaf is built along the width of the target.

If the target has not been bracketed, the sight settings of all guns are changed by the number of narrow brackets corresponding to the number of guns in the battery, and the battery volley is repeated.

If the burst from any gun has not provided observation for range, but the target has been bracketed equal to two narrow brackets, then a battery (platoon) volley is delivered on the sight settings of this gun.

71. Under favorable conditions permitting the determination of the amount of burst deviation from the target by range (close burst proximity to the target; availability of orientation points and terrain objects in the target area, terrain slope in the direction of the observation post, etc.), it is permissible to conduct fire of adjustment without bracketing the target. In this case, having determined the amount of burst deviation by range in meters and measuring its deviation in direction by the divisions of the grid azimuth, range and directional corrections are introduced and a battery (platoon) volley is delivered during battery (platoon) firing, or two rounds when firing a single gun (a salvo of four rounds by one combat vehicle in rocket artillery battery firing. Directional corrections are calculated with a consideration of the range factor and the deflection shift taken as

corresponding to the range change.

Fire of Adjustment with a Large Displacement
(correction for displacement of not less than 5-00)

72. Bursts are brought out to the line of observation changing the sight setting for which the range scale Md is used.

The target is placed into a grid azimuth scale bracket; to maintain the bursts on the line of observation, each change in the grid azimuth setting is accompanied by a corresponding correction in the sight calculated with the assistance of the deflection shift Shu.

73. The range scale, Md, and the deflection shift, Shu, are calculated graphically with the assistance of supplementary tables or graph (attachment 7).

Angle KTsO, equal to the correction for displacement, PS (Figure 6), is constructed on a piece of paper (plane table, map) for a graphic calculation of the distance scale and the dflection shift.

A voluntarily scaled (for example 10 meters at 1 cm) sector TsR, equal to $1\Delta X$ (by the Firing Tables) and 100 meters for rocket artillery and mortars, is constructed along the target line OTs from point Ts; a perpendicular, RA, is dropped from point R to the line of observation; from the same point, R, a perpendicular is constructed to line OTs and continued on to the intersection with the line of observation KTs (sector RB).

The length of sector RA in meters is divided by 0.001 Dk and the range scale Md is obtained in divisions of the grid azimuth:

$$Md = \frac{RA}{0.001Dk}$$

The length of sector RB in meters is divided by 0.001 Db and the deflection shift Shu is obtained for jumps of $1\Delta X$ (by 100 meters for rocket artillery and mortars) in divisions of the

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~~grid~~ azimuth scale:

$$\text{Shu} = \frac{RB}{0.001Db}.$$

Md and Shu are calculated with an accuracy to 0-01.

74. To bring the bursts out to the line of observation:

- the burst deviation (point of the burst center) from the target is measured in divisions of the grid azimuth;

- the angle obtained is divided by the range scale and the range correction is obtained: in sight divisions for rifled guns, and in hundreds of meters for rocket artillery and mortars;

- the range correction is introduced with a plus (+) sign when the burst deviates from the target in the direction of the battery and with a minus sign (-) when the burst deviation is in the opposite side.

A range correction of 1 Vd and less are introduced only after a repeat burst deviation is obtained with the same sight and to the same side; in this case, the correction is calculated by the average deviation.

Range correcting by means of changing the sight setting (level) is continued until a burst sign observation is reached; during fire of adjustment against broad targets, range corrections do not have to be introduced if, in so doing, the bursts do not leave the frontal limits of the target.

75. Having obtained the sign, the grid azimuth setting is changed in order to bracket the target in a griz azimuth bracket. For rifled guns and mortars, the width of the first grid azimuth bracket is designated in the limits of 20-40 grid azimuth divisions with such a consideration that it would contain a complete (an even number better) number of corrections by the amount of the deflection shift; ~~by 40 grid azimuth divisions~~ the width of the ~~grid~~ azimuth scale bracket is 40 ~~grid~~ azimuth scale divisions for rocket artillery.

Depending on the observed amount of burst deviation from the target, the width of the first ~~grid~~ azimuth scale bracket may be decreased or increased.

The first ~~grid~~ azimuth scale bracket is consecutively halved until a narrow bracket is obtained whose width is not more than 10 divisions of the ~~grid~~ azimuth scale for rifled guns and mortars of 160-mm caliber and more (5 divisions for fire of destruction). When firing rocket artillery, the bracket of 40 grid azimuth divisions is not halved, but if the first bracket was greater than 40 grid azimuth divisions, then it is halved until a bracket of not more than 40 ~~grid~~ azimuth scale divisions is obtained.

Simultaneously with every correction of the grid azimuth, a sight correction is introduced corresponding to the width of the ~~grid~~ azimuth scale bracket: the firing range is decreased with a shift in the direction of the observation post, and is increased with a shift in the opposing direction. If the angle at the target ~~xx~~ (PS) is 13-00 or greater, the sight setting is not changed.

76. When the target is bracketed in a ~~grid~~ azimuth scale bracket and a deviation to the right or left is obtained, the burst is brought out to the line of observation utilizing the range scale Md. The differences in the sights on which the ~~grid~~ azimuth scale bracket is obtained is taken as the amount of sight correction corresponding to the given ~~grid~~ azimuth scale bracket.

77. When the bursts are brought out to the line of observation and in searching for the initial ~~grid~~ azimuth scale bracket (if it is not a narrow one), fire is conducted by individual rounds from a single gun. Halving the bracket and searching for the first bracket, if its width is equal to a narrow bracket, is conducted: by platoon or battery volleys in battery (platoon) firing, and with two rounds during single gun firing.

In executing the fire mission by a battery or a platoon, it is permissible to conduct fire of adjustment with a single gun.

In rocket artillery firing, the order of fire is designated in accordance with article 60.

78. A shift to effect is made in firing rifled artillery and mortars on the center of a narrow ~~grid~~ azimuth bracket, and if a covering group is obtained, by the settings of the covering group or by changing them in accordance with article 79.

In firing rocket artillery, a shift to effect is made on the center of grid azimuth bracket or on the settings of the covering group.

It is sufficient to have one observation each on the limits of the final bracket.

If a hit is obtained during fire of adjustment on a target whose destruction requires a number of hits, a hit is considered as a plus and minus, and subsequent action is done in accordance with article 79.

In shifting to effect, a sheaf is designated depending on the character of the target, its dimensions, and its position relative to the plane of fire.

79. In firing for effect from rifled guns and mortars, the range is corrected by the correlation of lateral deviations relative to the target in accordance with article 140; at this, the deviation from the line of observation in the direction of the battery and the bursts on the line of observation in front of the target are taken as a short, deviations in the opposite direction and bursts on the line of observation beyond the target are taken as overs; if it is possible to measure the deviation of each burst, the range correction is calculated with the assistance of a range scale.

The direction is corrected by the results of observation of the burst signs; having obtained observations of one sign or the ratio of signs in the covering group is greater than 3 : 1, a correction is introduced of one half of a narrow ~~grid~~ azimuth bracket;

with a ratio of signs of 3 : 1 in the covering group, corrections are not introduced for rifled guns, while a correction of 1Vd is introduced for mortars.

Features of Fire of Adjustment During Ricochet Fire

80. Ricochet fire is used for the destruction of personnel and fire means out in the open and in open dugouts (trenches), as well as on the water.

81. Fire of adjustment is conducted and the shift to effect is made according to the rules of percussion fire. Observation of the signs of ground and air bursts and the areas where fragments fall are used on equal bases.

The number of ricochets in the target area must be not less than half the total number of bursts; if, during the fire of adjustment, less than half ricochets were obtained, then ricochet fire is relinquished and a shift is made to fire for effect on the same charge and designating the fuze setting for fragmentation effect.

Obtaining 2-3 ricochets during initial firing which have not given observation by range (including areas where fragments have fallen), then, for a continuation of fire of adjustment a fragmentation or demolition fuze is designated. In this case, when shifting to effect, the ricochet fuze, as during the period of fire of adjustment, must have a cap or be without a cap and must be set for delayed action.

After fire of adjustment with a fragmentation (demolition) fuze, a shift to effect is made in accordance to general rules (article 68).

Features of Mortar Fire From Rifled Guns

85. Mortar fire (firing at angles of elevation greater than 45^{o}) is employed against personnel and firing positions situated on reverse slopes, in ravines, in the yards of tall buildings, etc.,

as well as for the destruction of combat covered long-term defensive installations.

83. During mortar fire, consideration is given to correction for drift and a correction of the sighting angle to the angle of site for all methods of initial firing data preparation.

In shifting from one charge to another, consideration is given to correction for drift difference. If the drift is greater in firing with the new charge, then the correction for drift difference is taken with a minus sign (left); if a lesser drift correction corresponds to the new charge, then the correction is made with a plus sign (right).

Features of High Explosive Grenade Fire

84. In firing high explosive grenades, the distance of friendly troops from the shelled area must not be less than 400 m.

85. Fire of adjustment begins with calculated settings of the sighting devices with a regulation setting of the fuze by single rounds from a single gun. Noticing the bursts, it is brought out to the line of observation in accordance with the general rules, while if the air burst obtained has not given observation by range, then, in addition, the level setting is decreased by the measured amount of the burst elevation above the horizontal of the target multiplied by the range coefficient. Subsequent firing is conducted by battery volleys.

If air bursts are obtained during the first battery volley and observation for range is not obtained, then the burst elevation level is again lowered.

If only ground bursts are obtained, or if they predominate, the setting level is not changed.

86. Upon receiving observation for range, the target is bracketed. The width of the first bracket is designated in accordance with the factors indicated in article 61, but not less than 200 meters (two narrow brackets). Each change in the sight

setting is accompanied by a corresponding change in the setting of the fuze.

Obtaining a 200 meter bracket (in two narrow brackets), the fire of adjustment may be considered to be concluded; fire of adjustment may also be concluded in the case if a covering group is obtained on any sight.

87. The shift to effect is made in accordance with article 68 with the most advantageous average burst elevation for effect equal to two divisions of ~~the~~ the ~~grid~~ azimuth scale (for the firing position).

With the presence of half ground bursts, the average burst elevation is considered equal to zero. If the ground bursts number less than half, then in calculating the average burst elevation, the ground burst is taken as equal to zero.

In calculating the average burst height, the elevation of all bursts obtained within the limits of the last bracket, is considered, having the same level setting and under conditions that the sight change was accompanied by a Table change in the fuze settings.

88. In the case when fire of adjustment for range has been concluded and, at this, the average burst elevation is greater than the most advantageous, then the level setting is changed corresponding to the differences of the obtained average burst elevation and the most advantageous after which the shift to effect is made.

89. If the final bracket was obtained with ground bursts or if they predominated, then, for fire of adjustment with an average burst elevation, a control volley is delivered with the sight which has been designated for shift to effect, decreasing the fuze setting by two divisions with all bursts being ground bursts, and by one division if they predominate.

Obtaining only ground bursts with the new setting, or if they predominate, one more control volley is delivered with the fuze setting decreased as indicated above.

90. If, in the control volley, not more than half of them are ground bursts, or if virtually all of them are air bursts and even if just one of them gave observation by range, shift to effect is made on the sight of the control volley and, if necessary, a simultaneous correction of burst level elevation is made according to the instructions in article 88.

If only air bursts were obtained in the control volley which do not give observation for range, then in order to shift to effect, the sight setting is changed by the width of a narrow bracket (100 meters) and, simultaneously, the burst elevation level is corrected as indicated in article 88; subsequent actions taken are as indicated in articles 135-140.

91. If the bursts of some gun during fire of adjustment systematically are different in elevation from the bursts of the guns of the battery, the burst elevation of this gun is corrected by the level.

Fire of Adjustment with the Help of an Aircraft

92. Fire of adjustment with the help of an aircraft is conducted by batteries of 100-mm caliber and larger against targets (check points) not observed from ground observation points. Under unfavorable conditions of observation, it is expedient to initiate fire of adjustment with smoke or fire adjustment projectiles, but as the bursts approach the target, a shift is made to fire with fragmentation-demolition projectiles.

Prior to fire of adjustment with the assistance of an aircraft, it is necessary:

- to determine the fire of adjustment method;
- to determine the initial firing data to open fire against the targets (orientation marks);

- to ready the data computer or the grid for calculating the corrections (during fire of adjustment of consecutive controls by the cardinal points /stranam sveta/).

In order to determine the initial settings, a transfer of ifre is employed from the fire adjusted check point, a complete or a shortened preparation.

93. Fire of adjustment with the assistance of an aircraft is conducted by consecutive controls along the cardinal points, and in addition, by the scale when firing with rifled guns.

The burst deviations (center of the group bursts) are indicated by the navigator in meters from the target center.

94. Fire of adjustment with consecutive control on the cardinal points, is conducted by battery salvos with a concentrated sheaf. During fire of adjustment by rocket artillery, a salvo of four rounds is delivered by one combat vehicle or a battery salvo of one round per vehicle. Each salvo is delivered as commanded by the navigator.

By using the cardinal points, the navigator calculates the deviation of the center point of the burst groups from the target center and transmits it to the firer. At the command of the navigator, the corrected settings are used to deliver a second salvo, and a third if necessary. Fire of adjustment, as a rule, is continued until a covering group is obtained. The method of operation is indicated in attachment 6, part V.

The corrections are calculated by means of a grid (Figure 7) or by the data computer.

The grid is constructed on a piece of graph paper or on the fire adjustment (computer) plate two mutually perpendicular lines are graphed and designated with the letters S-U (north - south) and Z - V (west - east); the intersection of these lines is taken as the center of the target. According to the drift angle of the target, a target line is drawn on the grid, and a lateral deviation line is drawn perpendicular to it. In the grid scale (50 meters per square), a scale is superimposed with a division value of 100 meters, and a ~~grid~~ azimuth scale with a division value of 0-10 is placed on the lateral deviation line.

From the data obtained from the navigator, the average point of the bursts, R_1, is placed on the grid; a perpendicular is dropped from to the target line R_1A and the deviation of the average burst point by range (in meters) and by direction (in divisions of the ~~grid~~ azimuth scale) is calculated on the line of lateral deviation, R_1M, and the corresponding change is made in the setting. The same operations are followed in subsequent controls.

95. If the target coordinates are not known ahead of time, then the initial settings are preliminarily readied by the orientation points located in the area of the anticipated target location, and are utilized for constructing the grid which is used in ~~the event~~ this case for fire of adjustment on targets which are at a distance of not more than 1km by range and 1-00 by direction from the target.

96. On terrain which is poor in orientation points, fire of adjustment is conducted with the battery scale with a concentrated sheaf on the grid azimuth setting computed on the target and on the sight setting: for the first platoon -- by 200 meters less than the computed sight (first burst group); for the second platoon -- by 200 meters more than the computed sight (the second group of bursts).

At the navigator's command of "Fire", a battery salvo is delivered.

The navigator calculates and transmits the deviation in direction and range (in meters) of the average point of burst groups closest to the target and gives its number (Figure 8).

From the deviations obtained from the navigator, the range and direction corrections are calculated and a battery salvo is delivered with a concentrated sheaf with a single sight setting; after the control and introduction of corrections, a shift to effect is made.

97. When firing against moving targets, fire of adjustment is conducted on terrain lines (local object) situated along the target's line of movement. For this, the navigator transmits data to the firer on the character of the target and the coordinates of the designated terrain line (local object).

As the target approaches the fire adjusted terrain line, fire for effect is opened; according to observations of the initiation of fire for effect, the necessary corrections are introduced.

Fire of Adjustment with the Assistance of a Helicopter

98. Fire of adjustment with the assistance of a helicopter may be conducted at a range of observation of up to 15-20 kilometers by guns of 100-mm caliber and greater. As a rule, fire of adjustment is conducted by the observations transmitted by the navigator of the helicopter.

Target fire of adjustment is conducted by observing the burst signs or by consecutive controls along the cardinal points.

99. Fire of adjustment by observing the burst signs is conducted in accordance with articles 58-68. Under unfavorable observation conditions, fire of adjustment is conducted by platoon or battery salvos with a concentrated sheaf; at the start

of fire of adjustment, it is expedient to employ smoke or fire adjustment shells. The helicopter observation point is taken as the point of the observation post, and is usually selected in the area of the battery firing position.

During fire of adjustment, the navigator reports to the firer on the deviation of the bursts from the center of the target front by direction in divisions of the ~~grid~~ azimuth scale and the sign by range calculated at the moment of flight over the point of observation.

The firer calculates the corrections from the data received and gives the command to the firing position.

During independent execution of fire of adjustment, the navigator or the artillery officer who is a member of the helicopter crew, calculates the corrections and transmits the commands to the observation post or to the battery firing position.

If the helicopter observation point is at a greater distance from the firing position than 0.1 of the firing range, then, in calculating the corrections, the range factor and the grid azimuth are employed.

Fire of adjustment with subsequent controls on the cardinal points is conducted in accordance with articles 94-95.

Chapter IV

CALCULATING THE SETTINGS FOR FIRING AGAINST GIVEN FIRE OF ADJUSTMENT CHECK POINTS

Shifting Fire on a Topographic Basis

General conditions

100. With the availability of topographic basis, fire is shifted from the ground or the air check points; both the ground and the air check points may also be acoustical.

If the coordinates of the sound check point (ground or air) are accurately determined, then the shift of fire from this check point is also possible for a non-sound target.

If the coordinates of the sound check point have been calculated approximately, then fire can be shifted only to the sound-ranging target whose coordinates have been determined by the same sound ranging reconnaissance podrazdeleniye.

101. The check point can be either real or fictitious.

A real check point may be a fire adjusted target or any well observed local object (contour point) whose coordinates are either well known or can be calculated.

A fictitious check point (ground or air) can be the center of a burst group whose coordinates can be calculated by intersections with the tied-in point of observation, a radar set, or by a visual or sound-ranging reconnaissance; furthermore, a trajectory check point may be developed with the assistance of a radar set.

Air check points and trajectory check points are created in those instances when it is impossible to fire adjust a ground check point.

In forming a fictitious check point, it is necessary to intersect: for a ground check point (including a sound ranging one) and a trajectory check point -- not less than four bursts; for air check points (including sound ranging ones) -- not less than six bursts.

In the development of the fictitious and in fire of adjustment on real check points with the assistance of tied-in observation, the angle of intersection must not be less than 1-00 with a graphic-analytical and analytical calculation of the check point, and not less than 2-50 for the graphic.

For the creation of fictitious ground check points, an area is selected which supports favorable conditions for the intersection of the bursts

102. Shifting of fire on a topographic basis is employed in the case when the coordinates of the check point and the target

are known.

The best results are obtained by calculating the position of the check point and the target by the same method: intersection from the same points, by the same podrazdeleniye, or when the real check point and the target are on the same aerial photograph.

The coordinates of the firing position must be determined by the topographic podrazdeleniye or be tied in to the contour points of the map (aerial photograph) with the assistance of the battery (battalion) instruments.

The topographic data on the check point and the target are calculated with an accuracy to 10 meters by range and to one grid azimuth division by direction.

103. The check point is fire adjusted (created) by a single gun. In firing with the assistance of a helicopter by the method of consecutive control against the cardinal points and with the assistance of an aircraft with all methods of fire adjustment are conducted by batteries, while in the rocket artillery it is conducted by a single combat vehicle with salvos of four rounds or by battery salvos of one round from each combat vehicle.

Shifting of fire must follow the fire adjusted check point as soon as possible with the least interval of time.

Fire Adjustment of a Real Check Point and
and the Creation of a Fictitious Check Point

104. Fire adjustment of a real check point is made by ~~changing~~ measuring the deviations or by observing the burst signs.

Fire adjustment by measuring the deviations is conducted in accordance with article 42 until a deviation is obtained of the center of the last group from the check point of not more than 50 meters by range and 0-05 by direction (100 meters in range and 0-10 by direction) for rocket artillery). Those settings are considered to be fire adjusted on the check point which have been obtained after the corrections of the final group were introduced.

Check point fire adjustment by observing the burst signs is conducted in accordance with article 58 until the verified bracket is obtained equal to half of a narrow bracket (article 62) or by a verified covering group. The check fire adjustment range is taken to be that range which answers the verified covering group or the center of the verified bracket being equal to half of a narrow bracket.

A bracket is considered to be verified when there are not less than two shorts on the nearest limit and not less then two overs on the furtherest. A bracket may also be considered as verified if, on one of its limits, only one observation or several observations of one sign were obtained, while on the other, a verified covering group of not less than four signs with a predominance of signs opposite to the burst sign (signs) on the first limit.

A covering group is considered to be verified if it contains not less than two observations of each sign.

Check point fire adjustment is conducted:

- by the time scale -- for rifled guns with a level setting which corresponds to the check point site angle and a correction to the angle of elevation by the check point site angle;

- by the mil scale -- with the setting level being the same as indicated above, or with a setting of 30-00; In thelast case the check point site angle and the correction of the angle of elevation by the check point site angle is taken into account on the sighting scale.

105. In creating a fictitious check point, a point is placed on the data computer (plane table or map) and it is used to calculate the initial setting taking into account the ballistic and when possible, the meteorological firing conditions. In creating an air check point, the calculated level is increased by

10-20 divisions.

In orienting the instruments at the points of tied-in observations, a calculation is computed by the located point on the data computer device (plane table, map).

When fire is being supported by an optical reconnaissance platoon, the platoon commander is provided with the coordinates of the check point; the sound ranging reconnaissance podrazdeleniye commander is provided with the data indicated in article 47.

106. In creating a fictitious check point, the first round is fired in order to verify the direction of the instruments. If the first burst occurred to the side of the designated point and it was not intersected, then a second round is fired with a preliminary correction to the settings of the sighting devices of observation instruments. A group of rounds (article 101)is delivered after the burst has been intersected.

Using the average computation, a projection of the center of the group bursts is drawn on the data computer (plane table or map) and the topographic range to it and the topographic shift from the basic direction is calculated. The elevation of the ground check point is determined from the map.

107. In creating an air check point, the elevation of the bursts is measured in divisions of the ~~grid~~ azimuth scale from the command post or the nearest point of tied-in observation to it with the assistance of the device at which the zero point has been determined. The measurement is made from the horizon of the device.

The clevation of the air burst above sea level in meters is calculated as the sum of the elevation of the observation post and the height of the check point above the observation post.

The greater height of the check point is calculated by the formula

$$h_R = M_R \cdot 0.001Dk$$

in which M_R is the average elevation of the bursts in divisions of the ~~grid~~ azimuth measured from the observation post.

The absolute amount of the excess height obtained is increased by 1/20 (5%).

The check point angle of site is determined in accordance with article 33.

108. If the site of mask (ugol ukrytiya) of the battery creating the air check point permits an observation of all of the bursts ~~fxm~~ directly from the firing position, then the angle of site of the air check point may be determined by measuring the elevation of the bursts by means of the panoramic reflecters of two guns which are not firing.

In order to facilitate observation of each burst from the firing position, an air check point is created at a levelwhich corresponds to the battery site of mask increased by the value of 6Vrv (for range to the check point), divided by one mil of the range of fire. At this, the height of the air check point above the firing position must not be greater than 400 meters.

Calculating Fire Adjusted Corrections

for Range and Direction

109. Fire adjusted corrections for range and direction are calculated by subtracting the topographic range to the check point from the fire adjusted range.

Fire adjusted correction of direction by the check point is determined by subtracting the topographic shift from fire adjusted shift from the basic direction.

110. In order to locate the fire adjusted range:

a) for rifled guns and rocket artillery -- if the ~~sighting~~ level/setting during the fire of adjustment corresponded to the angle of site of the check point and to the correction of the angle of elevation to the check point angle of sight, then the fire adjusted range is found in the Firing Tables for the fire adjusted sight (angle of elevation); if the level setting, during check point fire of adjustment, did not correspond to the above indicated angles, then:

- the fire adjusted quadrant angle of elevation is calculated as the sum of the sight setting in mils and the level setting decreased by 30-00;

- by the check point angle of site and the angle of elevation equal to the difference between the fire adjusted angle of elevation and the check point angle of site, a calculation is made of the correction of the angle of elevation by the check point angle of site;

- the check point angle of site with a correction of the angle of elevation is superimposed on the angle of site (taking their signs into account); the derived amount is subtracted from the fire adjusted quadrant angle of elevation and the angle of elevation is obtained corresponding to the range to the projected check point on the horizontal of the gun; for rocket artillery, in addition, the correction for ground wind is excluded;

- the fire adjusted range is found by this angle of elevation in the Firing Tables;

b) in firing from mortars:

- the range corresponding to the fire adjusted sight is found in the Firing Tables, and the sight correction for the excess check point height is determined by this range;

- the sight correction for the excess check point height (with a consideration of its sign) is subtracted from the fire adjusted sight and from the derived sight, the Firing Tables are used to determine its corresponding fire adjusted range to the check point carried out to the horizontal of the mortar.

Features in Creating Check Points

With the Use of Radar Sets

111. In creating check points with the use of a radar set, the firer provides the radar set chief with data as indicated in

article 50; at this, the computed range and the check point grid azimuth is provided instead of the topographic data on the target.

The radar set chief provides the firer with the coordinates of the set's position, the amount of the check point angle of site in relation to the position of the radar set at which it is possible to create a trajectory check point, and the method for processing the results of the firing (with or without the employment of the primary installation).

112. In creating a ground check point with the employment of the primary device, the deviation of the burst group center by range and by direction reported by the radar set chief, are taken with the opposite signs and the fire adjusted correction for the check point is obtained.

In order to determine the topographic range to the check point, the deviation by range (with a consideration of the sign) as reported by the radar set chief is added to the range corresponding to the fire adjusted angle of elevation.

113. In creating a trajectory check point by the amount of the check point angle of site relative to the firing position, the firer calculates the absolute check point elevation on the trajectory, by the range from the station to the check point and by the elevation of the radar set position.

In the preparation of the initial firing data on the trajectory check point, the level setting is designated with a consideration of the check point angle of site for the firing position and the corrections of the angle of elevation for the check point angle of site calculated in accordance with articles 23 and 24.

In using the computing-tabulating (schetno-reshayushchiy) device, the fire adjusted corrections are determined in accordance with article 112; in so doing, the topographic range is determined in the following manner:

- the sum of the check point angle of site and the correction of the angle of elevation by the check point angle of site is subtracted (with a consideration of the signs) from the fire adjusted quadrant angle of elevation;

- the range is found in the Firing Tables from the angle obtained and correcting it by the amount of deviation of a specific set, the topographic range is obtained to the check point projection on the horizontal of the gun.

114. In creating a check point on a trajectory with an malfunctioning computing-tabulating device or a ground check point when there is no primary device, the radar set chief informs the firer of the grid azimuth and the range (polar coordinates) to each burst calculated in relation to the radar set position.

According to the polar coordinates of the center of the group of bursts, the check point is drawn on the data computer (plane table, map) and the topographic data for the check point are determined (if the check point was created on a trajectory, then the range to the center of the group of bursts is preliminarily multiplied by the cosine of the burst angle of site for the position of the radar set).

Fire adjusted corrections for direction and range are made in accordance with articles 109 and 110.

Shifting of Fire by Means of the
Firing Factor

115. Shifting of fire by means of the firing factor is employed in firing from rifled guns in the event when:

- the difference between the topographic range to the check point and to the target is not more than 2 kilometers, and not more than 1 kilometer in mortar fire;
- the angle of shift is not greater than 3-00.

116. In order to calculate the computed range to the target, the computed correction for range ΔD_{i}^{ts} obtained by calculation or taken from the graph is added (with a consideration of the

sign) to the topographic range to the target.

117. The following formula is used to calculate the computed correction of the range to the target (ΔD_i^{ts}):

$$\Delta D_i^{ts} = 0.01\, D_t^{ts} K$$

in which ΔD_i^{ts} is the computed correction for the range to the target in meters;

D_t^{ts} is the topographic range to the target rounded off in hundreds of meters;

$K = \frac{\Delta D_i^R}{0.01 D_t^R}$ is the firing coefficient calculated with a rounding off to the nearest tenth;

ΔD_i^R is the fire adjusted correction for the range to the check point with its sign in meters

D_t^R is the topographic range to the check point rounded off in hundreds of meters.

118. The firing factor graph (Figure 9) is constructed and employed in the following manner.

On a piece of graph paper at a selected scale, the range is laid off along the horizontal axis beginning at zero, while the correction for range, also beginning at zero, is laid off along the vertical axis. A point, R, is placed on the graph corresponding to the topographic range to the check point and the fire adjusted range correction, and a straight line is drawn through it and through the beginning of coordinate O. The corrections for differences in drift (for ranges of every 1 kilometer) are taken from the Firing Tables and placed at the top of the graph.

The computed correction for range to the target and the correction for difference in drift is taken from the graph for the topographic range to the target.

119. In order to calculate the angle of shift, the angle between the check point and the target is measured on the data computer (plane table or map), and the correction for the difference

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in drift is added to it. Correction for drift difference is taken to the left if the drift by the target is greater than the drift by the check point, and to the right if the drift by the target is less.

In determining the computed shift on the target from the basic direction, the fire adjusted check point direction correction and the correction for drift difference (with a consideration of the signs of these corrections) are added to the topographic shift on the target.

The level setting is calculated in accordance with article 23.

Shifting Fire by the Simplified Method

120. Shifting of fire by the simplified method is employed when the angle of shift does not exceed 3-00, while the difference in the ranges to the target and to the check point does not exceed 600 meters for large caliber rocket projectiles, 1 kilometer for medium caliber mortars and rocket projectiles, and 2 kilometers for long range rocket projectiles; for rifled guns, it is permissible to utilize the simplified method of shifting fire when the difference in the ranges to the target and to the check point does not exceed 500 meters.

The following is determined in shifting fire on the target:

- the computed range to the target D_i^d, for this, the check point fire adjusted range correction (with a consideration of its sign) is added to the topographic range to the target;

- the level setting for the target (for rifled guns and rocket artillery) or the sight correction for the higher target (for mortars) in accordance with articles 23 and 24;

- the angle of shift or the computed shift in accordance with article 119.

Shifting Fire with the Aid of aFire Adjusted Corrections Graph

121. The graph of fire adjusted corrections is employed in the case when:

- not less than two check points have been fire adjusted at the given charge, further, the difference in the directional angles of shift on the neighboring check point is not greater than 2-00 and the difference in the topographic ranges to them is not greater than 4 kilometers (not more than 2 kilometers for large caliber rocket artillery);

- the angle of shift on the target from check point nearest to the target does not exceed 3-00; whith a larger angle of shift, another check point is fire adjusted on the flank;

- the range to the target is found within the limits of the ranges to the check points on the edges.

If the range to the target is less than the range to the nearest check point or greater than the range to the farthest check point, then the fire is shifted from the nearest check point by means of the firing factor or the simplified method.

122. In order to construct a graph of fire adjusted corrections, a selected scale is used and the topographic range is drawn along the horizontal axis of a sheet of graph paper, and the fire adjusted range corrections and fire adjusted direction corrections are drawn along the vertical axis.

For rifled guns and rocket artillery, the range and corrections are laid off from zero (Figure 10), while for mortars, from the designated minimum firing range (Figure 11).

Points R_1 and R_2 are drawn on the graph from the data on the fire adjusted check points.

In connecting points R_1 and R_2 with straight lines, the line or range corrections (LPD) and the line of direction corrections (LPN) are obtained. In preparing the graph for rifled gun firing, in addition, the firing factor lines are drawn towards OR_1 and OR_2 in order to shift fire by 2 kilometers from R_1 to the lesser side and from R_2 to the greater side.

Furthermore, if one check point was fire adjusted on each flank, then points are placed on the graph corresponding to the fire adjusted corrections for these check points, and lines are drawn through these points parallel to the constructed lines LPD and LPN (see Figure 10 for the line passing through point R_3).

123. In order to shift fire on the target:

- the range and direction corrections corresponding to the topographic ranges to the target, are calculated by the graph;
- the correction for range and the correction for direction are introduced, respectively, into the topographic range and the topographic shift to the target from the basic direction and the computed range to the target and the shift from the basic direction on the target is obtained.

In those instances when the lines for flank check points have been drawn on the graph, the range and direction corrections are calculated for the intermediate shifts from the basic direction between the lines of the graph are calculated visually.

For rifled guns and rocket artillery, the target angle of site and the correction of the angle of elevation by the target angle of site are taken into consideration, while the computed sight correction for the higher location of the target is introduced for mortars.

124. The limits for shifting fire, as indicated in articles 115, 120, and 121, refer to shifting of fire by observed and unobserved targets in those instances when target fire of adjustment is not conducted.

In firing against observed and unobserved targets, when fire for effect is preceded by fire of adjustment, these limits may be increased.

Calculating the Settings on the Basis of Using the Data of the Fire Adjustment Gun

125. A rifled gun with the least bore wear is selected as the fire adjustment gun, and a mortar with an average bore diameter (caliber increased by 0.05-0.07 mm) as the fire adjustment mortar.

The fire adjustment gun and ammunition must be carefully readied for fire.

Check point fire adjustment is conducted by a group of charges for which the deviation of the initial velocity (range correction for rocket artillery) is known. In utilizing the relative deviations of the initial velocity of the charges (range corrections for rocket artillery), fire of adjustment is conducted by the primary group of charges; the deviation of the initial velocity (range corrections for rocket artillery) for this group of charges is taken as zero.

126. To calculate the fire adjusted range correction, the fire adjusted range by the check point is calculated (according to article 110), and corrections are excluded from the fire adjusted range:

- for deviation of the initial velocity of the gun (for rifled guns);
- for deviation of the initial velocity of the group of charges with which check point fire of adjustment was conducted (by the deviation of the range of the group of charges for rocket artillery);
- for deviation of projectile weights;
- for the fuze cap (if fire of adjustment was conducted with a demolition fuze);
- for the paint on the projectile;
- for the flash hider.

From the range calculated in this manner, the topographic range to the check point is subtracted, and the fire adjusted range correction is obtained.

To calculate the fire adjusted correction for direction, the topographic shift is subtracted from the fire adjusted shift from the Basic direction.

127. In employing the data of the fire adjustment gun, the preparation of the battery for firing is conducted in the same manner as with full preparation.

The battery receives the fire adjusted corrections for range and direction for each check point with an indication of the following data:

- time at which the fire of adjustment ceases;
- the charge number;
- the check point number;
- grid azimuth direction to the check point;
- topographic range to the check point;
- fire adjusted range correction (with its sign);
- fire adjusted direction correction (with its sign).

The indexes of the projectiles and the marking of the group of charges which were used to conduct the fire of adjustment are reported ahead of time.

128. In the battery which received the data of the fire adjustment gun, the corrections for range to the check point are totaled with the ballistic corrections for the primary gun, corresponding to the ranges from the fire adjustment gun to the check point, and the total corrections for range are obtained.

In the batteries of rifled guns, the firing factor is calculated (a firing factor graph is constructed) by the total range correction, while in mortar batteries and rocket artillery batteries the total range correction for shifting fire by the simplified method is employed; if the fire adjustment gun made a fire of adjustment of two (three) check points with one charge, the a graph of fire adjusted corrections is constructed.

Renewing Settings for Fire for Effect

129. Renewing the settings for fire for effect is made:

- when, after check point (target) fire of adjustment or after the compilation of the weather bulletin employed for complete preparation, more than two hours has gone by or more than four hours has elapsed under stable weather conditions;

- during prolonged fire for effect when observation of the results is not possible;

- when the ballistic conditions of firing have changed.

Settings may be renewed as follows:

- by recalculating the meteorological and ballistic corrections;

- by controling fire.

130. The recalculation of the meteorological corrections is made when a new bulletin is received or when new meteorological corrections have been received.

The recalculation of the ballistic corrections is made when there is a change in the ballistic conditions indicated in article 10.

A new graph of calculated corrections is constructed for the newly recalculated meteorological or ballistic corrections.

In order to renew the settings for the targets, the earlier introduced corrections for range and direction (with a consideration of their signs) are subtracted from the earlier computed settings for the targets and instead of them, new corrections are introduced which have been taken from the graphs.

In shifting to fire with the charges of the new group, consideration is given to the difference in the corrections for deviation of initial velocity (range in the case of rocket artillery) from the prescribed ones for the new and the previous group of charges.

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In shifting to projectiles with other weight signs, corrections are introduced in the level (sight) setting for the changes in projectile weight; to do this, the previous correction for deviation for projectile weight from the normal is excluded and the new one is introduced.

In shifting from a fuze setting without a cap to fuze setting with a cap (and reverse), the proper correction is found in the Firing Tables and introduced into the level setting.

131. Control fire is the repeated fire adjustment of the same check point (target) for the verification of earlier fire adjusted settings.

Control fire is conducted with the same gun which was used for the initial fire of adjustment. Firing is commenced with the same settings obtained as a result of the fire of adjustment, while for rocket artillery, with a consideration of the corrections for ground wind at the moment of control.

In the control against an actual check point, fire of adjustment is conducted by the measured deviations or by observing the signs of the bursts with the following features: fire of adjustment by observing the burst signs begins with single rounds; once the sign for observation by range has been obtained, the narrow bracket is immediately searched for.

132. The fire adjusted corrections for range and direction are once again determined by the results of control fire against the check point (target) from which the data shifting fire were calculated; from this we subtract (with a consideration of the sign) the previously fire adjusted corrections for range and direction; the settings for the targets are corrected by the difference of the fire adjusted corrections obtained in the control against the check point (target) and its preceding fire of adjustment.

133. In the case when the computed corrections for range

and direction were determined by the graph of fire adjusted corrections, and control fire was directed against one of the check points, the settings for the targets are corrected by the difference in the fire adjusted corrections obtained in control against the check point and at its initial fire of adjustment.

In control against two (three) check points, new lines of fire adjusted corrections for range and direction are constructed; in order to renew the settings for the targets, the earlier introduced corrections for range and direction (with a consideration of the signs) are subtracted from them, and the corrections which have been taken from the new LPD and LPN graphs are introduced.

134. If the data for fire against a target were calculated by fire of adjustment with the assistance of an aircraft (helicopter, radar set, etc.), while at the moment of fire for effect these facilities cannot be utilized for the control of previously fire adjusted settings, then at the conclusion of target fire of adjustment, fire of adjustment of the actual check point is conducted or a fictitious check point is created.

The check point must be as close as possible to the target and, in any case, not any farther than indicated in articles 115 and 120; a knowledge of the exact coordinates of the actual check point is not required.

In renewing the settings prior to fire for effect, the previously fire adjusted data against the target are corrected by the ~~fire~~ check point fire adjusted range and direction obtained by control and during the initial fire of adjustment.

Chapter V

FIRE FOR EFFECT

135. The settings for fire for effect against observed targets are determined, as a rule, by fire of adjustment directly against the target. For deep and broad observed targets, if required by the situation, the shift to fire for effect is permitted

after calculating the settings on the basis of a full preparation, utilization of the data of the fire adjustment (directing) gun, or by shifting fire on a topographic basis.

In determining the settings for fire for effect against unobserved targets (observed targets as well for rocket artillery) use is made of complete preparation, shifting of fire from the fire adjusted check point (target) on a topographic basis, fire of adjustment directly against the target ([illegible]) with the assistance of technical reconnaissance facilities (sound ranging reconnaissance, radar sets, aircraft, helicopter, etc.), or through the use of the data of the fire adjusted (directing) gun.

Fire for effect is conducted with a tempo not exceeding the permissible rate of fire for the given system (attachment 8).

Destruction of Observed Targets

136. Depending on the depth of the and target and the results of observation, fire for effect is conducted with one or several sight settings making jumps of 2-4 Vd (4 Vrd in firing high explosive grenades) within the target depth and in firing an equal number of rounds at each setting.

Firing is continued until the completion of the fire mission. The average expenditure of rounds is indicated in attachment 9.

The suppressed target must be kept under observation. If the target comes alive, then firing against it is renewed.

137. Fire for effect against observed targets, depending on the situation and the conditions for observation, begins with a volley fire or with a methodical fire with the greatest possible rate of fire facilitating observation of the burst signs; at first, two rounds per gun are designated in battery (platoon) fire, and four rounds in firing with one gun. According to the observed results, corrections are introduced (general for all guns in battery or platoon fire) and subsequent fire for effect is conducted with a series of volley fire of 4-8 rounds per gun.

with article 41.

140. During fire for effect, an indication of the fact that the sighting devices are mmm the most favorable is the destruction of the target or (with a sheaf of directional fire) an approximately even number of shorts and overs at the same angle of elevation.

Correcting the sight (level) settings during firing for effect is done with adherence to the following rules:

- the firing range is not changed if the ratio of signs in the covering group is less than 3 : 1;

- the range is shifted by 1 Vd in the direction of the lesser number of signs with a ratio of signs of from 3 : 1 to 4 : 1;

- the range is changed by 2 Vd (2 Vrd when firing with demolition grenades) in the direction of the lesser number of signs (in the direction of the target if one sign is observed at all observations) with a ratio of signs of more than 4 : 1 as well as when all observations give but one sign.

In calculating the ratio of signs, hits on the target are considered as both a plus and a minus.

In fire of neutralization, corrections are introduced only after the last series of deliberate fire.

In calculating the range corrections during fire for destruction and annihilation, consideration is given to the observation (signs) of the two-three preceding series of deliberate fire obtained consecutively at the same angle of elevation.

In firing from guns of large and particularly great power, consideration is given to range observations, in calculating the corrections, which have been obtained during the course of the last 20-30 minutes.

If, after the corrections have been made, observations of one sign (3 : 1 or more) will predominate, opposite to the observed signs predominating at the previous setting, or observations of one sign will be obtained, then corrections equal to one-half of the previous one will be made.

141. Fire against moving targets is conducted by volley fire. When the target leaves the burst area, the settings are changed in the direction of the target's line of movement. The amount of the jumps depends upon the direction and speed of the moving target, as well as on the signs obtained by observation; sight corrections are so made to eliminate over (short, if the target is retreating) bursts. The ~~grid~~ setting azimuth is changed with a consideration for the angular shift of the target and the amount of ~~grid~~ azimuth shift.

142. A rocket artillery battery conducts fire for effect against observed targets in the same manner as against concealed ones (articles 159-171).

~~the target moves away from the friendly forces~~
The distance of the target from from friendly forces must not be less than 600 meters in firing from heavy caliber systems, 800 meters with medium caliber, and 1000 meters in firing long range rocket systems.

Fire is conducted with salvos by batteries (platoons, combat vehicles) using projectiles having a charge of one group. If necessary to shift to fire with projectiles having charges of another group, the methods outlined in article 130 are used.

A rocket artillery battery meets moving personnel with salvos on a fire adjusted terrain line or on a terrain line for which initial firing data for fire for effect without fire of adjustment had been prepared; fire is conducted with a single sight setting with a parallel sheaf; if necessary,~~in moment~~ the salvo is repeated with a change in the setting and with a consideration of the direction and speed of movement of the target.

Features of Fire for Destruction

143. In fire of destruction against an observed target, an observation post is selected as close as possible to the target

and on the battery-target alinement.

In order to annihilate personnel and fire means located in durable cover, fire of destruction of the cover is conducted.

144. Dugouts and trenches are destroyed by fire from mortars or by plunging fire from howitzers.

Tanks and dugouts are annihilated by plunging or mortar fire from batteries of 122-mm or greater caliber.

In order to destroy field earth-and-wood defensive installations, flat trajectory fire is conducted by a platoon or a gun from howitzers or long barreled guns against the field (napol'naya) wall or by plunging (mortar) fire from howitzers and mortars against the combat cover.

Very resistant installations are destroyed by fire from mortars, guns, and howitzers of 152-mm caliber or greater.

145. Under conditions of a short artillery preparation, fire for destruction of field defensive installations ~~with~~ from covered fire positions is conducted only when it is completely impossible to execute this mission from open fire positions; for this, use is made of rifled guns and mortars of a 122-mm caliber or greater. If it is impossible to observe the bursts during the course of fire for effect, the settings are calculated for fire for effect without fire of adjustment (on the basis of full preparation or shifting of fire) or by fire of adjustment with the assistance of a radar set; fire for effect is conducted on three sight settings with jumps of 2-4 Vd and on one ~~grid~~ azimuth setting with a ~~[illegible]~~ sheaf interval of 0-02 for rifled guns and of 2-4 Vb for mortars.

If it is possible, two-three rounds from one gun are used to adjust fire by the measured deviations; in this case, fire for effect is conducted with one sight setting and on one ~~grid~~ azimuth setting with a concentrated sheaf.

Expenditure of projectiles is indicated in attachment 9 (article 220).

146. The destruction of long-term defensive installations by fire from concealed firing positions is conducted only when it is totally impossible to execute this mission from open firing positions.

Long-term defensive installations are destroyed:

- by flat trajectory fire from guns of a caliber greater than 122-mm and from howitzers of a caliber of 203-mm or greater against the field wall;

- by mortar fire from howitzers and mortars with a caliber of 203-mm or greater against the combat cover.

Flat trajectory fire against the field wall is most effective and requires the least number of projectiles and amount of time to accomplish the fire mission.

The most favorable conditions for firing against long term defensive installations:

- the charge which supports the least dispersion with sufficient concrete penetration;

- at flat trajectory fire, the plane of fire is approximately perpendicular to the installation wall to be destroyed;

- the firing position distance selected with the purpose of obtaining the greatest angle of impact (not less than 58° for concrete piercing projectiles) at a specific charge at given meteorological and ballistic conditions.

In flat trajectory fire, hits occurring after a ricochet are considered as shorts while direct hits on the combat cover are considered as overs.

Armored turrets and armored cupolas are destroyed by direct laying fire.

A protective embankment covering the field wall or the combat cover of a defensive installation must be destroyed ahead of time; fire for its destruction is conducted by a platoon or a battery with a concentrated sheaf.

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147. The reconnaissance of long-term defensive installations by artillery fire is conducted by howitzer or mortar batteries of 120-mm caliber or larger until the cover, concealing the installation, is destroyed.

Barrage Fire

General conditions

148. In preparing for barrage fire, the battery commander is given the designation of the sector for a standing barrage or the designation of the rolling barrage zone **and** the number of each terrain line, coordinates of the battery sector center, its extension, and the signals for calling, shifting, and ceasing fire.

After obtaining this data, the battery commander determines the settings by the center of the battery sector and calculates the battery shift to superimpose the sheaf center with the center of the sector; the sheaf interval is determined by means of dividing the extent of the battery sector by the number of guns in the battery, but it must not be greater than that indicated in articles 149 and 153. The settings for firing are calculated by the methods indicated in article 135; in so doing, it is desirable to verify the calculated settings by single shots.

Stationary Barrage fire (NZO)

149. In order to conduct a stationary barrage fire, use is made of batteries equipped with rifled guns and mortars with a caliber of up to 160-mm inclusive.

The extent of the stationary barrage fire sector, with frontal and flanking fire is determined from the computation:

- up to 40 meters per gun for rifled guns and mortars up to 100-mm caliber inclusive;
- up to 50 meters per gun for rifled guns and mortars of 100-mm caliber or greater.

150. The distance from the nearest terrain line (sector) of a stationary barrage fire to friendly infantry situated in

concealment during frontal and flanking fire must not be less than 200 meters for rifled guns and 300 meters for mortars; if the infantry is out in the open, the distances must be not less than 200-400 meters depending on the caliber, cannon system, and the fuze setting.

151. A frontal stationary barrage is conducted with one sight setting; the sheaf is designated for the width of the battery sector. Flanking fire is conducted with a concentrated battery sheaf, but the sight setting is designated by platoons with a range difference between the platoons of 100-150 meters.

152. Firing is conducted by volley fire with the following expenditure of projectiles per gun: 12 - for 82-mm and 85-mm, 10 - for 100-mm and 107-mm, 8 - for 120-mm and 122-mm, and 6 - for 152-mm and 160-mm.

The settings are corrected only for the elimination of real errors.

If necessary, the fire onslaught is repeated.

If the infantry has dropped to prone positions, then the fire against them is conducted in the same manner as against personnel in the open.

Rolling barrage fire (PZO)

153. The width of the battery sector on each terrain line of a rolling barrage fire is calculated from a computation based on 25 meters for each rifled gun regardless of caliber; the sheaf is designated by the width of the battery sector.

Mortar batteries do not receive independent sectors, but conduct fire against each PZO terrain line /vnakladku/ for the gun or howitzer battery being guided by the rules of conducting a stationary barrage fire (articles 149-152).

As a rule, the rocket artillery batteries participate in a rolling barrage fire in a battalion and conduct fire (vnakladku with the fire of rifled guns) only against one of the terrain lines which is at a distance of not less than 1000 meters from friendly troops; the fire is conducted by battery salvos with a parallel sheaf.

154. The fire against each terrain line is opened when called for (by a signal); volley fire is conducted with a single setting of the sight and ~~grid~~ azimuth prior to the command or the signal to shift or cease fire.

Rolling Barrage and Subsequent

Concentration of Fire

155. Rifled gun batteries execute all fire missions connected with the conducting of a rolling barrage.

Mortar batteries are used only to conduct concentrated fire against strong points and target sectors in the system of a single battery or double rolling barrage or in the second artillery group in conducting a double interval rolling barrage.

Rocket artillery batteries are brought in to conduct fire in the system of a rolling barrage only against strong points and target sectors situated at a distance of not less than 1000 meters from friendly troops.

156. In order to conduct a rolling barrage, the following is indicated to the battery commander:

- the number of basic and intermediate terrain lines (visible battery sectors on the basic terrain lines of the rolling barrage is indicated on the terrain);
- the coordinates of the sector ~~xxx~~ center and its front or the settings by the basic terrain lines of the rolling barrage;
- the duration for conducting fire against each terrain line of the rolling barrage and the tempo of fire;
- shell expenditure for each terrain line (exact - for the intermediate terrain lines, and orientation - for the basic ones);
- signals to open and shift fire.

The settings for firing against the intermediate terrain lines are calculated in the battery by interpolation of the settings by the adjacent terrain lines of the rolling barrage.

All of the data are written down on the rolling barrage range card of the battery.

157. Fire against each terrain line of the rolling barrage begins with a salvo and is conducted by deliberate fire with a tempo indicated in the rolling barrage range card.

The battery which takes part in conducting a single battery rolling barrage or which enters into the composition of the first artillery group during execution of a rolling barrage spread between two batteries, conducts fire against each basic terrain line until a signal or command is received from the battalion commander to shift fire; when the signal (command) is received to shift fire to the regular terrain line (intermediate or basic); in maintaining the rolling barrage on a given basic terrain line for more than 10 minutes, the fire is repeated in the previous sequence. Fire against an intermediate terrain line is conducted until the time indicated in the rolling barrage range card (1 or 2 minutes) has run out after which the fire is shifted to the next terrain line (intermediate or basic) without any signal.

The battery which is in the composition of the second artillery group, during execution of a rolling barrage spread between two batteries, opens fire simultaneously with the batteries which are in the composition of the first artillery group, but conducts fire only against the basic terrain lines beginning with the second one. At the same time that the batteries of the first artillery group shift their fire to the second basic terrain line, the battery which is in the second artillery group, shifts its fire to the third basic terrain line. This method of shifting fire is retained through the entire depth of the rolling barrage. As soon as the batteries of the first artillery group shift their fire to the last terrain line of the rolling barrage, the battery which is in the composition of the second artillery group ceases fire against this terrain line.

158. The battery commander, participating in consecutive fire concentration (PSO), issues directives in accordance with articles 159 and 160.

Rifled gun batteries and mortar batteries commence firing against a PSO sector with volley fire, firing 3-4 rounds per gun and then shift to deliberate fire at a tempo in which the remaining rounds will be expended in the given period of time. If no signal or command to shift fire will follow, fire is renewed and is conducted in the same manner.

Rocket artillery batteries (in the composition of a battalion as a rule) participate in consecutive fire concentration against the more important strong points of the enemy. Fire is commenced at the signal from the senior artillery commander or when requested by the commander of the supported unit (podrazdeleniye) and is conducted by battery salvos. The settings for fire for effect are determined in accordance with article 148.

Conducting Fire Against Concealed Targets

General Conditions

159. As a rule, fire against concealed targets is conducted by several batteries.

In calculating the settings for fire for effect on a battalion scale, the battery commander is provided with the following:

- the character of the target and its number;
- the projectile;
- the sighting scale;
- the sheaf;
- expenditure of rounds for each gun at each setting of the sight and the ~~grid~~ azimuth (number of salvos for rocket artillery) and the rate of fire;
- the amount of shift to the right (left) by half of the sheaf interval (when firing with two ~~grid~~ azimuth settings);

- the time at which to commence firing (readiness);
- the setting of the sight (against the center of the target), level, and shift from the basic direction.

160. In those cases when the settings for fire for effect are calculated in the battery, the battery commander is informed of the following:

- the target character and its number;
- the coordinates of the target center;
- the target front in meters;
- the number of ~~grid~~ azimuth settings (only when firing with two settings of the grid azimuth);
- the amount of sight jump (the scale size for rocket artillery) in meters when firing with three settings of the sight (scale);
- expenditure of rounds per battery (number of salvos for rocket artillery) and the duration for conducting fire;
- the fuze setting;
- the time at which to commence firing (readiness).

After these directives, the settings for the target center are calculated in the battery, the battery shift is computed to superimpose the center of the sheaf with the center of the target (the sheaf interval is determined by dividing the target front by the number of guns in the battery); the amount of the jump is calculated (the scale value in graduations of the sight for rocket artillery), the shells are distributed for the settings and the rate of fire is determined.

161. The rifled gun batteries and the mortar batteries, in conducting fire in the composition of a battalion with three sight settings, open fire simultaneously at different sight settings relative to the computed target center and during the course of firing, the settings are changed in the sequence indicated in table 2. When firing with several settings, an identical number of rounds

are fired at each setting of the sight and grid azimuth.

When firing in a battalion composition, a rocket artillery battery conducts scale fire at a single given sight setting in accordance with table 2.

Table 2

Firing Order for Three Sight Settings

Battery number	Sight settings for rifled gun batteries and mortar batteries: 1st	2nd	3rd	Sight setting for rocket artillery batteries
1	$h - \Delta h$	h	$h + \Delta h$	$h - \Delta h$
2	h	$h + \Delta h$	$h - \Delta h$	h
3	$h + \Delta h$	$h - \Delta h$	h	$h + \Delta h$
4	Same as the 2nd battery			
5	Same as the 1st battery			

Note. h is the computed sight setting; Δh is the jump of the sight (the amount of the scale for rocket artillery).

162. Depending on the importance of the target, the degree of engineer construction in the enemy's position, his state of morale, availability of ammunition and duration of neutralization, the norms of shell expenditure, indicated in articles 164, 165, and 171, may be increased or decreased.

Neutralization of unobserved personnel and fire means

163. During independent battery firing against an unobserved target, the fire is conducted with one ~~grid~~ azimuth setting and at three sight settings with a jump equal to 2-4 Vd, but not more than 1/3 of the depth of the target or the target sector (by one sight setting for the rocket artillery battery). The sheaf interval is equal to the target front divisable by the number of guns in the battery, but must not be more than 40 meters for rifled guns and mortars of calibers to 100-mm inclusive, and 50 meters for the heavier calibers (up to 75 meters for rocket artillery batteries).

The fire onslaught is commenced with the average sight setting; an equal number of rounds are fired at each setting.

164. The neutralization of personnel and fire means situated out in the open, as well as the destruction of a column, is conducted by a single fire onslaught (rocket artillery salvo); the firing is conducted by volley fire at the greatest ~~rate of fire~~ tempo permitted by the rate of fire.

The average expenditure of shells for 1 hectare of target area for the suppression of unobserved personnel and fire means situated in the open at a distance of up to 10 kilometers:

Rifled guns				Mortars				Rocket artillery		
caliber in mm								average caliber		heavy caliber
85	100	122	152	82	107	120	160	Non-finned	Finned	
45	30	20	15	40	15	10	8	8	10	5

When firing at a distance of 15 kilometers, the expenditure of shells is doubled, when firing over a distance of 20 kilometers it is tripled. When firing at intermediate distances, the ~~the~~ expenditure of shells is determined by interpolation.

For rocket artillery, the norms of shell expenditure is identical at all firing ranges.

If there is a snow cover of greater than 40 centimeters in depth, the expenditure of shells is doubled.

For the destruction of a column, 3-4 shells are designated for each setting of the sight; with a frontal movement of the column, the target front is taken as 200 meters, while at a flanking one, a sheaf interval is designated according to article 163. The first thing is the destruction of the head of the column. If necessary, the fire onslaught is repeated.

165. Personnel and fire means situated in strong points and trenches, and armored personnel carriers and tanks are neutralized by fire onslaughts of any duration (rocket artillery salvos).

Against concealed personnel and fire means, the rifled gun batteries and mortar batteries commence the fire onslaught with volley fire designating 2-4 shells per gun, and then conduct deliberate fire at such a tempo in which the number of rounds designated for the fire onslaught will be expended within the given time.

Against armored personnel carriers and tanks, and, in certain instances against concealed personnel and fire means as well, the fire onslaught is conducted only by volley fire with the greatest tempo permitted by the rate of fire.

The average expenditure of shells on 1 hectare of target area, for a dependable neutralization of unobserved concealed personnel and fire means, armored personnel carriers and tanks at distances up to 10 km:

Rifled guns					Mortars			Heavy caliber rocket artillery
caliber in mm								
85	100	122 howitzer	122 gun	152	82	107-120	100	
350	250	140	150	90	300	140	85	50

When firing at a distance of 15 kilometers, the expenditure of shells is increased 1.5 times; when firing against the intermediate distances, the expenditure of shells is calculated by means of interpolation.

Neutralizing enemy batteries

166. In the event of independent battery firing against an enemy battery, fire is conducted:

- with three sight settings with jumps of 2-4 Vd;
- with one ~~grid~~ azimuth setting if the battery sheaf is not greater than 25 meters, and on two ~~grid~~ azimuth settings with jumps equal to half the interval sheaf, if it is greater than 25 meters (the mortar battery conducts fire with one setting of the ~~grid~~ azimuth at any sheaf interval); the sheaf interval is equal to the

target front increased by 30 meters and divided by the number of guns in the firing battery.

A rocket artillery battery conducts fire against a battery with one setting of the sight and ~~grid~~ azimuth at a concentrated sheaf.

167. The enemy battery front is taken as equal to the distance between the outside /kraynimi/ guns, when the positions of all guns in the battery are known. If only one or several gun positions of the battery are known, then the front is taken as being equal to 200 meters for an artillery (rocket, anti-aircraft) battery and 150 meters for a mortar battery; in this instance, the coordinates of the battery center are taken as the average coordinates of the reconnoitered guns.

168. An enemy battery is neutralized by a battery fire onslaught (rocket artillery salvos) in combination with fire observation. The number of fire onslaughts (salvos) depends on the combat situation and the duration of the artillery preparation.

There must not be less than two fire onslaughts (salvos) during artillery preparation for the attack.

During the period of the artillery support of an attack or offensive, the newly reconnoitered and revived enemy batteries in the enemy's defensive depth may be neutralized by only one fire onslaught.

169. The initial fire onslaught and the fire onslaught at the moment the infantry and tanks go into the attack must be the most powerful.

The fire onslaught at the moment the infantry and tanks go into the attack must commence before the artillery preparation for the attack ceases and must overlap the attack time of the infantry and tanks against the forward trenches. The rocket artillery battery begins an overlapping /perekryvayushchiy/ fire onslaught at the moment the infantry and tanks go into the attack.

Fire onslaught is conducted by volley fire (salvos by rocket artillery). The overlapping fire onslaught is begun with volley fire with 2-4 rounds designated per gun; firing is then conducted with deliberate fire at a tempo in which the number of rounds designated for the onslaught will be expended exactly in the given amount of time.

170. Fire of observation is conducted during the intervals between the fire onslaughts. If the time interval between the fire onslaughts does not exceed 10-15 minutes, the fire of observation is not done.

Fire of observation is conducted by a battery at an average sight setting and with volley fire designating 2-4 rounds per gun, by deliberate fire, or by salvos from individual rocket artillery combat vehicles. Up to ¼ of the total number of rounds designated for neutralization may be designated for fire of observation.

171. The expenditure of shells to suppress the enemy battery is designated according to table 3 depending on the methods of determining the settings for fire for effect and the firing range.

For rocket artillery batteries brought in to neutralize the enemy battery, the following expenditure of rounds is designated regardless of the method of determining the settings for fire for effect and the firing range:

- 400 for non-finned medium caliber;
- 170 for non-finned heavy caliber;
- 200 for finned heavy caliber.

Table 3

Average expenditure of shells for a dependable neutralization of an enemy battery

Method of determining the settings for fire for effect	Caliber in mm	Firing range in km 4	6	8	10

1. Full preparation or use of the fire of adjustment gun data:					
target coordinates deter-	85	250	250	280	350
mined by aerial photos	100	220	220	240	300
	122	150	180	230	290
	152	130	150	180	230
	160	100	130	170	-
	240	80	100	120	150
target coordinates deter-	85	260	260	310	430
mined by the technical	100	230	230	280	400
means of the artillery	122	160	190	260	370
reconnaissance <u>podrazde-</u>	152	140	160	210	300
<u>leniye</u>	160	120	150	190	-
	240	90	110	140	200
2. Shifting fire from a fire	85	150	190	220	270
adjusted check point	100	130	180	200	250
	122	120	140	170	220
	152	90	110	140	180
	160	90	100	130	-
	240	70	80	100	150
3. Fire of adjustment directly against the target:					
with the assistance of an	100	210	220	230	240
aircraft, up to three con-	122	190	200	230	240
trols or a covering group;	152	140	150	160	180
with the assistance of a	100	130	150	170	200
helicopter	122	100	140	160	180
	152	70	90	110	140
with the assistance of a	100	170	180	210	280
sound ranging reconnais-	122	140	150	180	270
sance battery or with a	152	120	130	150	210

stopwatch	160	80	90	110	-
	240	65	70	80	120
with the assistance of a	122	130	140	155	175
radar set	152	110	125	135	150
	160	75	80	90	-
	240	55	60	65	70

CHAPTER VI

FIRING AT NIGHT, IN THE MOUNTAINS AND WITH SPECIAL DESIGNATION PROJECTILES (MORTAR SHELLS)

Firing at Night and Under other Conditions of Limited Visibility

172. In firing at night against non-illuminated targets, as well as against targets which have become invisible because of smoke, fog, snow fall, rain, etc., the settings for fire for effect are determined by direct fire of adjustment against the target as well as by shifting fire from the fire adjusted check point on the basis of a complete preparation or on the basis of the data of the fire of adjustment gun.

The settings for fire for effect against illuminated targets are determined by fire of adjustment directly against the target.

At night, fire for effect may be conducted in those cases when fire of adjustment on the targets was conducted during daylight hours; in so doing, the settings must be renewed prior to firing for effect (articles 129-134).

Fire for effect is conducted, as for unobserved targets, similarly to article 145 or 163.

173. In order to improve the conditions of observation at night, the observations posts should be moved forward as far as possible, use is made of optical devices with the greatest lumen output and of night vision devices; in order to facilitate observation of the bursts, ricochet fire is employed or fire of adjustment

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is conducted with high explosive grenades or smoke or fire adjustment projectiles.

Under favorable conditions for observing ground bursts, it is possible to conduct fire of adjustment with demolition-fragmentation grenades with the fuze set for fragmentation effect.

The use of illuminating facilities supports the employment of target and check point fire of adjustment at observations distances of not more than 3000 meters.

174. Fire of adjustment against non-illuminated targets is conducted according to general rules with the assistance of a sound ranging reconnaissance podrazdeleniye (stopwatch) combined with observation or with the assistance of a radar set as well as with the use of smoke projectile range finding.

The observation devices at the points of bilateral observation are directed at the target:

- by computation obtained by target tie-in during the day or computed on the data computer device (map), if the target coordinates are known;
- by the flash of the shot.

Fire adjustment against targets which have become invisible (article 172) is conducted with the assistance of the sound ranging reconnaissance podrazdeleniye or a radar set.

175. If a smoke projectile (mortar shell) was used for fire of adjustment at night, then to shift to effect with a grenade (fragmentation or demolition-fragmentation), the Firing Tables are used to calculate the range for a smoke projectile (mortar shell) corresponding to the fire adjusted sight, excluding from it the correction for drift for the weight of the smoke projectile (mortar shell) and the deviation of the initial velocity of the group of projectiles. According to the range calculated in this manner, the sight setting is determined for the grenade (fragmentation or fragmentation-demolition mortar shell) taking into consideration the

corrections for its weight sign and for deviation in the initial velocity of the projectile group.

176. Terrain illumination at night is used:

- for target reconnaissance and target indication;
- for conducting fire of adjustment and the control of fire for effect.

Terrain (target) illumination may be continuous during the entire period of executing the fire mission or periodic for short intervals of time connected with the execution of individual personal missions (locating the target on the terrain, observation of bursts by consecutive commands, etc.).

Terrain (target) illumination in firing at night is conducted by star shells, rockets, or illuminating aircraft bomb, while in firing against surface targets, projectors are used.

177. Fire of adjustment of illuminated targets is conducted according to general rules with the use of a range finder, with bilateral observation, or by observing the burst signs.

If the target is not visible from the observation post, fire of adjustment is conducted with the assistance of an aircraft (helicopter) which illuminates the target by means of illuminating aircraft bombs.

178. Terrain (target) illumination by means of star shells is conducted by specially designated batteries (platoon, gun) for this purpose, or by one or two guns of the same battery which executes the fire mission.

Depending on the caliber, the shell illuminates a terrain sector at a diameter of 500-1500 meters for a period of 25-35 seconds.

An indication of the most advantageous average elevation of star shell bursts is the complete combustion of the torch at the moment it falls to earth. If the torch falls to earth prior to its burning, or burns at a height of greater than 50 meters, then for rifled guns the level is used to correct the altitude of the bursts, and a change in the tube setting is used for mortars.

If there is a burst deviation of drift of the torch, corrections are made for range, direction, and altitude. If the mission can be executed without making corrections, then this is permitted.

179. Periodic illumination is employed, as a rule, during fire of adjustment for illumination of the target area at the moment the battery (platoon) shells burst (fall) in accomplishing the fire mission.

During fire of adjustment, the star shells are fired in such a manner that the star shell would burst 5-10 seconds before the projectile being used for fire of adjustment; in this computation, the flight time of the star shell and the projectile being used for fire of adjustment must be taken into consideration.

Continuous illumination is attained through deliberate fire by the battery (platoon). In the event when it is required to increase target illumination or to illuminate a large area (up to 3 kilometers of front), then fire is conducted by battery salvos with a tempo of 20-25 seconds and with an interval between bursts of 250 meters for the 82-mm mortars and 500 meters for other guns.

Fire against moving targets is conducted with continuous illumination.

For continuous terrain illumination, the requirement on the average is one gun and three rounds per minute for every 750-1000 meters of the illuminated sector front with a depth of up to 1.5 kilometers.

180. In fire of destruction against a non-illuminated target at night, target fire of adjustment is conducted by each gun with the assistance of bilateral observation in the following order. At first, the target is fire adjusted by one gun according

to general rules, then with the settings fire adjusted by this gun, consecutive fire of 4 rounds is conducted by the remaining guns of the battery. From the average deviation of the groups of 4 bursts from each gun, corrections are introduced (regardless of their amount) and the shift to effect is made.

Fire of destruction is conducted by vollery fire; after approximately half of the rounds have been expended, control fire is conducted, when possible, by one gun with 4 rounds designated to it. Corrections, common for the whole battery, are introduced by the control results. Firing is continued until the number of rounds indicated in attachment 9 (page 219) are expended.

Mountain Firing

181. Preparation and delivery of fire in the mountains have a number of features resulting from:

- the considerable differences in the altitudes of the firing position, the observation post, and the targets;

- the brokenness of the terrain in the target area, and between the firing position and the targets;

- the location of the targets on slopes and on horizontal areas of limited dimensions, as well as on the crests;

- the great relation of the meteorological conditions to the terrain relief and the altitude above sea level.

Peculiarities of preparaing initial firing data

182 182. In the preparation of initial firing data in mountain terrain, the Mountain Firing Tables and the weather bulletin, "Meteorology", are used. The method of using the Mountain Firing Tables and the bulletin .... in these firing tables.

183. If there is a ridge between the firing position and the target, the graphic firing tables are used to determine if it is possible to conduct fire against the given target over this ridge.

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The following are drawn on the trajectory graph for this:

- a point situated closer to the target (farther from the the target during mortar fire and fire from mortars) by 4 Vd, and if necessary to conduct fire of adjustment or execute a shift of fire, additionally by the value of the two initial brackets or by limit of shifting fire by range;

- a point which corresponds to the top of the ridge, for which a calculation is made on the map in the target direction for range and the greater height of the top of the ridge with relation to the firing position.

After placing both of these points on the map, a calculation is made as to which trajectory (at what charge and what sight setting) will cause the projectile to reach the target without hitting the ridge.

If it is anticipated that fire will be conducted with several sight settings, then it is determined if it will be possible to conduct fire over the ridge at the sight setting answering the least (greatest, for mortar fire from rifled guns and fire from mortars) designated firing range.

184. The height of the target above the firing position is calculated through the use of observation instruments, for which:

- the angles of observation of the target angle of site, M_{ts}, and the primary gun, M_o, are measured from the observation post (Figure 12);

- the horizontal range of observation to the target, Dk, and the base, B, is calculated on the map (on the data computer device, plane table);

- the excess height of the target Δh and the excess height of the firing position Δh above the observation post is computed by the formulas:

$$\Delta h_{ts} = Dk \cdot tg\ M_{ts}$$

$$\Delta h_o = B \cdot tg\ M_o$$

(the values of the tangents of the angles is taken from the Firing Tables);

- the excess height of the target, Δh, above the firing position is found as the difference between excess heights Δh_{ts} and Δh_o, taken with their signs:

$$\Delta h = \Delta h_{ts} - \Delta h_o.$$

If the angle of observation of the target site M_{ts} or the primary gun M_o is less than 5-00, as well as during visual preparation, the excess height is calculated through the use of instruments by the formulas:

$$\Delta h_{ts} = M_{ts} \cdot 0.001\ Dk;$$

$$\Delta h_o = M_o \cdot 0.001\ B.$$

The obtained absolute value of excess height is increased by 1/20 (5%).

When the target and the firing position are not visible from the observation post, the excess height of the target above the firing position is calculated from the map.

185. If only the target or the firing position is visible from the observation post, then the excess height of the target above the firing position is calculated by the use of the observation devices and the map, for which:

- the excess height of the observed target (firing position) over the observation post is calculated by means of instruments (article 184);

- the excess height of the unobserved firing position (target) over the observation post is calculated by the map;

- the excess height of the firing position above the observation post is subtracted (with a consideration of the sign) from the excess height of the target above the observation post, and the excess height of the target above the firing position is obtained.

186. If a slant range is calculated from the observation post to target or battery and, at this, the angle of observation of

the target location (primary gun) exceeds 5-00, then the measured slant range is converted to the horizon by the formulas:

$$Dk = Dk_h \cdot \sin(15\text{-}00 - M_{ts});$$

$$B = B_h \cdot \sin(15\text{-}00 - M_o),$$

in which Dk_h and B_h are the slant ranges to the target and to the battery respectively.

The values of angles M_{ts} and M_o are taken without consideration of their signs.

187. The sight setting at any method of preparation is calculated by the computed range to the target with the use of the tables of sight settings of the Mountain Firing Tables, selected in relation to the charge and the altitude of the firing position.

The level (sight) correction is determined by the height of the target above the gun: at angles of elevation to 400 mils -- by the topographic range to the target, while for greater angles -- by the computed range. The level (sight) correction is introduced into the sight setting by the mil scale.

188. Range corrections for deviations in meteorological and ballistic firing conditions are taken from the Mountain Firing Tables for altitude of 1500 meters by the angle of elevation which is calculated by the tables of sight settings corresponding to the height of the firing position and the topographic range to the target. Directional corrections are taken by the angle of elevation which is calculated by the table of sight settings corresponding to to the height of the firing position and the computed range. The correction for level is taken as indicated in article 187.

Peculiarities of firing against targets on slopes sloping towards the observation post

189. Fire of adjustment against targets situated on slopes which slope towards the observation post, or which are on horizontal areas but at a height considerably less than that of the observation post, is conducted by means of staking out the plane of fire

and, in addition, when firing from rifled guns and mortars, by the graph or by using the range scale.

When it is impossible to employ the indicated methods, fire of adjustment is conducted by observing the burst signs.

Deviation of the bursts by direction and elevation are measured from the observation post in divisions of the grid azimuth.

If the burst does not occur on the slope (on the horizontal area) on which the target is situated, a change is made in the sight setting or ~~grid~~ azimuth with the calculation of obtaining the next burst on the slope (area) on which the target is situated.

190. Fire of adjustment by the graph is conducted by one gun at any displacement. To prepare the graph, two mutually perpendicular lines are drawn on a piece of graph paper (Figure 13): the perpendicular line is taken as the line of observation, the horizontal one as the line of lateral deviations for the observation post, and the point of intersection of these two lines as the target point.

In drawing the bursts on the graph, the following scale is taken: along the horizontal -- 1 division of the ~~grid~~ azimuth for 1-2 mm; along the vertical -- 1 division of the ~~grid~~ azimuth for 5-10 mm.

One round is fired from the computed settings, and by the deviations measured by means of the horizontal and vertical scale of the battery commander's telescope (binoculars) grid, the burst is drawn on the graph (point R_1, Figure 13).

In those instances when it is possible to judge the position of the burst by range according to the deviations (for example, right 20, down 3, i.e., a short), the range scale is calculated, and then the scale of the lateral deviations. For this, a second round is fired for ranges increased (decreased) by 200-400 meters depending on the length and steepness of the slope with the purpose of range bracketing the target. Drawing the second burst on the graph (point R_2), a straight line is drawn connecting the points

~~of the first and second~~

of the first and second bursts showing the direction of fire. Dividing the section R_1R_2 into 4-8 units, the range scale in meters is obtained.

The third round is fired at the sight at which the burst closest to the target occurred, but with the ~~grid~~ azimuth changed by 20-40 divisions so as to place the target into a ~~grid~~ azimuth bracket.

Drawing the third burst R_3 on the graph and connecting point R_3 by a straight line with point R_2, the line of lateral deviations is obtained. Dividing the sector R_2R_3 into 4-8 parts, the lateral deviations scale in divisions of the ~~grid~~ azimuth is obtained.

If it is not possible to judge the range by the first burst but it is possible to evaluate its position by direction, then the scale of lateral deviations is obtained first and then the range scale.

To calculate the corrections, the target line is drafted through point Ts parallel to section R_1R_2 (R_2R_3), and the line of lateral deviations parallel to section R_2R_3 (R_1R_2). The section of the lateral deviation line R_2N corresponds to the correction for direction, while the section NTs corresponds to the correction for range. Introducing the corrections into the sight and ~~grid~~ azimuth, a group of four rounds is fired at a tempo permitting a tieing-in of each burst.

According to the average deviation of the burst group, the center of the burst group ~~ix~~ (R_4) is drawn on the graph, the corrections are determined and, introducing them into the settings, the shift to effect is executed.

At a small displacement, only two bursts are used (R_1 and R_2, see Figure 13). The sight corrections are found from the value of the section from point R_2 to the line of the lateral deviations. To calculate the ~~grid~~ azimuth corrections, the number of squares are counted from the point of intersection of section R_1R_2 with the line of lateral deviations to point Ts and the number of counted squares is multiplied by the value of one square ~~the~~ and the distance factor.

191. Fire of adjustment with the use of the range scale is utilized for corrections for displacement of less than 5-00. A round is fired with the initial settings; with a large deviation by direction, the burst is drawn on the line of observation. Obtaining a burst on the line of observation, a measurement is made of its deviation from the target by elevation in divisions of the ~~grid~~ scale azimuth and the sight setting is changed by 200-400 meters with the purpose of bracketing the target; simultaneously, the ~~grid~~ azimuth setting is changed by the amount of ~~grid~~ azimuth drift to keep the burst on the line of observation and the next round is fired with the corrected settings.

After measuring the deviation of the second burst from the target by elevation and by direction, the angle for elevation /ugol po vysote/ between the two bursts is determined; the amount of this angle is divided by the width of the bracket obtained in in divisions of the sight (in hundreds of meters for mortars) and the range scale is thusly obtained.

Dividing the amount of deviation of the last burst from the target by elevation by the range scale, the correction for range is obtained in divisions of the sight (in hundreds of meters for mortars). After making the corrections for range and direction, a group of four rounds is fired at a tempo which permits observation of each group.

After determining the deviation of the center of the burst group from the target and after making the corrections, the shift to fire for effect is then executed.

Fire for effect is conducted as guided by article 140.

192. Fire of adjustment by the method of staking out the firing plane is conducted when there is large displacement.

In order to stake out /proveshivat'/ the firing plane, two rounds are fired with the computed setting of the grid azimuth, but with different sight settings (by two groups of shots of two rounds each for rocket artillery battery fire). The amount of the sight jump is taken as being equal to the width of the initial bracket.

Catching the target in a range bracket, it is halved and at the same time the target is caught in a grid azimuth bracket for which the position of the firing plane with relation to the target is calculated on the terrain. The size of the grid azimuth bracket is designated and subsequent fire of adjustment is conducted in accordance with articles 72-78.

193. At very steep slopes (more than 40°) and a flat trajectory (angle of fall up to 20°), fire of adjustment is conducted in the following manner:

- obtaining the first observation for range, the angle of elevation (depression /ponizheniye/) of the burst above the target is measured in divisions of the grid azimuth and is multiplied by the range factor; the corrections are made to the setting of the level (sight), and a group of four rounds is delivered;

- new corrections are introduced according to the average angle of elevation (depression) of the burst group and a shift to fire for effect is made.

Corrections for direction are made in the usual way.

194. Fire of adjustment against a target situated on a ridge is conducted by observing the burst signs.

The sight setting for the first shot is designated with the purpose of obtaining a short burst, provided that this does not endanger friendly troops. Obtaining a short, fire of adjustment is conducted with a subsequent consecutive approach of the bursts to the target (article 64), designating the sight jump as one-two narrow brackets.

Features in calculating settings by the data of fire adjusted check points

195. Shifting fire from a check point in mountain terrain is the fundamental method for determining the settings for the destruction of unobserved targets, as well as observed targets with rocket artillery.

196. To calculate the possibilities of shifting fire from the check point to the target, the range differences (X^{ts} and X^{r}) are determined corresponding to the quadrant angle of elevation for the target and the check point found in the Firing Tables by the topographic data (Figure 14):

$$\Delta X = X^{ts} - X^{r}$$

If the range difference ΔX to the target and to the check point does not exceed the limits of shifting fire, indicated for a plain terrain, then it is possible to shift fire; in the worst case, another check point is selected in order to facilitate the necessary conditions for shifting fire.

197. Upon the termination of fire of adjustment (creation of) on a check point, the fire adjusted range X_p^r is calculated by the Firing Tables corresponding to the fire adjusted check point quadrant angle of elevation, and the fire adjusted range correction ΔD_p^r is computed, subtracting from the fire adjusted range to the check point X_p^r, the range X^r, found by the quadrant angle of elevation corresponding corresponding to the topographic range to the check point and its height above the firing position.

198. With the assistance of the Mountain Graphic Firing Tables, the fire adjusted range correction is determined in the following manner (see Figure 14):

- a point is drawn on the corresponding trajectory graph along the topographic range to the check point D_t^r and the height of the check point above the firing position Δh_r;

- a trajectory is found on the graph which corresponds to the fire adjusted quadrant angle of elevation by the check point ($\varphi 3$ on Figure 14);

- the distance between the ends of the trajectories, corresponding to the quadrant angles of elevation fire adjusted by the check point and found by the topographic data is measured along the range axis; the measured distance R_1C is equal to the fire adjusted range correction ΔD^r_p. The correction is taken with a plus sign if the distance X^r_p is greater than the distance X^r, and with a minus sign if the distance X^r_p is less than distance X^r.

The fire adjusted correction for direction is determined in the usual manner.

199. The fire adjusted range correction is utilized in shifting fire according to the rules indicated in articles 116 and 120; with this, instead of the topographic ranges to the check point and to the target, you use the ranges from the quadrant angles of elevation corresponding to the topographic ranges and the height of the target and of the check point above the firing position.

200. The graph method of fire adjusted corrections (LPD and LPM) is ~~also~~ employed in the same manner as for plain terrain, but in constructing the graph, the range to check point X^r is marked off along the horizontal axis corresponding to the angles of quadrant elevation by the check point calculated from the topographic data.

201. In order to calculate the computed ranges to the target into the range corresponding the angle of quadrant elevation, the calculated range correction is made taken from the LPD graph (computed by the firing factor method of by the simplified method). The computed quadrant angle of elevation is computed by calculated range to the target with the help of the Mountain Firing Tables. To do this, section Ts_1S_1, equal to the value of the computed range

ΔD_1^{bs} is marked off on the range axis on the trajectory graph (see Figure 14) from the intersection point of the range axis with the trajectory corresponding to the quadrant angle of elevation by the target found from the topographic data (point Ts_1). It is marked off to the right if the correction has a plus sign and to the left if the correction has a minus sign, and a trajectory is found which passes through end S_1 of the marked off section. The sought for quadrant angle of elevation (φ 6 on Figure 14) for fire against the target is determined from the trajectory found.

For rifled guns and rocket artillery the order is given to set the sight by the mil scale equal to the computed quadrant angle of elevation and a level of 30-00.

FIRING SPECIAL DESIGNATION PROJECTILES

Firing smoke projectiles for smoke screening

202. One round is fired at the computed settings; evaluating by means of the range finder or visually the amount of deviation by range and direction of the first burst, corrections are made in the settings and a battery (platoon) salvo is fired. Depending on the results of the observed salvo, a shift is made to firing for smoke screening.

Bracket fire adjustment is conducted with individual shots and brought to:

- obtaining a bracket of 200 meters in smoke screening individual targets;

- obtaining a bracket of 400 meters in setting up a smoke screen.

A battery (platoon) salvo is delivered to the center of the obtained bracket; observing the cloud of smoke passing by in relation to the target, the necessary corrections for range and direction are introduced after which a shift to fire for smoke screening is made.

203. With properly calculated settings for smoke screening the smoke cloud must pass in front of the target front (terrain line). To do this, the center point of the bursts, with the wind blowing towards the enemy, must be located some 50-100 meters in front of the target in smoke screening individual targets, and some 100-400 meters in front of the terrain line when setting up a smoke screen; with the wind blowing from the enemy, the center point of the burst should be superimposed with the target (terrain line).

With a wind parallel or oblique in relation to the smoke screen front, a center point of the bursts is introduced towards the side from which the wind is blowing by 50-100 meters depending on the wind velocity.

If the wind is blowing from the enemy, smoke screen fire against the nearest targets is not conducted.

204. For smoke screening the individual targets, fire is conducted:

- by a platoon against narrow targets; with a concentrated sheaf;

- by a battery against a broad target; parallel sheaf if the wind is blowing from or towards the enemy, as well as at a weak lateral wind; concentrated sheaf if there is a strong side wind;

- by platoon or battery at a flanking fire regardless of the wind direction; the sheaf is concentrated.

205. Smoke screening fire commences with volley fire with 4-8 rounds designated for each gun.

The formed cloud (screen) is maintained by fire with continuous observation of its movement and density; in order to maintain the cloud, volley and deliberate fire is alternated. As soon as the cloud (screen) thins out, a shift is made to volley fire.

Firing incendiary shells

206. Incendiary shells are used:

- for the destruction of wooden buildings and wooden bridges;
- to create fires in the enemy dispositions, including forest and prairie fires;
- to fire against supply dumps (containing fuel and ammunition), areas of concentration of vehicles, personnel carriers, and tank cars loaded with fuel.

Firing of incendiary shells against populated points, supply dumps, stations, etc., is accompanied by the firing of demolition-fragmentation projectiles to prevent fire fighting activities.

207. Fire of adjustment with incendiary shells is conducted according to general rules, being guided by observations of the sites where the incendiary elements fall or by observations of the smoke of the bursts.

The most advantageous average burst elevation of the incendiary shells (for the firing position) in firing against buildings is 2-3 divisions of the ~~grid~~ scale azimuth, and it is 5-8 divisions of the grid azimuth when firing against underbrush, forest, etc.

The average burst elevation is corrected to the most advantageous one: by changing the level setting before the target becomes bracketed, and by changing the tube setting after the target has been bracketed.

Fire against buildings, in which there may be combustible materials, is conducted with the tube set for thrust /udar/.

208. Fire against individual targets is conducted by a series of deliberate fire of 2-4 shells per gun with a tempo permitting observation of the results of each shot; the sheaf is concentrated.

Fire against targets which occupy a large area (forest, field supply dumps, etc.) is conducted by volley fire at several sight settings with 2-4 shells per gun. The settings of the sight and the grid azimuth is made in such a manner that several fire centers would be created in different points of the target area.

Chapter VII

FIRING AGAINST SURFACE TARGETS

General Conditions

209. A battery delivers fire against surface targets from concealed firing positions either in a battalion formation or independently.

It is expedient to have the observation post located in alinement with the primary direction of fire.

When firing with bilateral observation, the angle of intersection must not be less than 2-50.

210. Fire against surface targets is conducted with the fuze set for fragmentation or demolition effect depending on the character of the target; furthermore, against amphibious-landing means, it is possible to use ricochet fire or high explosive grenade fire.

211. Firing against individual targets is conducted with a concentrated sheaf constructed for a range of 10 kilometers for long range guns to 17 kilometers and for a range of 15 kilometers for long range guns of more than 17 kilometers; subsequently, fire against an individual target is conducted with this sheaf regardless of the range.

The firer does not order the level setting; it is determined at the firing position prior to opening fire against a given target; the level setting is not changed while fire is being conducted against this target.

212. Fire against stationary surface targets is conducted in the same manner as against stationary ground targets.

Firing Against an Individual
Moving Target

213. Battery firing against a surface target is conducted with the use of a radar set, bilateral observation, or an aircraft.

Prior to firing against an individual moving target, the position of the primary battery gun is placed on the data computer device, as are those of the battery observation post, the radar set or the point of bilateral observation, while when firing in a battalion grouping, additionally, the battalion commader's observation post as well.

Straight lines, parallel to the horizontal lines of the coordinate grid, are drawn through the points of the battalion commander's observation post and the position of the radar set.

During firing, intersections of the target are made every 20 seconds and according to the data of these intersections, the points of subsequent target positions are drawn on the data computer device.

Firing with radar sets and with bilateral observation

214. When the target appears in the fire sector, the firer transmits the target location for intersection and gives the command to the firing position indicating target nomenclature, projectile, fuze, and charge.

The settings (sight and ~~grid~~ azimuth) for the first intersection of the target are transmitted to the firing position for preliminary training of the guns on the target.

The initial firing data against a moving target are determined for the lead point.

In order to calculate the position of the lead point, target intersection is conducted during the period of observation after every 20 seconds (article 213). The period of observation is usually designated as being 100 seconds.

From the results of each intersection, the target position is drawn on the data computer device. Utilizing the points thusly charted, a straight line is drawn in such a manner that the target intersection points would be equally distributed on both sides of the line.

Assuming that the lead time is equal to the observing time, a lead point is marked on the straight line obtained, in the direction of target movement, beyond the last point of intersection (or from its projection on the straight line obtained) at a distance which is equal to the route covered by the target during the period of observation (Figure 15). (Note. The lead time is composed of the amount of time required to make the settings, transmit the commands to the firing position, train the guns, fire a salvo, and the flight time of the projectile).

216. The beginning of lead time count down at opening fire is the moment that the target intersects the last point of the period of observation. In shifting to effect, after fire of adjustment with a radar set, the beginning of the lead time is the moment the shells of the fire adjustment salvo fall, while in firing with bilateral observation, it is the moment of the next target intersection after the shells of the fire adjustment salvo have fallen.

The firer starts the stopwatch at the beginning of the lead time. The moment at which the command "Fire" is given for the fire adjustment salvo (first salvo of the first volley when firing for effect) is determined by means of subtracting the projectile flight time from the lead time.

The firer gives the command "Fire" only for the fire adjustment salvo and for the first salvo of the first volley in fire for effect; during the course of firing, all other salvos are delivered at the command of the senior officer of the battery until the command "Cease fire" /stoy/ is given by the firer.

The amount of change in range (VIR) and the amount of change in direction (VIH) are calculated by two point intersected after one minute. VIR is determined as the difference in the ranges (sights) from the firing position to these points, and VIH as the difference in the ~~grid~~ settings azimuth~~s~~ of the same points (see Figure 15).

218. If the initial settings for conducting fire against the individual surface target were determined by means of the complete preparation or by shifting fire from the check point, then fire for effect is opened immediately during the course of which the settings for effect are precisioned; a fire adjusted salvo is delivered during the preparation of initial firing data by other methods.

219. If fire is being conducted with the assistance of a radar set and the correction for drift does not exceed 5-00, then the deviation of the fire adjusted salvo from the target by range, taken with the opposite sign, is taken as the correction for range; correction for direction is taken as equal to the amount of deviation measured by the radar, multiplied by the range factor, and taken with the opposite sign. With corrections for drift of more than 5-00, the deviations measured by the radar are transformed for the firing position on the data computer device.

Range and direction corrections are taken into consideration in calculating the settings for fire for effect.

220. If fire is being conducted with bilateral observation, then the deviation of the fire adjusted salvo from the target is taken into account by means of marking off the observation instruments by the salvo center in accordance with Artillery Regulations, Reconnaissance and Signal Communications in the Battalion and Battery.

221. In order to shift to effect, the settings are determined by the new lead point.

The new lead point is charted on the data computer device in accordance with article 215, utilizing the results of the last target intersection.

When firing with a radar set, the new lead point is charted away from the target point intersected at the moment the fire adjusted salvo falls (Figure 16).

When firing with bilateral observation, the next target intersection is made after the fire adjusted salvo is marked off. From the intersection results, the target point is charted on the data computer device, and a straight line is drawn through it parallel to the earlier charted direction of target movement. The amount of lead is then marked off from this point (Figure 17).

222. The range (sight) computed by the new lead point is changed by 1/3 VIR in the direction of the target's movement (increasing as the target moves away or decreasing it as the target approaches). When firing with a radar set, moreover, the ~~grid~~ azimuth calculated by the new lead point and changed by 1/3 VIR, the range is corrected by the amount of corrections obtained after observing the bursts of the fire adjusted salvo.

223. Fire for effect is conducted until the completion of the fire mission by continuous volleys (with three salvos for each sight setting in each volley) with equal time intervals (rate of fire) of 20 seconds between the salvos and the volleys (Figure 18).

The firer orders the setting immediately for each two volleys (six salvos); at this the settings for the first salvo are calculated at the observation post directly with the use of the data computer device, while for the subsequent salvos, they are ordered as changes in the settings of the first salvo; the sight for the first volley is determined in accordance with article 222, while for the second volley, it is changed in the direction of the target's movement by a specific (renewed) VIR according to the last target intersections; the ~~grid~~ setting azimuth for the second and each successive salvo is changed in the direction of the target's movement by 1/3 of the renewed VIN.

224. In conducting fire for effect with the use of a radar set or by observing the burst signs, the range correction is calculated relative to the second salvo of each odd volley; this correction is taken into consideration in determining the settings for the two successive volleys (the third and fourth -- by the results of the deviations of the second salvo of the first volley; for the fifth and sixth volleys -- by the results of the deviations of the second salvo of the third volley, etc.). In this case, the range corrections are calculated similarly as are the corrections after the fire adjusted salvo (article 219).

When firing with bilateral observation, the amount of range correction is determined after the entire volley has been observed. It is taken to be equal to 200 meters if the observed volley was of one sign, and 100 meters if the target was covered by the first or third salvo; the sight is changed in the direction of the least number of signs in the volley. Range correction is not introduced if there is an approximate equality of signs in the volley.

If when firing for effect the deviation of the first salvo of the volley, the range observation is away from the target (over as the target approaches or short if the target moves away), then the correction is calculated for this salvo, and a new sight setting is immediately designated for all subsequent volleys with this correction taken into account.

225. If, during the course of fire for effect, deviations of salvo ~~eruptions~~ splashes away from the target by direction occur, the correction for direction is immediately ascertained and transmitted to the firing position for computing in the subsequent salvos. To calculate the amount of correction of salvo deviation from the target, it is multiplied by the range factor and the sign is changed.

226. The settings for the third and fourth volleys (every subsequent two volleys) are calculated by the new lead point which is drawn on the data computer device according to the last

target intersections relative to the given moment. With a lead time of 100 seconds, a new lead point is marked away from the target location point, calculated according to the results of its intersection at the moment of impact of the second salvo of the first, and each subsequent odd numbered, volley. Corrections for range and direction calculated by the first (odd-numbered) volley are calculated either on the data computer device before the lead point is charted or when designating the settings for the new volleys.

The sight for the new lead point is changed by 1/3 of the renewed VIR and it is designated for carrying out the third (and each subsequent odd-numbered) volley, while the sight is changed according to the renewed VIR for the fourth (even-numbered) volley.

The ~~grid~~ azimuth for the lead point is designated for the first salvo of the third (odd-numbered) volley, while for the second and remaining four salvos of the volley, it is consecutively changed by 1/3 of the renewed VIN.

The method of operation is indicated in attachment 10.

227. When firing against actively maneuvering targets, supplementary corrections of 100-200 meters for range and 10-20 ~~grid~~ azimuth divisions in the direction the target is turning are introduced in addition to the range and direction corrections obtained from the results of observing the effective salvos.

The supplementary range correction is taken into account when the sight is designated for two consecutive volleys or only for the next following volley (article 224); the supplementary ~~grid~~ azimuth correction is immediately computed (article 225); the rate of fire and the continuity of fire for effect is maintained.

If the volley against an actively maneuvering target gave observations of one sign, but the introduced supplementary correction did not change the position, fire for effect is stopped and the settings are again readied according to the general rules (articles 215-218).

228. If the situation or the fire rapidity of the gun does not permit target intersection or xx a rate of fire of effect of 20 seconds, then a tempo of 30 seconds is designated. In this instance, the lead time is taken equivalent to 150 seconds; in designating a new sight for fire for effect, it is not changed to 1/3 VIR but to ½ VIN; the grid azimuth between the salvos and between the volleys is changed by ½ VIN.

Firing with an aircraft

229. Fire against individual moving surface targets with an aircraft is conducted when it is not possible to utilize a radar set or bilateral observation for target intersection.

The navigator is provided with the flight altitude and the location of the firing position or some point of orientation which is clearly visible from the air.

In addition to the grid azimuth numbering /otsifrovka/, the numbering of the magnetic azimuths in degrees is marked down on the grid azimuth scale of the data computer device. Furthermore, the battery reference point is marked down on the data computer device and a scale in degrees is marked on the artillery circle /artilleriyskiy krug/.

230. The navigator calculates the data on the moving target in the following sequence:

- approaches the firing position (orientation point) from the rear and assumes a course in such a manner that the flight direction would coincide with the fire position (orientation point) - target alinement, computes the aircraft's course from the compass and reports this xx as the direction towards the target;

- flying over the fire position (orientation point), he measures the vertical angle to the target and reports it to the firer;

- taking the vessel's nautical data into account in the execution of its combat mission, the size of the forward and after wakes left by the vessel, he visually calculates the speed of the vessel;

- moving along a course parallel to that of the target, he calculates the direction of his own course from the compass and reports this to the firer as the direction of the target's course.

231. The initial settings are readied in the following order:

- upon receiving the direction towards the target, the stopwatch is started and the straightedge is set in degrees corresponding to the direction towards the target;

- the range to the target is calculated by the vertical angle (attachment 11); it position, according to the range to the target and the direction to the target, is charted on the data computer device;

- the artillery circle (aiming circle?) is then placed on the target point and oriented by the cardinal points; a point is then marked opposite the division which corresponds to the target's course; the target's course of direction is then obtained by connecting it to the target point;

- the amount of lead is calculated from the speed of target movement and the amount of lead time (attachment 12) and, corresponding to it, a lead point is marked on the line of target movement of the data computer device;

- the sight and azimuth is calculated from the lead point and are transmitted to the fire position.

232. Target fire adjustment is made by the scale (article 96).

The time at which fire is opened is calculated in accordance with article 215; the navigator is informed of the time at which fire will be opened. The stopwatch is stopped at the command "Fire", and is started again after the lead time has run out.

The navigator calculates and transmits the deviations in the manner indicated in article 96.

233. The lead point for the first salvo, when firing for effect, is marked away from the lead point for the fire of adjustment salvo. Corrections with a consideration of the deviations, reported by the navigator, are introduced into the new settings calculated by the new lead point, and the sight is changed by 1/3 VIR in the direction of the target's movement. The settings for the subsequent salvos are calculated according to article 223; at this, the VIR and the VIN are calculated on the data computer device by means of analyzing the amount of lead.

234. Fire for effect is conducted in accordance to general rules (article 223). If, because of the combat situation, further observation from the aircraft is not possible, then, taking the last observations into account, two volleys (6 salvos) are delivered and then fire is ceased.

Features of Conducting Fire When in a Battalion Composition

235. When conducting fire in a battalion composition, the processing of the results of target intersection, the calculation of the VIR and the VIN, and the calculation of the lead point location, is made at the observation post of the battalion commander.

The location of the lead point is indicated to the batteries by polar coordinates relative to the position of the radar set or the battalion commander's observation post with corrections introduced for range and direction from the results of observation of the fire adjustment salvo or the salvos when firing for effect.

236. Each battery commander marks down the lead point on the data computer device and from it, prepares the initial settings for his battery introducing the corrections for deviation of the ballistic and meteorological firing conditions from the ones in the tables.

The computed sight from the lead point, against which fire for effect is commenced, and is changed by 1/3 VIR in the direction of the target's movement.

237. All batteries of the battalion conduct fire for effect in the same manner as in conducting a fire mission by a single battery utilizing, without changes, the VIR and VIN calculated by the battalion commander for the center /sredney/ battery.

238. When participating in the establishment of a rolling barrage for the defense of a coast line, a battery receives a 300 meter sector in the battalion zone.

The method of conducting fire with a scheduled rolling barrage is that indicated in article 153.

For a non-scheduled PZO (rolling barrage), the batteries prepare the settings by the lead point corresponding to the center of the battalion zone according to article 236. The prepared settings are corrected in such a manner so as to superimpose the center of the battery sheaf with the center of the battery sector, for which the batteries formulate the shift tables ahead of time (the approximate form is shown in attachment 13).

Features in the Firing of Rocket Artillery

239. As a rule, a rocket artillery battery is brought in to fire against amphibious-landing facilities and conducts fire in the composition of a battalion.

In firing against amphibious-landing facilities, the sheaf is parallel, and the sheaf is concentrated when firing against individual targets.

240. The initial settings are prepared by the lead point utilizing either complete preparation or by shifting fire from a check point.

The lead time and observation time is taken as being equal to 2 minutes (120 seconds). The VIR and the VIN are not computed.

241. In all instances, fire for effect against surface targets is conducted without fire for adjustment, by one salvo. If

necessary to repeat the salvo, the initial settings are prepared from the new lead point which is charted on the data computer device according to general rules (article 215).

CHAPTER VIII

FIRING BY CASE I POINTING

242. Direct fire (firing by case I pointing) supports the most rapid execution of the fire mission with the least expenditure of ammunition against ground and surface targets in all forms of combat.

Preliminary Preparation for Firing

243. In addition to those indicated in article 5, the formulation of a gun range card (Figure 19) also enters into the preliminary preparation when firing by case I pointing.

244. The range to the target is determined from the gun range card, by means of a range finder, from the map, or visually.

245. When firing from rifled guns over ranges of more than 1500 meters, use is made of the earlier fire adjusted or computed corrections; if such corrections are not available, approximate corrections are introduced: when the air temperature is below 0°, a range correction for the deviation of the ballistic and meteorological firing conditions is added to target range:

200 meters if the air temperature at ground level is from 0° to -15°;

300 meters if the air temperature at ground level is below -15°.

A correction for direction of 2 ~~grid~~ azimuth divisions (with a minus sign) is introduced when firing at a range of greater than 1500 meters when the wind is blowing from the left.

246. When firing for effect against stationary targets at night, without fire of adjustment, and under conditions of limited visibility, the settings are computed with a consideration of the

corrections for the ballistic and meteorological firing conditions.

The ballistic corrections are computed for deviations in:

- the initial velocity of the gun;
- the initial velocity for the available group of charges;
- the projectile weight.

The meteorological corrections are computed:

- by deviations in the temperature of the air and the charge;
- by the ground wind;
- by drift.

The deviations in the air and charge temperatures are calculated from the data obtained in measuring the air and charge temperatures at the firing position; the ground wind direction and speed is measured either with the use of a wind direction and velocity indicator or visually.

The firing direction is determined directly by sighting on the target from the firing position through the use of the panoramic sight of the gun or some other device.

Features of Burst Observation In Direct Fire

247. The deviation of the tracer shell by range is determined by its path. If the path passes the target above its upper edge, then it is an over trajectory; if the path passes below the target it is a short trajectory. If the path misses the target but is below its upper edge and above the base, then the sight and the pointing by elevation are correct.

248. In night firing over plain terrain when it is not possible to determine the sign of the burst by range (elevation) directly from the gun, then a lateral observer is sent out to the side from the gun at a distance of up to 150 meters, and for whom the direction to the target is staked out during daylight hours. Voice or telephone communications are established with him.

If the deviation of the burst from the target is in the direction of the gun, the lateral observer reports: "Minus"; if the burst deviation is in the opposite direction, he reports: "Plus".

In this case the gun commander determines only the deviation by direction, while the sign of the range observation is taken into account from the report of the lateral observer.

Fire Against Stationary Observed Targets

249. For the first round, the gun is pointed towards the designated target point (at the center or vulnerable spot; embrasure of a defensive installation, building windows, etc.).

250. Not receiving a sign for range on the first round because of lateral deviation, the burst is brought out to the line of observation, for this, a shift is ordered in the direction of the target by the amount of the measured deviation.

For guns which have a panoramic sight, the grid azimuth setting is changed by the amount of shift ordered; the sighting point is not changed. For guns which have optical sights, the peak of the middle edge /tsentral'nyy ugol'nik/ is brought out by the amount of the ordered shift using the lateral correction scale.

A second round is fired with the changed settings.

251. After determining the amount of burst deviation by range in meters, the sight is changed in the direction of the target by the amount of burst deviation and 2 rounds are designated. Subsequent fire is conducted as indicated in article 253.

252. If the amount of burst deviation by range in meters has not been determined, then regardless of the type of preparation, a sight jump of 100 meters is made for firing ranges up to 1500 meters, and of 200 meters for firing ranges greater then 1500 meters; depending on the observation results, the sight jump may be either increased or decreased. Fire is conducted by individual rounds until the target is caught in a bracket with a width of 100 meters; once a 100 meter bracket is obtained, two rounds

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are designated for the center of the bracket.

253. After the two rounds are fired and both have been observed with the same sign, a correction of 50 meters is introduced or the point of sighting is changed; corrections are not introduced in the remaining instances.

Subsequently, fire is continued in groups of four rounds each. If, with the given sight, all observations are of one sign or the relation of signs is greater than 3 : 1, either a 50 meter correction is made or the point of sighting is changed; if the relation of signs is 3 : 1 or less, no corrections are made. If there are two-three identical signs in a group, it is permitted to make corrections without waiting to use up the designated number of rounds.

254. If there is a hit on the target, which requires several hits for its destruction or annihilation, two rounds are fired with sighting point being changed if required; subsequently, fire is conducted by general rules.

255. When firing from guns whose sight groove does not permit corrections to be made, indicated in article 253, they are made by means of changing the sighting point without changing the sight setting: with shorts, the sighting point is designated higher than the previous one, while with overs, by designating it lower than the previous one depending on the amount of correction and the height of the target.

256. When firing against vertical targets (house, the field wall of a defensive structure, etc.), as well as when the target is situated on a slope facing the gun, firing is conducted, as a rule by marking off the bursts (shell holes).

After making the corrections, two projectiles are designated. If hits have not been obtained on the target, the actions taken are in accordance with article 253.

257. Against targets situated in dangerous proximity to

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friendly troops, the initial sight is increased by 200 meters.

If an over is obtained, the bursts are consecutively brought closer to the target by sight jumps of 100 meters.

Catching the target in a bracket, subsequent steps taken are in accordance with article 252 and 253.

258. Fire for the destruction of obstacles /nadolb/ is conducted at ranges not exceeding 1000 meters; the sighting point is the obstacle base. Each obstacle in the designated pass must be destroyed in such a manner that their remaining parts would not be able to hinder the passage of tanks.

Firing Against Armored Targets at
Direct Fire Ranges

259. The movement of the target in relation to the angle of approach (the angle between the direction the target is moving and the direction to the gun) may be:

- frontal (with angles of approach of 0-30° and 150-180°);
- flanking (at angles of approach of 60-120°);
- oblique (with angles of approach of 30-60° and 150-180°).

The direction of a target's movement is determined by its silhouette (Figure 20).

When firing from guns which have the panoramic sight, the grid azimuth is set at 30-00 and the reflector at 0, while for the independent line of sight, in addition, the level is set at 30-00.

260. To account for the lateral displacement of the target during the projectile flight time, a lateral lead is introduced by means of moving the sighting point in the direction of the target's movement. The lead is calculated as indicated in Table 4 or in article 267.

In event of a sharp change in direction or in the speed of the target, the amount of lateral lead is calculated again.

261. As a rule, the center of the target is selected as the

sighting point for elevation for the first round. The location of the sighting point may also be different depending on the caliber, type of gun, and the firing range.

As the target approaches the gun by 150-200 meters, the gun is pointed with the purpose of obtaining a hit in the vulnerable part of the target (side, final drive assembly, stern, turret).

262. Direction and range are corrected:

- by observing the deviation of the projectile's path when firing armor-piercing and subcaliber projectiles;

- by observing the points of impact (bursts) of the projectiles when firing shaped-charge and concrete-piercing projectiles and fragmentation grenades.

Deviation is measured from the center of the target or from its vulnerable part.

263. If a lateral deviation is obtained when firing with an optical or a night sight, the sighting point is changed by the amount of deviation obtained, in a direction opposite to that of the deviation. To do this, the center square /ugol'nik/ is brought forward by means of the scale of lateral corrections along the target course by the amount of deviation obtained plus the lead (Figure 21).

When firing with a panoramic sight and a lateral deviation of one figure or less is obtained, the sighting point is changed by the amount of deviation obtained, in a direction opposite to that of the deviation; when the deviation is more than one figure, corrections are made in the ~~grid~~ azimuth setting without changing the sighting point.

264. At a direct fire range, firing is conducted at permanent sight settings corresponding to the close range shot decreased by 200 meters for guns and by 100 meters for howitzers and gun-howitzers. Rate of fire is maximum. The range is corrected by means of changing the sighting point for elevation in target figures (with

an accuracy of a half-figure); it is also permitted to correct the range by means of changing the sight setting.

265. When firing projectiles which do not have tracers and an over is obtained to the side of the target, corrections for direction are introduced without changing the sighting point by elevation.

When firing projectiles which have tracers and an over is obtained to the side of the target, corrections for direction are introduced and the sighting point is changed by elevation (in target figures) by the amount of the measured path deviation.

266. Fire is continued until the tank is put out of commission; indications of this are, buring of the tank, visible destruction, or shell holes in the hull and turret, etc.

Features of Firing Against Moving
Armored Targets at a Range Greater Than
At A Close Range Shot

267. The lateral lead for the first shot is determined by means of the sight or binoculars by measuring the amount of the lateral displacement of the tank during the projectile flight time.

To measure the lateral displacement of the tank, the gun commander (pointer) trains the cross-hairs of the observation device (the top of the central square of the sight) on the forward section of the target and observe for target displacement in relation to the cross-hairs (top of the central square) during the projectile flight time (Figure 22, a, b).

As a rule, the lead is calculated in grid azimuth divisions.

Corrections for direction by the firing conditions are added to the lateral lead if the target is moving to the left, and subtracted if the target is moving to the right.

268. Pointing for the first shot is made:

- when firing with optical sights by bringing the top of the central square forward from the front section of the target along the target course by an amount equal to the lateral lead (with a consideration for corrections in direction -- Figure 22, c);

- when firing with panoramic sights -- on the forward section of the target.

With a frontal movement of the target, it is pointed against its center.

269. When firing armor-piercing-tracer projectiles, the range corrections after the first shot, in optical sight divisions (in hundreds of meters), is equal to:

- one-and-a-half times the amount of measured path deviation by elevation in figures of the tank for 100-mm guns;

- the amount of measured path deviation by elevation in tank figures for the remaining guns.

In those instances when the deviation of the projectile path by deviation cannot be calculated, as well as when firing projectiles without tracers, the following steps are taken after the first observation for range:

- if a short is obtained as the target moves towards the gun or an over as the target moves away from the gun, the sight setting is not changed, or else changed by 100 meters in the direction of the target;

- if an over is obtained when the target is moving towards the gun or a short as the target moves away from the gun, the sight setting is changed by 200 meters in the direction of the target;

- if an over or a short is obtained with a flanking movement of the target as well as when firing against a halted tank, the sight setting is changed by 100 meters in the direction of the target.

Firing Against Moving Infantry, Motorcyclists and Infantry on Vehicles (Armored Personnel Carriers)

270. Fire is opened when the target reaches an earlier

fire adjusted terrain line.

If the terrain line has not been fire adjusted, then attempts are made to obtain shorts and the approach of the target to the line of bursts is awaited.

When firing against infantry at ranges greater than 500 meters, the target is bracketed (article 69).

Fire is conducted by grenades with the fuze setting for fragmentation, while against deep targets, for ricochet as well (the tap is set at "Z" without the cap), by volley fire of 2-4 projectiles.

271. Target displacement during firing for effect is taken into account by means of changing the sight setting by 1-2-4 divisions (50-200 meters) depending on the speed and direction of target movement, while at distances up to 500 meters, by means of changing the sighting point by elevation.

Each time the target is contained, fire is intensified, increasing the number of rounds in the series up to six rounds per gun.

272. During self-defense, infantry is annihilated by grenades with the fuze set for fragmentation effect.

Features of Night Firing and Under Conditions of Limited Visibility

273. Firing at night against an illuminated target or with a night sight is conducted under the same rules as for firing during the day.

274. For firing at night and under conditions of limited visibility against stationary non-illuminated targets, use is made of guns which have panoramic sights.

The settings for fire for effect are calculated on the basis of a complete preparation (article 246); at this, the range to the target is calculated as accurately as possible, the direction is given to the gun by pointing at the target and marked on the night training point or on the gun collimator.

If possible, fire of adjustment is conducted by two-three rounds.

If there is a fire adjusted target, then the computed settings for the new target are calculated by shifting fire by the simplified method.

275. If it is planned to move the gun out to the firing position at night and fire is to be conducted without illumination of the target, then prior to darkness, the settings are calculated for training the gun on the target, for which:

- at the spot where the gun is to be placed, an aiming circle (battery commander's telescope) is placed in such a manner that the lens of the device would be at approximately the height of the rotating head of the panoramic telescope;

- at a setting of 30-00, the cross-hairs of the device are trained on the target, the target angle of site is calculated and then marked on the night training point or on the gun collimator;

- a chaining pin is driven into the ground under the plumb bob of the instrument.

When the gun arrives at the firing position:

- the gun is placed in such a manner that the panorama would be above the chaining pin;

- the gun is trained horizontally according to the earlier calculated ~~grid~~ setting azimuth;

- the sight is set corresponding to the computed range calculated by means of the complete preparation and the level is set corresponding to the target angle of site;

- the level bubble is set at the center through the use of the elevating mechanism.

276. During firing, horizontal training is conducted by the training point (gun collimator) and vertical training by the level.

277. Fire for effect is conducted: after fire of adjustment

-- by one setting of the ~~grid~~ azimuth and by one setting of the sight; with a full preparation -- by three settings of the sight and three settings of the ~~grid~~ azimuth with an equal distribution of shells among the settings. The settings are changed in sequence as indicated in Figure 23.

When firing for effect on the basis of a complete preparation at ranges up to 1000 meters, the sight jump is equal to 50 meters and the ~~grid~~ azimuth jump is 0-01; at ranges greater than 1000 meters, the sight jump is equal to 100 meters and the ~~grid~~ azimuth jump is 0-02.

The possible short-term improvements in visibility conditions during fire for effect are used to precision the settings.

278. Expenditure of shells for target destruction at a complete preparation of the initial settings or in shifting fire from a fire adjusted target, they designate:

Target	Gun system	Firing range in meters	600	1000	1500	2000
Field defensive installations	Gun		9	18	27	54
	Howitzer		9	18	36	72
Dug-in tank	Gun		12	27	45	90

If target fire adjustment has been made, then the expenditure of shells indicated in the table is decreased by half for howitzers and three times less for guns (but not less than 9 rounds are used).

Features of Firing Over Broken Terrain and Mountains

279. Fire against armored targets in the mountains is conducted according to articles 259-269; in those cases when there is a vertical displacement of the target with relation to the gun, the lead is taken by elevation calculating its amount during the projectile flight time, in target figures ($\frac{1}{2}$ figure or more), in reflector divisions, or in sight divisions approximately as given

in article 267.

Firing Against Surface Targets

280. Fire by case I pointing is conducted:

- against small ferrying means (cutters, landing craft, etc.) and amphibious tanks by individual guns at ranges up to 3000 meters according to general rules;

- against large ferrying and amphibious facilities by batteries (platoons) at ranges which permit observation of the target and the bursts to be made.

281. The initial battery (platoon) firing data are computed by the methods listed in article 135; at the initial ~~grid~~ azimuth setting is designated with a consideration of the lateral lead (article 260 and 267) and corrections for side wind and drift. The gun is trained on the forward section of the target.

Battery (platoon) firing against large amphibious-landing and ferrying craft commences with single shots from the right gun.

After observations for range have been obtained, further fire adjustment is conducted by the battery (platoon) scale. At this, the sight setting of the right gun is changed by 200 meters in the direction of the target's movement, while the sight settings of the remaining battery (platoon) guns is changed in the diredtion opposite to the observed sign; the difference in the sight settings of the adjacent guns is taken as being equal to 200 meters.

282. Once the target has been bracketed, a shift is made to fire for effect by battery or platoon salvos with one sight setting:

- on the sight towards which the target is moving during frontal or oblique movement of the target;

- on the sight corresponding to the center of the bracket during a flanking movement of the target.

If a salvo consists wholly of shorts or overs, the sight is changed by 100-200 meters depending on the direction and speed of the target's movement. If different signs are observed in the salvo, the sight is not changed.

283. As the target comes up to close range fire, the sight setting is not changed, but the sighting point is changed by elevation selecting it above the previous one by half of a figure at shorts and by half a figure lower than the previous one at overs.

284. Fire of adjustment and fire for effect by case I pointing at ranges close to the limiting ones is conducted according to the regulations for firing against moving surface targets from covered firing positions.

285. Battery fire is conducted against rapidly moving targets (torpedo boats, landing boats, etc.).

The battery commander indicates the boat against which all battery guns are trained.

The lateral lead is calculated according to article 267 and taken into account by means of changing the [redacted] azimuth settings in the direction the target is moving.

A sight is designated:

- when the target is moving in a flanking direction -- corresponding to the range to the target changed by 200-300 meters in the direction of the the target's movement;

- when the target is moving in a frontal or oblique direction -- corresponding to the range to the target changed by 400-600 meters in the direction of the target's movement.

286. The destruction of rapidly moving targets is conducted by salvos with corrections introduced in the intervals between them.

The sight setting is changed:

- by 200-300 meters when all splashes have the same sign and the target is moving in a flanking direction;

- when the target is moving in a frontal or oblique direction, by 400-600 meters in the direction of its movement if a covering group is obtained or if all of them are overs as the target approaches (if all are shorts as the target moves away).

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In other cases, the sight setting is not changed.

Correction for direction is introduced in accordance to the general rules.

287. Ricochet fire is employed for the annihilation of enemy personnel riding in open boats and light ferrying craft.

Observation of the signs is conducted by the burst cloud of smoke and by the impact areas of the fragments.

Features in Firing Rocket Artillery

288. All combat vehicles, except the long-range ones, are used in firing by case I pointing.

The grid azimuth setting is designated at 30-00, while the sight setting is set to correspond to the computed range to the target; the same target point is set for all combat vehicles if they are all to be pointed.

Under winter conditions, for safety precautions during firing, the calculated range to the target is increased by 200 meters; furthermore, if there is a side wind having a velocity of 6 meters per second or greater: when firing non-finned projectiles, the range is increased by 400 meters, while when firing with finned projectiles, the ~~grid~~ azimuth setting is changed by 0-60 in the direction from which the wind is blowing.

289. The distance of the friendly troops from the target against which fire is being delivered must not be less than 1000 meters, while when firing at ranges greater than 2000 meters with visual calculation, it must not be less than half the range; when friendly troops are deployed along the flanks, in relation to the firing plane, their distance must not be less than 500 meters.

290. Fire against stationary targets and against targets which are moving at a speed not in excess of moving infantry is commenced from a combat vehicle by a group of 4 rounds.

Corrections for direction and range are introduced by the amount of deviation from the burst group center, calculated visually, and transmitted to all of the combat vehicles. A shift to fire for effect is made by a salvo on the corrected settings. If the deviations of the group of 4 rounds centers is less than 100 meters by range and less than 0-10 by direction, corrections are not made.

291. When firing against rapidly moving targets, use is made of the earlier fire adjusted terrain lines along the possible routes of movement of the target. As the targets approach the fire adjusted terrain line, fire for effect is commenced; as the target passes close to the fire adjusted terrain line, fire is shifted on the target by the visual method.

292. If there are no fire adjusted terrain lines prior to the shift to effect, a group of 4 rounds is fired by one combat vehicle trained on the target front; the angle between the center of the burst group and the target front is measured and introduced into the grid azimuth as a correction for the lateral lead in the direction of the target's movement; the range corrections are estimated visually by the deviation of the center of the group burst from the target and introduced into the sight calculated for the salvo moment. Using the corrected settings, all of the combat vehicles train on the target center and open fire for effect.

Attachment 1

(to article 8)

TARGET DESIGNATION

1. Target designation must be accurate, brief, and understandable. The method of target designation must be such that the recipient of the target designation would be able to find the target rapidly.

All calculations for target designation are made by the one giving the target designation. He gives the following to the recipient:

- the target position on the terrain (from an orienting point, from the primary direction, in rectangular coordinates, etc.);
- naming the target and its indications;
- characteristic terrain indications or local objects by the target;
- the mission (if necessary): destroy, suppress, observe, intersect, ready the initial settings, etc.

The one accepting the target designation is obligated to take all measures for a rapid location of the target on the terrain. Upon receiving the target designation, he reports:

- "Target observed", if he has located the target;
- "Target understood", if he has clarified the character and coordinates of an unobserved target;
- "Target not observed", if he cannot see the target but has clarified its position;
- "Target not understood", if he has not clarified the position of the target.

The one giving the target designation must verify that the one receiving it has properly clarified it and be convinced that it has been properly understood.

2. For target designation by training the device on the

target, the one giving the target designation trains the cross-hairs of the device on the target and, to the one receiving it, indicates its signs.

3. Target designation from an orienting point (local object) is employed without recalculation for the one receiving it in the following instances:

- when the one giving and the one receiving the target designation are at the same observation post or at a distance from each other of not more than 100 meters;

- when the target is located close to the orienting point.

In such cases, the one giving the target designation calculates and transmits to the one receiving it:

- the horizontal angle between the target and the orienting point closest to it [right (left) by so much"];

- the difference in the ranges to the target and the orienting point in meters ["further (nearer) by so much"] or, if the one receiving the target designation is at the same post, the angular height of the target above the orienting point in ~~and~~ azimuth scale divisions ["higher (lower) by so much"].

Example 1. "Orienting point, fifth, left 50, closer 200, observation post at the northern edge of the underbursh - observe".

2. "Orienting point thirty first, right 60, higher 3, infantry on the black pasture - annihilate".

When the observation range of the one giving and the one receiving the target designation differ considerably from each other, the amount of the angle between the target and the orienting point by the range factor. The range factor (the relation of the observation ranges from the posts of the one giving and the one receiving the target designation) is calculated by the formula

$$Ku = \frac{D_d}{D_p}$$

in which D_d is the range to the orienting point from the one giving the the target designation;

D_p is the range to the orienting point from the one receiving the target designation.

The range factors for the orienting points may be calculated ahead of time with an accuracy to 0.1. The difference in the ranges to the target and the orienting point are transmitted without changes.

If there is no orienting point close to the target, target designation is made by means of shifting from an orienting point to well observed intermediate local objects.

The one receiving the target designation trains the device on the indicated orienting point, searches for the target taking into account its distance from the orienting point or the or the amount of the angular height and characteristics of the target.

4. For target designation in polar coordinates from the primary direction, the one giving the target designation:

- calculates the target position on the terrain (by use of a range finder, by intersection data from the bilateral observation posts, or visually);

- marks target point on the map or chart (data computer device);

- calculates, from the map or chart (data computer device), for the post of the one receiving, the angle between the primary direction and the direction towards the target (or the reading on the device) and the range to the target in meters, and transmits to the one receiving the target designation.

Example 1. "Primary direction, right 1-30, range 1500, elevation 116, machine gun at the edge of a deep forest - annihilate" (Figure 24).

2. "Reading 28-20, range 1600, dugout shelter - dark knoll on a yellow field - destroy".

The one receiving the target designation sets the device according to the angle transmitted from the primary direction or by computation and, at the indicated range, searches for the target according to its indications.

5. For target designation in rectangular coordinates, the one giving the target designation transmits the coordinates of the target to the receiver after he has determined them from the map (chart, aerial photographs, data computer, plane table).

Example (Figure 25): "X /iks/ 54760, Y /igrek/ 36430, elevation 230, concentration of tanks in a grove - neutralize".

After receiving the coordinates, the one receiving the target designation marks the target point on the map (diagram, aerial photograph, data computer, plane table), determines the reading of the [illegible] device for the target or the angle between primary direction and the direction to the target and the range, sets the device according to the reading or to the angle from the primary direction and searches for the target according to its signs at the measured distance.

If there is a local object (orienting point) whose position on the map has been determined with sufficient accuracy, the one receiving the target designation searches for the target in relation to the local object (orienting point).

6. Target designation by means of rockets and tracer bullets is employed by rifle and tank podrazdeleinye in mutual support with the artillery.

Short machine gun bursts with tracer bullets (1-2 rounds of tracer shells), or two-three rockets are fired at the target. The order of fire xxx xxx and the color of the rockets are determined ahead of time.

Special observers are detailed to the operating areas of friendly infantry and tanks in order to receive the target designation fired by tracer bullets (shells) or rockets. Once the observers have noted the path of the bullets or the rockets of the required color, they report approximately as follows: "Orienting point fifth, right 20, tracer path (rocket) falling by a destroyed house".

7. Target designation by means of projectile (mortar shell) bursts is employed in those cases when it is not possible to indicate the target rapidly and dependably by any other means or when the concentrated of several batteries is required against the target which has already been fire adjusted by one of the batteries. Fragmentation-demolition and smoke projectiles and mortar shells as well as high explosive grenades are used for this.

The one giving the target designation indicates the area in observation of bursts must be made, gives the target indications, and gives the command to the fire adjusted battery. For target designation, 2-4 rounds of volley fire are fired at the fire adjusted settings by one gun, or by a battery salvo with a concentrated sheaf. Target designation by smoke projectiles is conducted with individual rounds.

The command "Shot" is transmitted to the one receiving the target designation to alert him; the one receiving the target designation marks the center point of the bursts, xxxxx searches for the target, taking its indicators into account, and reports according to attachment 1; if he does not see the bursts then he reports: "I do not see the bursts". The shots (salvos) are repeated until the one receiving the target designation can clarify the target.

In target designation by a high explosive grenade, the first shots are fired at a level setting which will facilitate observation of the bursts and after the one receiving the target designation has noticed the bursts, they are lowered by the level to the target horizon and 2-4 rounds of fragmentation-demolition grenades are fired by one gun or by a battery salvo.

Example 1. "Narrow" gully, infantry concentration in the area of a smoke mortar shell burst - annihilate".

7. "'Long' height observe four air bursts"; after the report of the one receiving the target designation of "Bursts seen": "In the same place, observe four ground bursts, infantry under cover - annihilate".

8. Target designation from the ground to an aircraft (helicopter) and from an aircraft (helicopter) to the ground by a map (aerial photograph) in rectangular coordinates is made by the system of map (aerial photograph) grids; at this, the maps used have a scale of 1 : 25,000, 1 : 50,000, or the aerial photographs have a scale of 1 : 15,000, 1 : 20,000.

The target coordinates are calculated in meters through the use of a millimeter scale and circle or through the use of the artillery coordinate measure.

Upon receiving the coordinates, the one receiving the target designation marks the target on the map (plane table) with the aid of the millimeter scale or the coordinate measure.

9. Target designation from the ground to an aircraft and from an aircraft to the ground away from the basic orienting point is conducted in the following manner.

Selecting several local objects as orienting point on the map (aerial photograph) which are located in an area occupied by the enemy, they are numbered. The target is indicated from one of these orienting points by the cardinal points in meters using the millimeter scale or the coordinate measure.

For this, a line S-Yu is drawn through the orienting point closest to the target and a target point is projected on it. By using the millimeter scale or the coordinate measure, the target coordinates are calculated and are transmitted first along the S-Yu (North-South) direction and then along the Z-V (West- East) direction.

Example. "Second orienting point, north - 200, east - 150; target - a six gun battery".

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The one receiving the target designation, after measuring the indicated distance in the proper direction from the orienting point, marks the target on the map (Figure 26).

10. In target designation from the ground to an aircraft (helicopter) by shell (mortar shell) bursts, the navigator is provided ahead of time with the map square in which he has to observe the bursts, the character and the signs of the target.

Example. "Square 2448, a four gun battery at the edge of 'Round' grove, observe the battery salvo - four rounds (one smoke projectile burst).

At the navigator's command, the computed settings are used to deliver a battery salvo of fragmentation-demolition grenades (fragmentation-demolition or demolition mortar shells) with a concentrated sheaf or individual shots of smoke projectiles (mortar shells).

The word "Shot" is transmitted from the ground at the moment of the salvo (shot).

Attachment 2

(to article 10)

CALCULATING THE INITIAL VELOCITY DEVIATIONS OF A CHARGE GROUP BY FIRING

In organizing firing for calculation of the initial velocity deviation of a group of charges, it is necessary:

- to select a terrain sector or a check point at a range of 1/2 to 3/4 of the range limit of firing for the given charge (caliber); the impact area of the shells must be level and clearly observed:

- to conduct a tie-in of the firing positions and the posts of bilateral observation (intersection angle according to article 101) or the observation post on the topographical system;

- to select ammunition of one group with identical marking and with one type of fuze;

- to facilitate identical temperature of the charges;

- to verify carefully the sighting device and set the gun horizontally;

- to take measures (if necessary) for a timely receipt of the meteorological bulletin;

- to calculate the initial firing settings against the center of the selected sector or check point.

1. Otstrel and sostrel of a charge group for rifled guns and mortars

A. When firing with bilateral observation

a) A round is fired at the initial settings and at a charge group for whom the initial velocity deviation is known; corresponding corrections to the deviation of the bursts from the check point (sector center) are introduced and a group of 4 rounds is fired, each burst is intersected.

b) According to the deviations measured from the points of bilateral observation, a calculation is made of the coordinates of the middle point of the bursts, the topographic range to it, and the check point angle of site.

c) All corrections are introduced into the topographic range according to the rules of a complete preparation except the correction for $\Delta v_{0_{zar}}$, and the computed range, D_i, is obtained.

d) The fire adjusted range D_p is calculated.

e) The deviation of the initial velocity from the tabled one for the given charge group is found by the formula

$$\Delta v_{0_{zar}} = \frac{D_i - D_p}{\Delta X_{v_0}}$$

In order to calculate the corrections, three-four shots are fired, and for the unknown amount of corrections, the average value is taken of the known amounts of initial velocity deviations.

During sostrel of a charge group after a group of shots delivered at the charge of the initial group (the group for which the initial velocities are known), a group of 4 rounds is delivered with each of the remaining charge groups.

According to the calculations of the points of bilateral observation, a calculation is made of the deviation in range (in meters) of the burst group center for each charge group in relation to the group burst center of the initial charge group.

The deviation obtained (with a consideration of its sign: a minus sign if the group burst center of the given charge group was closer to the group burst center of the initial charge group, and a plus sign if it was further away) is divided by the standard range correction on the change in initial velocity by 1% (ΔX_{v_0}) and we obtain the deviation of the initial velocity of the given group charge in relation to the primary one (in percent).

B. In firing by observing the burst signs

a) With a preliminary complete preparation:

- a complete preparation is made with a consideration of all of the corrections, except the correction for $\Delta v_{0_{zar}}$, and the computed range D_i is obtained;

- the check point (target) is fire adjusted according to the general rules (article 104);

- the Firing Tables are used to find the fire adjusted range, D^r_p, and the range correction by changes in the initial velocity by 1% (ΔX_{v_0}); further steps are taken as indicated in paragraph "A","e".

b) With subsequent processing: after check point (target) fire adjustment, all corrections are introduced into the topographic range according to the rules of complete preparation, with the exception of the correction for $\Delta v_{0_{zar}}$ and the calculated range, D_i, is obtained. For the rest, the same steps are followed as indicated in paragraph "A", "d" and "e".

In all cases, the value of ΔX_{v_0} is taken from the Firing Tables by the fire adjusted quadrant angle of elevation (sight).

In charge sostrel, the check point (target) is fire adjusted from the charges of each group beginning with the primary one. Fire is conducted by one gun (mortar) with one of the average charges or with a charge designated for effect. Then, from the fire adjusted quadrant angle of elevation (sight) for the primary group of charges, we subtract the fire adjusted quadrant angles of elevation (sights) for each of the remaining charge groups. The differences in the quadrant angles of elevation (sights) are changed by means of the Firing Tables into meters and divided by the tabled range corrections of the changed initial velocity by 1% (ΔX_{v_0}) and we obtain the relative initial velocity deviation (in percent) of the given group of charges in relation to the primary one. The values ΔX_{tys} and ΔX_{v_0} are taken from the Firing Tables by the fire adjusted quadrant angle of elevation (sight) for the primary charge group.

Adding (with a consideration of the sigh) the relative deviation to the deviation of the initial velocity of the primary charge group (as a rule this deviation is known), we obtain the deviation of the initial velocity for the given charge group.

II. Projectile sostrel and otstrel in rocket artillery

Fire is delivered by one combat vehicle from a temporary firing position over two ranges, over one range if the other is not possible.

When firing over two ranges, one check point is developed for the range which is equal to approximately 0.5 of the maximum firing range of the given caliber, while the other is equal to approximately 0.8 of the maximum range. When developing only one check point, the average of the ranges over which fire will probably be delivered is taken.

Fire commences with individual shots in order to develop possible burst intersections. If necessary, corrections are made

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in the firing direction and range and transfer to the development of a check point, firing projectiles consecutively with each group of charges (with which it is anticipated that fire for effect will be conducted) in a group of 6-8 rounds.

After calculating the average computation at the observation posts ~~at~~ from the data on all burst intersections, the centers of the burst groups are then marked on the plane table or the data computer device and the range to the center of each burst group is calculated.

Processing and utilizing the projectile
<u>sostrel</u> results

If necessary, corrections (with a consideration of the sign) for the type of powder and painting of the rocket parts of the projectiles are introduced into the ranges obtained for each group of charges.

Then, from the range which corresponds to the charge group accepted as the primary one, we subtract the ranges obtained for each group of charges and we obtain the range corrections for these groups relative to the basic one.

The topographic ranges to the centers of the burst groups of the primary charge group and the corrections for each group of charges is made known to the headquarters organizing the <u>sostrel</u>.

If the projectile <u>sostrel</u> was conducted at two ranges, a corrections graph (<u>sostrel</u> graph) is constructed. A sheet of graph paper is used; the topographic range, over which the <u>sostrel</u> was conducted is marked off along the horizontal axis, while the corrections obtained are marked off along the vertical.

In calculating the settings on the basis of utilizing the data of the fire adjusted combat vehicle, we add, to the computed range, the correction taken from the <u>sostrel</u> graph (with a consideration of its sign).

If only one check point was developed, then the correction for range deviation for the given group of charges is added to the computed range without changes.

Processing and utilizing the results of projectile otstrel

The following are introduced into the topographic ranges to the centers of the projectile burst groups: for the meteorological firing conditions, for deviation of the charge temperatures, and, if necessary, by the deviation of the ballistic conditions if they differ from the ones in the table (by powder type, paint on the rocket part of the projectiles, as well as by the deviation for the projectile weight of the M-31-UK projectiles).

The computed ranges obtained are subtracted from the table ranges corresponding to the angles of sighting at which the otstrel was conducted and the range corrections for the charge groups are obtained.

The projectile otstrel results are forwarded to the headquarters organizing the otstrel.

A graph is constructed from the obtained corrections, laying off the topographic ranges along the horizontal axis, while the amount of correction is marked off on the vertical.

In calculating the settings on the basis of a complete preparation, the range correction for the charge group is added to the computed range taken from the corrections graph.

Attachment 3
(to ~~page~~ article 13)

The Method for Calculating and Constructing a Graph for Calculated Correction

1. For a beforehand selected forms of trajectory (high angle), of a shell (122-mm OF-462) $\frac{1}{2}$ and a charge (third) and indicated next to the calculated ranges (6, 7, and 8 km), and calculate the ballistic corrections (table 5).

Table 5

1st Battery ballistic calculations

Shell OF-462, unpainted Fuze RGM-2 with hood		$\Delta v_{0\,op} = 1{,}8\%$					
Range, in km.		6		7		8	
Charge lot and number	Correction	Tabular	Calculated	Tabular	Calculated	Tabular	Calculated
Third Charge							
24-56-00 $\Delta v_{0\,3ap} = +1.6\%$	$\Delta v_0 = \Delta v_{0\,op} + \Delta v_{0\,3ap} + \Delta v_{0n} = -1.8 + 1{,}6 - 0{,}5 = -0{,}7\%$	74	+52	85	+60	99	+69
	Shell index	-	-	-	-	-	-
	Fuze type	-	-	-	-	-	-
пг $\frac{3}{56}$ No. 122-38 125 r	Shell unpaintedness	-	+31	-	+46	-	+70
Flash hider ~~Flame extinguisher~~	$(2\Delta X_H)$	15	+30	19	+38	24	+48
$\Delta v_0 = -0{,}5\%$							
	Total	-	+113	-	+144	-	+187

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2. The meteorological corrections obtained from the battalion headquarters (table 6) are noted down for these same computed ranges and three directions of firing (grid azimuth 40-00, 45-00, and 50-00).

3. The ballistic and meteorological corrections are added and the total corrections are obtained (table 7).

4. From the computed ranges we subtract the total corrections corresponding to them and the topographic ranges are obtained for constructing the graph of computed corrections.

The topographic ranges for constructing the graph are rounded off to hundreds of meters (table 7, lower part).

5. To construct a graph of computed corrections, a sheet of graph or millimeter paper is used. The topographic ranges are marked off along the horizontal axis, while along the vertical axis the amount of range correction is marked on the left and the amount of direction correction on the right.

The graph scale is selected in accordance with the computed amount of correction in such a manner so that the range corrections could be calculated with an accuracy to 10 meters, while the correction for direction to an accuracy of up to 0-01 (Figure 27). The range corrections graph is drawn with solid lines while the direction corrections graph is drawn with dotted lines.

6. The corrections for range and direction towards the target is calculated by means of the graph along the topographic range to the target with the range corrections rounded off to 10 meters and the direction corrections to 0-01.

7. The method for constructing a computed corrections graph on the data computer device scale is described in "Regulations on the use of devices for reconnaissance and firing ground artillery".

8. Having received the meteorological bulletin but not the computed corrections, the corrections are computed (table 8) and the following steps taken are as previously described.

Table 6

1st battery meteorological corrections

Range, in km.		122-mm howitzer, model 1938, shell OF-462					
		6		7		8	
		Correction					
Charge number	Firing direction	range, meters	direction, grid azimuth	range, meters	direction, grid azimuth	range, meters	direction, grid azimuth
3	40-00 (OH-5-00)	+516	- 6	+636	- 6	+728	- 8
	45-00 (OH)	+495	-10	+619	-11	+739	-12
	50-00 (OH 5-00)	+439	-13	+551	-14	+676	-16

Rules for filling in the meteorological corrections computation blank

1. The following are written into the blank ahead of time:

- data on the system, projectile, charge, and on the average elevation of the battery firing position;
- the ordered ranges (line 6);
- the ordered grid azimuths for firing including the primary direction (in line 8).

2. The following are noted down from the Firing Tables:

- the type and height of the trajectory for each of the ordered ranges (in line 7);
- the corrections for drift corresponding to the ranges (in line 13);
- the table corrections for firing condition deviations corresponding to the charge and the ranges previously marked down in line 6 (in lines 14, 16, 17, 18, and 19, into the first graph of each vertical column); the corrections taken out of the Tables are divided by 10, separating by a comma one number from the right

Table 7

Total Corrections, 1st battery

28.2.57 20.30

Shell OF-462

Charge	Range, in km	6			7			8		
	Direction (directional angle)	40	45 (OH)	50	40	45 (OH)	50	40	45 (OH)	50
3	Range correction:									
	meteorological	+516	+495	+439	+636	+619	+551	+728	+739	+676
	ballistic		+113			+144			+187	
	total	+629	+608	+552	+780	+763	+695	+915	+926	+863
	Direction correction	-6	-10	-13	-6	-11	-14	-8	-12	-16
	Topographic range for constructing the graph	5400	5400	5400	6200	6200	6300	7100	7100	7100

(i.e. 0.1 of each table correction is written into each square).

3. Upon receiving the meteorological bulletin:

- the nearby /podruchnaya/ battery is requested by the firing position to provide the temperature of the charge;

- the contents of the meteorological bulletin are noted down on the upper part of the blank;

- the higher position of the meteorological station, above that of the firing positions and the average elevation of the firing positions is subtracted from that of the meteorological station; this is written down in the left graph of the 5th line;

- dividing the greater height of the meteorological station

Graph for calculated corrections, 1st battery

range correction, in m.

directional correction (angle graduations)

Range (km)

Range correction (m)

Directional correction (ang. gra.)

Figure 27. Calculated corrections graph

by 10, we obtain the amount of corrections by bringing the atmospheric pressure to the elevation of the firing positions;

- the deviation for atmospheric pressure is written into the left graph of line 17 together with its sign and the corrections for the atmospheric pressures brought to the firing position elevation is introduced into it together with the same sign which obtained in calculating the greater height of the meteorological station;

- the charge temperature (with its sign) obtained from the firing position of the nearby battery is written into line 19, 15° is subtracted from it and we obtain the charge temperature deviation from its table value;

- the direction and velocity of the ballistic wind is taken from the bulleting, corresponding to each earlier written trajectory elevation and this data is written into line 9;

- the ballistic deviations of the air temperature corresponding to the trajectory elevations are taken from the bulletin and written into line 12.

4. A breakdown of the ballistic wind to its components is

Table 8

Calculation of meteorological corrections

Meteorological correction, 1st battery

Meteo-fire No. 18

1	122-mm howitzer, 1938				Meteo-fire		02	83	38	08	20	78	44	08
2	Shell OF-462				28 20 30		04	81	39	10	24	78	42	10
3	Charge, third				0090		08	80	41	12	30	77	41	13
4	Firing point altitude, 150 m				51685		12	80	42	12	40	76	42	17
5	Excess AMS	90-150=60 m					16	79	44	10	50	75	42	19
6	Range (m)				6000				7000				8000	
7	Form of fire and trajectory altitude				Flat 612				Flat 918				Flat 1390	
8	Direction of fire			40	45	50		40	45	50		40	45	50
9	Wind direction and speed		Tabular Correc-tions	40	11 m/cem		Tabular Correc-tions	41	12 m/cem		Tabular Correc-tions	43	11 m/cem	
10	Angle of wind			0	5	10		59	4	9		57	2	7
11	Wind com-ponents	longitudinal		+11.0	+9.5	+5.5		+12.0	+11.0	+7.0		+10.5	+11.0	+8.0
		side		0	-6	-10		+1	-5	-10		+ 3	- 2	-7
12	Air temperature deviation				-30°				-30°				-30°	
13	c di	by derivation			-6				-7				- 10	
14	o rec-tions	for side wind	0.7	0	4	-7	0.7	+1	-4	-7	0.8	+2	- 2	-6
15	r	total		-6	-10	-13		-6	-11	-14		-8	- 12	-16

16	r	r	for longitudinal wind		14.1	+155	+134	+78	17.1	+205	+188	+120	21.0	+220	+231	+168
17	e	a	for de-flec-	air pressure	1.5		- 33		1.9		- 42		2.4		- 53	
18	c	n	tion	air temperature	8.0		+240		9.7		+291		11.8		+354	
19	t	g		charge temperature	4.4		+154		5.2		+182		5.9		+207	
20	i	e	total			+516	+495	+439		+636	+619	+551		+728	+739	+676
	o															
	n															
	s															

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made, for which:

- from each of the firing directions written into line 8, the direction of the ballisticwind written in line 9 is subtracted and we obtain the wind angle for each firing direction and range; the wind angle is written down for each firing direction and each firing range in the corresponding square of line 10;

- according to the wind angle and its velocity written in line 9, the wind breakdown table (in the Firing Tables) is used to find the longitudinal and lateral wind components for each firing range and direction and these are written down in the corresponding square in line 11;

5. The correction signs are determined and written down in the proper squares.

6. The deviations of the conditions are remultiplied by their corresponding tenth parts of the table corrections written down earlier in the first vertical graph of each column, the amount is obtained for each correction and is written down in the corresponding square; at this, the corrections for lateral and longitudinal wind are counted up and written down for each range and each firing direction (lines 14 and 16), while all other corrections, whose values do not depend on the firing direction, are counted up and written down once for each firing range (lines 17, 18, and 19).

7. The corrections for direction written down in lines 13 and 14 are added (with a consideration for their signs) and the sum of these corrections are written down (separately for each firing range and firing direction) in line 15.

8. The range corrections written down in lines 17, 18, and 19 are added (with a consideration for their signs) and to this sum we add the correction for the longitudinal wind from line 16; the range corrections sums for each firing range and each firing direction are written down in line 20.

Rules for deciphering the meteorological bulletin "Meteoognevoy"

The bulletin is transmitted in the form of a cipher telephonogram consisting of a series of cipher groups whose significance is determined by their position in the group and the position of the group in the telephonogram.

Example. "Meteoognevoy 282030 - 0090 - 51685 - 02 - 833808 - 04 - 813910 - 08 - 804112 - 12 - 804212 - 16 - 794410 - 20 - 784408 - 50 - 754219 - 60 - 994421".

First group - 6 ciphers (282030) indicates the date of the month (28) the hour of observation (20), the minute of observation (30), the 28th 20 hours 30 minutes.

Second group - the four ciphers (0090) - indicate the elevation of the artillery meteorological station above sea level: 90 meters.

Third group - five ciphers (51685) includes: 1) the first three ciphers - the ground atmospheric pressure deviation from its table value (516); 2) the last two ciphers (85) - the ground temperature deviation from its table value. At this, in the given group as well as in the first cipher pair, each of the following odd groups (5th, 7th, 9th, etc.) in front of a negative value of pressure or temperature deviations we do not place a minus sign but instead, the set number 5 is added to the first cipher of the given group. Therefore, the first three ciphers of this group (516) indicate a ground pressure deviation of minus 16 mm; the last two ciphers (85) signify that the ground air temperature deviation is minus 35 degrees.

Fourth group - two ciphers (02) - indicates the height of the trajectory (in hundreds of meters) for which the data is forwarded in the following (fifth) group: 200 meters.

Fifth group - six ciphers (833808) - includes the following data: 1) the ballistic deviation of the air temperature for the trajectory whose height is indicated in the preceding (fourth) group (83); the ballistic deviation of the air temperature minus 33 degrees; 2) the grid azimuth (in hundredths of the azimuth scale divisions) of the direction of the ballistic wind for that trajectory (38); the grid azimuth of the ballistic wind is 38-00; 3) the velocity of the ballistic wind in meters per second (08): 8 m/sec.

In all of the following groups consisting of 2 ciphers we indicate the trajectory heights in hundreds of meters, as in the fourth group, and the groups consisting of six ciphers provide the corresponding heights for the trajectories as well as all other data indicated in the fifth group.

If any amount is expressed in a number of ciphers less than designated for it, then the zero is used to fill in for the missing cipher, placed in front of the number as indicated in the second group. Places for which data are lacking are filled in with the cipher 9 as this was done in the last group of the bulletin discussed.

Attachment 4
(to article 23)

ANALYTICAL CALCULATION OF THE TOPOGRAPHIC RANGE AND THE SHIFT FROM THE PRIMARY DIRECTION
(Figure 28)

1. The difference in the coordinates of the target and the firing position is calculated.

2. The least, by absolute value, coordinate difference is divided by the greater one to three decimal places and the directional factor (the tangent of angle ρ) from the division.

3. Using column "N" (see attached table) of the table, the number is searched for which is equal in value to the obtained value of the "directional factor" (tangent of angle ρ) or a value closest to it; at the same time, the "range factor", D, is taken from the table; it is found in the table to the right of value "N" (cosecant of angle ρ).

4. The grid azimuth direction to the target (check point) is determined depending on the sign of the difference of the coordinates and the obtained value "N"; at this, the number of hundreds of azimuth scale divisions (large divisions) are taken in the upper or lower lines of the table -- there where the action will be indicated in general terms which was done in accordance with paragraph 2; the numbers of tens and units of the azimuth scale divisions are searched for in the same line where value "N" was found, in the extreme left graph if the number of large divisions of the azimuth scale were taken from the upper part of the tables, and in the extreme right graph if the number of large azimuth scale divisions were taken from the lower part of the scale.

5. The firing range is determined for which the greater coordinate difference is multiplied by the value of "D" taken from the tables.

6. The shift from the primary direction to the target is calculated, for which the grid azimuth of the primary direction (page 198 /original/ shows an example of this calculation) is subtracted from the grid azimuth direction to the target.

Attachment 5
(to article 24)

EXAMPLE FOR COMPUTING THE SETTINGS AT A COMPLETE PREPARATION

Fire is being delivered by a 122-mm howitzer model 1938. By means of measurement by the data computer or by the analytical method, it has been determined: D_{Γ}^{ts} = 6830 meters; the shift from the primary direction towards the target is +1.54. It has been determined from the map: the elevation of the firing position is 185 meters, the target elevation is 325 meters.

The firer has selected charge three.

Interpolating between the lines of range and direction corrections, he obtained, on the graph of computed corrections, the

(page 198 original)

Computation of Topographic Data

Data	Target 147	Target 148	Target 151	Target -
x_u	48290	45730	52240	
x_σ	- 51985	- 51985	- 51985	- 51985
$\Delta x = x_u - x_\sigma$	-3695	-6255	+ 255	
y_u	07346	07730	02380	
y_σ	- 13090	- 13090	- 13090	- 13090
$\Delta y = y_u - y_\sigma$	-5744	-5360	-10710	
$K_u = \frac{\text{lesser difference}}{\text{greater difference}}$	$\frac{3695}{5744}$ = 0,643	$\frac{5360}{6255}$ = 0 857	$\frac{255}{10710}$ = 0,024	
a_u	39-54	36-77	45-23	
a_{OH}	- 38-00	- 38-00	- 38-00	- 38-00
topographic shift por $\partial u_T = a_u - a_{OH}$	+ 1-54	- 1-23	+ 7-23	
K_d	1,189	1,316	1,000	
Δ_T^v (greater difference, multiplied by K_d)	5744X1,189= =6830	6255X1,316= =8232	10710X1,0= =10710	

the target location for calculating the range correction (point Ts on Figure 27) and for calculating the direction correction (point Ts' in Figure 27).

The amounts of corrections are read opposite points Ts and Ts' (see dotted line in Figure 27):

$$\Delta D = +850 \text{ m}, \quad \Delta Yg = -0\text{-}13.$$

The computed range was determined:

$$D_i^{ts} = D_t^{ts} - \Delta D = 6830 + 850 = 7680 \text{ m}.$$

The shift from the primary direction is equal to:

$$d = 1\text{-}54 + (-0\text{-}13) = +1\text{-}41.$$

According to the computed range and the selected charge, the closest sight setting by the range scale is found in the Firing Tables: 154. But sight setting 154 does not correspond to range 7680 but to 7700 meters; in order to account for the extra 20 meters, it was decided to decrease the level setting by 2 divisions because according to the Tables, $\Delta X_{tys} = 8.2$ meters and it is not possible to account for these 20 meters any more accurately.

The target angle of ~~sight~~ site was calculated:

$$\varepsilon = \frac{3.25 - 185}{0.001 D_t} \quad \frac{140}{6.8} = +0\text{-}21$$

Decreasing its absolute value by 1/20 or 5% (article 23), we obtained:

$$\varepsilon = +0\text{-}20$$

Using the Firing Tables, the sighting angle was calculated by means of interpolation corresponding to the computed range $\alpha = 491$ mils.

It was found, in the tables of corrections of the sighting angle by the target angle of sight for charge three and in the case when the target is higher than the battery, that with a sighting angle of 500 mils (closest to 491) and a target angle of site of 0-20, the correction of the sighting angle is positive and equal to 6 divisions:

$$\Delta\alpha = +0\text{-}06$$

The sight setting was calculated:

Primary setting	30-00
Target angle of site	+ 0-20
$\Delta\alpha$	+ 0-06
Range remainder	- 0-02
Setting	30-24

Attachment 6
(to articles 47, 48,
52-56, 94, 101)

OPERATING METHODS WHEN FIRING WITH SERVICING

PODRAZDELENIYE

A. With a sound-ranging reconnaissance podrzdeleniye

(Example for articles 47, 48, and 101)

In target fire of adjustment with the aid of a computer (or computing method).

For fire servicing, a 122-mm howitzer battery (call sign - "Volga") has a sound-ranging reconnaissance podrazdeleniye attached to it, (call sign - "Don").

The battery commander has been given the assignment of fire adjusting target No. 102 (an enemy battery) which has been intersected by the sound-ranging reconnaissance podrazdeleniye "Don". The target coordinates: x = 49200; y = 06100.

After determining the initial settings for firing against target No. 102, the battery commander transmits to "Don":

"'Don', according to the computer, fire adjust target No. 102, caliber 122, fragmentation fuze, flight 30, inform rate of fire and readiness".

From "Don" to the battery commander:

"'Volga', right: x = 41806; y = 07309; left: x = 41422; y = 03516, rate 55, "Don" ready".

From battery commander to "Don":

"'Don', obs ve one burst" (after the t, 'Volga' warns warns 'Don', transmiting: "Shot").

"Don" to battery commander:

"'Volga', the burst has been intersected".

After determining the deviation of the burst from the target for the right and left acoustic bases, "Don" reports to the battery commander:

"'Volga', right, left 10; left, right 5".

With the use of the computer (or by the computing method), the battery commander determines the corrections and introduces them into the settings and gives this command to "Don":

"'Don', observe four bursts" (after each shot, "Volga" warns "Don" by sending "Shot").

"Don" to battery commander:

"'Volga', four bursts intersected", and after calculations, transmits the deviation of the burst group center for the right and left acoustic bases.

For fire of adjustment by the plane table of the sound-ranging reconnaissance podrazdeleniye

A 122-mm howitzer battery (call sign "Volga") has a sound-ranging reconnaissance podrazdeleniye (call sign "Don") attached to it for servicing fire.

The battery commander has received the mission of fire adjusting target No. 101 (an enemy battery) intersected by the sound-ranging reconnaissance podrazdeleniye "Don". Target coordinates are x = 50400; y = 05840.

After determining the initial settings for firing against the target, the battery commander orders "Don":

"'Don', according to the ~~firing~~ plane table, fire adjust target 101; firing position coordinates: x = 42240, y = 05810, caliber 122, fragmentation fuze, flight 30, inform rate of fire and readiness".

"Don" informs the battery commander:

"'Volga', rate 50, 'Don' is ready".

The battery commander sends to "Don":

"'Don', observe one burst", warns with "Shot" after it has been fired.

"Don" reports to the battery commander:

"'Volga', burst has been intersected".

After calculating the deviation of the burst from the target by direction (in azimuth scale divisions) and by range (in meters), "Don" reports:

"'Volga', right 20, over 150".

The battery commander introduces the corrections into the sight and azimuth scale and orders "Don";

"'Don', observe four bursts, 50 second shot".

After each shot, "Volga" warns "Don" by transmitting "Shot".

"Don" to battery commander:

"'Volga', four bursts intersected".

After calculating the deviation of the burst group center from the target, "Don" informs the battery commander:

"'Volga, right 8, short 30".

In fire adjusting a non-acoustic target, the battery commander, in the first order to the sound-ranging reconnaissance <u>podrazdeleniye</u>, indicates the target coordinates in addition; the remaining commands remain the same.

In developing a sounding check point
for shifting fire

A 122-mm howitzer battery (call sign "Volga") has a sound-ranging reconnaissance <u>podrazdeleniye</u> ("Don") attached to it for servicing fire.

The battery commander has been given the order of developing a souding check point for shifting fire against a sounding target in the area of grove "Redkaya": x = 57300; y = 25800.

[illegible]

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After determining the initial settings for firing, the battery commander orders "Don":

"'Don', intersect the sounding check point two in the area of grove "Redkaya", x = 57300, y = 25800, caliber 122, fragmentation fuze, flight 25, report rate of fire and readiness".

"Don" to battery commander:

"'Volga', rate 40, 'Don' is ready".

Battery commander to "Don":

"'Don', observe one burst" (after firing, "Volga" warns "Don" sending "Shot").

"Don" to battery commander:

"'Volga', burst intersected, registration good".

Battery commander to "Don":

"'Don', observe three bursts, 40 second shot" (after each shot "Volga" warns "Don" sending "Shot").

"Don" to battery commander:

"'Volga', four bursts intersected".

After calculating the check point coordinates, "Don" reports to the battery commander:

"'Volga', acoustic check point second: x = 57210, y = 25630".

The battery commander, upon receiving the coordinates from the sound ranging reconnaissance podrazdeleniye, marks the acoustic check point on the plane table and calculates the firing factor for subsequent shifting of fire to the acoustic target.

B. With a radar set when firing against a moving target (example for articles 52-56)

A 122-mm, model 1938, howitzer battery (call sign "Ural") has been brought in for fire for effect against a moving tagget. The firing position coordinates: x = 18255, y = 63280, elevation 85. Primary direction 5-00.

Battery firing is serviced by a radar set (call sign "Kiyev").

Radar set coordinates are: x = 20110, y = 65165.

The following are charted on the battery data computer: the firing position, the radar position, and the points of contact at earlier noted routes.

To develop a fictitious check point (in 23.20), the battery commander marked a point whose coordinates are x = 25700, y = 68075, after which he orders:

- to the firing position: "Against the check point, fragmentation-demolition, high explosive fuze, charge second, sight 177, primary direction, right 0-50 for the first, one round, load";
- to the radar position: "'Kiyev', observe the development of a fictitious check point, 3-20, 5900, flight 29".

Radar chief: "Kiyev is ready".

Battery commander: "Fire".

Radar chief: "Burst, 3-20, 6100".

Battery commander: "Four rounds, 20 second firing, fire".

The radar chief reported the computations for each burst, the battery commander calculated the average arithmetic for the burst group: 3-18, 6075.

After processing the results of fire adjusted check point, we obtain: D_t = 9020, topographic shift from the primary direction +0-45. Fire adjusted corrections: ΔD_1^r = -170 meters, Δd_p^r = +0-05.

In 0.20, the radar chief reported:

"'Ural', group type target, a column, moving along the front, from left to right, depth 300, 0-80, 56-40".

Battery commander: "'Kiyev', track".

After marking the target point on the PUO, the flight time was calculated to the nearest point of contact ("Udav-1") equal to 30 seconds.

Timekeeper (scout): "'Kiyev', attention", then: "Stop"; at the same time, the battery commander started his stopwatch.

Radar chief: "'Ural', 1-10, 5580" (first intersection).

Thirty seconds after the first command of "Stop", the timekeeper gave the second command "Stop". The radar chief reported: "'Ural', 1-35, 5540"(second intersection).

Marking the target on the data computer according to the results of the first and second intersections, it was established that the target's direction of movement conforms with route "Udav".

The battery commander gives the command:"'Udav-1', right 0-17, sheaf 0-07, 3 round volley, load" (the remaining data against target "Udav-1" were transmitted to the firing position ahead of time).

It was determined on the PUO, that the distance between the first and second is placed 5.5 times in the section between the first target intersection and point of contact No. 1 on route "Udav" which corresponds to a lead time of 165 seconds.

The battery commander has determined that the command of "Fire" must be given at a stopwatch reading of 130 seconds (165 -30- 5 = 130). (Note: 30 seconds is the projectile flight time; 5 seconds is the interval between the command "Fire" and the first shot). At this reading of the stopwatch, the battery commander gave the command "Fire".

After the fire onslaught, the radar chief reported: "'Ural', bursts were not observed, target dispersed in depth, 5-10, 5280".

The battery commander, having ordered:"'Kiyev', track", determined that the target has changed its direction of movement. On the order of the battery commander, the timekeeper gave the command: "'Kiyev', attention", and then "Stop". At the command of "Stop", the battery commander started his stopwatch.

The radar chief: "'Ural', 5-25, 5190" (first intersection with the changed target course).

A straight line was drawn along the points marked on the PUO from the data of the five consecutive target intersections in the

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direction of its movement. Then, from the fifth point, a sector was marked off equal to the distance covered by the target during the time between the first and fifth intersections and a new point of contact was marked (the time interval between the first intersection and the point of contact turned out to be equal to four minutes).

Then the battery commander gives the command:

"Target 101, fragmentation fuze, charge second, sight 149, 151, 147, primary direction, right 2-09, sheaf 0-07, 3 rounds each, volley fire, load! 'Kiyev', point of contact -- 6-46, 4670".

When the stopwatch reads 3 minutes 30 seconds (240 -26 -4 = 210 seconds), the battery commander gave the signal "Fire".

B. Method of issuing commands during battery fire with an aircraft

(Example for article 94)

The battery commander has been ordered to fire adjust an enemy battery in grid square 3715 with the aid of an aircraft. The fire of adjustment is executed by consecutive control against the cardinal points. A radio is used for communicating with the aircraft: wave 103, reserve 150.

Call signs: aircraft - "Sokol", firer - "Raketa"; password for aircraft recognition - "15"; the time at which the aircraft leaves the airfield - 0820 hours.

The chief of the radio set, having established contact with the aircraft, reports to the battery commander:

"Contact established with the aircraft".

The navigator reports to the battery commander: "Password - 9".

The battery commander replies"'Sokol', I am 'Raketa', answer - 6" (total is 15).

Having identified the aircraft, the battery commander sets the mission:

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"....Reconnoiter the battery in grid square 3715".

The navigater, transmitting the call signs, repeats in full the reconnaissance mission: "Reconnoiter the battery in grid square 3715".

Battery commander: "Correctly heard".

Navigatter: "Going to reconnoiter".

After reconnoitering the target, the navigater reports its coordinates: "Coordinates: x = 37300; y = 15500 -- a six gun battery, guns in dugouts; x = 37100; y = 15250 -- a six gun battery not yet dug in".

Battery commander: "I repeat the coordinates: x = 37300; y = 15500 -- a six gun battery in dugouts; x = 37100; y = 15250 -- a six gun battery not yet dug in".

Navigater; "Correctly heard".

After readying the initial target data (shifting fire from the orienting point), the battery commander informs the navigator: "Observe battery fire against the target, coordinates: x = 37300; y = 15500"; and gives the command for a battery salvo to the firing position.

The navigator reports to the battery commander: "I understand you" (or "I do not understand, repeat").

Battery commander: "'Sokol', I am 'Raketa', battery ready".

Navigator: "Heading for fire control".

After taking the necessary position for observation, the navigator gives the command: "Fire".

The battery commander immediately gives the command "Fire" to the firing position and after the salvo, sends "Shot" to the navigator.

After determining the deviation of the burst group center, the navigator reports: "South 400, east 100".

The battery commander repeats the deviation of the burst group center reported by the navigator and after confirmation, introduces the corrections; when the battery is ready, he sends "Battery ready" to the navigator.

Navigator: "Heading to control fire"; after taking the necessary position for observation, he gives the command "Fire".

The battery commander gives the command "Fire" to the firing position, and after the salvo, reports "Shot" to the navigator.

After determining the deviation of the burst group center, the navigator reports: "North 125, west 50".

The battery commander repeats the deviation of the burst group center reported by the navigator and after confirmation, introduces the corrections; when the battery is ready, he transmits "Battery ready" to the navigator.

The navigator reports to the battery commander on the observation (deviation) of the battery salvo burst group center, for example: "Target covered" or "North 25" (fire of adjustment is concluded).

Upon conclusion of the fire of adjustment, the battery commander reports to the navigator: "You may depart" or "Observe fire for effect".

In controling fire for effect, the navigator reports the correlation of the burst signs: "So-many shorts, so-many overs".

If necessary, the battery commander introduces the correction and sends "You may depart" to the navigator.

Note 1. If the crew of the aircraft was given its mission prior to departure, then the battery commander transmits "Execute your assigned mission" to the navigator (after receiving the reply from him).

2. The method of fire of adjustment is indicated in the mission prior to departure. However, if the navigator has received the mission while aloft, the method of fire for adjustment may be selected by the navigator which he reports after transmitting the target coordinates: "By the cardinal points" or "By the scale".

3. If the bursts were not noticed, then the navigator reports : "Bursts were not noticed".

In this case, the salvo is repeated in the same order.

4. Upon conclusion of the fire of adjustment, the battery commander may assign a new mission under exceptional circumstances taking into account the work capabilities of the crew.

5. If it is impossible to continue execution of the mission, the navigator reports: "I cannot continue to execute the mission because of the following reason".

Attachment 7

(to article 73)

GRAPH FOR CALCULATING THE VALUES Md AND Shu DURING FIRING WITH A GREAT DISPLACEMENT

(Figure 29)

Clarification. The graph is computed for ΔX = 10 meters. In order to calculated Md and Shu, the basic data used are: PS, Dk, Db.

The values of Md and Shu for ΔX = 10 meters are located on the graph at the point of intersection or the horizontal line, PS, and the vertical line Dk (for Md) and Db (for Shu). To calculate Md and Shu with another value of ΔX, the values of Md and Shu, found by means of the graph, are multiplied as many times as there are tens of meters in the value of ΔX.

Example. Dk = 3000 meters, Db = 5500 meters, PS = 8-50. On the Md graph, we search for the point of line intersection corresponding to PS = 8-50 and Dk = 3000 and we find Md = 0-02.5; on the Shu graph we search for the point of line intersection corresponding to PS = 8-50 and Db = 5500, and we find Shu = 0-02.

If ΔX = 50 meters, then the values of Md and Shu found by means of graph must be multiplied five times. For the given example of X = 50 meters, we will obtain: Md = 0-12 and Shu = 0-10.

//Translator note: typewritten pages 164-174 should be read before continuing on with the following//

Attachment 10
(to article 226)

EXAMPLE OF BATTERY FIRING AGAINST A SURFACE TARGET

At a 100-mm gun battery firing position.

Target reconnaissance and firing is supported by a radar set. Prior to firing, the following was marked down on the data computer (PUO-7): the placement point of the primary battery gun, the observation post, and the location of the radar set -- and a numbering is made of the sector scale and the azimuth scale sector of the data computer. Complete data on the meteorological firing conditions are lacking. Radar set call sign: "Ryabina", call sign of the battery firing position: "Sheksna".

The battery commander has been given the mission of destroying an enemy trawler.

Having reconnoitered the target, the radar chief reports to the battery commander (firer):

"Single target, moving left, approaching, 45-00, 10600".

Accepting the target designation data, the firer gives the following orders:

"Timekeeper and plane table operator, have begun, intersection tempo 20 seconds.

'Ryabina', track the target, attention, stop.

Plane table operators, first report of settings on the first point, and subsequently - by the lead points".

They report from the radar set: "44-80, 10500". The subsequent commands "Attention" and "Stop" for target intersection are given by the timekeeper (telephone operator for communication with the battery firing position).

Attachment 8
(to ~~page~~ article 135)

Rate of Fire

Rate of fire for rifled pieces

Total firing time in minutes	76-mm gun		85-mm gun D-44		100-mm gun BS-3	
	Charges		Charges		Charges	
	Full	decreased	Full	Decreased	Full	Decreased
	Number of rounds from one piece					
1	15	15	10	10	7	7
3	35	35	25	25	18	18
5	50	56	40	40	30	30
10	70	70	50	60	50	50
15	85	85	60	75	60	65
20	100	100	70	90	65	75
25	110	115	80	100	70	90
30	115	130	90	110	75	100
40	125	160	110	130	85	120
50	138	180	125	150	90	140
60	150	200	140	170	95	160
120	220	320	230	290	135	250
Each Subsequent hour	70	100	80	100	40	80

Page 2 to Attachment 8
(to page 135)

Rate of Fire

Rate of fire for rifled pieces

Total firing time in minutes	122-mm howitzer M-30		122-mm gun A-19		152-mm Howitzer D-1		152-mm gun howitzer ML-20		203-mm howitzer
	Charges		Charges		Charges		Charges		Charges
	full & No.1	No. 4-6	Full & No.1	No.3	Full & No. 1	No.4-6	Full & No.1	No. 6-12	Any
1	6	6	5	5	4	4	4	4	1
3	16	16	12	12	12	12	12	12	2
5	25	25	20	20	20	20	20	20	3
10	40	40	35	35	30	30	30	30	6
15	55	55	50	50	40	40	40	40	9
20	65	70	60	60	50	50	50	50	12
25	70	80	70	70	60	60	55	60	15
30	75	90	75	80	65	70	60	70	18
40	85	110	85	100	75	90	70	82	22
50	90	130	92	115	82	105	75	95	26
60	100	150	100	130	90	120	80	110	30
120	150	260	150	220	135	210	120	200	60
Each subsequent hour	50	80	40	70	45	70	35	60	25

Note:

1. The intermediate rates of fire are used for the intermediate charges; the number of rounds in determined by interpolation proportional to the charge number.

2. The rate of fire norms shown above the dark line are limited primarily by the capabilities of the gun crews, while those below the dark line by the capabilities of the materiel unit.

3. The rate of fire norms given in the table correspond to the surrounding air temperature lying from -10° to 10°. With a temperature deviation of 10°, the rate of fire norms shown below the dark line change by 10% for each 10° (decreasing as the temperature rises or increasing as the temperature falls), while those shown above the dark line do not change.

Rate of Fire for Mortars and Recoilless pieces when firing with maximum charge

Total firing time	82-MM		107-MM M-107	120-MM M-120	160-MM M-160	240-MM M-240		Recoilless piece	
	10-finned mortar shell	6-finned mortar shell				All charges except special	Special charge	82-MM B-10	107-MM B-11
		Number of rounds per mortar						Number of rounds per piece	
1 Minute	20	20	7	9	3	1	1	5	5
3 Minutes	45	45	20	25	9	3	3	15	15
5 Minutes	75	60	25	30	12	5	5	25	25
10 Minutes	110	75	30	35	18	10	10	30	30
15 Minutes	125	85	35	40	21	15	13	35	35
30 Minutes	150	100	50	50	30	30	20	45	45
1 Hour	210	140	60	70	48	38	25	70	65
2 Hours	--	--	90	110	88	51	35	130	120
3 Hours	--	--	120	150	128	64	45	190	175

Note:

1. When firing from a 107-mm or 120-mm with a minimum (initial) charge for a continuity (total time) of 30 minutes or more, the rate of fire is increased by 1½. For the intermediate targets between maximum and minimum, an intermediate firing rate is also taken which is proportional to the charge number.

2. The rate of fire with any charge remains the same for the 160-mm and 240-mm mortars.

Rocket Artillery Rate of Fire

Total firing time in minutes	Number of battery salvos for a medium calibre battery	for a large calibre battery: for finned shells	for a large calibre battery: for non-finned shells	for a long range battery
3	1	1	1	1
10	2	2	-	2
15	3	3	2	-
20	-	-	-	3
25	4	4	3	-
30	5	5	-	4
40	6	6	4	-
45	-	-	-	5
50	7	7	5	-
60	8	8	6	6
In each subsequent hour	6	6	4	4

Note. The equipment is charged well in advance for the first salvo.

Attachment 9
(to ~~pages~~ 136,
145, and 180)

Average Expenditure of Shells During Fire of Annihilation

Average expenditure of shells and mortar shells [1] for the suppression of non-entrenched infantry groups or fire facilities at ranges of up to 4 km after termination of an exchange of shots and shifting of fire.

Caliber, in mm	Against non-entrenched infantry group	Against fire weapons (machine guns, guns, mortars, etc)
85	50	16
100	35	14
122	25	12
152	20	8
120	15	8
160	12	5

When firing at a range of from 4 to 8 km., the average expenditure of shells (mortar shells) will be increased $1\frac{1}{2}$-2 times.

(1) The average expenditure of shells and mortar shells given in this and the following tables do not include the shells (mortar shells) used in the exchange of shots.

Average Expenditure of 82-mm Mortar Shells

Charge	Range	Average mortar shell expenditure	
		for suppression of fire weapons or infantry groups, to squad size, in the open	for the destruction of personnel concealed in open trenches, for each 10 m of open trench
1	500	15	30
1	1000	20	40
2	1500	30	60
2	2000	40	80

Note: 1. With a flank fire against trenches of 50 meter or more in length, the average mortar shell expenditure will be decreased by 1/3.

2. If the trench sector is less than 50 m in length, the average mortar shell expenditure will be the same as for a 50 m long sector.

Average expenditure of shells and mortar shells for the destruction of observed dugouts (trench sectors) for each 10 meters of target front (after termination of exchange of shots)

A. Shells

Range, km / Caliber, mm	up to 4	4-6	over 6
122	45	60	80
152	30	45	60
203	20	25	35

B. Mortar Shells

Range, km / Caliber, mm	up to 2	2-3	3-5	over 5
107 and 120	60	100	170	
160	15	30	40	50
240	8	15	20	30

Note: 1. For mortar fire destruction of a dugout or trench sector with a length of less than 50 meters, an average of mortar shell expenditure is required for the 107-mm and 120-mm (less than 30 meters for the 160-mm) in this case which is similar to the destruction of dugouts and trench sectors having a length of 50 meters (30 meters).

2. With a flanking fire, the expenditure of shells and mortar shells is decreased by 1/3.

Average expenditure of shells or mortar shells for the destruction of observed targets: dugout shelters, observation posts, dugouts for firing points, and for the destruction of a dug-in tank (after termination of exchange of shots).

Target designation	Range, km / caliber, mm	2	3	4	5	6
Dugout shelter	122	40	60	110	120	150
	152	20	30	45	60	80
	160	40	60	120	150	-
	203	-	20	25	30	40
	240	15	20	30	90	100
Observation post	122	40	50	90	100	120
	152	15	25	30	40	50
	160	50	70	150	170	-
	203	-	15	20	30	40
	240	20	30	40	100	110
Dugout for fire point	122	15	25	40	45	60
	152	10	15	30	35	40
	160	50	70	140	150	-*
	240	20	25	35	90	100
Dug-in tank	122	15	20	40	50	70
	152	10	15	30	40	60
	160	70	100	180	-*	-*
	240	50	60	90	-*	-*

* firing is not expedient

Average expenditure of shells (mortar shells) for the destruction of dugout shelters with covered firing positions when impossible to observe the bursts during the course of firing for destruction

Method for determining the installation for firing for destruction	caliber, mm / firing range, km	122	152	203	160	240
Complete preparation, target coordinates determined by the optical reconnaissance section (with an observer)	1	-	-	-	90	40
	2	170	140	100	220	120
	3	270	230	150	420	240
	4	410	360	230	-	-
An exchange of shots with the assistance of a radar set for each piece (4 shots per piece)	1	-	-	-	90	60
	2	150	130	90	130	90
	3	200	170	120	170	120
	4	260	280	150	230	-
	5	360	300	-	-	-
Exchange of shots with combined observation, or by observing the burst signs	1	-	-	-	30	10
	2	40	30	15	70	30
	3	80	60	30	130	50
	4	130	110	50	220	120
	5	190	160	90	-	-
	6	270	230	130	-	-

Average expenditure of shells (mortar shells) for the destruction of dugout shelters with covered firing positions when impossible to observe the bursts during the course of firing for destruction

Method for determining the installation for firing for destruction	caliber, mm / firing range, km	122	152	203	160	240
Shifting fire from the check point:						
a) the same optical	1	-	-	-	35	20
reconnaissance pla-	2	90	70	40	100	60
toon has intersected	3	150	130	70	180	110
the check point and	4	240	200	110	230	-
target	5	380	310	170	-	-
b) the check point and	1	-	-	-	120	50
target are on the same	2	230	200	100	230	110
aerial photo	3	290	250	120	-	-
	4	370	320	140	-	-

Note: 1. The total number of expended shells (mortar shells) does not include the shells (mortar shells) used in exchange of shots with the target (check point).

2. When the calculation of is made with the aid of the PBS and the message is used after 1 hour, the expenditure of shells (mortar shells) is decreased $1\frac{1}{2}$ times at full preparation.

3. The expenditure of shells (mortar shells) indicated in the table is increased:

- when firing for the destruction of observation posts and the destruction of dug-in tanks -- by $\frac{1}{4}$.
- when firing for the destruction of earth-and-wood strong points; by 3/4 for the 122-mm and 152-mm howitzers, and by $\frac{1}{2}$ for the other weapons.

After processing the target intersection data of the radar set, the plane table operator reports: "The target is entering the firing sector, sight 286, azimuth setting 1-40, flight 34, low displacement".

According to this data, the firer gives commands to the battery firing position for training the guns on the target area: "'Sheksna', against the trawler, fragmentation-demolition, demolition fuze, charge full, sight 286, azimuth scale 1-40, load". After giving the command, the firer calculates the range coefficient:

$$Ku = \frac{10500}{14300} = 0.7$$

Upon the conclusion of the period of observation, during the sixth intersection, the timekeeper, prior to the command "Attention, stop", gives the command, "Lead". At this command, the firer starts the stopwatch while the plane table operator moves the lead point out from the given target intersection.

The plane table operators report: "Lead, sight 270, azimuth setting 0-88, flight 32". With this data, the firer orders the settings for target fire of adjustment: "Sight 270, azimuth setting 0-88", and calculates the projectile flight time from the lead time (100 - 32 = 1 minute 8 seconds).

After calculating and reporting the settings for the lead point, the plane table operators calculate the VIR and VIN by three consecutive intersections of the target and report to the firer: "VIR minus 280, VIN left 15".

According to the stopwatch reading, 1 minute 8 seconds, the firer gives the command "Fire", after which he warns the plane table operators and the radar installation with: "Plane table operators, lead, 'Ryabina', fire adjustment, attention, falling", then he stops the stopwatch and at the moment of salvo impact (at the moment the timekeeper gives the command "Stop"), starts it anew.

The radar set reports the following based on the fire adjusting salvo: "44-08, 9720, right 35, short 230". From this report, the firer calculates the direction correction (35 • 0.7 = 25) and gives the command: "Plane table operators, left 0-25, range over 230".

According to the computations 44-08 and 9720, the plane table operators mark a point on the PUO from which they move out the lead point. The computed index of the azimuth scale setting is moved "left 0-25", while [illegible] the temporary computed index in the amount of "over 230" is marked on the sighting scale slide /polzun/ and it is superimposed on the lead point, computed and the setting reported: "Lead, sight 264, azimuth setting 0-32, flight 31". After this, the new VIR and VIN are computed by the next three intersections

Having changed the sight by 1/3 VIR (-100 meters) in the direction of target movement and utilizing the earlier calculated VIR (-6$\triangle$X) and VIN (-0-15), the firer commands the effect settings for the first two volleys (six salvos): "By volleys, sight 262, less 6, azimuth setting 0-32, left 5". Subtracting the flight time (31 seconds) from the lead (100 seconds), and calculates the time at which to give the command "Fire": 1 minute 9 seconds.

From the reports of the plane table operators, the firer wrote down the new VIR and VIN values (VIR = -240 meters, VIN = -0-18).

When the stopwatch reads 1 minute 9 seconds, the firer gives the command "Fire", after which he warns the plane table operators and the radar installation: "Plane table operators and 'Ryabina', first effect, lead and correction by the second, attention, falling", stops his stopwatch and at the moment the splashes of the first effect salvo appear, when the timekeeper gives the command "Stop", starts it again and does not stop it until the end of the entire series of effect salvos.

Having measured the deviation of the first salvo from the target (left 10), the firer calculates the correction for direction (10 • 0.7 = 7) and immediately transmits it to the battery firing position and to the plane table operators: "Right 0-07".

The radar installation reports on the second salvo: "43-32, 9050, left 12, over 120". Receiving this report, the firer becomes convinced that the correction he has made in direction is correct and he gives the following command to correct the range: "Plane table operators, range less 120".

According to the computations 43-32 and 9050, the plane table operators mark a point on the PUO from which a new lead point is moved out. The computed index of the azimuth scale setting is moved "right 0-07", and a new index in the amount of "less 120" is marked on the sighting scale slide from the earlier marked index, and the previously marked index is erased. Superimposing the new temporary sighting scale index with the lead point, the plane table operators compute and report the settings to the firer: "Sight 252, azimuth scale 0-02, flight 28". After this, the three consecutive target intersections are used to calculate the new values of VIR and VIN for the fifth and sixth volleys (13-18 salvos).

Having changed the sight by 1/3 VIR (-100 meters) in the direction of target movement and utilizing the previously calculated VIR ($-5\Delta X$) and VIN (-0-18), the firer orders the effect settings for the third and fourth volleys (7-12 salvos): "Third and fourth volleys, sight 250, less 5, azimuth setting 0-02, left 6".

Fire is continued in the established sequence until the completion of the fire mission.

Attachment 11
(for ~~page~~ article 231)

Determining the Range to the Target by the Vertical Angle from an Aircraft to the Target

"c in degrees	Aircraft altitude in meters: 4000	5000	6000	7000	"c in degrees	Aircraft Altitude in meters: 4000	5000	6000	7000
	Distance from the aircraft to the target, in meters					Distance from the aircraft to the target in meters			
40	3350	4200	5030	5850	56	5930	7410	8900	10380
41	3480	4350	5210	6080	57	6160	7700	9240	10780
42	3600	4500	5400	6300	58	6400	8000	9600	11200
43	3750	4650	5600	6500	59	6600	8320	9990	11650
44	3850	4800	5800	6800	60	6930	8660	10400	12100
45	4000	5000	6000	7000	61	7210	9020	10820	12630
46	4150	5200	6200	7250	62	7520	9400	11280	13160
47	4290	5360	6430	7500	63	7750	9810	11880	13740
48	4440	5550	6660	7770	64	8200	10250	12300	14350
49	4600	5750	6900	8050	65	8580	10720	12870	15010
50	4770	5960	7150	8340	66	8980	11230	13470	15720
51	4940	6170	7410	8640	67	9420	11780	14140	16490
52	5120	6400	7680	8960	68	9900	12370	14850	17320
53	5310	6630	7960	9260	69	10400	13000	15650	18250
54	5500	6880	8260	9630	70	10900	13750	16500	19250
55	5710	7140	8570	10000					

Note: "c is the vertical angle (the angle between the vertical and the line of direction from the aircraft to the target).

SECRET

Attachment 12
(for ~~page~~ article 231)

Determining the Amount of Lead when Firing Against a Surface (naval) Target with the Aid of an Aircraft

(The tabular columns give the values for determining the vector in millimeters for a scale of 1 : 25,000)

Target speed in km/hr	Lead time, in seconds			Target speed in km/hr	Lead time, in seconds		
	80	100	120		80	100	120
10	9	11	13	26	23	29	35
11	10	12	15	27	24	30	36
12	11	13	16	28	25	31	37
13	12	14	17	29	26	32	39
14	13	16	19	30	27	33	40
15	13	17	20	31	28	34	41
16	14	18	21	32	28	35	43
17	15	19	23	33	29	37	44
18	16	20	24	34	30	38	45
19	17	21	25	35	31	39	47
20	18	22	27	36	32	40	48
21	19	23	28	37	33	41	49
22	19	24	29	38	34	42	50
23	20	26	31	39	35	43	51
24	21	27	32	40	36	44	53
25	22	28	33				

SECRET

Attachment 13
(for ~~page~~ article 238)

Approximate Table of Shifting During Battalion Firing Against Surface (Water) Targets

(for conducting a rolling barrage fire against landing-dropping facilities)

1. Battery Shifting

Firing range, in km	Battery shifting from the center of the battalion sector to superimpose the center of the fan with the target center		
	1st battery, to the right	2nd battery, to the right	3rd battery, to the left
10	0-45	0-12	0-18
9	0-50	0-14	0-20
8	0-55	0-16	0-22
7	0-60	0-18	0-25
6	0-70	0-20	0-30
5	0-85	0-25	0-35
4	1-05	0-30	0-45

Note: 1. With a different composition of the battalion, the table is made similar to the given table.

2. The data in this table is partially rounded off.

(Attachment 13, continued)

2. Fire Distribution in the Battery from the Right Piece

Firing range,	Fire distribution from the right, under conditions when the following was set up:								
	concentrated fan for distance						parallel fan		
	10 km			15 km					
	with an average interval between pieces, in meters								
	20	30	40	20	30	40	20	30	40
10	0-05	0-05	0-05	0-04	0-04	0-04	0-03	0-02	0-01
8	0-06	0-05	0-05	0-04	0-04	0-04	0-04	0-02	0-01
6	0-07	0-06	0-06	0-06	0-05	0-04	0-05	0-03	0-02
4	0-10	0-08	0-06	0-09	0-07	0-05	0-08	0-05	0-02

Table 1

Table for Calculating the Topographic Range and Directional Angle of the Target

H	0-105		105-213		213-325		325-445		445-577		577-727		727-900		900-1000		H
4 +Δx −Δy	45-00		46-00		47-00		48-00		49-00		50-00		51-00		52-00		+Δx −Δy
3 −Δy −Δx	30-00		31-00		32-00		33-00		34-00		35-00		36-00		37-00		−Δy −Δx
2 −Δx +Δy	15-00		16-00		17-00		18-00		19-00		20-00		21-00		22-00		−Δx +Δy
1 +Δy +Δx	0-00		1-00		2-00		3-00		4-00		5-00		6-00		7-00		+Δy +Δx
	H	∠	H	∠	H	∠	H	∠	H	∠	H	∠	H	∠	H	∠	
	0,..	1,..	0,..	1,..	0,..	1,..	0,..	1,..	0,..	1,..	0,..	1,..	0,..	1,..	0,..	1,..	
00	000	000	105	006	213	022	325	051	445	095	577	155	727	236	900	346	100
02	002	000	107	006	215	023	327	052	448	096	580	156	730	238	904	348	98
04	004	000	109	006	217	024	330	053	450	097	583	157	733	240	908	351	96
06	006	000	111	006	219	024	332	054	453	098	586	159	736	242	912	353	94
08	008	000	113	006	221	025	334	054	455	099	589	160	739	244	916	355	92
10	010	000	116	007	223	025	337	055	458	100	591	161	743	245	919	358	90
12	012	000	118	007	226	026	339	056	460	101	594	163	746	247	923	360	88
14	015	000	120	007	228	026	341	057	463	102	597	164	749	249	927	363	86
16	017	000	122	007	230	027	344	057	465	103	600	165	752	251	931	366	84
18	019	000	124	007	232	027	346	058	468	104	603	167	756	253	935	369	82
20	021	000	126	008	235	027	348	059	471	105	606	169	759	255	939	372	80
22	023	000	129	008	237	028	351	059	473	106	609	171	762	257	943	374	78
24	025	000	131	009	239	028	353	060	476	107	611	172	766	259	947	377	76
26	027	000	133	009	241	029	356	061	478	109	614	174	769	261	951	379	74
28	029	000	135	009	243	029	358	062	481	110	617	175	772	263	955	382	72
30	031	000	137	009	246	030	360	063	483	111	620	176	776	265	959	385	70
32	034	001	139	010	248	030	362	064	486	112	623	178	779	267	963	388	68
34	036	001	141	010	250	031	365	064	489	113	626	179	782	269	967	391	66
36	038	001	143	010	252	031	367	065	491	114	629	181	786	272	971	394	64
38	040	001	146	010	254	032	369	066	494	115	632	183	789	274	975	397	62
40	042	001	148	011	257	032	372	067	496	116	635	185	793	276	979	400	60
42	044	001	150	011	259	033	374	068	499	117	638	186	796	278	983	403	58
44	046	001	152	011	261	033	377	068	502	119	640	188	799	280	987	405	56
46	048	001	154	012	263	034	379	069	504	120	643	189	803	282	992	408	54
48	050	001	156	012	266	034	381	070	507	121	646	190	806	285	996	411	52
50	052	001	158	012	268	035	384	071	510	122	649	192	810	287	1000	414	50
52	055	001	160	013	270	036	386	072	512	124	652	193	813	289			48
54	057	002	163	013	272	036	389	073	515	125	655	195	817	291			46
56	059	002	165	013	275	037	391	074	518	126	658	197	820	293			44
58	061	002	167	014	277	037	393	075	520	127	661	199	824	295			42
60	063	002	169	014	279	038	396	075	523	129	664	200	827	298			40
62	065	002	171	014	281	040	398	076	525	130	667	202	831	300			38
64	067	002	173	015	284	040	400	077	528	131	670	204	834	302			36
66	069	002	175	015	286	041	403	078	531	132	673	206	838	305			34
68	071	002	178	015	288	041	406	079	533	134	676	208	841	307			32
70	073	003	180	016	291	042	408	080	536	135	680	209	845	309			30
72	076	003	182	016	293	042	410	081	539	136	683	211	849	311			28
74	078	003	184	016	295	043	413	082	542	138	686	212	852	314			26
76	080	003	186	017	297	043	415	083	544	139	689	214	856	316			24
78	082	003	188	017	300	044	418	084	547	140	692	216	860	318			22
80	084	003	191	018	302	044	420	085	550	142	695	218	863	321			20
82	086	004	193	018	304	045	423	086	553	143	698	220	867	323			18
84	088	004	195	018	306	045	425	087	555	144	701	221	870	326			16
86	090	004	197	019	309	046	428	088	558	145	704	223	874	328			14
88	092	004	199	019	311	047	430	089	561	146	707	225	878	330			12

-90	094 004	201 020	313 048	433 090	563 148	711 227	882 333		10
92	097 005	204 020	316 048	435 091	566 149	714 229	885 335		08
94	099 005	206 021	318 049	438 092	569 150	717 231	889 338		06
96	101 005	208 021	320 050	440 093	572 152	720 233	893 340		04
98	103 005	210 021	323 050	443 094	575 153	723 235	897 343		02
100	105 006	213 022	325 051	445 095	577 155	727 236	900 346		00
$\frac{+\Delta x}{-+\Delta y}$	14-00	13-00	12-00	11-00	10-00	9-00	8-00	7-00	$\frac{+\Delta x}{+\Delta y}$ 1
$\frac{\pm\Delta y}{-\Delta x}$	29-00	28-00	27-00	26-00	24-00	23-00	23-00	22-00	$\frac{+\Delta y}{-\Delta x}$ 2
$\frac{-\Delta x}{-\Delta y}$	44-00	43-00	42-00	41-00	40-00	39-00	38-00	37-00	$\frac{-\Delta x}{-\Delta y}$ 3
$\frac{-\Delta y}{+\Delta x}$	59-00	58-00	57-00	56-00	55-00	54-00	53-00	32-00	$\frac{-\Delta y}{+\Delta x}$ 4
H	0-105	105-213	213-325	325-445	445-577	577-727	727-900	900-1000	H

FIGURES

Figure 6 (page 52, original). The graphic method for calculating Md and Shu.

Figure 7 (page 62, original). The grid for calculating the deviation of the burst group center.

Figure 8 (page 64, original). Examples of transmitting observations during fire of adjustment with the use of an aircraft scale: a) to the left 300, the first is short 150; b) to the right 200, the second is at target level; c) correct, the first is a short 150; d) to the left 100, the second is a short 200.

Figure 9 (page 77, original).

Corrections for differences in drift in azimuth scale divisions

range correction in meters

Topographic range, kilometers

Graph for calculating the computed range corrections when shifting fire by means of the firing factor.

Figure 10 (page 80, original).

Fire adjustment correction graph for 2nd battery

Corrections for range in meters

Corrections for direction in azimuth scale divisions

Topographic range in kilometers

The LPD and LPN drawn through points R_1 and R_2 refer to the primary direction
The LPD and LPN drawn through point R_3 refer to ON-3-00

The graph of fire adjusted corrections (for rifled guns and rocket artillery).

X_p^R - fire adjusted range by the check point corresponding to the quadrant angle of elevation fire adjusted by the check point;

ΔD_1^{ts} - computed range correction to the target;

ΔX - difference of tabled ranges.

Figure 15 (page 137, original). Calculating the lead point, VIR and VIN when firing against a moving surface target (1-6 - target intersections during the period of observation).

Target intersection at the last point of the period of observation

(lead point)

Target course

Lead time BU is equal to the observed AB

Observation time 100 seconds

Direction of fire

Figure 16 (page 140, original). Calculating a new lead point in battery firing with a radar set (I-II - target intersections).

Lead time

Lead point for the fire adjusted salvo

Period of observation

Target course

Lead time

New lead point

New target course

Figure 11 (page 81, original). The graph of fire adjusted corrections (for mortars).

1st battery fire adjusted corrections graph, mortar shell OF-843, 5th charge, group 93-50-M

Range corrections in meters

Corrections for direction in azimuth scale divisions

Topographic range, in kilometers

The LPD and LPN drawn through points R_1 and R_2 refer to the primary direction; the LPD and LPN drawn through point R_3 refer to ON-4-90, and ON-3-00 through point R_4.

Figure 12 (page 119, original). Calculating the greater height of the target above the firing position.

Lateral deviation line

Line of observation

Figure 13 (page 122, original). Constructing a graph during fire of adjustment with unilateral observation.

Figure 14 (page 128, original). Calculating the fire adjusted corrections and the computed quadrant angle of elevation by means of the graphic firing tables:

D_t^R - the topographic range to the check point;

D_t^{ts} - ~~greater height of check point and target above the firing positions~~ topographic range to the target

X^R, X^{ts} - tabular ranges to the check point and target, corresponding to quadrant angle of elevations, calculated by the check point and the target;

Δh_R, ΔH_{ts} - greater height of the check point and target above the firing position;

ΔD_p^R - fire adjusted range correction by the check point;

~~D_p^R~~

Figure 17 (page 141, original). Calculating the new lead point during battery firing with bilateral observation (1-2 - target intersections)

Period of observation 100 seconds

Lead time, 100 seconds

Lead point for the fire adjustment salvo

Initial target course

New target course

Target intersection missed (salvo marks were conducted)

Next regular target intersection after impact of the fire adjustment salvo

Corrected target course

Lead time 100 seconds

Lead point for shifting to fire for effect

Figure 18 (page 143, original). Order of battery firing for effect against individual moving surface targets:

Ts_1-Ts_6 - consecutive points of the target position (after every 20 seconds); R_1-R_3 - position of the salvo centers of the first volley; R_4-R_6 - position of the salvo centers of the second volley

First sight setting

First volley salvo centers

Second vollery salvo centers

Second sight setting

First volley

Second volley

Stopwatch readings (in seconds)

Data firing card

1st gun, 2nd battery

Calling for fire from neighbors -- red rocket

Signal from neighbor -- yellow rocket

Gun commander

Sergeant Kovalev

Conventional symbols

- basic firing sector of the gun
- supplementary firing sector of the gun (may be several)

decimal numerator - orienting point number;

decimal denominator - sight (in this example, $\Delta X = 100$ m)

The circumference indicates the range limit at which fire is conducted at permanent sight settings (in this example the permanent sight is 8)

Figure 19 (page 152, original). A gun's firing card.

Figure 20 (page 158, original). Calculating the direction of movement of a target by its silhouette.

a - frontal; b - flanking; c - oblique.

Figure 21 (page 161, original). Introducing corrections in direction when firing with guns having optical sights.

a - training with the previous shot

b - training at the command "left 0-03" "half-figure left" or "half-figure lead"

Figure 22 (page 162, original). Calculating and computing the lateral displacement of a moving target.

beginning of computation t_s; completion of computation t_s; training for the shot

 50X1-HUM

Figure 23 (page 167, original). Diagram for changing the settings of the sighting devices for firing at night and under conditions of limited visibility:

ΔYg - the amount of azimuth scale jump; Δh - the amount of the sight jump; 1 - the computed settings for fire for effect; 2-9 - consecutive changes in the settings during the course of fire for effect.

"Temnyy" forest

Primary
direction

Figure 24 (page 177, original). Example of target designation in polar coordinates from the primary direction:

K - commander's observation post where the target designation is taken; polar coordinates of the target: primary direction, right 1-30, range 1500, elevation 116.

Figure 25 (page 178, original). Example of target designation by rectangular coordinates: x = 54760, y = 36430, elevation 230.

Figure 26 (page 180, original). Target designation from a basic orienting point:

orienting point two - a crossroads in grid square 4327, orienting point two, north 200, east 150, a six gun battery

Graph for calculating
corrections for the 1st battery
28-2-57 20.30 charge 3

range corrections (meters)

direction corrections ~~kgrixx~~ (azimuth scale divisions)

Range (km)

________ range correction (m)

.... direction corrections (in azimuth scale divisions)

Figure 27 (page 190, original). Computed corrections graph.

Figure 28 (page 197, original). Analytical calculation of range and shift from the primary direction.

Figure 29 (page 211, original). Graph for calculating the values of Md and Shu when firing with great displacement.