THE RUSSIAN VIEW

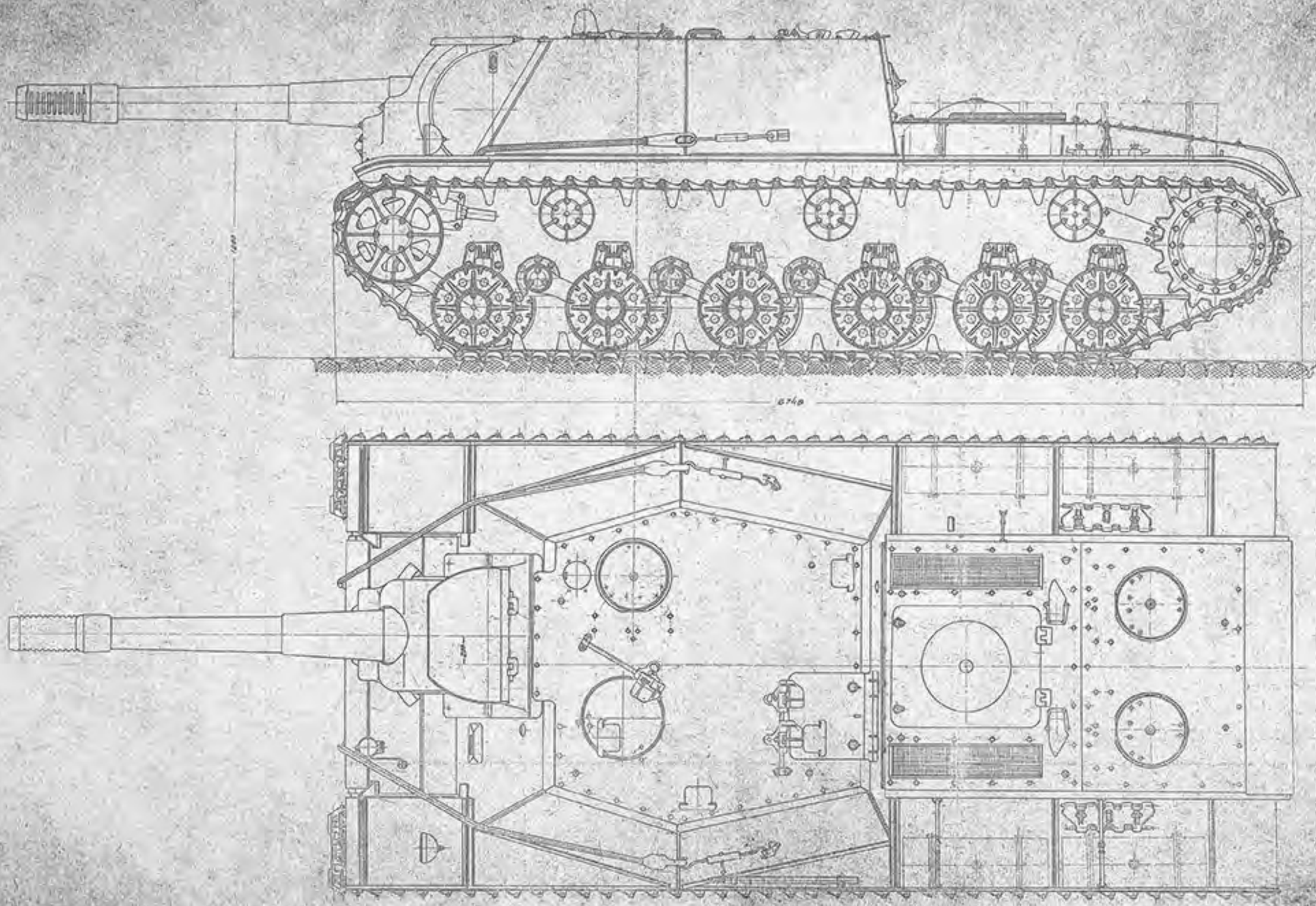
YURI PASHOLOK

WORLD OF TANKS

THE SU-152

AND RELATED VEHICLES

CONSTRUCTION & DEVELOPMENT



Yuri Igorevich Pasholok

THE SU-152

AND RELATED VEHICLES

The SU-152 and Related Vehicles

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The quality of some illustrations is that of the archival source material.

The book includes documentation, photography, and illustrations from the following collections: the Central Archive of the Ministry Of Defense of the Russian Federation (TsAMO RF), the Russian State Archive of Sociopolitical History (RGASPI), the Russian State Archive of Economics (RGAE), documents from the archives of Factory No. 9, the Russian State Archive of Film and Photo Documents (RGAKFD), the 1967 photo album "History of KBM," as well as materials from the archives of Igor Zheltov (IZh), the publisher Strategiya KM (ASKM), Vyacheslav Len (V. Len), Sergei Ageyev (SA), and the author's personal archive (YuP).

For worldwide distribution except in the CIS (countries of the former Soviet Union) contact:
Casemate Book Distributors
1950 Lawrence Road
Havertown, PA 19083-1709, USA
610-853-9131
www.casematepublishing.com

First North American Edition published by
Lombardy Studios
835 8th Avenue
Oakland, California 94606-3608 USA
www.WorldofTanksBooks.com

Library of Congress Control Number 2015912117
ISBN (print): 978-1-940169-02-6 Copyright © 2017
ISBN (eBook): 978-1-940169-08-8 Copyright © 2017

Printed in China.

featuring the art and graphics of

Publisher's Preface

In 2010 the massive, multiplayer online game *World of Tanks* (*WoT*) was launched by the company Wargaming. At the time this book was published, *WoT* had more than 80 million registered players worldwide.

The creative people at Wargaming.net are not just tank enthusiasts—they are passionate about the history of armored fighting vehicles (AFVs) and getting them right in the game. In 2012, the company started publishing a series of books in Russian that utilized documents and archival materials that had never before been seen by outsiders or published in any language about the design, procurement, development, manufacturing, and combat employment of Soviet AFVs during World War Two (the Great Patriotic War to Russians).

Now these remarkable books are being published in English with the obvious descriptor The Russian View—English readers may be surprised by some of the opinions of the Russian authors in this series. The series included three categories of titles: Construction and Development (as for the SU-152); Combat Service; and Military Operations.

Yuri Igorevich Pasholok, the author of this book about the SU-152 and other self-propelled (SP) guns based on the KV tank chassis, uncovered intriguing facts and the secret story of Soviet heavy artillery SP guns through his research, including:

- *The plan for SP guns began in 1931*
- *Competition to develop a "bunker buster" SP gun started in earnest in 1938 but just missed battlefield deployment in the 1940 Russo-Finnish Winter War*
- *Soviet pre-war intelligence indicating that Germany was working on super heavy tanks increased the urgency of the SP program—although the German invasion of the Soviet Union in 1941 showed that intelligence to be wrong*
- *The impact of evacuating factories and other industry beyond the Ural mountains as German forces advanced*
- *Joseph Stalin's personal interest in the SP program and competition between factory design teams for resources and support*
- *How the destruction of the Barricades factory in Stalingrad (modern day Volgograd) severely reduced Soviet manufacturing of 152 mm and larger guns*
- *Why SU-152 manufacture stopped after only 670 were produced and why no new heavy SP artillery was deployed to help Soviet armies batter their way through German fortifications in 1944-45*

Pasholok's research provides readers of World War Two history in the West with a much better understanding and greater appreciation of Soviet SP weapon development, and I am extremely fortunate to be able to offer these terrific books for the first time in English.

Dana Lombardy
Lombardy Studios
September 2015

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Author's Introduction

During the Great Patriotic War the SU-152 SP gun was nicknamed *Zveroboy*, or "Beast Killer," in reference to the threat posed by Tigers and other beasts in the German menagerie. According to some accounts, the monster from Chelyabinsk was developed literally over a two-week period in response to the fielding of heavy tanks by the Germans.

It is true that the first battlefield appearance of the SU-152 coincided with Germany's extensive use of heavy tanks and tank destroyers. This brainchild of the design bureau headed by Zh. Ya. Kotin proved to be a highly effective weapon against enemy armor from its first engagements. But in actual fact, the history of the Soviet Union's first mass-produced heavy SP gun began not in late 1941, as some authors have stated, but much earlier. The idea of developing a heavy SP gun for combating reinforced concrete bunkers was born during the Soviet-Finnish War of 1939–1940 and got underway in early 1940. The development of "bunker busters" continued for the next two years, even during the early part of the Great Patriotic War, when the preliminary efforts were transferred from Leningrad to Chelyabinsk and Sverdlovsk. The SU-152 was an act of desperation, because the first chassis for a heavy SP gun had failed to enter mass production. In addition, instead of being used against fortifications, the SU-152 was employed primarily to combat armored vehicles.

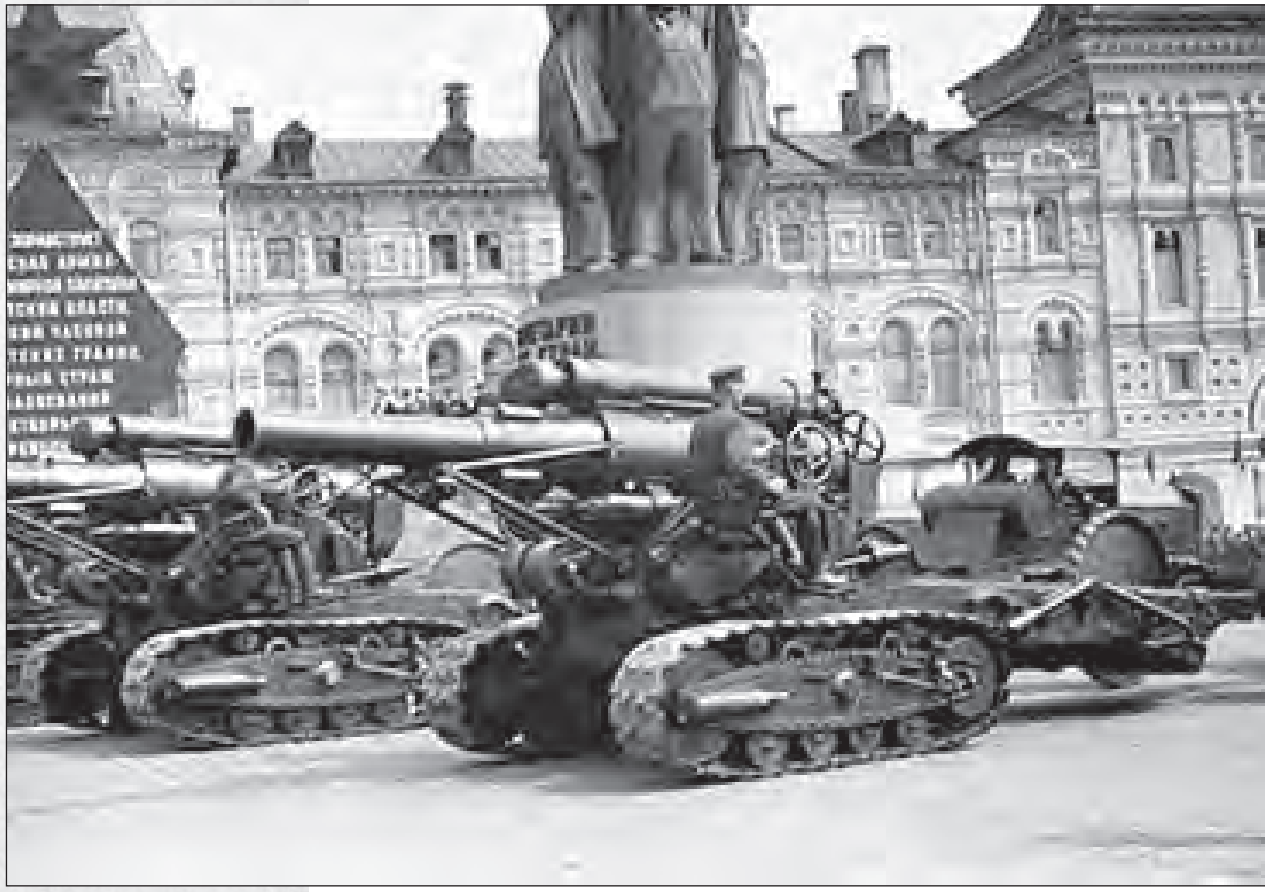
This book addresses all of the ups and downs in the history of the development of domestic heavy SP guns based first on the KV tank chassis and then on the KV-1S chassis. A large number of the documents contained in this book are published here for the first time. Documents from the Central Archive of the Ministry Of Defense of the Russian Federation (TsAMO RF) in Podolsk served as the primary sources for the book. Other important sources were documents from the Russian State Archive of Economics (RGAE), the Russian State Archive of Sociopolitical History (RGASPI), and the archive of Factory No. 9 (Yekaterinburg). Materials from the archives of Igor Zheltov, Maxim Kolomiets, Vyacheslav Len, Gennady Malyshev, and Nikolai Shashmurin were also used in the book. The author would also like to thank Sergei Ageyev (Yekaterinburg), whose efforts made it possible to fill in a large number of blanks in the history of the SP guns developed in Sverdlovsk.

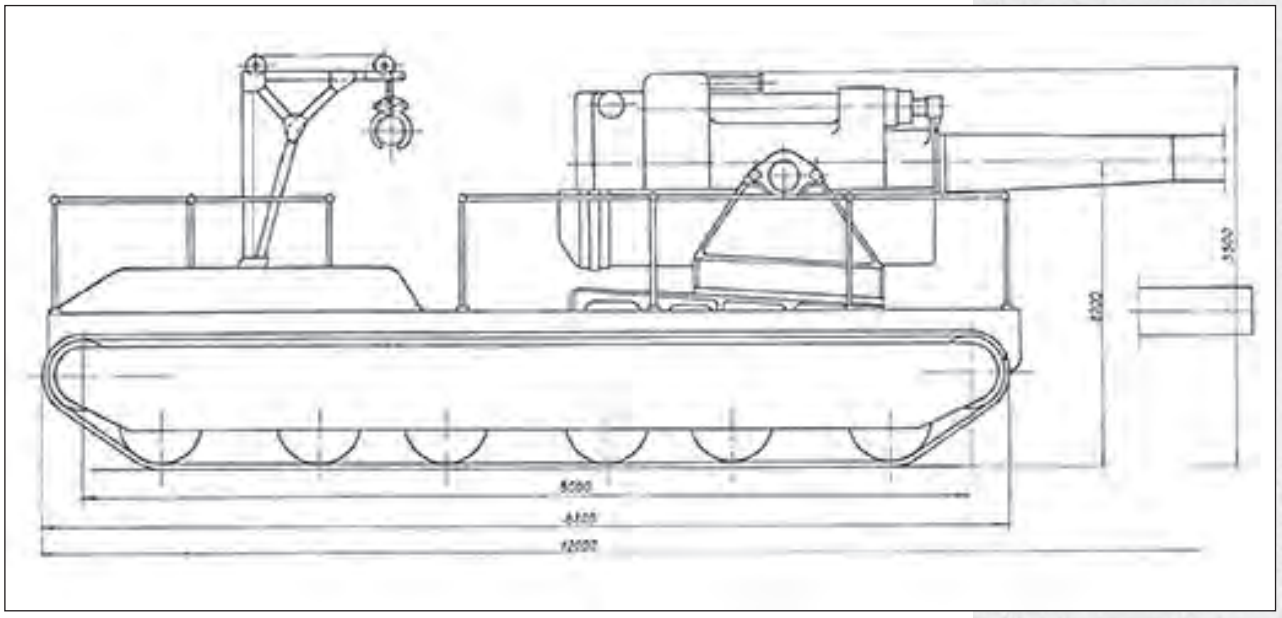
Yuri Igorevich Pasholok
2013

CHAPTER 1. **Lessons of the Winter War**

The story of the development of heavy SP guns in the Soviet Union began in September 1931. The primary goal was to increase the mobility of heavy artillery through mechanization. The SU-7 and SU-14 SP guns were developed during work on a "self-propelled corps-level triplex." The SU-7 was designed to carry the 152 mm gun, the 203 mm howitzer, and the 305 mm mortar. The SU-14 was designed for the 107 mm gun, the 152 mm gun, and the 203 mm howitzer. Two prototypes were built and assigned the designations SU-14 and SU-14-1. Both systems were initially armed with the B-4 203 mm super-heavy howitzer model 1931, which was later replaced by the BR-2 152 mm heavy gun model 1935. There was talk of starting mass

B-4 203 mm heavy howitzers on parade in Moscow (RGAKFD).





Sketch of the SU-7 from a Plant No. 185 report on its experimental work.

production of the SU-14. The "small triplex" project was canceled on August 7, 1938, after the political arrest of N. N. Magdesiyev (developer of the B-4 howitzer), followed by the arrest of P. I. Syachintov, who headed up the work on the SU-14.

The subject of super-heavy SP artillery came to the fore again in late 1939. On November 30, units of the Red Army crossed the border into Finland, and the conflict that the Finns refer to as the Winter War got underway. The Red Army units quickly encountered the layered defensive line known as the Mannerheim Line. The assault on the line failed. The attacking units, which included tank units, suffered heavy losses, and the offensive bogged down. The Finns managed to hold out until late February 1940. The Mannerheim Line featured a high concentration of defensive structures, some of which could only be put out of action by direct hits from corps-level artillery weapons or super-heavy artillery. The Finns used a large number of antitank artillery guns, which made it difficult to defeat the bunkers. This situation gave rise to an acute need for self-propelled large-caliber guns with armor sufficient to at least protect against small arms and shrapnel.

At that time, Leningrad was the center of heavy tank and heavy SP gun development. In April 1938, a competition got underway between two design bureaus—the Kirov Factory and Leningrad Experimental Machine Building Plant No. 185 (S. M. Kirov). Plant No. 185 had acquired a great deal of experience developing tanks and SP guns (including the SU-7 and SU-14 discussed previously), but it only manufactured a few dozen vehicles between 1933 and 1940. The Kirov Factory could not boast of a large number of development projects, but it had one very well known product—the T-28 medium tank. In 1933, the factory's special design bureau, SKB-2, converted

that crude vehicle into the Soviet Union's main medium tank of the prewar period. So when the Defense Committee under the Council of People's Commissars signed Resolution No. 198ss, "On a Tank Armament System for the Red Army," on August 7, 1938, these were the two candidates for developing a breakthrough tank to replace the T-28 and T-35.

Plant No. 185 started work on the T-100 tank (often simply called "100" in correspondence), and SKB-2 began developing the SMK tank (named after Sergei Mironovich Kirov). Mockups of both tanks were displayed in October 1938. The prototype of the SMK tank had been built by May 1, 1939, and a T-100 prototype was ready by July 1 of the same year. By that time, the competition included a third project: SKB-2 had developed the KV breakthrough tank (named after Kliment Voroshilov) based on the SMK. The decision to manufacture the KV was made on February 27, 1939; a mockup was displayed in March, and a prototype had been built by September 1. In contrast to the twin-turreted SMK and T-100, the KV had a single turret and was smaller, enabling the thickness of the armor to be increased from 60 to 75 mm.

Proving-ground tests demonstrated that the KV was the most suitable model for use as a breakthrough tank. A decision had been made to produce a pilot batch of 15 tanks even before testing began. The fate of the SMK and the T-100 remained unsettled during the autumn of 1939, but both tanks were having problems with the AM-34 engine. However, the SMK was the preferred choice because the T-100's coil suspension was unsatisfactory, and the tank also had poor visibility. The main complaints about the SMK concerned the engine and cooling system, and the T-100 exhibited the same shortcomings. The war with Finland became a unique testing ground for the new breakthrough tanks. They were also seen as a potential platform for the development of self-propelled assault guns.

In mid-December 1939, the design bureaus at the Kirov Factory and Plant No. 185 were tasked by the Military Council of the Northwest Front to manufacture engineer tanks armored to protect against small arms and shrapnel. Plant No. 185 immediately began two projects: work got underway on an SP gun based on the T-100 chassis, and it was decided to add additional armor to the SU-14. Thus, instead of becoming a super-heavy SP gun, the SU-14 was turned into an armored bunker buster. It was thought that up-armoring finished SP guns would be the quickest solution, but in reality work was finished only on March 20, a week after the war ended. Also, the project to base a bunker buster on the T-100 chassis changed a great deal before production began. The vehicle was given the B-13 130 mm naval gun instead of the BR-2 super-heavy gun by order of Plant No. 185's director, N. V. Barykov. In addition, the project, which was given the designation T-100Kh (100Kh), had to be revised because the superstructure proved to be too complicated. The simplified version was designated the T-100U (100U; later we also encounter the SU-100U). The heavy SP gun had its first reliability trial on March 14; like the SU-14, it came too late for the war with Finland.

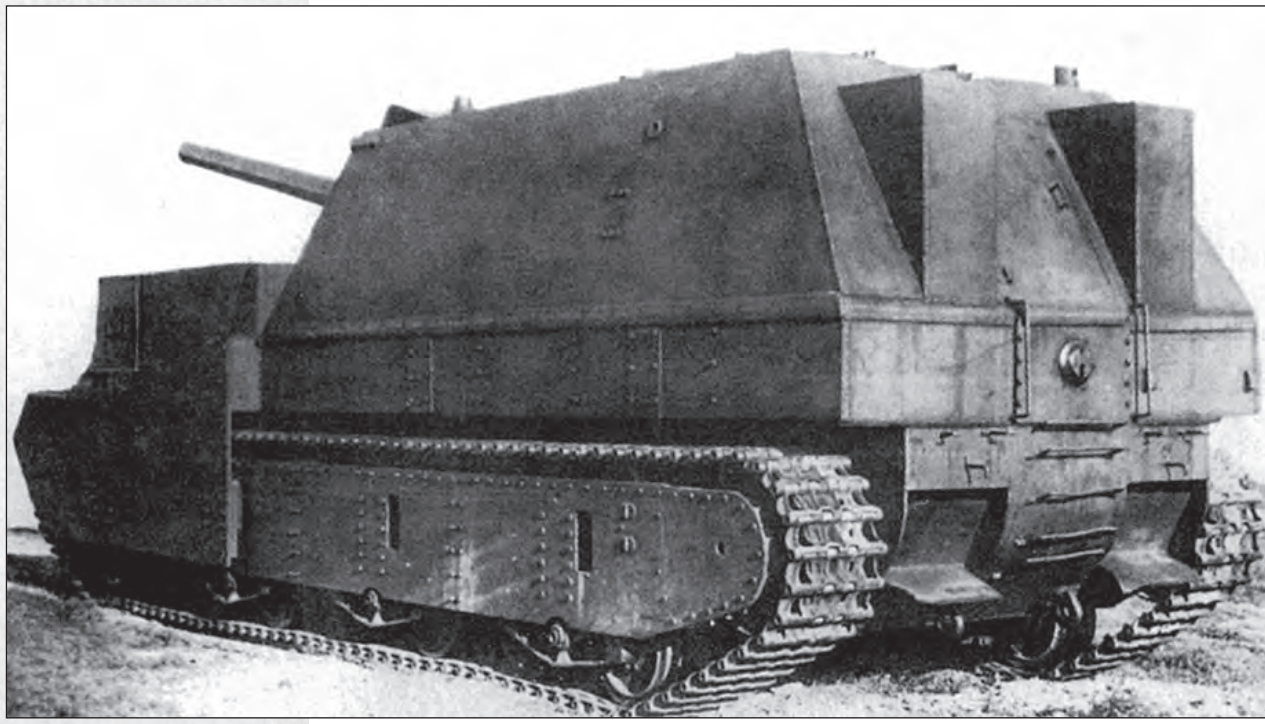
An SU-14, the first heavy Soviet SP gun built, 1934 (TsAMO RF).

The Kirov Factory took an entirely different approach. The KV prototype (serial number U-0) arrived from the front on January 1940. This tank had been the reference standard for the pilot batch. At the request of the Military Council of the Northwest Front, the first four tanks were equipped with 152 mm howitzers for use against bunkers. A larger turret was quickly developed for that purpose. A team of SKB-3 designers led by N. V. Kurin developed a plan to install the new turret within a very short period of time. The plan initially called for installation of the 152 mm howitzer model 1909/30; the system was assigned the designation L-21. In its final form, the assault version of the KV received the tank version of the 152 mm M-10 howitzer with a shortened barrel. This chassis was given the designation MT-1. On February 10, 1940, the modified U-0 underwent firing trials, and on the 17th the U-0 and U-1 tanks were sent to the front. The first "large-turret KVs" saw action on February 22, and by March 3 there were four tanks of that type at the front. They were unable to make a significant contribution to the breakthrough of the Mannerheim Line. Still, some received as many as 15 hits in battle without having their armor penetrated.

CHAPTER 2. **A New Chassis**

During the spring and summer of 1940, work was underway at the Kirov Factory and Plant No. 185 to design heavy SP guns based on the T-100 and SMK tanks. No final decision had yet been reached about the future of these two tanks. Plant No. 185 was struggling with the T-100 and vehicles based on it. In January 1940, Marshal G. I. Kulik had requested that a turret be developed for the T-100 to mount the M-10 152 mm gun. That version was designated the T-100Z. In April, designers at Plant No. 185 developed a project for a coastal defense tank based on the T-100. It was assigned the factory designation 103. It differed from the similar T-100U project in that it had the B-13 130 mm naval gun in a rotating turret. Similar projects were also underway at the Kirov Factory: correspondence indicates that there were projects for mounting the B-13 130 mm naval gun and even the B-1-P 180 mm naval gun on an SMK chassis. Unfortunately, information about these projects is unavailable.

SU-14 with added armor, 1940 (V. Len).



On June 11, 1940, a document appeared with the title "Proposals for Refining the Tank Armament System," which also made mention of the following SP assault guns:

1. *The KV tank must have a 76 mm gun with a muzzle velocity of at least 800 meters per second in order to have the capability of piercing 70–80 mm of armor. The gun must have a rapid-fire capability and a sufficient supply of rounds.*
   The gun currently most suitable for the purpose is the 76 mm antiaircraft gun model 1931. The tank must have armor between 90 and 100 mm in thickness.
2. *The KV-2 tank must have a 107 mm gun with a muzzle velocity of 730–750 meters per second in order to be capable of penetrating 100–110 mm of armor. The gun should be capable of rapid fire, possess excellent penetration capability, have a sufficient supply of rounds, and fire a time-fuzed shell in addition to an armor-piercing projectile.*
   The most suitable gun type at the present time is the 107 mm M-60.
3. *Have self-propelled, armored heavy artillery with the task of destroying reinforced concrete bunkers. As armament for the self-propelled turretless vehicle, use 122 mm, 152 mm, and 180 mm guns.*
   a) *The most realistic way of solving this problem is to manufacture and mount a 100–130 mm gun on a tank chassis and equip it with an armor-piercing projectile capable of penetrating 130–150 mm of armor.*
   b) *As a matter of urgency, build a prototype for mounting the 152 mm gun model 1935 (BR-2) on the SMK tank chassis and equip it with an armor-piercing shell system capable of penetrating 150–160 mm of armor and a concrete wall 1.5 m thick.*
      The gun must be protected by 60–70 mm of armor, and the entire system must weigh no more than 65 tonnes.
   c) *Mount a 180 mm gun on a turretless vehicle (the SMK chassis) and modify the suspension as needed and reduce the armor thickness in order to decrease the weight.*
4. *For the transition period, adopt the following solutions:*
   a) *KV tanks—produce tanks armed with the 152 mm howitzer model 1938 (M-10).*
   b) *The KV tank—produce tanks armed with the L-11 76 mm guns having rounds with normal propelling charges.*
   c) *Immediately begin designing a chassis for the 76 mm antiaircraft gun model 1931 and the 107 mm gun (M-60).*
   d) *Immediately begin production of the T-100 with the 130 mm gun and, as a matter of urgency, mount the 152 mm gun model 1935 (BR-2) on the SMK chassis.*
   e) *Mount the 122 mm or 152 mm gun on the T-35 and test its added armor at the same time.*

The T-100 heavy tank served as the base chassis for development of the first specialized bunker buster (V. Len).

f) Have two types of T-34 tanks: a model equipped with the 45 mm gun and one equipped with the 76 mm gun. Improve the armor penetration of the 45 mm projectile and begin production of the F-32 or F-34 76 mm gun.

g) Arm all tanks with DS machine guns having thicker barrels capable of more prolonged firing than the DT. [1]

Note that the Kirov Factory's brainchild was considered the highest priority platform for heavy SP guns. A note made by Military Engineer 3rd Class P. K. Voroshilov on June 27, 1940, bears eloquent witness of that fact (the adopted son of Marshal Kliment Voroshilov, he oversaw the development of Soviet heavy tanks):

Regarding the use of the tank as the chassis for super-heavy SP artillery, the most suitable model is the SMK. The arguments in favor of choosing it are that the SMK was the prototype for the KV tank, they have interchangeable suspensions, and parts of their transmissions are also interchangeable. Now, having worked backwards for commonality, we can achieve complete interchangeability of all transmission and suspension assemblies on both tanks.

This interchangeability will benefit tank production and cause no difficulty in supplying military units with spare parts. [2]

[1] TsAMO RF, collection 38, series 11355, file No. 10, pp 87–88.

[2] TsAMO RF, collection 38, series 11355, file No. 6, p. 53.

The future of the SMK and the T-100 had been conclusively decided by late June of 1940. The results of comparison tests made it clear that neither tank would enter the inventory, because there was the better-protected KV, which also weighed less. The "large-turret KV" emerged as a temporary solution to the bunker buster problem: mass production of tanks had begun in July 1940.

As mentioned above, the "large-turret KV" was a temporary solution to the problem of developing a heavy SP assault gun. The vehicle developed by Kurin's team was essentially an oversized support tank like the BT-7 artillery tank (which is frequently called the BT-7A—but that designation belongs to a different tank). A major advantage was that the tank based on the KV chassis (designated the KV-2 in 1941) shared a great many common components with the base vehicle. It is worth noting that the KV-2 suffered from a large number of deficiencies. The KV chassis would only support a gun of limited power, whereas the military's specifications called for a bunker buster equipped with the BR-2 gun. The small turret made it difficult to load the M-10T gun. In addition, having a rotating turret did not mean that the tank could fire at any angle.

T-100U (SU-100U) SP gun, 1940 (ASKM).

Zh. Ya. Kotin, chief designer of the Kirov Factory, photo dated November 1937 (V. Len).

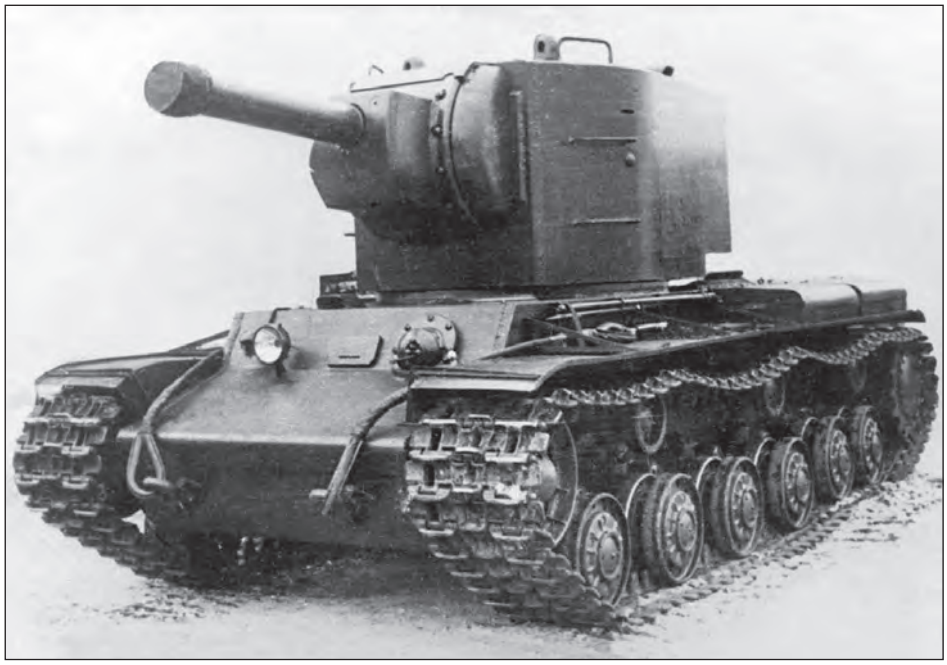
After the SMK and T-100 programs ended, it was decided to concentrate on developing a heavy tank by upgrading the KV. The proposal for a new tank armament system introduced a number of changes: the 180 mm gun was abandoned in favor of the B-13 and BR-2 guns. On July 17, 1940, the Defense Committee under the Council of People's Commissars issued decree No. 198ss giving the go-ahead to develop armored vehicles based on the KV chassis. According to this decree, the Kirov Factory was to manufacture the following vehicles:

a) KV tanks (T-220) with 100 mm of armor: one must be equipped with the F-30 85 mm gun, and the other with the F-32 76 mm gun;
b) Two prototype KV tanks with 90 mm of armor: one must be equipped with the F-32 76 mm gun, and the other with the F-30 85 mm gun;
c) One prototype vehicle armed with the BR-2 152 mm gun.[3]

The factory assigned the KV with 90 mm of glacis armor the factory designation 150 (the designator T-150 was used in correspondence of the Red Army's Main Armored Forces Directorate [GABTU]). In November 1940, the tank served as the basis for a vehicle featuring the F-32 76 mm gun and a commander's cupola. Plans called for this tank to replace the KV-1 in production under the designation KV-3.

The tank known as the 220 was very different from the KV. The hull was elongated and the number of road wheels on each side was increased to seven. A new turret with the F-30 85 mm gun was designed for the T-220. The

KV-2 heavy tank, the first Soviet assault tank (V. Len).



[3] TsAMO RF, collection 38, series 11355, file No. 10, p. 76.

T-220 heavy tank. After the SMK and T-200 programs were killed, it came to be seen as the base chassis for a future heavy SP gun (TsAMO).

850 hp V-2F (V-10) engine served as its powerplant. This tank was completed on December 5, 1940.

The operational requirement for designing a 152 mm SP gun was issued in late August 1940. It should be noted that the operational requirement was signed only by Maj. Gen. Savchenko, deputy chief of the Main Artillery Directorate (GAU); GABTU chief Lt. Gen. Fedorenko did not add his signature to the document. The operational requirement was seven pages long. Therefore, only a portion of it will be quoted here:

I. General characteristics.
1. Vehicle type: tracked, armored
2. Total weight: not more than 55 tonnes
3. Dimensions: of a size allowing rail transportation in Western Europe.
4. Speed: 35 km maximum
Maximum gradient on solid ground: 35°
5. Armament:
BR-2 152 mm gun: one (with recessed rifling)
DT machine guns: three (with one configured for antiaircraft fire)

PPD pistols: two
Gun depression angle: minus 3°; the machine-gun dead space must not exceed 10 meters
Elevation angle: maximum possible
The gun must traverse an angle of at least 10°.
The machine-gun traverse angle must be at least 30°.

6 *Combat load:*
152 mm projectiles: 50
Machine-gun cartridges: 3000
F-1 hand grenades: 30
PPD cartridges: 1000

7. *Mobility:*
Gradient: at least 40°
Side slope: at least 30°
Vertical step: at least 0.8 m
Trench: at least 3.0 m
Ground pressure: not more than 0.70 kg/cm²
Ford (unprepared): at least 1.5 m

8. *Fuel endurance: at least 10 hours of engine operation*

9. *Crew: 8*
Provide a capability for the crew to move around inside the vehicle (without exiting it).
Note: the installation and design of the gun must allow for firing at a 20° angle of depression.

10. *Communications equipment:*
For external communication: a shortwave quartz radio and a set of flags
For internal communication: an intercom system at four locations (commander, driver, gunner, radio operator)
A rod antenna that can be lowered alongside the vehicle from the inside

11. *Armor protection.*
Armor thickness:

Glacis	*75 mm*
Side	*60 mm*
Turret	*60 mm*
Roof	*30 mm*
Bottom	*40 and 30 mm*

The armor must be sloped at least 20°.

12. *Engine: V-2K diesel engine supercharged to 850 hp.*

13. *Observation and aiming devices.*
In the turret, a PT-1 from the 45 mm tank gun and a new 6x telescopic sight with a 6–11° field of view.
Mount a cupola for the commander with 360° visibility on the vehicle roof.
Vision blocks with mirrors may be used.

BR-2 152 mm gun mod. 1945.
This gun, which could penetrate a concrete wall up to 2 meters thick, was the highest priority armament for future bunker busters (YuP).

Provide the driver-mechanic with a vision block for forward vision and an optical device with a mirror in the vehicle roof for observation to the sides.
Provide a vision block with a mirror for the radio operator.
All vision devices must be designed to prevent projectiles, bullets, lead spray, and burning liquid from entering the tank through them.
Provision must be made for replacing vision devices, their heads and lenses, and the crew must be able to safely clean them from inside the vehicle.

14. Special equipment:

a) The driver's position must be designed for maximum comfort when driving the vehicle.
b) Locate the instrumentation for easy visibility by the driver and keep it to a minimum.
c) Provide protection for the driver against wind, dust, and rain when driving with the hatch open.
d) Use KV-type seats for the driver, radio operator, and all turret seats.
e) Power steering may be installed to facilitate driving.

f) Provide for cleaning and heating the air in the fighting and driving compartments.
g) Provide a gyrocompass for the driver.
h) Develop tools for facilitating the mounting of tracks, for removing the main assemblies and armor from the hull, and for self-recovery of the vehicle.
i) Develop a simple hoist for projectiles.[4]

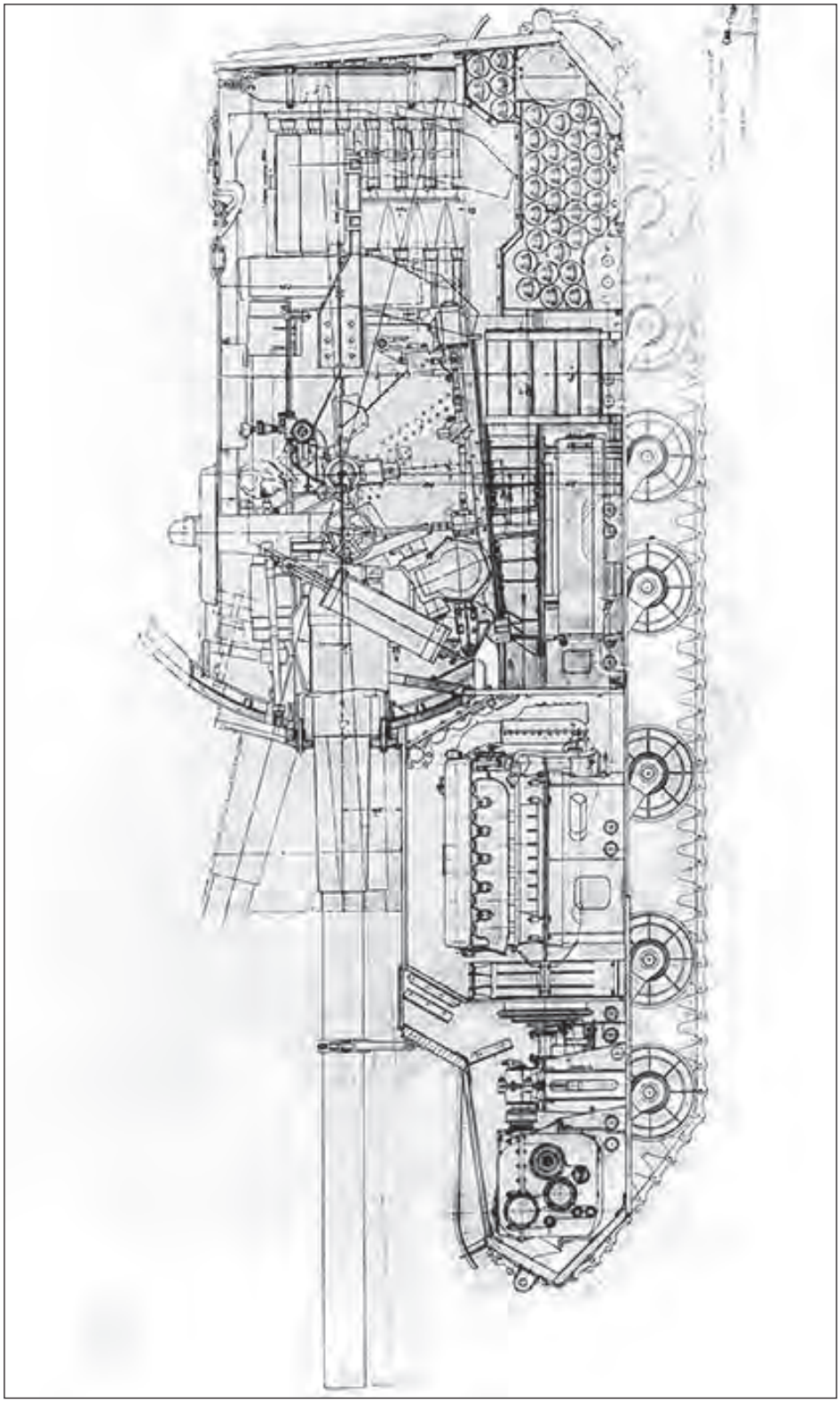
The SP gun that the Kirov Factory was tasked to develop was assigned the factory designation 212 (it has often been called Object 212). The lead designer on the SP gun project was Ts. N. Golburt. This was the second vehicle with the same designation: a recovery vehicle based on the KV chassis had also developed under the designation 212. Therefore, the SP gun was often referred to as the 212A. Self-propelled gun 212 resembled an up-armored SU-14-1, especially in the arrangement of its fighting compartment. The chassis of the 212 was a reworked 220 (T-220) chassis with the engine compartment located in the center of the vehicle and the transmission and drive wheels in the front. The driver's compartment was located in the bow, with only enough space for the driver-mechanic. The fighting compartment was located in a large superstructure at the rear of the vehicle. On the one hand, this design significantly increased the vehicle's overall size; on the other hand, it improved crew comfort. In addition, placement of the superstructure at the rear made it possible to reduce the extent to which the BR-2 152 mm gun extended beyond the vehicle.

The sum allocated for development of the 212 was 2 million rubles. Of that amount, 100,000 rubles went for development of the engineering design; 25,000 for constructing the mockup; 300,000 for drawings; 75,000 for revising the drawings; 1,100,000 for manufacturing a prototype; 100,000 for testing; and 300,000 for maintenance. That figure did not include the cost of armament.

Plans called for manufacturing the SP gun prototype by December 1, 1940. However, it became necessary to make major adjustments to the plan. On December 10, 1940, the GAU's Artillery Committee received a letter from the Kirov Factory signed by Zh. Ya. Kotin, head of SKB-2; P. F. Fedorov, head of SKB-4; and Ts. N. Golburt, the system's chief designer. The letter contained a large number of comments on the operational requirement concerning issues that had arisen during design of the SP gun:

I. The vehicle weight of 55 tonnes stipulated in the operational requirement cannot be met with the armor specified for the following reasons:
1) The operational requirement states that the vehicle must be designed using the KV chassis and powertrain. The weight of these components, which totals 17,400 kg (excluding the engine with its fuel and cooling systems), cannot be reduced.
2) As installed on the vehicle, the BR-2 and its ammunition package weigh 17,600 kg.

[4] TsAMO RF, collection 81, series 12104, file No. 147, pp. 47–49.



Cross-section of SP gun 212 (ASKM).

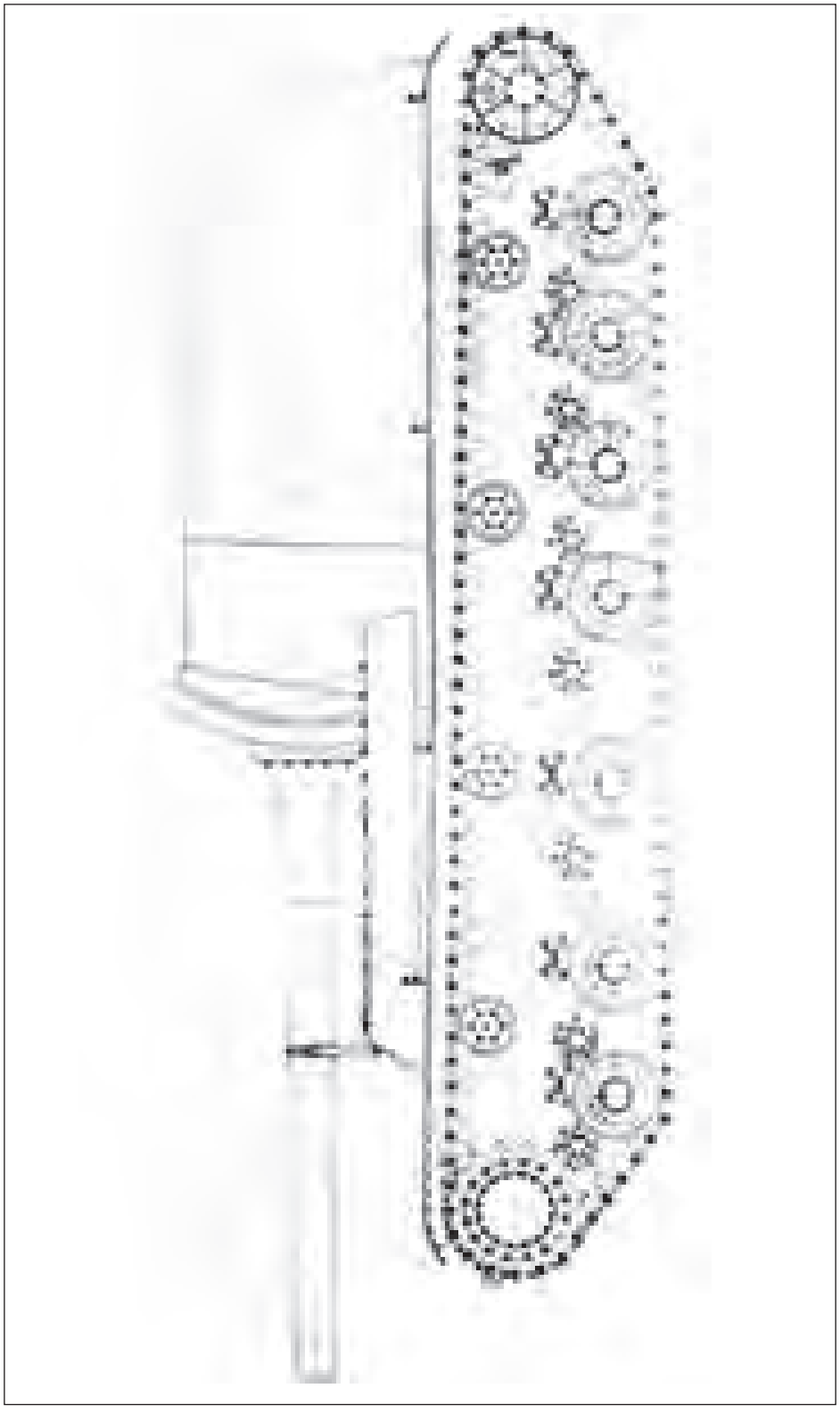
3) The machine guns, ammunition, observation turret, seating, radio, fuel, crew, spare tools and accessories kit, etc., weigh 3000 kg.
4) Therefore, if the vehicle is to weigh 55,000 kg, the weight of the hull with (fixed) turret must be 17,000 kg.

The large size of the system results in the following hull dimensions:
Length: 7900 mm, width: 1920 mm, and height to top of turret: 2570 mm (from the bottom of the vehicle).
A weight of 17,000 kg is clearly not feasible for a hull of that size.
The size of the hull cannot be further reduced.
The hull of the SMK-1 may be taken as an example of a hull of similar size. Fitted with 60 mm of armor (side, glacis, turret), a bottom thickness of 30 and 20, and a roof thickness of 30, it weighed 31 tonnes (with turrets).
The armor thicknesses listed in the operational requirement are as follows:
Glacis: 75 mm
Side: 60 mm
Turret: 60 mm
Top: 30 mm
Bottom: 40 and 30 mm
It is impossible to design a vehicle weighing 55 tonnes with a hull and turret weighing a total of 17 tonnes.
Our design is armored as follows:
Side: 60 mm
Glacis: 60 mm (slope: 30°)
Lower front plate: 50 mm (slope: 45°)
Lower rear plate: 50 mm (slope: 40°)
Turret: 60 mm (slope: 10°)
Bottom front: 30 mm
Bottom rear: 20 mm
Top: 20 mm

The weight of the vehicle without fuel, ammunition, and crew is 60 tonnes.
The combat weight of the vehicle is 65 tonnes.
At a weight of 65 tonnes, its ground pressure without armament is 0.83 kg/cm².

II 1. In comparison with the BR-2 field gun, the laying rate is reduced by 33% in elevation and 10% in traverse.
The efforts required to operate the hand wheels are as follows: elevation: up to 10 kg; traverse: up to 8 kg.
2. The current recuperator mechanism design does not support firing at a depression angle of 3°.
3. The traverse angle is 4°, the same as the original field gun.
4. The combat load consists of 47 projectiles. There is no projectile hoist; there is a loading tray similar to the M-10 on the KV.
5. The vehicle's dimensions fit within loading gauge "0", and its corners come close to the limits for structure gauge "0".[5]

[5] TsAMO RF, collection 81, series 12104, file No. 147, p. 46.



Factory drawing of bunker buster 212 (V. Len).

The situation caused a heated debate in two directorates. Development of SP guns was overseen by the GAU, and the GBTU was frequently at odds with the artillerymen. In the case of the 212, the GAU oversaw work on the gun, and GABTU was in charge of the chassis. The artillerymen looked for various ways to solve this problem, as eloquently stated in a letter that M. M. Zhevannik, head of the second department of the GAU's Artillery Committee, wrote on December 26, 1940, to Military Eng. 1st Class Komarov, chief of the Field Artillery Directorate's Science and Technology Department (NTO UVNA):

Since vehicles are the responsibility of the NTO UVNA, the conclusion and report on the Kirov Factory's letter should be written by NTO UVNA.

I hereby provide the opinion of the Artillery Committee's second department on the issue:

1. Based on its preliminary engineering analysis, the Kirov Factory believes that the combat weight of the vehicle with the BR-2 gun will be approximately 65 tonnes instead of the 55 tonnes stipulated in the draft operational requirement.

In view of the fact that the maximum weight of a vehicle that may be loaded on a railcar must not exceed 60 tonnes and the weight of the vehicle without munitions, crew, and fuel will be approximately 60 tonnes, the Artillery Committee's second department believes that a deviation from the specified weight (55 tonnes) can be accepted if a weight reduction of 2 tonnes is achieved by slightly decreasing the thickness of the turret armor.

A smaller weight reduction can be achieved by replacing the BR-2 with the BR-13 gun.

2. Without examining the design drawings, the Artillery Committee's second department is unclear about the reason for reducing the traverse rate as compared with the BR-2 field gun.

3. We believe that the BR-2 laying devices should be used with just the attachment points changed.

In order to be capable of firing at depression angles on the order of -15–20° and retaining air in the recuperator while moving down a slope, we suggest that the Kirov Factory lengthen the tubes in the recuperator. The increased tube length must be such that air is still reliably retained at elevation angles on the order of 35°.

4. The 8° (+/-4°) traverse angle should be considered satisfactory.

5. The reduction in the number of rounds in the combat load from 50 to 47 is consistent with the draft operational requirement.[6]

All of the Kirov Factory's suggestions were eventually accepted. According to the GABTU's report on the project, assemblies for the 212 had been manufactured by January 1941. A manufacturing plant had also been developed for the SP gun and drawings had been sent to the Izhor Factory for manufacturing the hull. By that time, a total of 1.5 million rubles had been spent on the project. Work on the SP gun was delayed because the T-150 and T-220 had a higher priority, and there were also problems of a different

[6] TsAMO RF, collection 81, series 12104, file No. 147, pp. 43–44.

nature. As of February 24, 1941, work on the "self-propelled object" had reached the following stages:

Drawings of parts, units, and assemblies are complete. Orders to manufacture the parts have not been sent to the shop and will not be sent until March 1, 1941. The hull and turret are in the production stage at the Izhor Factory and will be complete only on March 1, 1941.

The hull for the first SP gun was not received from the Izhor Factory until March 5, 1941. According to the report, assembly was delayed due to lack of parts. Meanwhile, a situation was developing at the Kirov Factory in the spring of 1941 that caused the 212 to gradually fade into the background. The Kirov Factory had received an urgent order to develop a heavy tank, which inherited the designation KV-3 from the T-150. This project, which received the factory designation 223, was developed from the T-220. The thickness of the glacis armor was increased to 120 mm, and it was given a new turret with the ZIS-6 107 mm gun. The combat weight of the KV-3 was estimated at 68 tonnes. Development of this tank was driven by intelligence about the appearance of a German heavy tank. The Kirov Factory also began designing the KV-4 and KV-5 heavy tanks. The combat weight of the KV-5 was 100 tonnes. All this was in addition to the fulfillment of plans for two other projects that were being pushed, the KV-1 and KV-2. With this workload, progress on the 212 came to a standstill beginning in the second half of March 1941. In both April and May 1941, progress reports on the "self-propelled gun based on the KV chassis" reflected "no change."

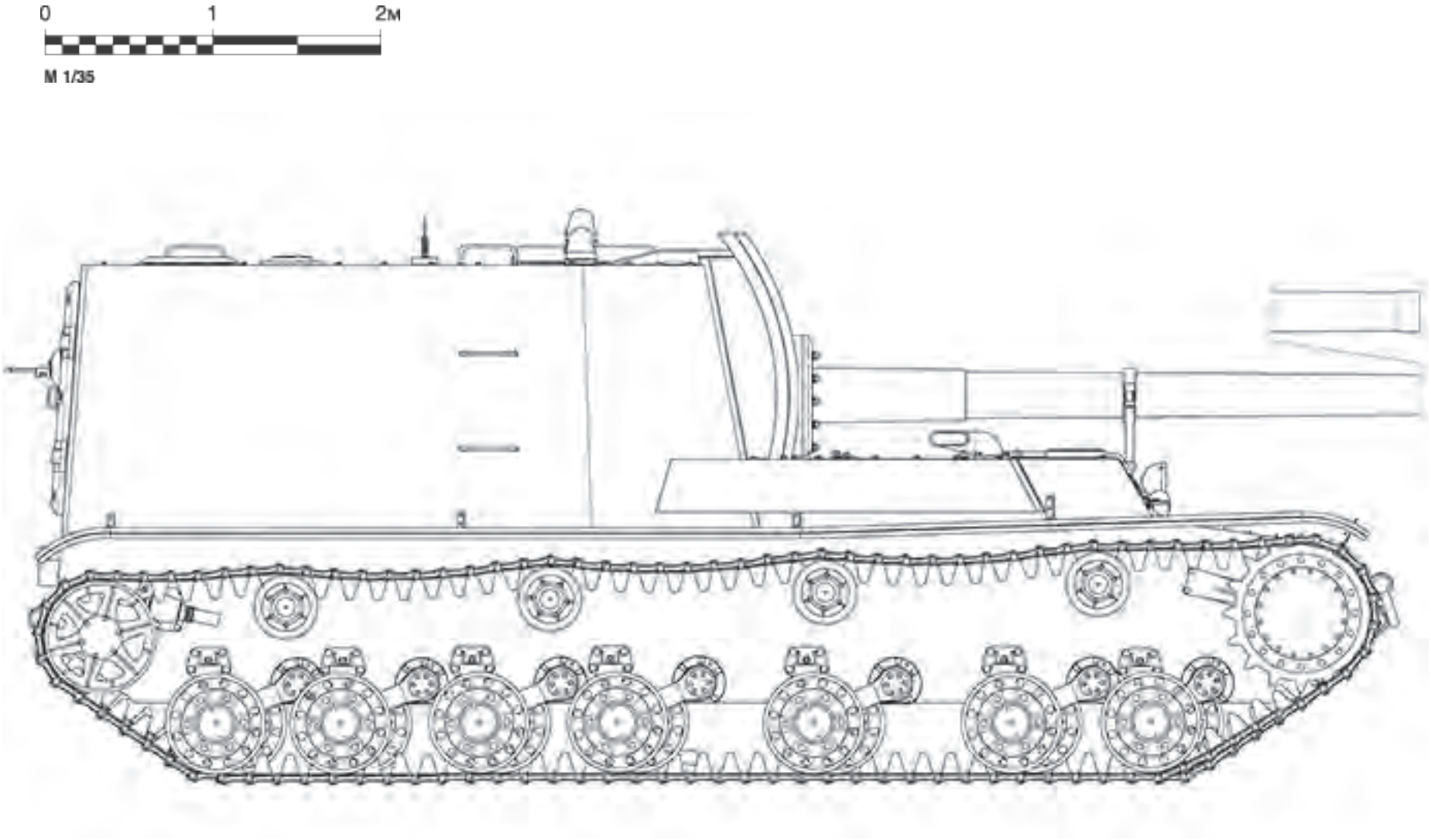
The GABTU had somewhat different plans for the bunker buster. According to a GAU report on development work dated May 22, 1941, plans called for manufacturing 12 type-212 SP guns, with an estimated cost of 300,000 rubles for the BR-2 system. Somewhat later, the number of SP guns was cut back to 10 vehicles, and the cost of a system grew to 1 million rubles.

The decree "On Self-Propelled Artillery" issued May 27, 1941, by the Council of People's Commissars and the Central Committee clearly demonstrates the serious nature of the plans for manufacturing an SP gun with the BR-2 gun. That document, which must have been signed by Joseph Stalin, said the following:

The Council of People's Commissars of the USSR and the Central Committee of the All-Union Communist Party (Bolshevik) decree that:

1. *The inventory of the Red Army shall include the following types of self-propelled guns:*

   1) SP bunker busters;
   2) SP tank destroyers;
   3) Assault artillery for supporting the mechanized infantry;
   4) SP antiaircraft guns.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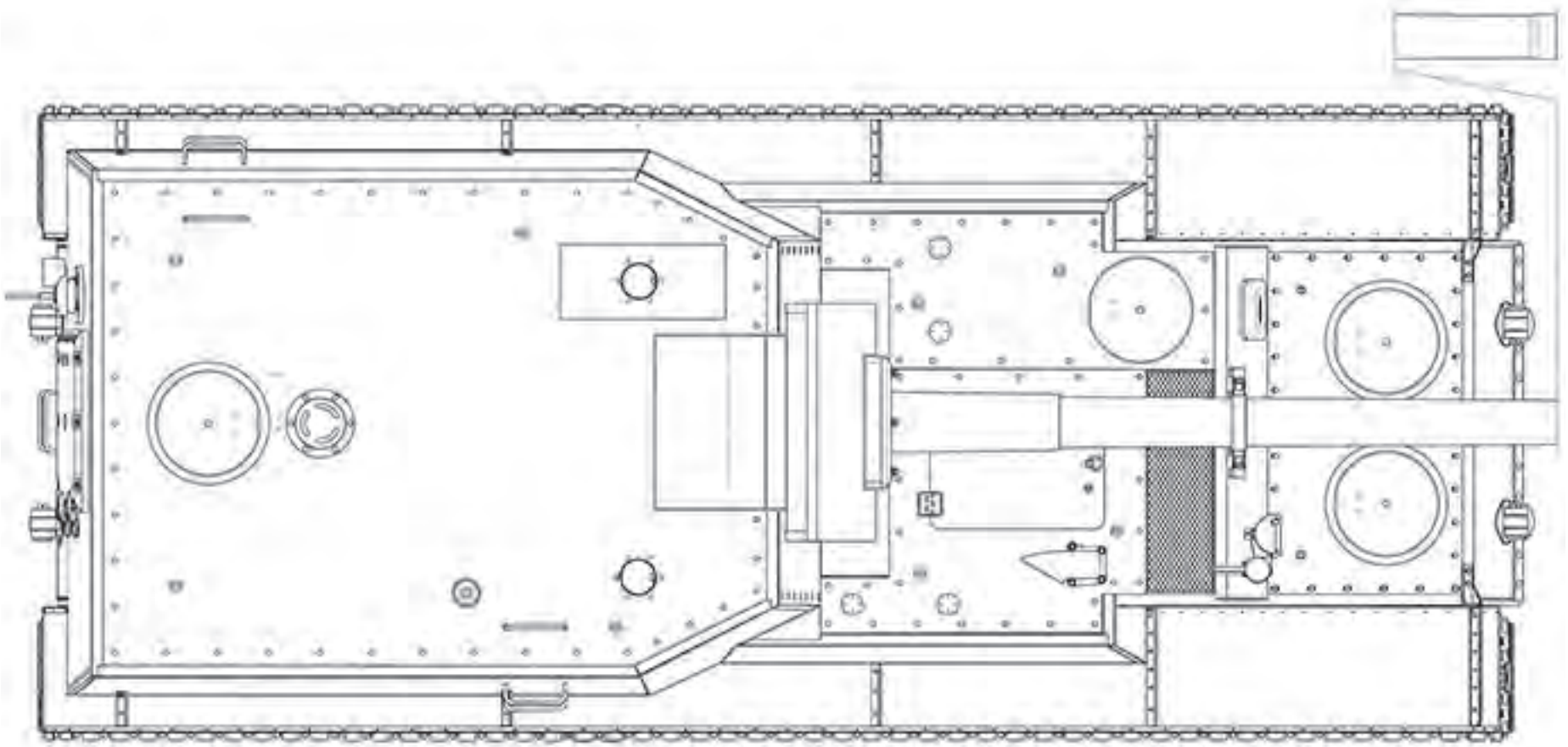
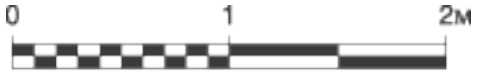


Bunker buster 212, 1:35 scale drawing.



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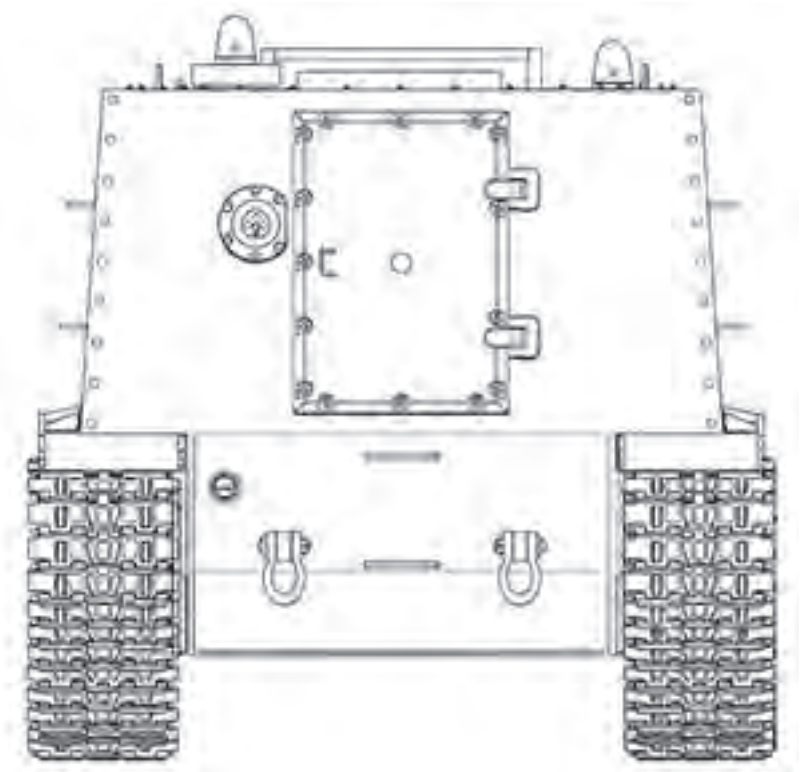
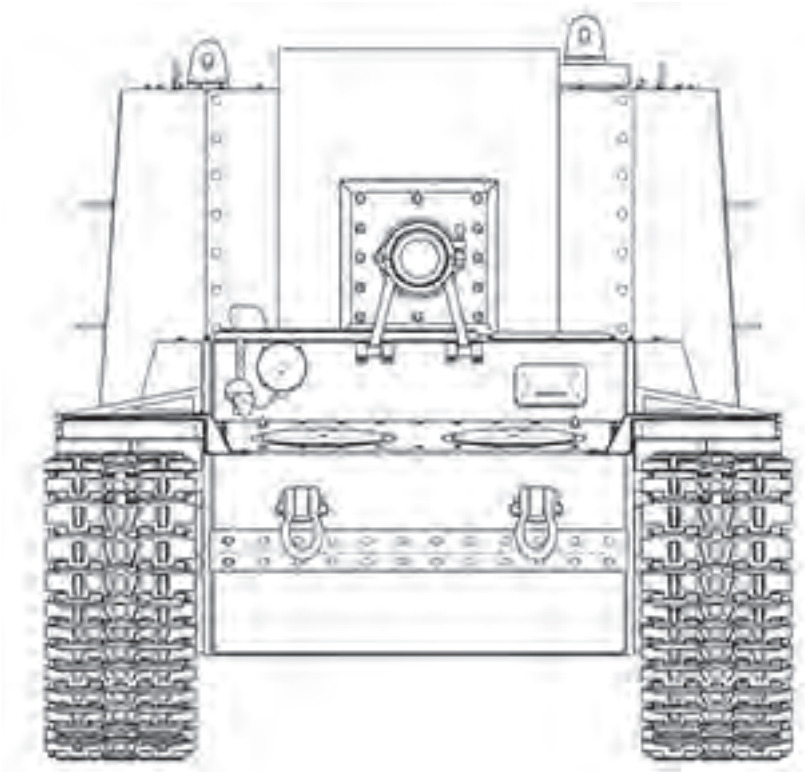
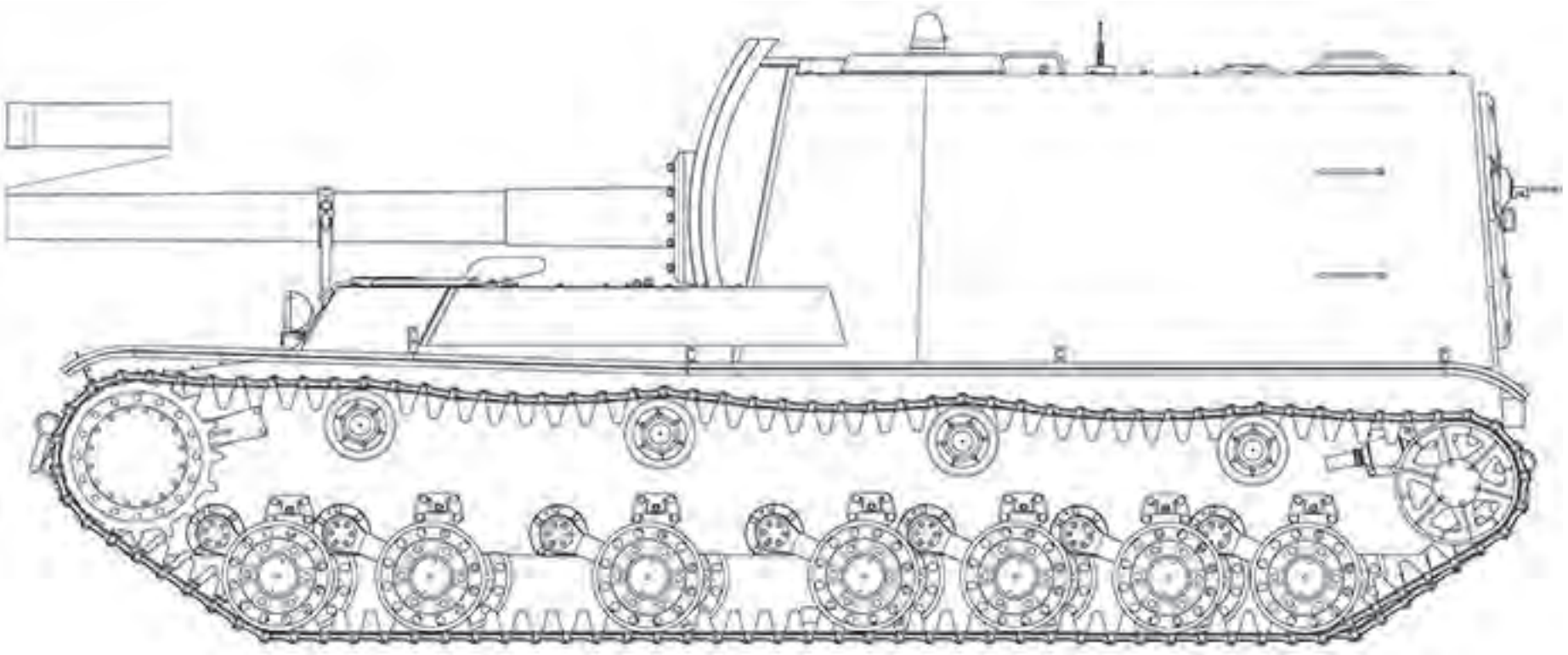






Bunker buster 212, 1:35 scale.

It shall also have special self-propelled vehicles for transporting ammunition and motorized infantry soldiers.

II The following steps shall be taken to acquire these arms:
1. Bunker busters.

To carry out the decree of the Council of People's Commissars of the USSR and the Central Committee of the All-Union Communist Party (Bolshevik), the People's Commissariat of Heavy Machine Building shall deliver self-propelled 152 mm BR-2 guns on KV-3 tank chassis to the People's Defense Commissariat during the following months:

August: 1 unit
September: 2 units
October: 2 units
November: 3 units
December: 2 units

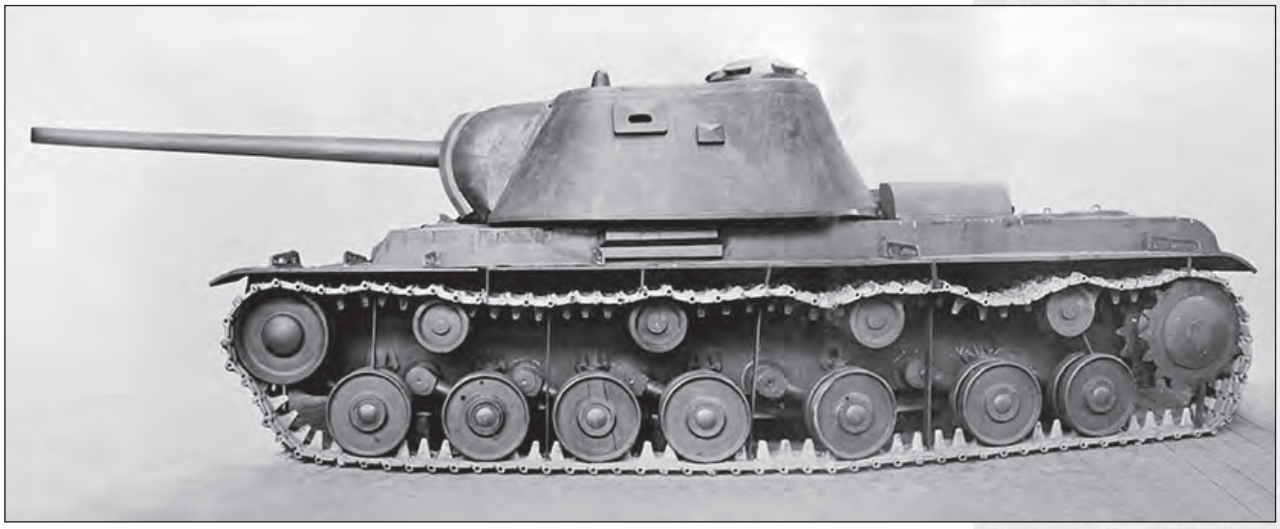
shall provide the Kirov Factory hulls and armor parts for these vehicles one month prior to delivery of the completed vehicles to the People's Defense Commissariat.

Within 20 days after receiving the first vehicle, the People's Defense Commissariat shall subject it to testing.[7]

It should be noted that reference to the KV-3 as the base chassis did not mean the self-propelled gun had undergone a radical change. As mentioned above, the KV-3 was developed from the T-220, so the chassis change was basically a paper exercise. The May 26, 1941, operational requirement No. 1397 "for design of a 152 mm self-propelled gun" said as much. Here is a short quote from that operational requirement:

I. General characteristics.
1. Vehicle type: tracked, armored
2. Full combat weight with ammunition, fuel, water and crew: not more than 65 tonnes
Shipping weight: not more than 60 tonnes
3. The overall dimensions of the system on a railcar must be limited to 3500 mm in width and 5300 mm in height (from the rails); that is, the vehicle must not exceed the zero-gauge parameters.
4. Speed: 30 km/h maximum.
Maximum gradient on solid ground: 30°
5. Armament:
BR-2 152 mm gun
DT machine guns: two
PPD pistols: two

[7] TsAMO RF, collection 38, series 11355, file No. 190, pp. 49–50.



Model of the KV-3 heavy tank. Beginning in the spring of 1941, this tank's chassis came to be viewed as the base for the 212A SP gun (TsAMO).

Angle of depression of the gun: minus 3°; the machine-gun dead space must not exceed 10 meters.
Gun elevation angle: +15°
Gun traverse angle: +/- 4°
Traverse angle:
Rear machine gun: at least 30°
Bow machine gun (radio operator): at least 15°

6. *Combat load:*
   152 mm projectiles: 47
   Machine-gun cartridges: 3000
   F-1 hand grenades: 30
   PPD cartridges: 1000
7. *Mobility:*
   Gradient: at least 30°
   Side slope: at least 25°
   Vertical step: at least 0.8 m
   Trench: at least 3.0 m
   Ground pressure: not more than 0.85 kg/cm²
   Ford (unprepared): at least 1.5 m
8. *Fuel endurance: at least 10 hours of engine operation*
9. *Crew: 7*
   Provide a capability for the crew to change position inside the vehicle (without exiting it).
   Note: the installation and design of the gun must allow for firing at a 5° angle of depression.
10. *Communications equipment:*
    For external communications: a shortwave (10R), quartz radio and a set of flags

For internal communication: an intercom system at four locations (commander, driver, gunner, radio operator)

Rod antenna

11. Armor protection.

Armor thickness:

1) Glacis: 60 mm
2) Side: 60 mm
3) Lower front plate: 50 mm
4) Lower rear plate: 40 mm
5) Turret: 60 mm
6) Top: 20 mm
7) Bottom: 20 mm

The armor must be sloped at least 10° on the front and sides and -5° on the rear wall.

12. Engine: V-2K turbocharged diesel engine of 700–850 hp

13. Observation and aiming devices.

In the turret, a PT-1 from the 45 mm tank gun and a KT-1 telescopic sight.

Mount a cupola for the commander with 360° visibility on the vehicle roof.

Vision blocks with mirrors may be used.

Provide the driver-mechanic with a vision block for forward vision and an optical device with a mirror in the vehicle roof for observation to the sides.

Provide a vision block with a mirror for the radio operator.

All vision devices must be designed to prevent projectiles, bullets, lead spray, and burning liquid from entering the tank through them. Provision must be made for replacing vision devices, their heads and lenses, and the crew must be able to safely clean them from inside the vehicle.

14. Special equipment:

a) The driver's position must be designed for maximum comfort when driving the vehicle.
b) Locate the instrumentation for easy visibility by the driver and keep it to a minimum.
c) Provide protection for the driver against wind, dust, and rain when driving with the hatch open.
d) Seats must be provided for the entire crew while the vehicle is in motion.
e) Power steering may be installed to facilitate driving.
f) Provide for filtering and heating the air in the fighting and driving compartments.
g) Develop tools for facilitating the mounting of tracks, for removing the main assemblies and armor from the hull, and for self-recovery of the vehicle.
h) Develop a folding tray to facilitate loading.[8]

[8] TsAMO RF, collection 81, series 12104, file No. 147, pp. 77–80.

B-13 130 mm naval guns undergoing assembly at the Bolshevik Factory. This gun and others with its ballistics were frequently used as armament for SP guns (V. Len).

In addition to SP gun 212, work also continued on a vehicle armed with the B-13 130 mm naval gun. This SP gun, later dubbed the SU-B-13, was first mentioned in a December 26, 1940, letter written by M. M. Zhevannik. Marshal Gregory Kulik also mentioned it in passing in an April 17, 1941, letter to Stalin, and he also discussed a different caliber for a similar SP gun:

Based on our analysis of the penetrability of the armor on Red Army artillery systems and the trends toward increasing armor protection of foreign tanks, I consider it urgent to increase the power of our antitank and tank artillery. To accomplish this, I believe we need to take the following actions:

<...>

III. Self-propelled guns:

To combat super-heavy tanks and bunkers, we must develop self-propelled guns with the following heavy artillery systems: the BR-2 152 mm gun, the B-13 130 mm gun, and the powerful new 107 mm gun. The BR-2 152 mm gun is capable of defeating 155 mm of armor at a 0° angle of incidence from a range of 2300 meters. The 130 mm gun can penetrate 130 mm of armor at a 0° angle of incidence from a range of 4000 meters, and the new 107 mm gun should penetrate 160 mm of armor at a 30° angle of incidence from a range of 1000 meters.

The 152 mm self-propelled gun has been developed, and a prototype is being manufactured at the Kirov Factory.

An elongated KV-4 tank chassis was used as the base vehicle.

The vehicle with the 152 mm gun weighs 65 tonnes.

The vehicle is equipped with armor 60 mm thick.

Ammunition for the M75 107 mm antitank gun (TsAMO).

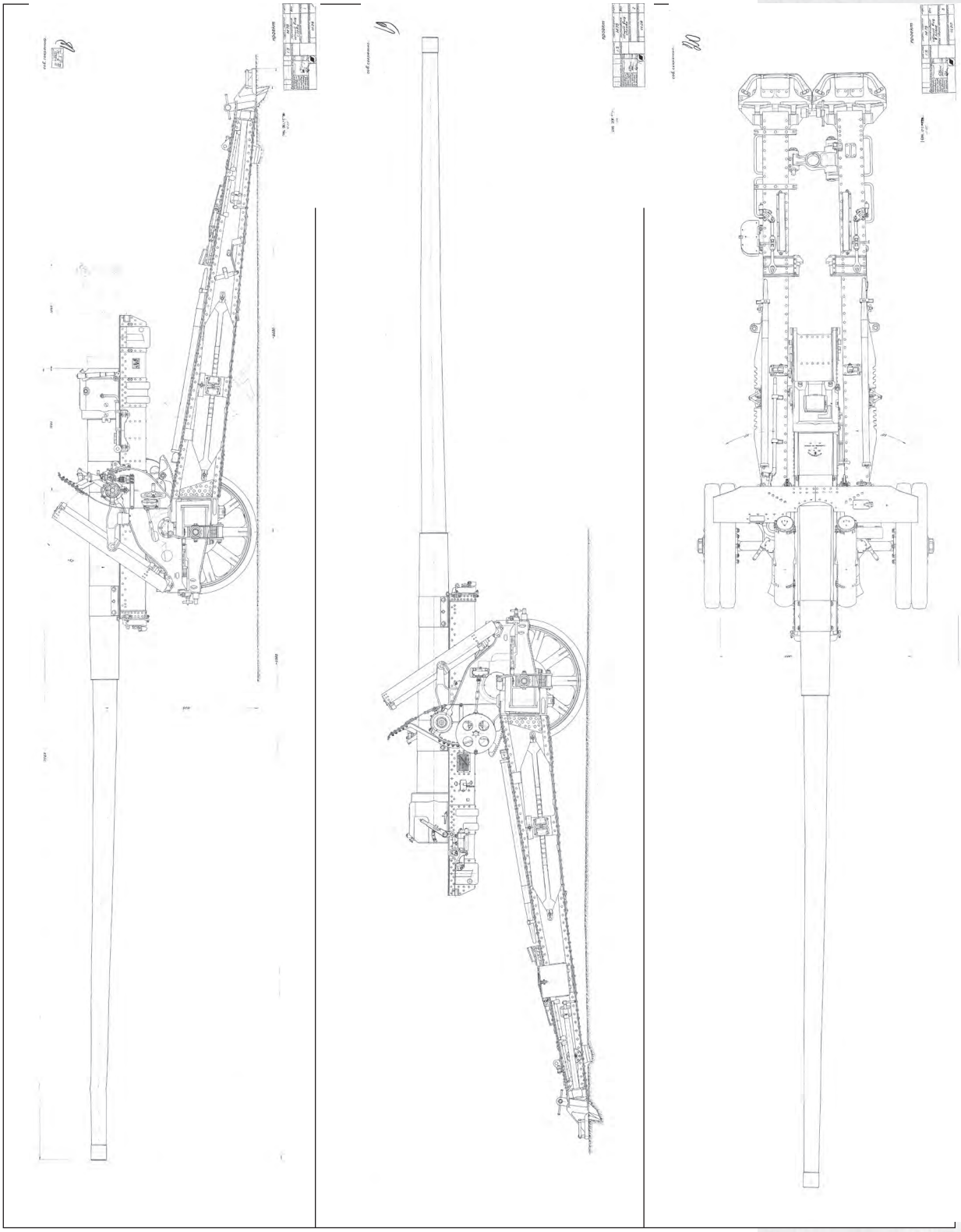
Under a February 7, 1941, decree issued by the Council of People's Commissars of the USSR and Central Committee of the All-Union Communist Party (Bolshevik), the People's Commissariat of Heavy Machine Building has been tasked with producing 10 vehicles mounting the BR-2 152 mm gun at the Kirov Factory this year.

The People's Commissariat of Heavy Machine Building must be required to deliver the prototype of this self-propelled gun by June 1, 1941, and manufacture the remaining systems this year.

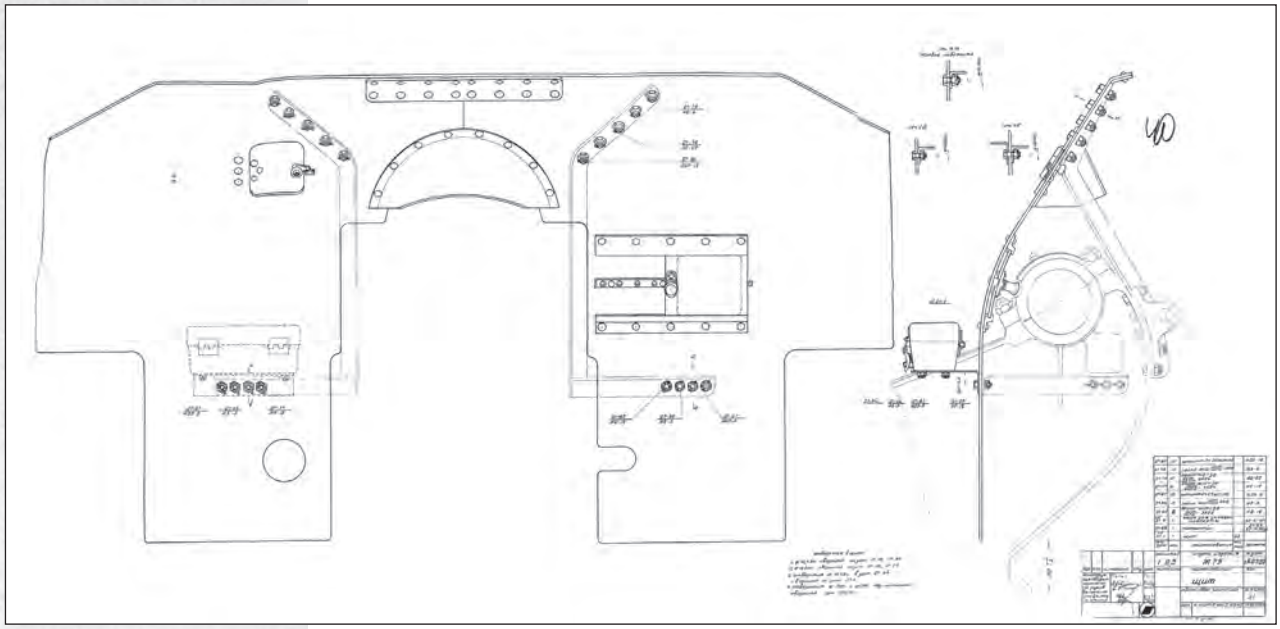
In addition, the People's Commissariat of Heavy Machine Building must produce a prototype of the 130 mm self-propelled gun by September 1 and a prototype of the 107 mm self-propelled gun by October 1. The chassis used for the 152 mm system is also being used for these systems. A B-13 130 mm gun has already been delivered to the factory. The People's Commissariat of Arms must be required to manufacture the new 107 mm gun's tipping parts at Factory No. 172 and deliver it to the Kirov Factory by June 1941.[9]

In the spring of 1941, there were already two promising 107 mm antitank guns. In addition to the ZIS-24, which had been in development since 1940, work began on another gun in the spring of 1941. Its armor-penetration

[9] TsAMO RF, collection 81, series 12104, file No. 147, pp. 195–198.



Factory drawings of M75 107 mm gun (TsAMO).



Factory drawing of gun shield for the M75 107 mm gun (TsAMO).

characteristics were as specified in Kulik's letter. Factory No. 172 (in the city of Molotov, now Perm) was tasked with developing and manufacturing two antitank-gun prototypes. This system was assigned the designation M75. M75 development was headed up by the designer S. N. Dernov, and Factory No. 172's chief designer, S. P. Gurenko, was responsible for overall management of the project.

M75 involved mounting a 170 mm barrel 70 calibers in length on the carriage of the ML-20 152 mm gun-howitzer. This gun weighed an estimated 7.5–8 tonnes, which drastically limited its mobility on the battlefield. The main mission of this antitank monster was to fight the heavy and super-heavy tanks that intelligence received from spies indicated Germany was producing.

On May 22, 1941, a plenary session of the GAU's Artillery Committee reviewed and approved a draft operational requirement for a "special-purpose 107 mm antitank gun and the ammunition for it." The operational requirement called for a muzzle velocity of 1020 m/s and a capability to penetrate 160 mm of armor at a 30° angle of incidence from a range of 1000 meters. In addition, the gun was to be mounted on the carriage of the ML-20 152 mm gun-howitzer, which was clearly a plus for Factory No. 172. The length of the barrel was not to exceed 70 calibers, and it was to be capable of firing 10 rounds per minute. The system was estimated to weigh a total of 8000 kg.

Top right: M75 107 mm antitank gun with barrel at maximum elevation (TsAMO).

Bottom right: M75 107 mm antitank gun during testing (TsAMO).

No project to mount the 107 mm antitank gun on the KV chassis similar to the 212 or the SU-B-13 was in the works—not even at the operational requirement level. While the leaders were thinking up new types of weapons, the artillerymen were working on current projects. They completed the

M75 prototype by July 1941, and the gun entered factory testing that same month. It should be noted that, unlike its counterparts, Factory No. 92's design bureau had not progressed beyond design work in July because it was heavily engaged in other projects. Problems with manufacturing the required number of 107 mm shells and higher priority tasks made it necessary to temporarily scale back work on the heavy antitank gun.

M75 testing continued into 1942. By that time, however, there was no longer a need for the antitank monsters. The super-heavy German tanks had not materialized, and, in addition, the actual M75 parameters did not meet requirements for a variety of reasons. Work on the gun was put on hold, but it came up again in 1943 when the heavy German tanks eventually made it to the front.

In contrast to the 107 mm SP gun, the B-13 project with the 130 mm gun was listed in GAU development plans dated May 22, 1941. A proposal in 1941 called for production of 12 SP guns of that type, at a cost of 300,000 rubles each. The specifications for the SU-B-13 can be found both in a letter written by Kulik and in a draft operational requirement dated June 16, 1941:

1. General characteristics.
1. Vehicle type: tracked, armored
2. Total weight: 55 tons

M75 107 mm antitank gun. Unlike the ML-20 and A-19, this gun had a sliding wedge breechblock (TsAMO).

M75 107 mm antitank gun in travel position (TsAMO).

3. Armament: the B-13 130 mm gun and 3 DT machine guns
4. Combat load: rounds for the gun, 100
Machine-gun rounds: 2500
Hand grenades: 30
5. Armor:
Glacis: 30 mm
Side: 30 mm
Top: 30 mm
Bottom: 20 mm
6. Crew: 7
7. All of the vehicle's remaining dynamic characteristics and its mobility are to be the same as the KV-4 tank. The engine mount, transmission, and suspension system must be the same as those used on the KV-4.
8. The vehicle's dimensions must allow shipment by rail.
9. SU-B-13 artillery system specifications:
a) The artillery system must be installed on a production chassis without a turret, and the crew must be protected against diving aircraft.
b) The angle of traverse must be at least +/-10°.
Elevation +20° to 25°
-2° to -3°

[10] TsAMO RF, collection 38, series 11355, file No. 6, pp. 142–143.

c) The layout of the artillery system, aiming devices, and ammunition rack must enable at least three aimed shots per minute.
d) The vision devices must provide good visibility from the vehicle, and a commander's cupola enabling 360° vision must be installed.
e) The vehicle must support firing from cover.
f) The artillery system must have a means of securing the gun in travel position.

10. Communications equipment:
a) A KRSTB radio must be provided for external communication. A TPU-4 intercom system must be installed for internal communication.
b) Provide for stowage of 2 telephone sets and 2–3 km of wire.[10]

Unlike the 212, the SU-B-13 was not a bunker buster. The specifications clearly describe a heavy tank destroyer that was developed in a rush to combat German heavy and super-heavy tanks. This is clearly evident from the rate-of-fire requirement and the requirement for 30 mm of armor, the same armor thickness as on the SU-34 tank destroyer based on the T-34 and the A-46 tank destroyer based on the A-42 prime mover, which were developed by Kalinin Factory No. 8 (in Kaliningrad, a city now named Korolev). The identification of the KV-4 as the base chassis is an error. Records show that this is what Kulik called the KV-3 (Project 223), confusing it with the KV-3 (Project 150, or the T-150), which originally was supposed to go into production. Because the Great Patriotic War began a week after the operational requirement was drafted, the SU-B-13 did not make it past the conceptual design stage.

CHAPTER 3. **The Evacuation**

The tank programs underwent a fundamental revision immediately after Germany attacked the Soviet Union. The manufacture of armored vehicles already in production was accelerated, and programs that were in the design stage or that did not conform to wartime realities were shut down. The most common theory has it that Project 212 met a similar fate, but its actual history was somewhat different.

Under Order No. 253ss issued by the People's Commissariat of Heavy Machine Building on June 26, 1941, preparations for production of the KV-3 were transferred from the Kirov Factory to the Chelyabinsk Tractor Factory (ChTZ). Chelyabinsk received a team of designers from the Kirov Factory, as well as production engineers, materials, and the KV-3 prototype minus its turret and a number of other assemblies. As of February 1942, this KV-3 was located in experimental shop OP-2. But Project 212 continued to be listed as a Kirov Factory project until early August 1941, as evidenced by a letter GAU Deputy Director Lt. Gen. V. I. Khokhlov wrote on the 11th to V. A. Malyshev, People's Commissar of Medium Machine Building:

According to Government Decree (No. 274-130ss, dated February 7, 1941), the Kirov Factory is to manufacture a batch of 10 BR-2 152 mm self-propelled guns based on the KV-3 tank.

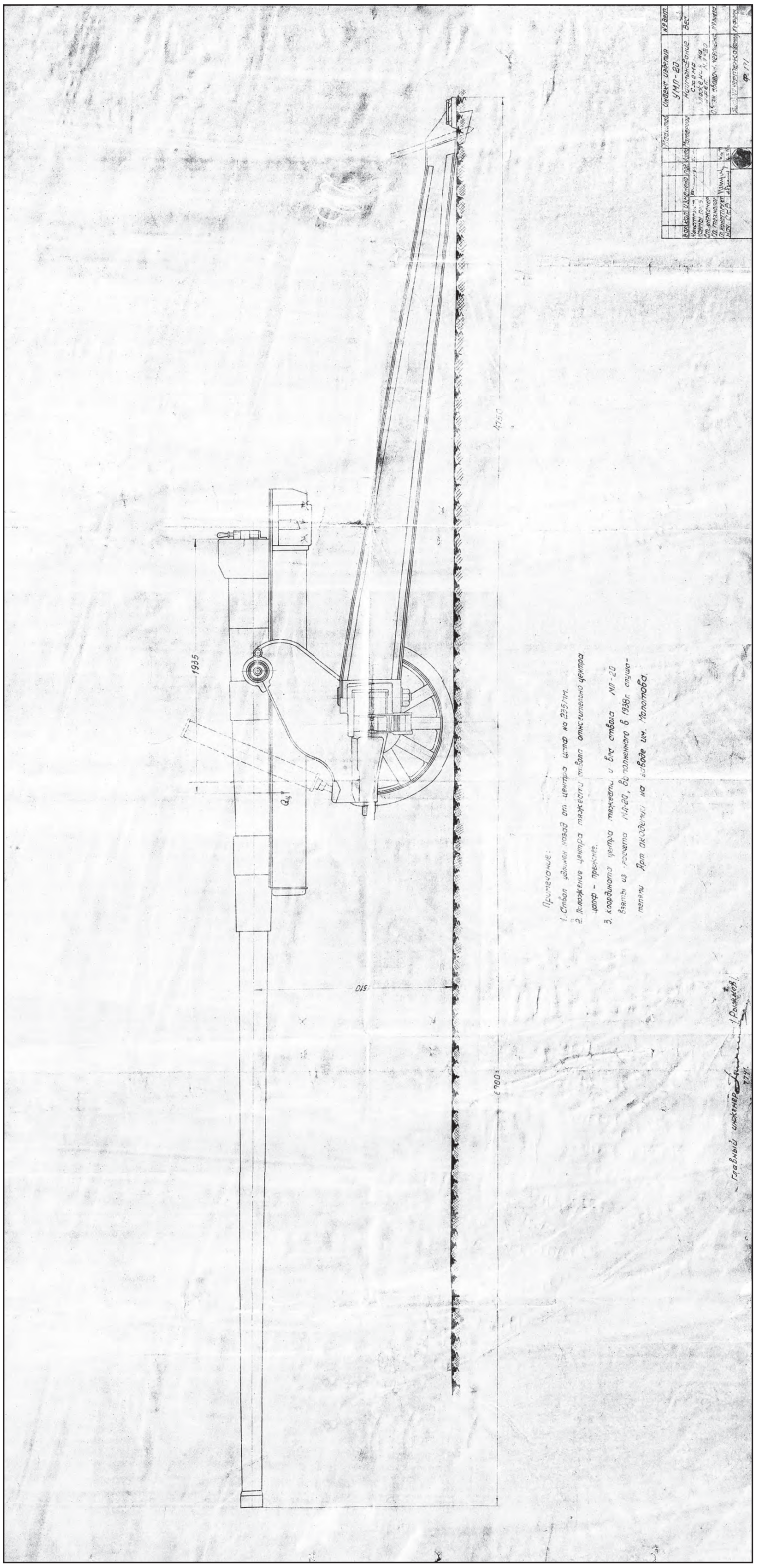
It has not yet begun manufacturing the systems, and the contract sent by the Director has not been signed. According to a statement by Comrade Bondarenko, Kirov Factory's chief engineer, the factory will not manufacture the vehicles due to the press of other work.

Please inform me who authorized the withdrawal of production of these vehicles from the Kirov Factory.[1]

It was only in late August 1941 that SP gun Project 212 was transferred to the Ural Heavy Machinery Plant (abbreviated UZTM and located in Sverdlovsk, now named Yekaterinburg). The choice of UZTM as the site where work on the bunker buster would continue was no accident. The giant Sverdlovsk factory was the main supplier of KV-1 armored hulls for the Chelyabinsk Tractor Plant. Equally important was that, as the war began, UZTM's design Bureau had a wealth of experience in the design and manufacture of howitzers and corps-level artillery. The factory's design bureau under V. N. Sidorenko had developed the U-1 howitzer in 1937, and in 1938, it had developed the U-2. The following year, it developed the U-3 203 mm corps-level heavy howitzer. The decision was made in 1940 to engineer

F. F. Petrov, developer of many famous towed, tank, and self-propelled artillery pieces (V. Len).

[1] TsAMO RF, collection 81, series 12104, file No. 147, p. 240.



The UML-20 was an initiative project for the ML-20 107 mm antitank gun proposed by F. F. Petrov in July 1941 (TsAMO).

production of the M-30 122 mm howitzer at UZTM, and its creator, Fedor Petrov, traveled to Sverdlovsk for that purpose. Fedor's business trip lasted 34 years. He became chief of the factory design bureau at his new location. In 1941, UZTM received a number of initiatives from Sverdlovsk that had been discussed in the GAU. For example, a project for a 107 mm antitank gun under the designation UML-20 was discussed in July. Like the M75, this gun was based on the ML-20's carriage. But as with a number of other similar projects, the UML-20 did not go beyond the conceptual design stage.

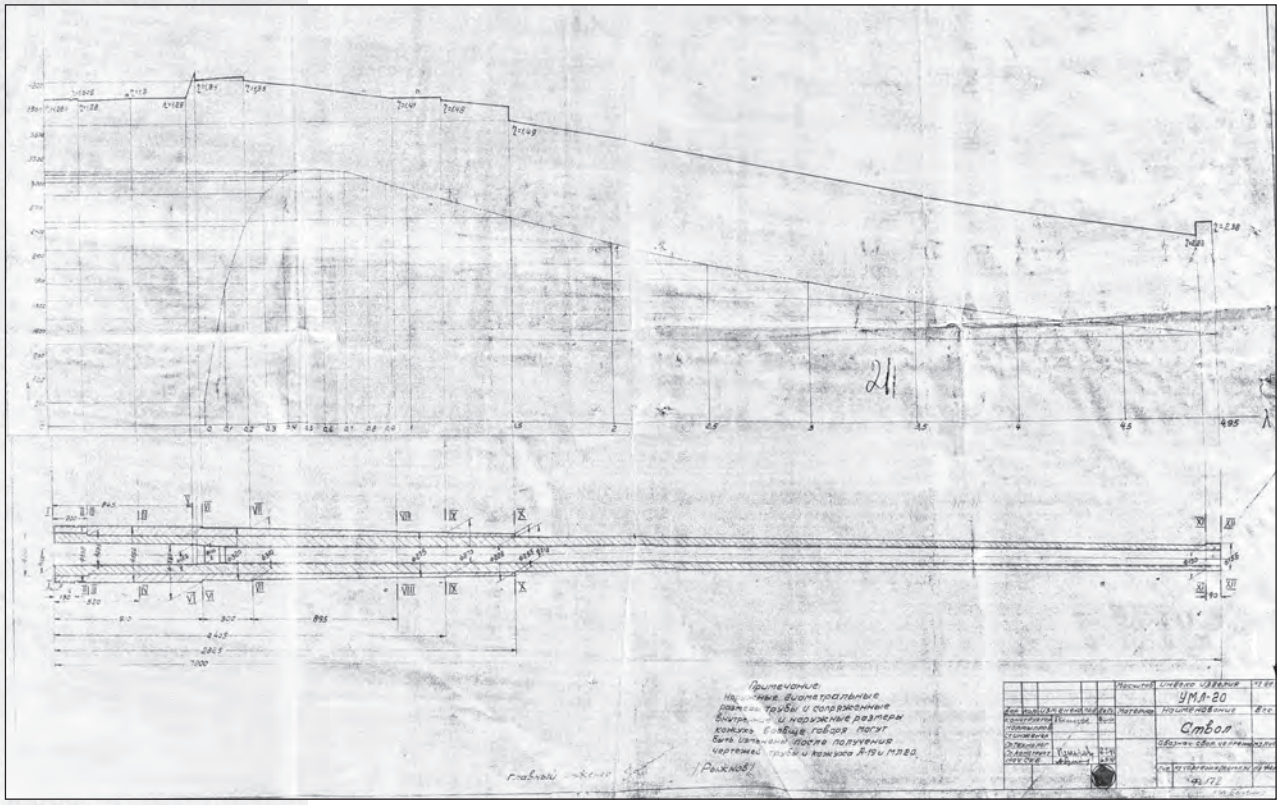
Despite the design bureau's competent team, the new task was a serious challenge for the factory. In a letter to GAU Deputy Chief Gen. V. I. Khokhlov on October 7, 1941, UZTM Chief Engineer A. S. Ryzhkov said the following:

In response to your letter No. 281377 of August 25, 1941, we inform you that the Ural Heavy Machinery Plant has the design staff needed to begin work on the task assigned by you and signed by Marshal of the Soviet Union Comrade Kulik to develop a self-propelled gun (a bunker buster).

Because Ural Heavy Machinery Plant employees have not previously worked on topics of this type, and the plant has no materials on this or similar topics, to assure a proper and timely solution of the problem, the following materials must be sent to them or the appropriate organizations instructed to send them:

1) *Drawings, models, and descriptions of similar foreign systems;*
2) *The same for heavy tanks;*
3) *The following materials:*
    1. *A full set of the drawings for the KV-3 tank, and*
    2. *A full description of the KV tank and its equipment.*
    3. *Complete technical specifications for the KV tanks.*
    4. *The complete set of engineering analyses done on the KV tank.*
    5. *All drawings and engineering analyses of the BR-2 152 mm gun traversing mechanism.*
    6. *Drawings of the DT machine gun.*
    7. *Drawings of the PPD submachine guns.*
    8. *Drawings of the PT-1 and KT-1 sights.*
    9. *Description of the PT-1 and KT-1 sights.*
    10. *Drawings of the fixture or storage racks for the M-10 152 mm tank howitzer projectiles.*
4) *Samples of the following:*
    1. *DT machine gun.*
    2. *PPD submachine gun.*
    3. *PT-1 sight.*
    4. *KT-1 sight.*
    5. *All other devices.*
    6. *Flags.*

Please instruct the Chelyabinsk Factory to allow a team of designers from our plant to observe the KV-3 and KV tanks during testing.



Engineering analysis of the UML-20 107 mm antitank gun (TsAMO).

Also, please instruct the Chelyabinsk Factory's special design bureau and the factory that manufactures the engines to support the necessary consultations between our designers and the designers of the engines for the system.

We believe it is especially important that you order a captured heavy tank sent to the Ural Heavy Machinery Plant so that our designers, production engineers, and production workers can study it while developing the system.[2]

The tank industry was not prepared for the KV-3 in October 1941, much less for the bunker buster based on it. The Kirov Factory had been evacuated to Chelyabinsk (and renamed the Chelyabinsk Kirov Factory, or ChKZ for short), as had the Izhor Factory, which produced the KV's armor. UZTM was temporarily given the name Izhor Factory. Its original name was only restored on January 4, 1942. An additional item on UZTM's plate was the evacuation of the Kalinin Factory No. 8 and the Ordzhonikidze Factory No. 37 (Moscow) to the plant's grounds in the fall of 1941. Factory No. 75 which had developed the V-5 engine, was evacuated to Chelyabinsk, and its main mission was to begin producing the V-2 diesel engine, the need for which was much greater. The situation with production of the BR-2 152 mm guns was no better: the last guns of that type had been manufactured in 1940 by Factory No. 221 ("Barricades" in Stalingrad, now named Volgograd).

[2] TsAMO RF, collection 38, series 11355, file No. 190, p. 146.

The bunker buster project was dropped as a high-priority task, but not for long. The system showed up again in GAU correspondence in November 1941. A report by Military Engineer 2nd Class Getmanov (of the Field Artillery Armament Directorate's Main Artillery Directorate) discussed work done in Chelyabinsk from November 12 through 24, 1941:

During this period it was found that:

a) As regards the issue of artillery prime movers:

State Defense Committee Decree No. 899ss dated November 14, 1941, instructed the People's Commissariat of the Tank Industry (NKTP) to expand the production of tanks, for which purpose a number of factories have been transferred to the NKTP from other Commissariats, including all tractor plants.

State Defense Committee Decree No. 982 of November 13, 1941, relieved the Kirov Factory (ChTZ) of responsibility for manufacturing artillery tractors (the S-2) and agricultural tractors (the S-65).

State Defense Committee Decree No. 892 is understood by the People's Commissariat of the Tank Industry as giving it the right to cease tractor production at other factories as well (the Voroshilovets at Factory No. 183, and the STZ-5 at the Stalingrad Tractor Plant).

Therefore, production of tractors has ceased.

The situation with artillery prime movers was bad before this, but after this decision artillery may be left without prime movers.

I believe the People's Commissar of Defense, Comrade Stalin, should be informed about this situation.

b) As regards the issue of self-propelled guns:

A study of this issue for a report prepared for Comrade Kotin, Deputy People's Commissar of the Tank Industry at the People's Commissariat of the Tank Industry and with designers at UZTM and the Kirov Factory, came to the following conclusions:

I. The work schedule of the People's Commissariat of the Tank Industry for 1942 includes the following self-propelled guns:

1. A bunker buster mounting the BR-2 152 mm gun on a chassis incorporating assemblies from the KV tank.

2. A tank destroyer mounting the 85 mm antiaircraft gun on a chassis incorporating assemblies from the T-34 tank.

3. A regimental assault gun mounting the 76 mm USV or the ZIS-3 on a chassis incorporating assemblies from the T-60 tank.

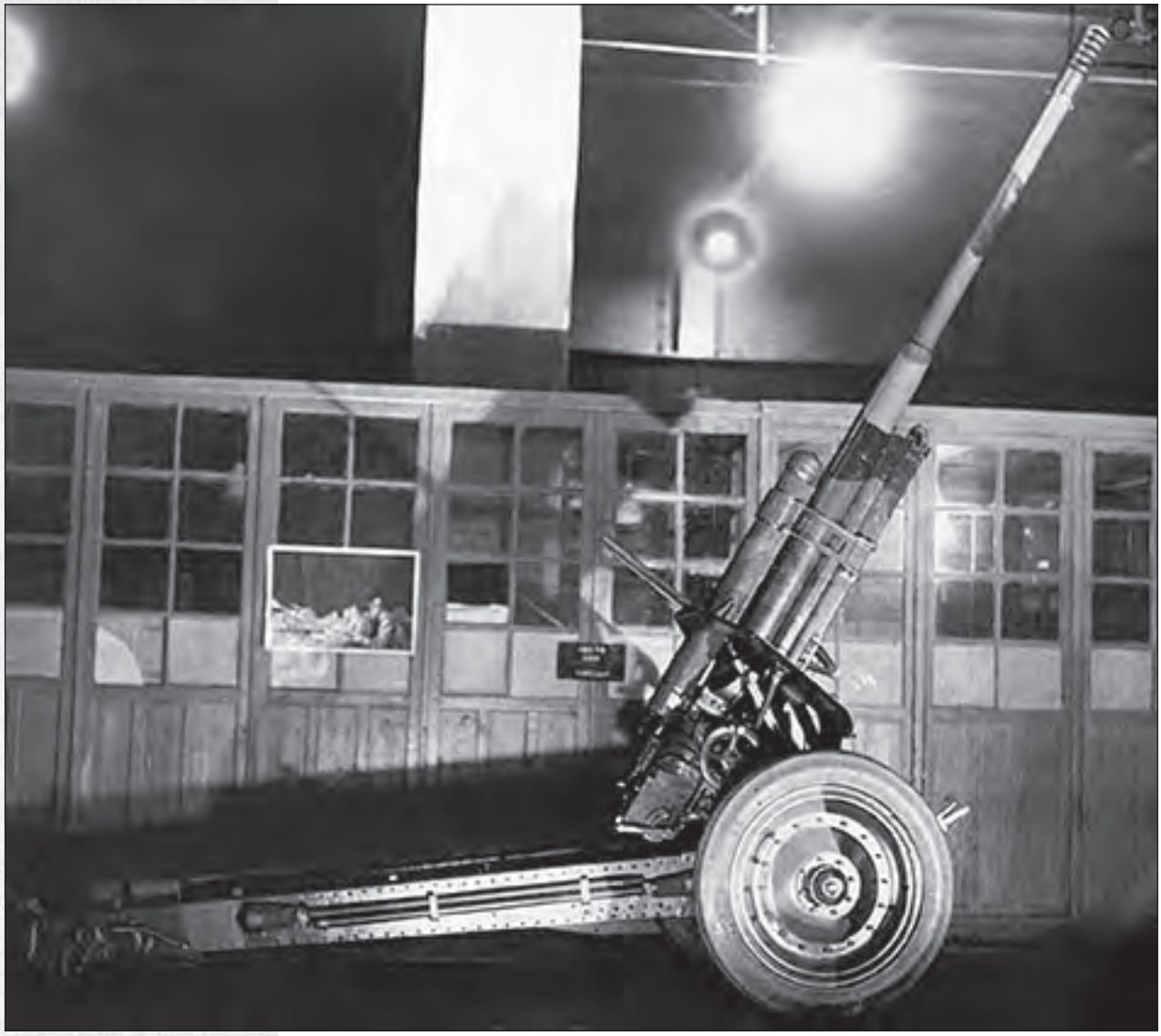
4. Self-propelled antiaircraft guns:

a) A 37 mm gun on the T-60 tank

b) A 25 mm gun on the T-60 tank

c) A 37 mm gun on the T-50 tank

d) A 37 mm gun on the T-34 tank



Instead of SP guns, in the fall of 1941 UZTM was actively working to develop new conventional artillery pieces like the U-10 85 mm antitank gun shown in the photo (TsAMO).

Comrade Kotin has accepted the recommendations for these self-propelled guns and stated that he would issue the appropriate orders to the factories.

I believe it is urgent that an operational requirement be sent to the People's Commissariat of Medium Machine Building and the factories, that a GABTU representative visit the People's Commissariat of the Tank Industry, and that the systems listed in the work schedule be pursued. A liaison visit should be made to the factories that are beginning work on the projects and appropriate advice should be given. [3]

This letter marked the initiation of wartime development of SP guns. Beginning in November 1941, work intensified on many of the SP gun

[3] TsAMO RF, collection 81, series 12038, file No. 115, pp. 16–17.

projects named in the draft decree of the Council of People's Commissars of the USSR and the Central Committee of the All-Union Communist Party (Bolshevik) "On Self-Propelled Artillery" that was issued on May 27, 1941. Operational requirements were still being drawn up prior to 1942; however, conceptual designs were not even being discussed. Most of the factories assigned to develop SP guns were either still in the process of setting up production lines at the sites to which they had been evacuated in the summer and fall of 1941, or they had been loaded down with more urgent orders. Nevertheless, the development plan for 1942 again featured the "KV-3 Tank" project with a completion date of May 1, 1942. The project also included a "1200 hp two-stroke diesel engine" (with a completion date of October 1, 1942) and a "supercharged 1200 hp V-2 diesel engine" (to be completed by July 1, 1942).

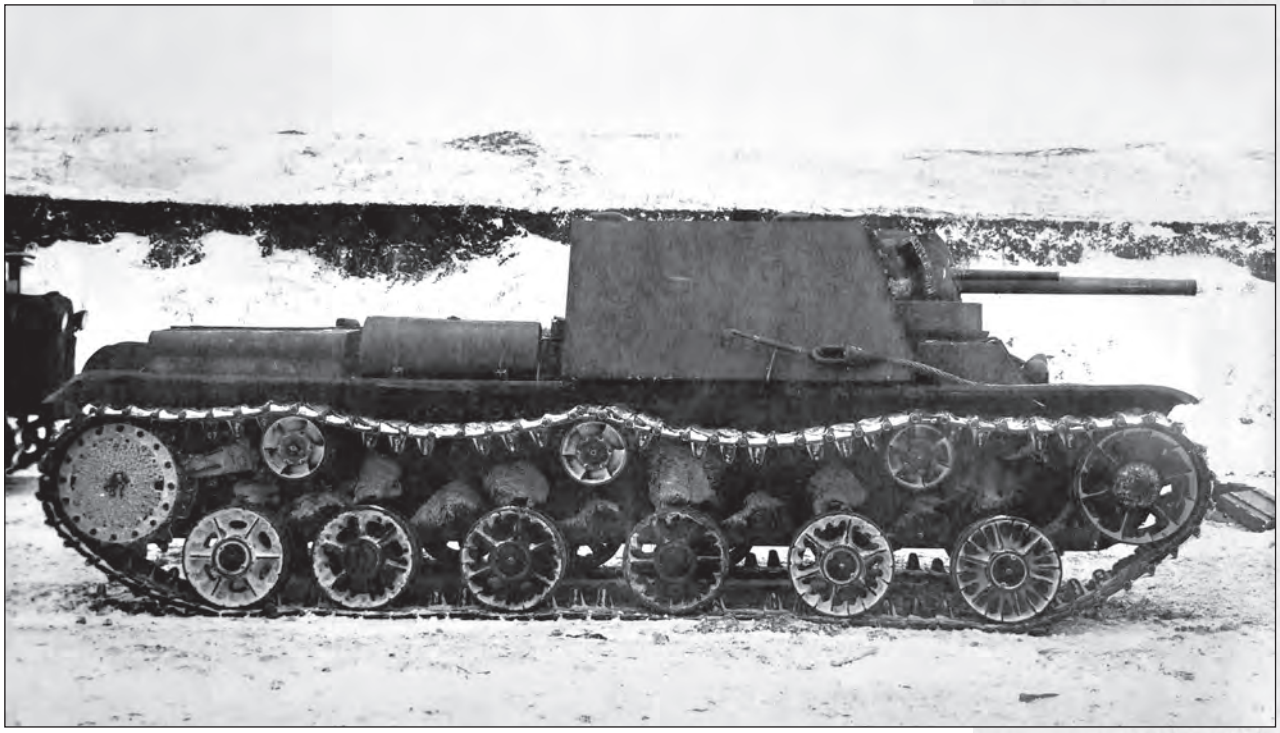
The project bearing the title "A 152 mm Self-Propelled Gun Incorporating Assemblies from the KV Tank Chassis" (a bunker buster) surfaced again in March 1942. The KV tank was specified as the base chassis, and the armament was to include the tipping parts from the BR-2 gun. Pilot Plant No. 100 (established in Chelyabinsk in 1942) of the People's Commissariat of the Tank Industry was given responsibility for the chassis, and Factory No. 8 of the People's Commissariat of Arms at its new location in Sverdlovsk was to be responsible for the gun. The amount allocated for development was 1.5 million rubles, and a prototype was expected by July 1, 1942. However, the KV-3 project was finally killed in the spring of 1942, and an entirely different vehicle began to be considered as the base chassis for the bunker buster.

CHAPTER 4. **A Personal Order from Stalin**

On November 28, 1941, a report from P. F. Solomonov on his trip to Chelyabinsk reached the desk of Military Engineer 2nd Class Anisimov, chief of the Field Artillery Armament Directorate's 2nd Department. The purpose of his trip was to look into the availability of the KV-1 tank's armament. The report addressed development in addition to gun supplies. In November 1941, A. N. Bulyshev was managing development of the U-11 and U-12 systems, which involved mounting the M-30 122 mm howitzer and the 52-K 85 mm antiaircraft gun in the KV-1's turret. The report's third paragraph is of much greater interest to us.

By order of Joseph Vissarionovich Stalin, the Kirov Factory is developing a triple mount for the KV: One F-34 gun and two 45 mm guns (barrels without

KV-7 assault tank, December 1941 (TsAMO).



Side view of a KV-7 (TsAMO).

recoil mechanisms), with the recoil mechanisms for the triplex taken from the ZIS-5. No 360° field of fire; angle of traverse +/-15° or +/-7.5°, as allowed by the installation; basic load 300 rounds (100 for each weapon); in addition, the triplex to have 3—4 machine guns.

In December, the factory must equip 1/5 of all KV tanks with these triplex systems.

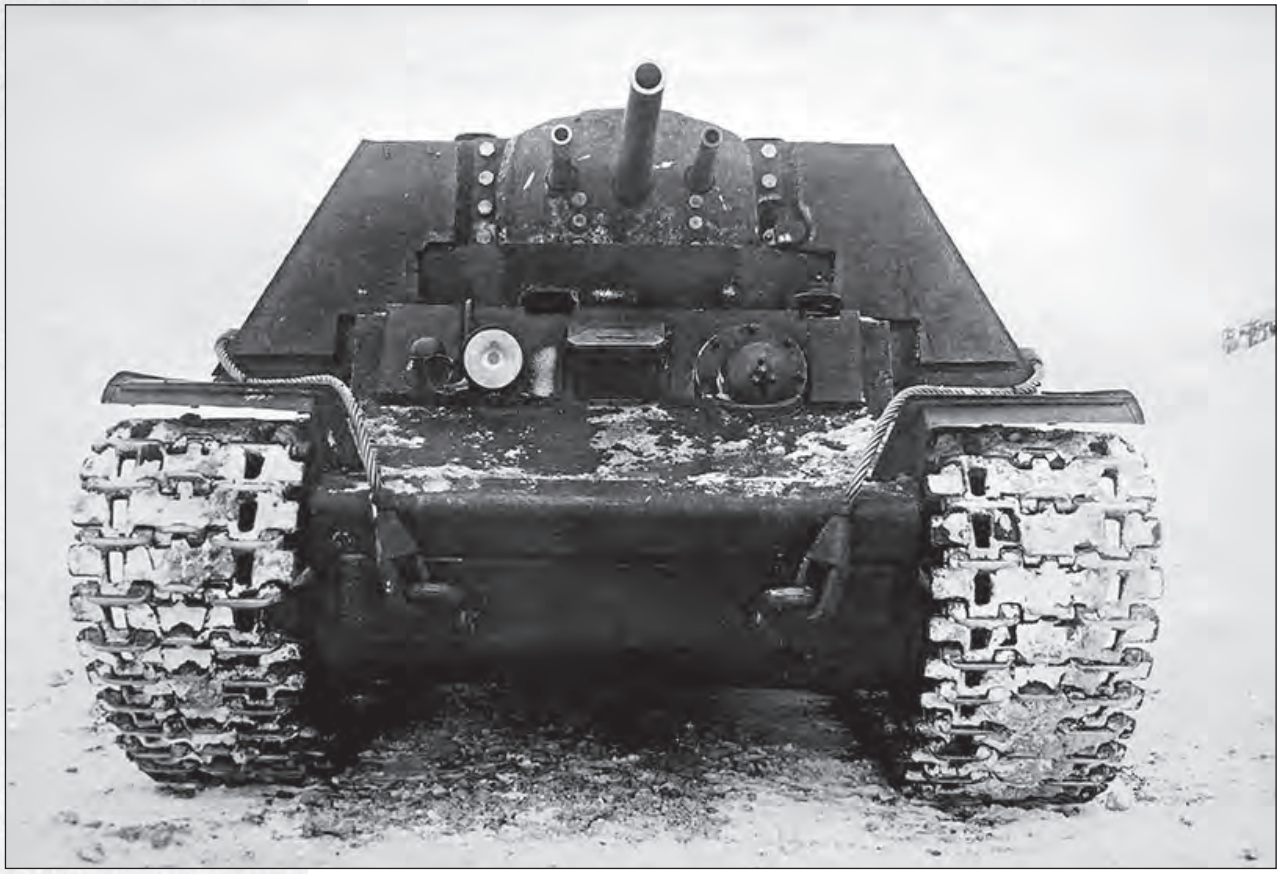
The factory urgently needs the drawings and engineering analysis of the 45 mm tank guns, drawings and engineering analysis of the F-34 (they can make do with on-hand blueprints of the F-34, but the engineering analysis is necessary), and drawings for the ZIS-5 cradle (ruggedized).

The factory also urgently needs four 45 mm tank gun barrels together with their breech mechanisms and, in preparation for testing the triplex, a location, ammunition, and a test program. It is crucially necessary to solve the problem of sights for the triplex.[1]

A note dated November 29, 1941, attached to the report reiterated the identity of the person who initiated development of the vehicle:

By personal order of People's Commissar of Defense Comrade Stalin, the Kirov Factory (ChTZ in Chelyabinsk) is developing a triple mount for the KV tank (two 45 mm tank guns and one F-34 76 mm gun).

[1] TsAMO RF, collection 81, series 12104, file No. 79, p. 181.



Front view of a KV-7; the tank's massive mantlet and the skirt underneath it are clearly visible (TsAMO).

Urgently deliver four 45 mm tank guns to the Kirov Factory for development of these mounts.

To support the planned total production of KV tanks equipped with triple mounts, by December 1941 the Kirov Factory needs to take delivery of 180 45 mm tank gun barrels with breech mechanisms minus the cradle, recoil mechanisms, semiautomatic mechanisms and optics; and it needs 260 such items by January 1942.[2]

This unconventional vehicle, which was assigned the factory code 227 and the designation KV-7, was dictated by a desire to increase the KV-1's firepower. The ZIS-5 76 mm gun fitted to the Chelyabinsk KV-1 was sufficient to defeat enemy tanks, but requests came from the fronts to increase firepower for combating non-armored targets, including light field fortifications. Conceptually, the triple mount would enable the guns to be fired both separately and simultaneously.

A group of SKB-2 designers led by G. N. Moskvin that had been evacuated to Chelyabinsk was assigned to solve this non-trivial problem. Because the triple mount did not fit into the standard KV-1 turret, a decision was made

[2] TsAMO RF, collection 81, series 12104, file No. 79, p. 182.

Rear view of the KV-7 (TsAMO).

to install a superstructure in its place (in correspondence, this superstructure was called a "non-rotating turret"). To provide normal working conditions in the fighting compartment for the crew, the superstructure was given the shape of a prism, and its bottom extended over the tracks. In constructing the superstructure, maximum use was made of parts from the KV-1 turret, including the rear machine gun's ball mount, turret hatch covers, and vision blocks. Recovery tank No. 5161, which had been produced in September 1941, was used to build a KV-7. According to the records, the vehicle was initially equipped with an M-17T engine, and it had seen action on the Leningrad front.

Development of the artillery portion of the triple gun system was assigned to UZTM special design bureau OKB-3. Work on the system, which was developed by engineers N. N. Yefimov and K. N. Ilyin, began in November 1941 and was finished by December 10. The chief designer of the system, which was assigned the factory designation U-13, was F. F. Petrov. L. I. Gorlitsky, who arrived from Leningrad in October 1941, played an important role in developing the U-13. At the time, he was chief of the Kirov Factory's artillery design bureau. Gorlitsky became deputy chief designer at his new

L. I. Gorlitsky, developer of numerous SP guns, the best-known of which were the SU-122, SU-85, and SU-100. He became UZTM's chief designer in October 1942 (IZh).

location. The U-13 system was shielded by a common mantlet, which was protected against penetration from beneath by an armor plate.

A test program for the "triple artillery system mounted on a KV tank" was signed on December 17, 1941. Testing was scheduled to last 10 days, but in reality the KV-7 was not tested until December 27, and then it was done at the factory. Capt. P. Solomonov sent a report to the GAU and GABTU based on the test results:

A number of flaws need to be corrected and proving-ground tests urgently performed on the triple mount for the KV-7, which underwent factory testing on December 27, 1941.

Without proving-ground tests, the artillery system cannot be equipped with the necessary sights and vision devices. The TMFD-8 supplied is simply a placeholder for the sight, but modifications are needed for servicing the tank, particularly new scales for aiming. Attachment of a sight at a single point is undesirable.

The Kirov Factory performed proof firing for durability using regular service ammunition. No supercharged rounds were available. No punching, marking, or measurement of the installed parts had been done. The strength of the installed parts must be checked by firing.

The design of the screw-type traversing mechanism with two pivot joints is poor, which causes scattering of shots; in other words, unsatisfactory accuracy. In addition, the traversing mechanism will require constant special monitoring and maintenance. The slightest maladjustment and weakening or wear of the joints will degrade accuracy.

It is necessary and desirable to modify the traversing mechanism. The ideal solution would be to replace it with a sector-type traversing mechanism. The traversing and elevation mechanisms should be equipped with stops. The spent case catcher needs to be modified. Its left and right branches need to be extended forward at least one half the length of the breech, otherwise there is nothing protecting the crew from the recoil. The overall width of the spent case catcher can be reduced, but its sides (right and left) should be somewhat higher.

The position of the headrest needs to be changed; it is not in the right position for the gunner to rest his head on.

The position of the foot switch most be changed; the footrest prevents stowage of several canisters with 76 mm shells in their racks.

The gunner's seat needs to be improved; the back should be curved.

When the gun is fired at a depressed angle, the recoil will break the roof lamp. The light spots should be located so as to illuminate the recoil indicator scales.

The gunner and the driver need to be linked by a speaking tube, because rough laying is done by the tank. [3]

The KV-7 underwent the next phase of firing trials on January 5, 1942, at Factory No. 8's range, where the KV-7 and the KV-8 and had been sent earlier that month. All three guns successfully fired simultaneously only on the third volley, and the accuracy at a range of 400 meters was quite low. A rate of 20–24 rounds per minute was achieved during the firing rate test. When

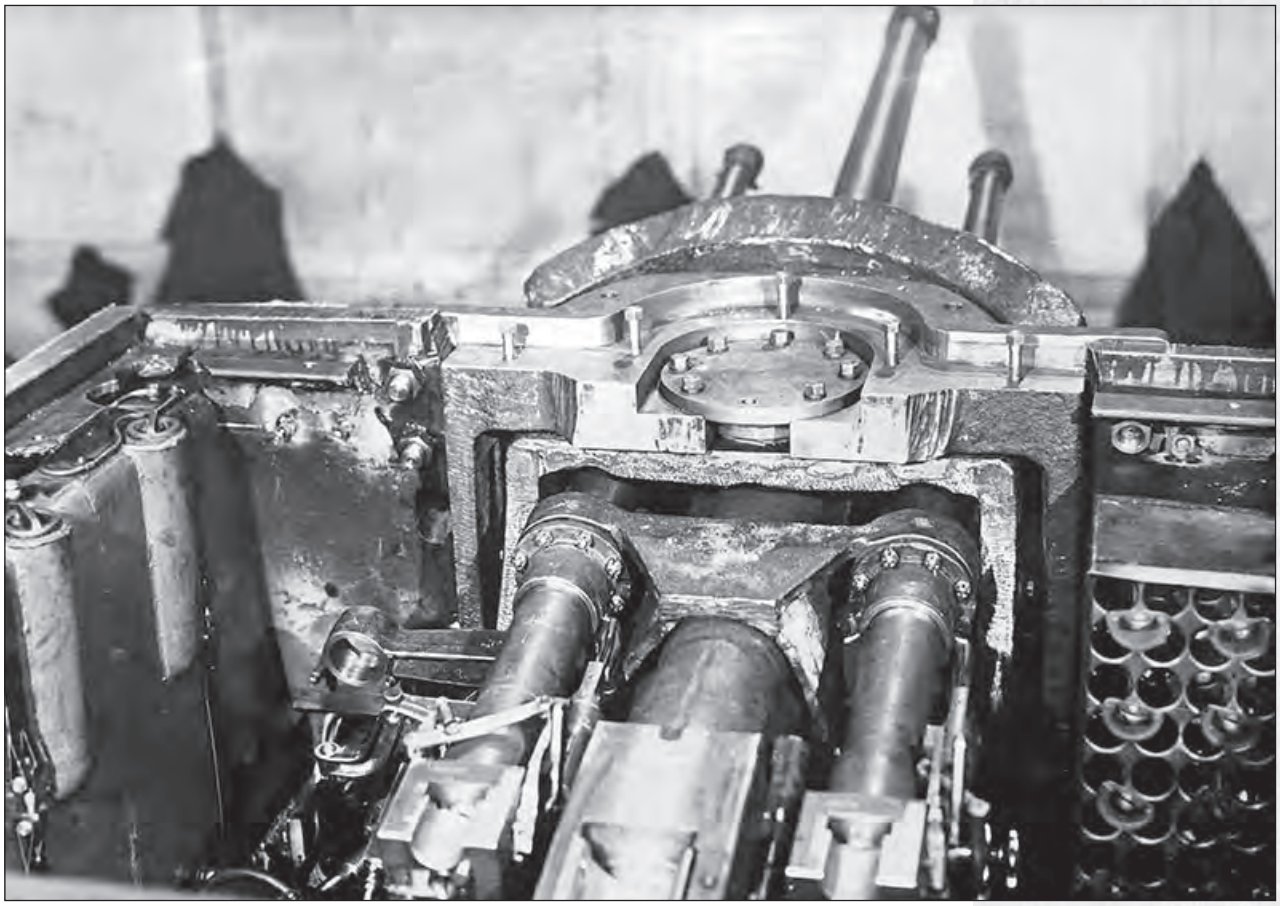
[3] TsAMO RF, collection 38, series 11355, file No. 668, pp. 1–2.

fired separately, the rate of fire was approximately on a par with conventional tanks, but the feasibility of salvo fire was questionable. The F-34 76 mm gun was able to fire three shots in 34 seconds, and the 45 mm tank guns got off five rounds each.

The firing trials coincided with a display of the KV-7 and KV-8 prototypes for senior leadership and resulted in the following report:

The tanks were inspected on January 5, 1942, at Factory No. 8's test range, Mytishchi Station; attending were the following personnel: Comrade Voroshilov, Deputy Chairman of the Council of People's Commissars of the USSR; Comrade Malyshev, Deputy Chairman of the Council of People's Commissars of the USSR and People's Commissar of the Tank Industry; Comrade Voznesensky, Deputy Chairman of the Council of People's Commissars of the USSR; Col. Gen. Voronov, Deputy People's Commissar of Defense of the USSR; Lt. Gen. of Tank Forces Fedorenko, Deputy People's Commissar of Defense of the USSR and Chief of the Red Army's GABTU; Army Commissar 2nd Class Biryukov, Military Commissar of GABTU of the Red Army; Comrades Zaltsman, Nosenko,

The KV-7's fighting compartment (TsAMO).



and Petrasyan, Deputy People's Commissars of the Tank Industry; Col. Gen. Yakovlev, Chief of GAU of the Red Army; Maj. Gen. Melnikov, Chief of Main Directorate of Chemical Defense; Brigade Engineer Korobkov, Chief of the Armor Directorate of GABTU; and Comrade Kotin, Chief Designer, Department No. 1 of the Kirov Factory.

The KV-7 tank

The proposed prototype for the KV-7 assault tank has the same suspension and transmission as the mass-produced KV-1.

In place of a turret capable of rotating 360°, it has a fixed turret with three guns: two 45 mm guns and one 76 mm gun (F-34).

The triple gun system traverses through an angle of +/-7.5°, with a -5° depression angle and a +15° elevation angle.

The guns fire independently.

DT machine guns: 2

Basic load: 200 rounds for the 45 mm guns and 93 rounds for the 76 mm gun.

Glacis thickness: 100 mm, turret thickness: 105 mm, and mantlet thickness: 100 mm

Crew: 6

After the inspection and the firing test, the following was noted:

1. *Mobility was satisfactory.*
2. *The glacis and turret armor was unsatisfactory.*
3. *The practical rate of fire (5—6 salvos per minute) was satisfactory.*
4. *The layout and location of the triple system and ammunition was satisfactory.*
5. *The accuracy was unsatisfactory.*

The following requirements must be met:

1. *The thickness of the armor plates on the front of the turret must be 115—120 mm, and the thickness of the glacis armor must be 110 mm.*
2. *The gun's traversing mechanism must be modified to improve accuracy.*
   Improve the optical sight mount.
   Modify the trigger mechanisms to enable simultaneous firing from the three systems.
3. *One vehicle from the first batch of KV-7 tanks to be produced during the January-February timeframe must have its artillery system tested according to the program of the GAU's Field Artillery Armament Directorate, in coordination with the Main Armored Forces Directorate, to verify that the noted flaws were corrected during manufacture of the preproduction batch.*

Conduct the tests prior to February 15, 1942.

<...>

SU–152 from one of the motorized artillery regiments, fall of 1943.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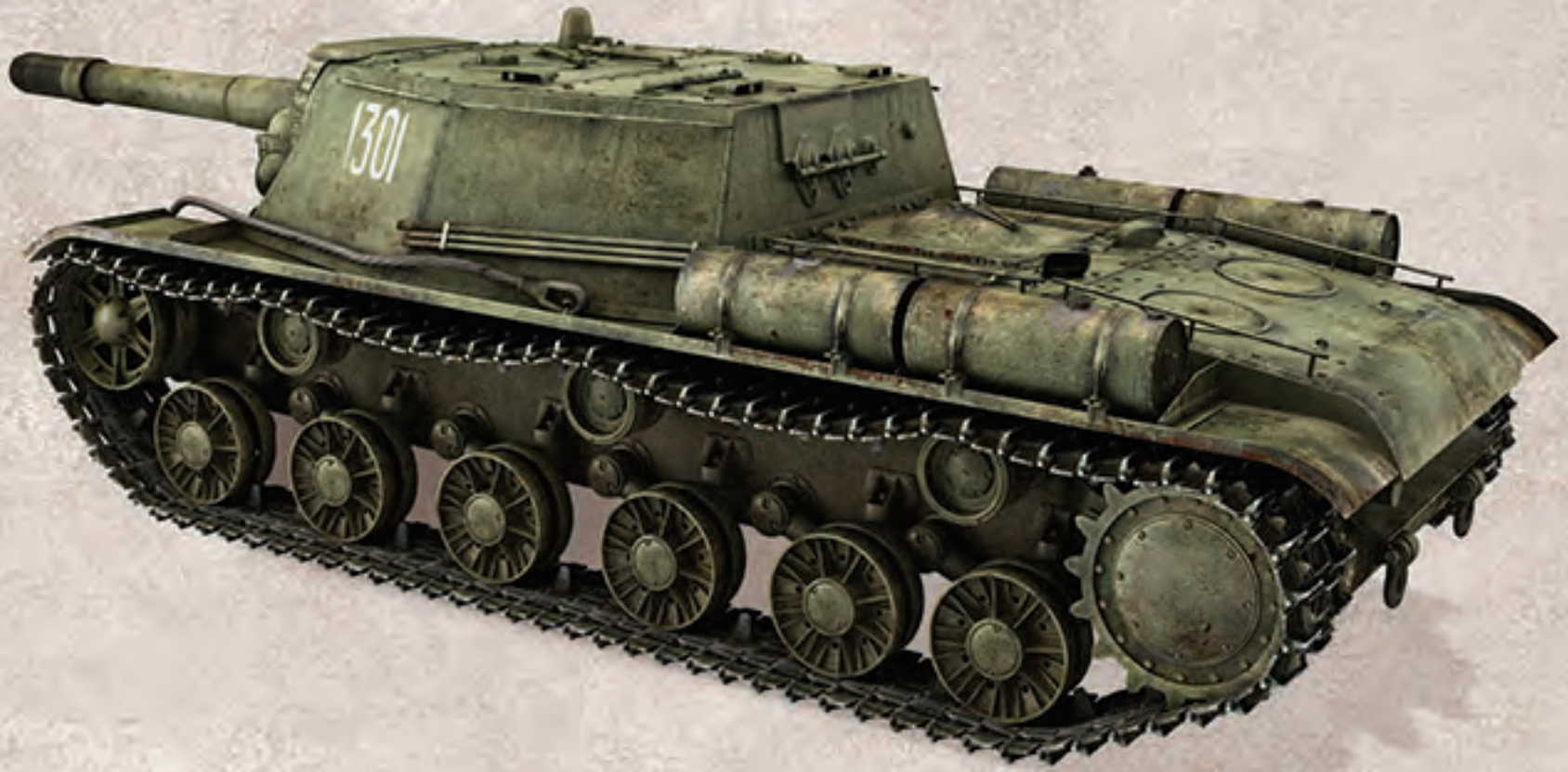
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8. LOADING TRAY
9. COMMANDER'S SEAT
10. EVACUATION HATCH
11. SHOVEL MOUNT
12. PROPELLANT CRADLE
13. LOADER'S SEAT
14. AIR INTAKE LOUVERS
15. AUXILIARY FUEL TANKS
16. SPARE TRACKS
17. TRANSMISSION ACCESS HATCH
18. REAR TOW HOOK
19. GEARBOX
20. MULTI-DISC MAIN CLUTCH
21. TRANSMISSION
22. REAR LAMP
23. "VORTOX" AIR PURIFIER
24. V-2K ENGINE
25. COOLANT RESERVOIR
26. RADIATOR
27. LOADER'S SEAT
28. TORSION BARS
29. GUNNER'S SEAT
30. SHELL STOWAGE
31. GUN ELEVATION MECHANISM
32. ROPE TIE-DOWN
33. BORE CLEANING ROD
34. PROPELLANT STOWAGE
35. FUEL TANK
36. GUN TRAVERSING MECHANISM
37. HANDRAIL
38. PG-1 PANORAMIC SIGHT
39. DASHBOARD
40. DRIVER'S VISION BLOCK
41. INTERCOM
42. TELESCOPIC SIGHT
43. PPSH DRUM STORAGE

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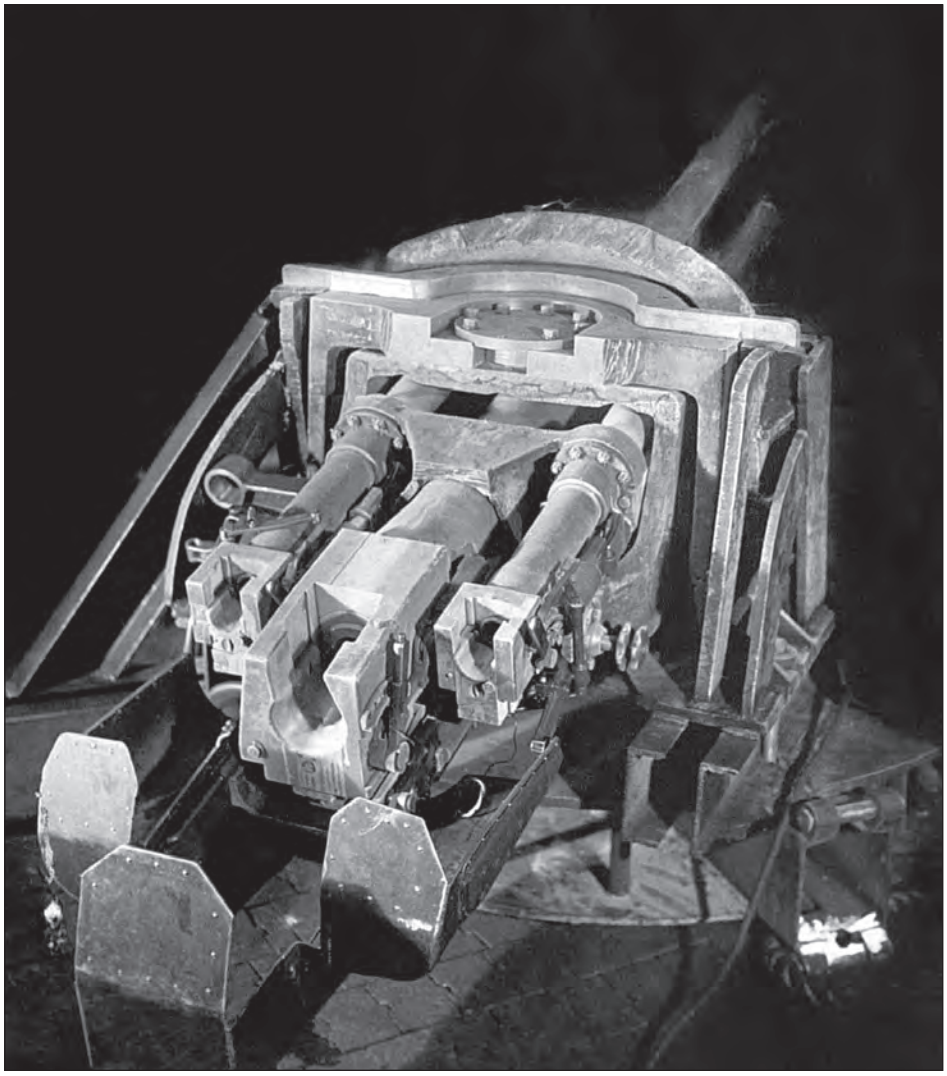
LET'S BATTLE



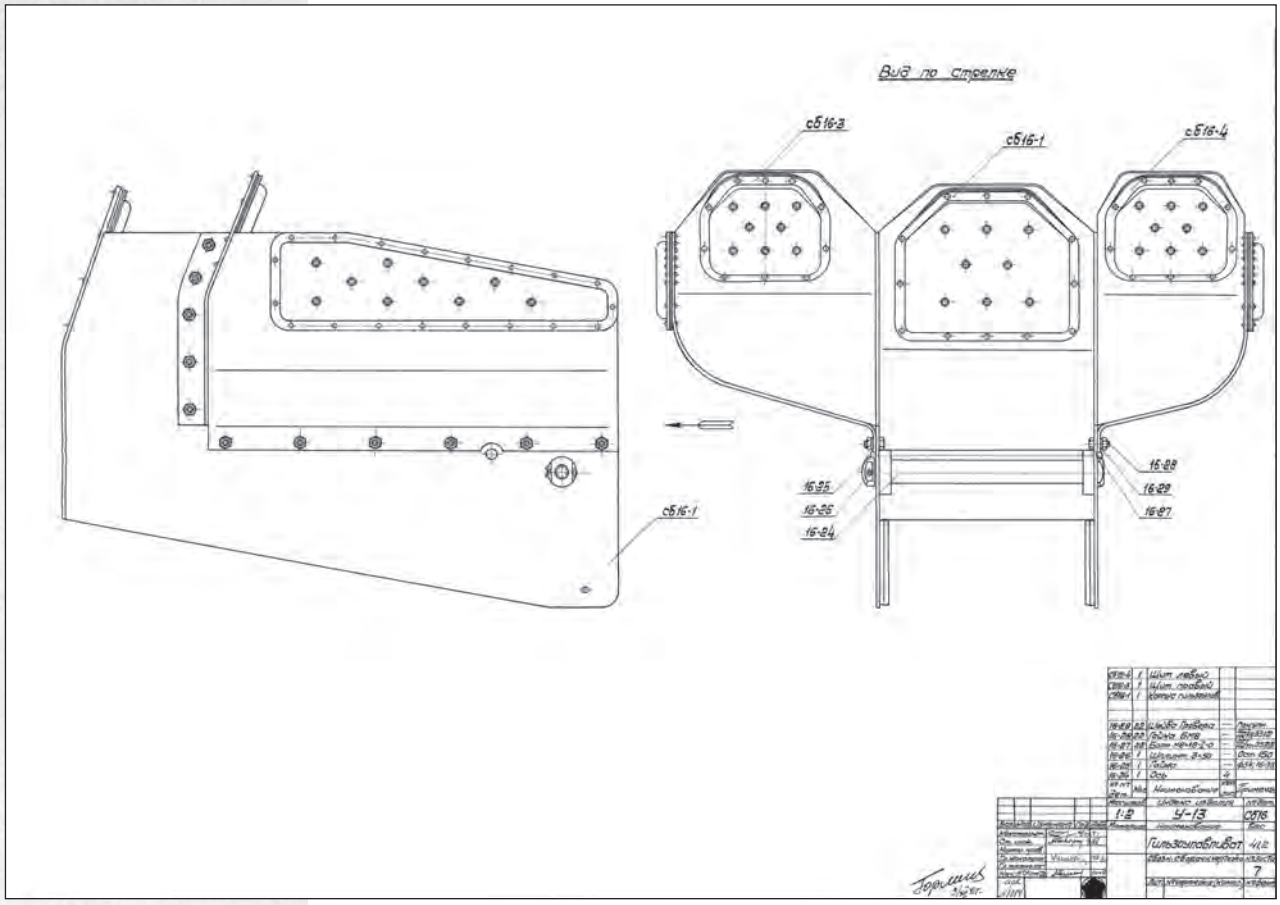
U-13 triple gun system developed by UZTM's design bureau (TsAMO).

The Commission considers it desirable to develop and install on the KV-7 a dual gun system consisting of two F-34 76 mm guns and modify that tank to accept the more powerful 122 or 85 mm artillery system.

Development of these prototype artillery systems is hereby assigned to the Kirov Factory's design bureau of the People's Commissariat of the Tank Industry.[4]

The KV-7 was also inspected by military engineers Obukhov and Kivalin, who studied the usability of the U-13 system. Their inspection identified a number of issues. The sight headrest was found to be unusable, and the sight itself was difficult and inconvenient to calibrate. In addition, the scale on the TMFD-8 sight mounted on the U-13 was for the F-32 gun, which had different ballistics from those of the F-34. The mantlet opening for the sight

[4] RGASPI, Fund 664, series 2, file No. 32, pp. 31-33.



Factory drawing of the U-13's spent-case catcher (SA).

was too large, increasing the danger from enemy fire. The inspection resulted in a suggestion to mount the 9T-7 sight in production models of the triplex and develop a new mount for the sight.

However, no preproduction batch of the KV-7's was ever produced. The day after the display of the KV-7 for the commission, Stalin personally drafted State Defense Committee Decree No. 1110ss "On Production of Tanks KV-7 and KV-8," which reads as follows:

1. *Cancel the proposed three-gun model of the KV-7.*
2. *Mount two 76 mm guns coaxially in the KV-7 with a traverse angle of +/-7.5° and an elevation angle of +15° -5°.*
3. *Accept the KV-8 into the inventory and begin producing it. Manufacture 10 KV-8 systems in January and 50 in February after correcting the flaws noted in the report of January 5, 1942.*
5. *Manufacture a production model of the KV-1 with the 122 mm gun by January 25.*[5]

[5] RGASPI, Fund 664, series 2, file No. 32, p. 30.

The fact that Stalin himself drafted the State Defense Committee decree on the KV-7 confirms again that he was the project's initiator. On January 27, 1942, S. A. Ginsburg, Deputy Chief of the 2nd Department of the People's Commissariat of the Tank Industry, drafted the operational requirement for the new version of the KV-7:

The KV-7 tank is a turretless tank with enhanced armament (two coaxial 76 mm guns).

I. Combat weight: 50-55 tonnes

II. Armor:

a) Mantlet thickness: at least 75 mm

b) Armor protection of the hull: similar to that of the KV-1 tank's hull

III. Armament:

1. Number of guns (coaxial): 2
Angle of traverse of the twin guns: +/-7.5°
Angles of elevation: +20° -5°

2. Number of DT machine guns

a) In the bow: 1

b) In the rear of the fighting compartment: 2
Machine gun traverse angle: 30°
Machine gun elevation angles: +15° -5°

IV. Basic load:

1. 76 mm gun rounds: 120–150

2. Number of machine-gun drums: at least 40

V. Crew: 6

VI. Tank hull

The KV-7 hull is similar to that of the KV-1 except for the upper portion of the fighting compartment and parts linked directly to the system mount.

VII. Fighting compartment and armament installation

1. The fighting compartment must allow for convenient placement of the gun crew and have instruments for 360° observation.

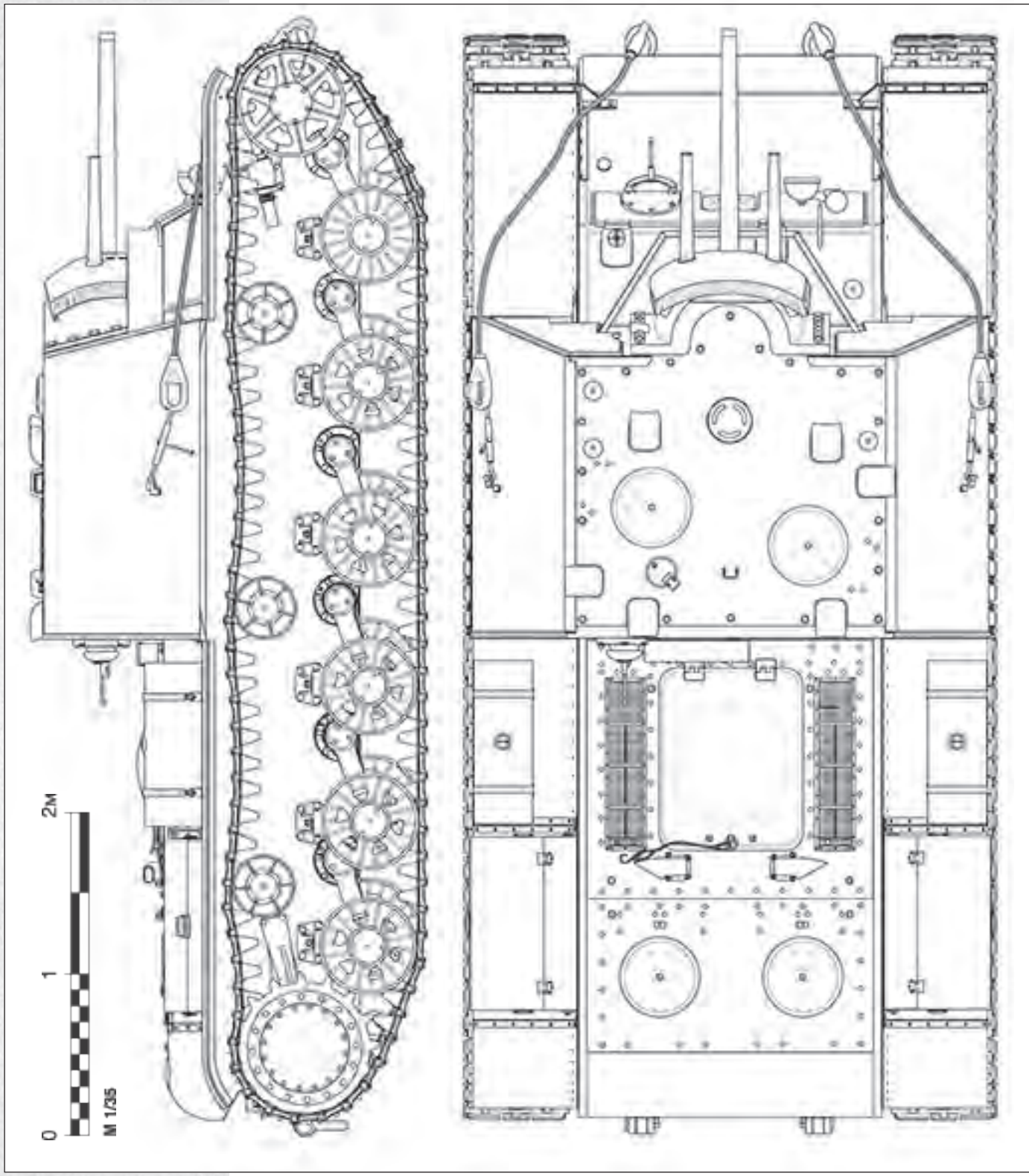
2. The fuel tanks may be located on the bottom of the fighting compartment to increase the amount of ammunition that can be carried and its convenient placement.

3. The twin 76 mm guns must be capable of firing salvos and firing separately.

4. The rate of fire during salvo firing (number of salvos per minute) must be close to that of the KV-1; when both guns are fired separately (one at a time) the rate of fire must exceed that of the KV-1 by 70–80%.

VIII. The tank's mobility, engine, suspension, and communications equipment must be similar to that of the KV-1.

Note: the factory may alter and supplement this operational requirement to improve the design in coordination with the People's Defense Commissariat, the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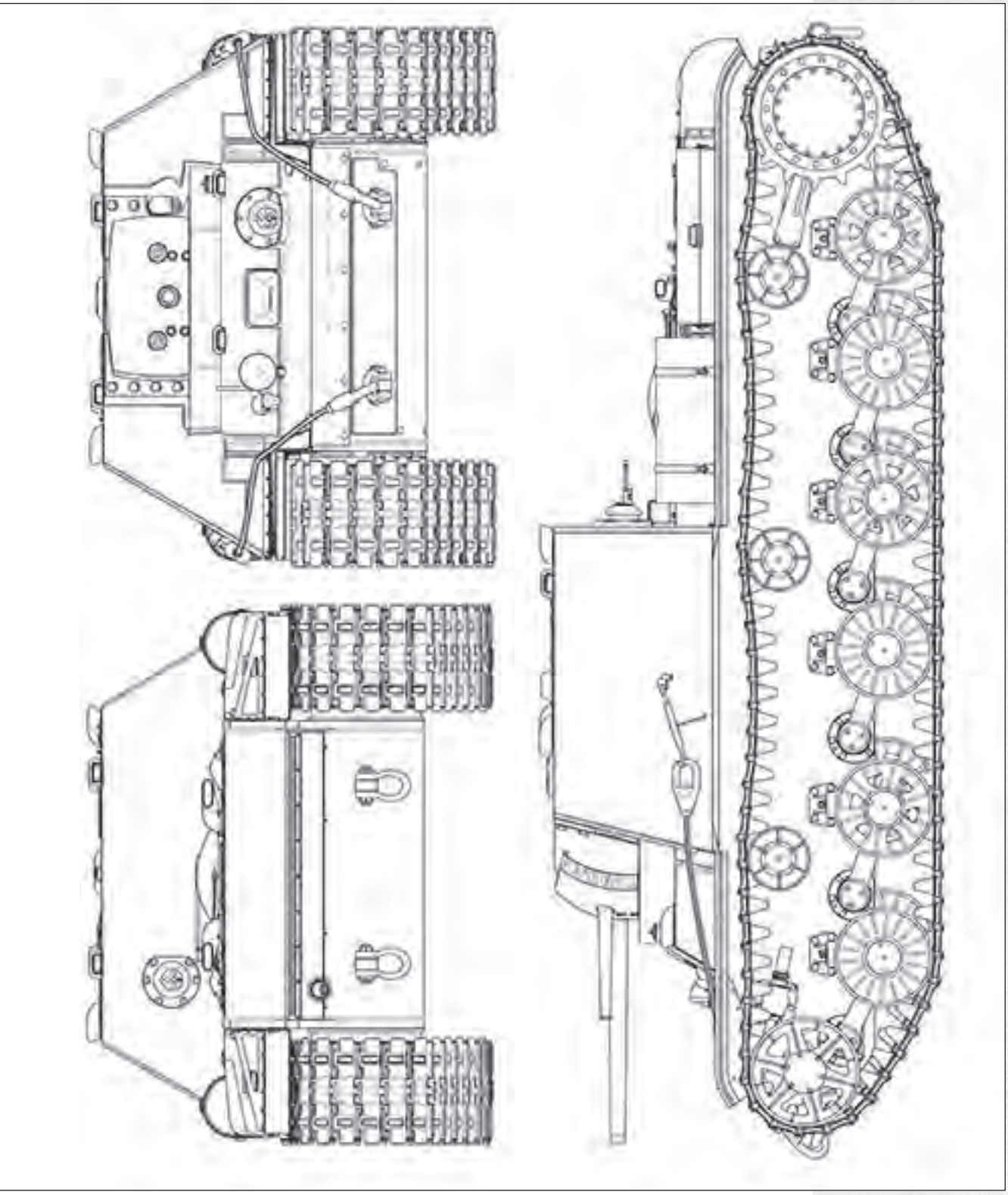
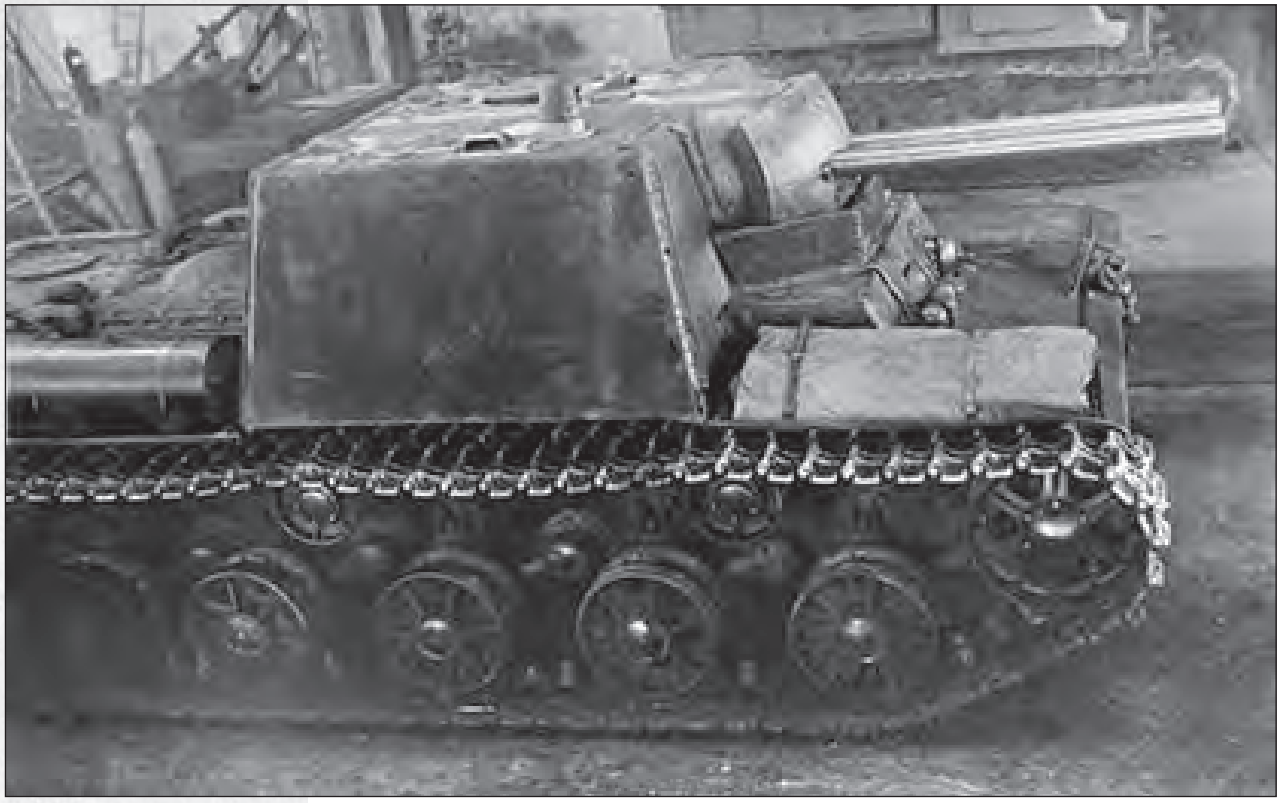


KV-7 assault tank with U-13 triple gun system, 1:35 scale drawing.



KV-7 assault tank with U-14 twin gun system, Chelyabinsk, spring 1942 (IZh).

Armor Directorate of the Red Army, and the People's Commissariat of the Tank Industry.[6]

As was the case with the gun system for the first version of the KV-7, work on the twin ZIS-5 76 mm guns was assigned to the Ural Heavy Machinery Plant. The project was overseen by L. I. Gorlitsky (on drawings, he is identified as the chief designer), and N. V. Kurin and G. F. Ksyunin worked on the system that was assigned the factory designation U-14. Judging by the dates listed on the drawings of individual parts, design work began not later than January 25, 1942; that is, before the operational requirement for the upgraded KV-7 was issued. Design work on the U-14 lasted until mid-February, and work to manufacture the upgraded KV-7 began in the second half of that month. The assault tank was not built from scratch: the existing KV-7 with the U-13 system was modified. The superstructure itself did not need to be altered; the changes affected only the mantlet and the ammunition storage rack.

The test program for the upgraded KV-7 was drafted by March 7, 1942. In addition to the firing trials during which 400 rounds were to be fired, it was proposed that the vehicle be driven a total of 50 kilometers. However, the tests had to be postponed because the Chelyabinsk Kirov Factory was occupied with other projects at the time. As a result, the firing trials were

[6] TsAMO RF, collection 38, series 11355, file No. 668, pp. 155–156.

held much later, and no mobility test was performed. Kirov Factory chief designer, Maj. Gen. Zh. Ya. Kotin was given the following report about the tests conducted on May 16, 1942:

Assembly of the KV-7 tank was completed on May 11, 1942, and on the 14th it underwent preliminary testing at the Kopeysk Test Range. Seventeen high-explosive fragmentation shells were fired from both systems, 5 by individual fire and 12 in salvos. A 1.5 X 1.5 meter target at a range of 800 meters was used.

The following preliminary conclusion can be drawn from the data:

1. *The accuracy of the twin systems in firing from a halt is good. After zeroing, 11 rounds fell in an ellipse with a long axis of 40 meters and the short axis of 3 meters.*
2. *The rate of fire was 6–7 salvos per minute. Due to system imbalance and the self-braking elevation mechanism—a sector-type (elevation) mechanism mounted on the twin guns—the elevation angle increased spontaneously by 25 mils after each salvo.*
3. *The twin gun traversing mechanism requires both hands to operate, which is completely unacceptable.*
4. *The placement of shell cases in an inset in the turret causes great difficulty during operation and cannot be accepted. Open storage must be used.*
5. *The effort required to operate the twin gun trigger mechanism during salvo firing is too great and must be cut at least in half.*
6. *No retraction device is provided for the twin guns; the rear wall of the turret must be adapted for that purpose, simultaneously making it an entryway for the crew.*[7]

According to development plans at Experimental Tank Plant No. 100 of the People's Commissariat of the Tank Industry (located in Chelyabinsk), which had been established in March 1942, the upgraded KV-7 was to undergo factory tests from June 1 through 10, followed by state testing. That did not take place: interest in an assault tank had waned, and Factory No. 100 was fully engaged in developing the KV-1S. That meant other development projects had to be postponed. The main reason the KV-7 project stopped was that design work to install the ML-20 152 mm gun howitzer in it was in full swing by June 1942.

The assault tank story might have ended here, but work on it did not cease. The KV-7 came up again in October 1942. P. F. Solomonov (a major at the time) inspected the SP gun during a business trip to the Kirov Factory. At Solomonov's insistence, the KV-7 was taken for a 15-kilometer test run. Firing trials could not be conducted because the traversing mechanism was malfunctioning. On November 10, Kotin received a letter from the chief of the GAU's Artillery Committee, Col. Gen. V. I. Khokhlov, that read as follows:

[7] TsAMO RF, collection 38, series 11355, file No. 639, p. 29.

Modified KV-7 assault tank (IZh).

The Kirov Factory of the People's Commissariat of the Tank Industry of the USSR has built a KV-7 tank with a non-rotating prismatic turret and twin ZIS-5 76 mm tank guns installed. After undergoing factory tests, the tank remains at the experimental factory of the People's Commissariat of the Tank Industry, and no decisions have been made concerning it.

It is the opinion of the Artillery Committee that this system should be sent for proving-ground tests and troop trials.

The troop trials should be performed under actual combat conditions, and the proving-ground tests should be done at the Tagil Test Range of the People's Commissariat of Munitions of the USSR.

The following actions must be taken before the KV-7 is sent for testing:

1. *Install a commander's observation cupola.*
2. *Inspect and repair the transmission, powerplant, and running gear.*
3. *Check the artillery system and repair and adjust the laying devices (elevation and traverse).*
4. *Adjust the trigger mechanisms*
5. *Modify the spent case catcher for greater convenience in loading.*

If you agree, please task Factory No. 100 of the People's Commissariat of the Tank Industry to perform the necessary work and provide a crew for the tank.[8]

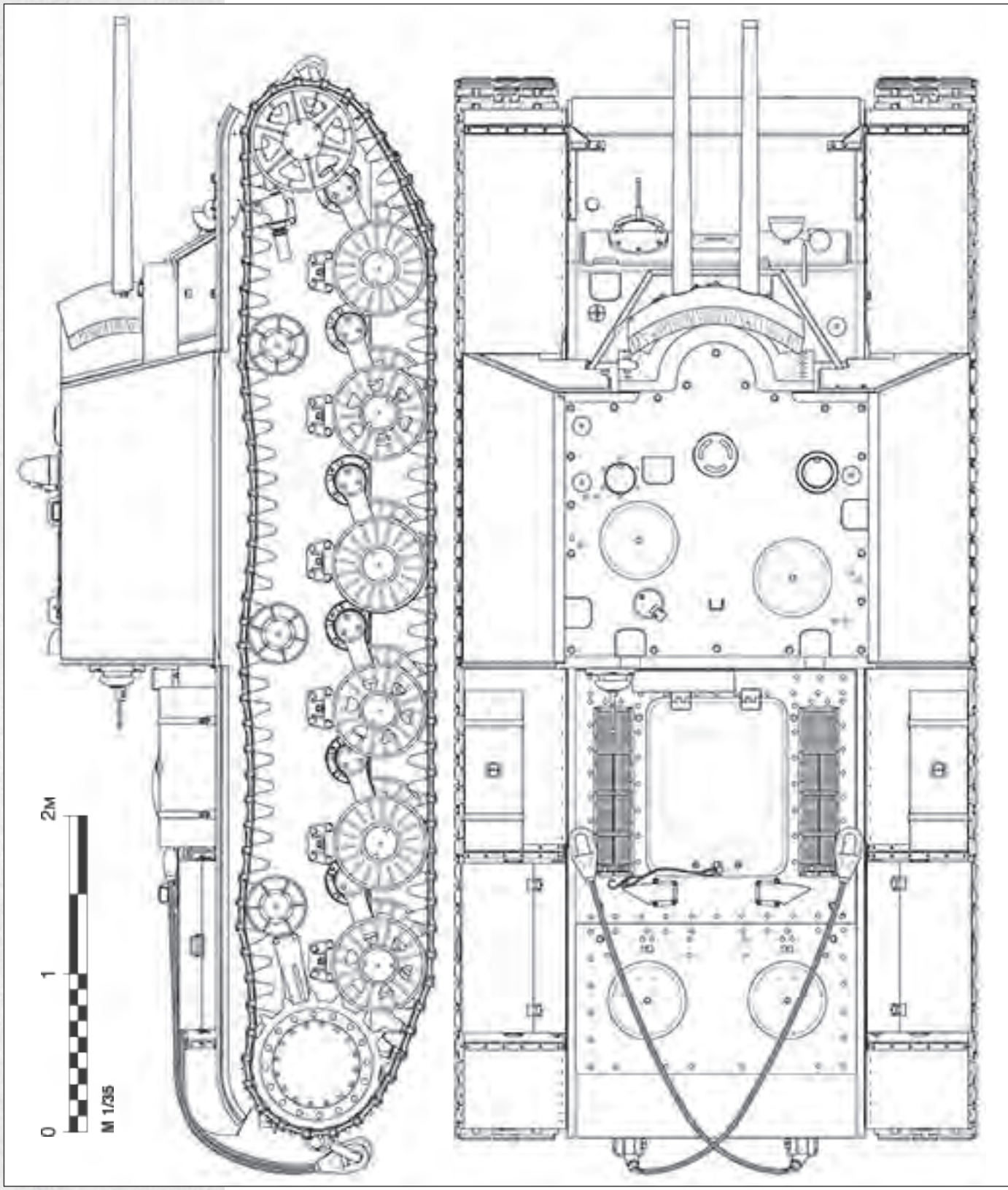
[8] TsAMO RF, collection 38, series 11355, file No. 938, p. 262.

The KV-7 was neither upgraded, nor did it undergo troop trials. S. A. Afonin, chief of the GABTU's Armor Directorate, felt that it made no sense to upgrade the tank, which had undergone a number of tests by December 10, 1942, because it had failed to fire a synchronous salvo. Also, instead of pairing the ZIS-5 76 mm guns, a single gun of a much larger caliber should be mounted, which Factory No. 100 was currently engaged in doing. However, work on the KV-7 project did not end there.

Decrees No. 12016ss and 12017ss issued on June 27, 1942, by the People's Council of Commissars of the USSR tasked the Saratov Gear-Cutting Machinery Plant to manufacture prototypes of a planetary transmission. A team led by G. I. Zaichik at the Bauman Institute of Mechanical Engineering in Moscow developed this transmission. Manufacture of the transmission was delayed: instead of August, two prototypes were made in December 1942, and they arrived at Factory No. 100 on the 30th. A team of designers from the Bauman Institute arrived in Chelyabinsk on January 2 to supervise the installation. The KV-7 was selected as the tank for use in testing the planetary transmission. Installation of the new transmission was delayed because Factory No. 100 was occupied with other projects. Instead of January 16 as instructed by I. M. Zaltsman, People's Commissar of the Tank Industry, the installation was completed only on February 17. It is possible that the delay at this stage was deliberate, because a different transmission had been undergoing testing on KV-1S No. 15002 since November 19, 1942—one designed by Eng. Col. A. I. Blagonravov.

The low build quality of the planetary transmission was apparent during the first few kilometers of the tests. All of the bronze rings were replaced with steel rings and the control ball bearings with forged needle bearings.

Front view of KV-7 with twin U-14 guns (IZh).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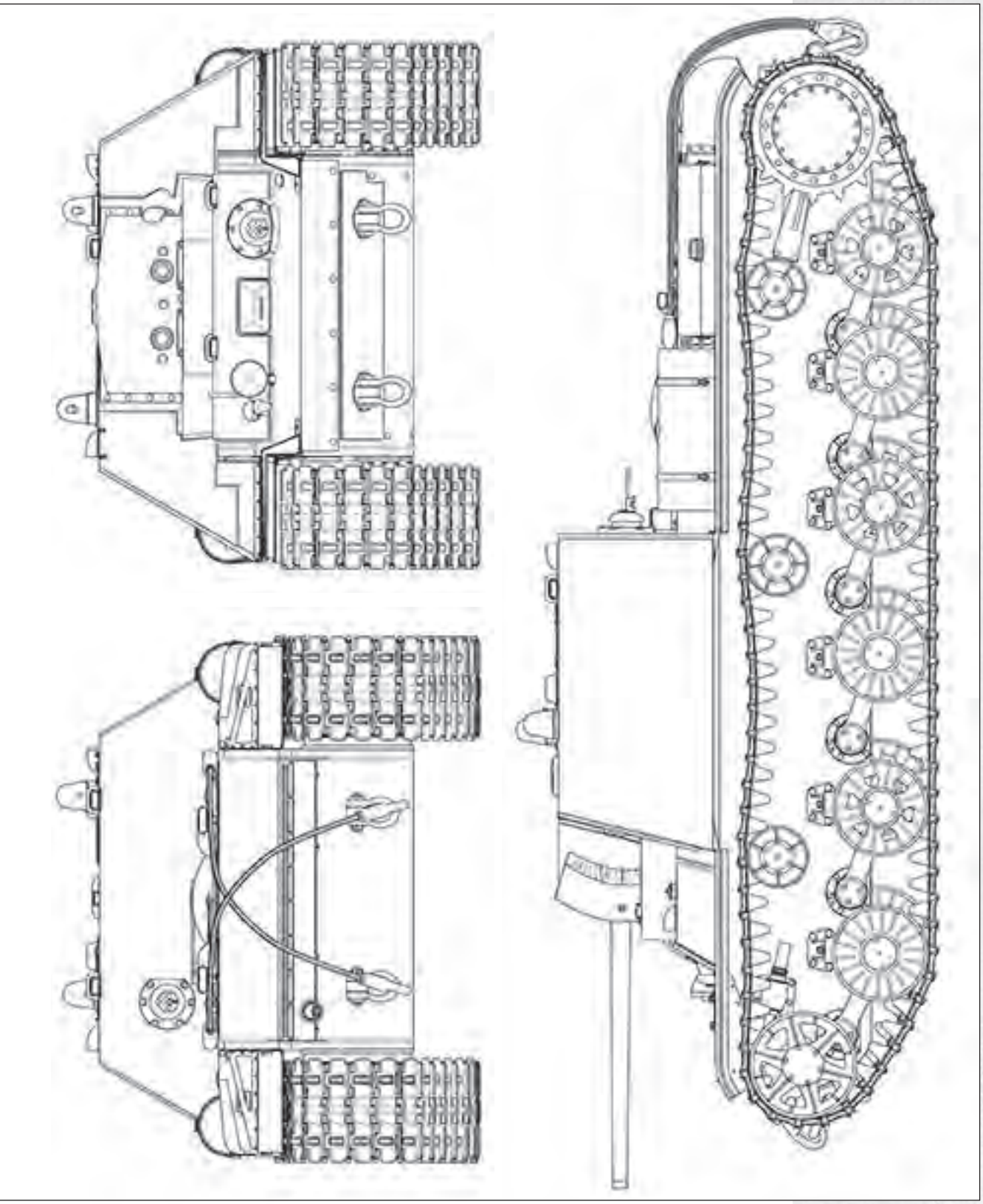
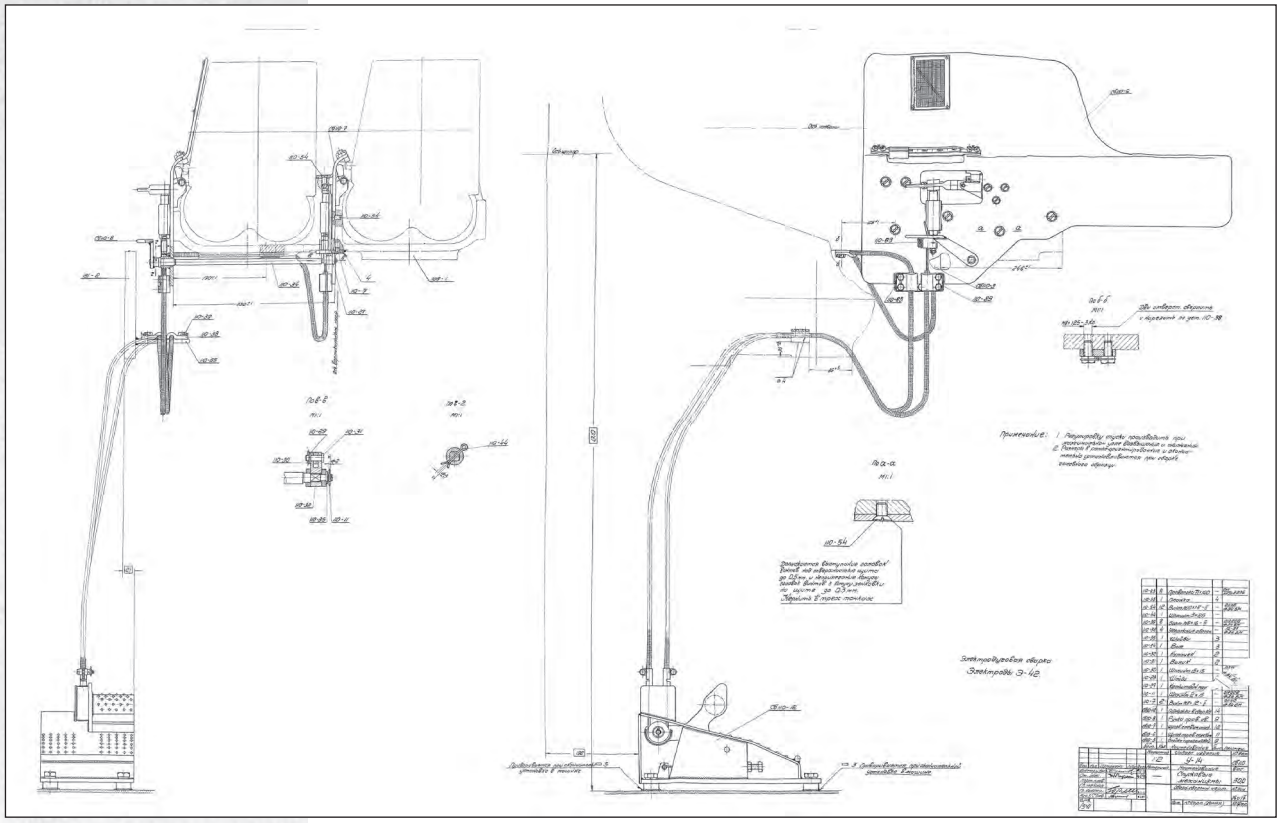


KV-7 assault tank with twin U-14 guns, 1:35 scale drawing.



U-14 twin gun trigger mechanism (SA).

Furthermore, an oil leak needed to be corrected and the Ferodo brakes replaced with cast-iron brake shoes. After the defects were corrected, the transmission was again installed in the KV-7, after which it traveled a distance of 545 km on March 4 without a problem. In a memorandum to People's Commissar Zaltsman on June 5, 1943, the chief of the GABTU's Armor Directorate stated the following:

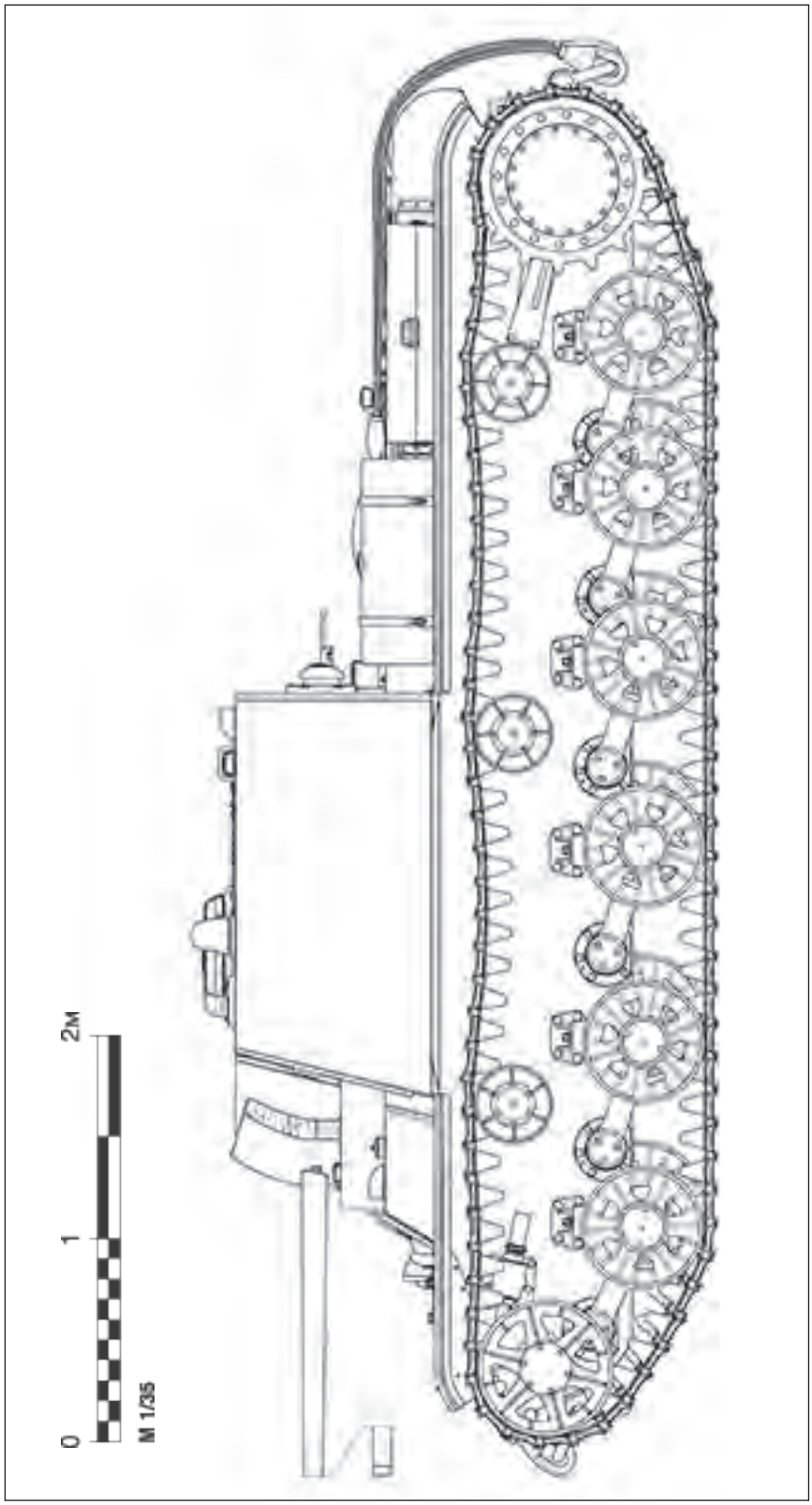
The tank with a planetary transmission is becoming more maneuverable and responsive. Changing gears is accomplished easily and quickly without losing speed.

The design defects identified during testing—oil leaks through seals, increased effort on the pedals and control levers, no automatic adjustment of brake bands—can be corrected when the transmission is refined for mass production.

In order to completely determine the performance of the planetary transmission, testing on the tank with this transmission is extended until the full guaranteed distance of 2000 km is achieved.[9]

Meanwhile, the testing dragged on. A final reduction gear failed in April after a 160 km run (excluding the 545 km traveled during February-March). Testing of the planetary transmission continued after repairs were made. The

[9] TsAMO RF, collection 38, series 11355, file No. 1377, p. 153.



The KV-7 assault tank with twin U-14 guns was to go to the front in this configuration, 1:35 scale drawing.

tank was driven a total of 843 km between February and April 1943, and then strange things began happening. Factory No. 100 delayed completion of testing for various reasons, and the KV-7 did not move for the entire month of May. The situation was the same in June. Factory No. 100's management cited a simple lack of manpower as the reason, although the true reason was unwillingness to work with a transmission developed elsewhere. According to reports by Eng. Maj. Dolitsky, deputy to the senior military representative of GABTU's Tank Directorate, only two people would be needed to correct the defects and continue testing. It is difficult to believe that the factory did not have them. The situation continued unchanged in July and August 1943, even though the GABTU management sent a letter "up the chain" demanding that testing be continued. In September, tests on the planetary transmission designed by Zaychik simply vanished from Factory No. 100's plans, and it reported on November 30 that assembly of a planetary transmission designed by Factory No. 100's special design bureau was complete. Development was delayed, and in the spring of 1944 the transmission was installed in the first prototype of heavy tank Object 701. The conflict continued: the second prototype of the new tank had the transmission developed by Zaychik's team.

Judging from the correspondence, the second phase of testing on the planetary transmission did not take place. The KV-7 traveled another 1089 km, after which the transmission was removed. This marked the end of this vehicle's career. According to a decision by Factory No. 100's management, in late December 1943 the KV-7, KV-9, and KV-12 were decommissioned and scrapped.

Despite the unfortunate fate and lack of soundness of the concept of an assault tank equipped with a salvo fire system, the KV-7 was a major milestone in the history of the Soviet tank industry. It was actually the first wartime Soviet heavy SP assault gun, and its design was the point of departure for the development of SP guns of that class. Development along those lines actually began simultaneously with work on the KV-7 that was equipped with the U-14. In addition, the scheme featuring installation of weapons in a frame was subsequently used in a number of wartime Soviet SP guns.

CHAPTER 5. **The Sverdlovsk Era**

In early January, ideas of arming the KV-7 with weapons more powerful than the twin 76 mm guns or the 122 mm howitzer began making the rounds of GABTU management and were mentioned in a report about tests of the assault tank. An example of this kind of proposal can be found in a January 8, 1942, finding about the KV-7 signed by Maj. Gorokhov, chief of the 4th Branch of the 3rd Department of the Red Army's Armor Directorate:

After reviewing the system and the firing conducted with it, I believe that this type of weapon is unacceptable to the armored forces for the following reasons:

1. *The system is useless against tanks because it has little flexibility of fire; it can traverse only 15° to each side.*
2. *Nor can it be used against reinforced concrete bunkers or earth-and-timber emplacements because it is ballistically inefficient and its shells are insufficiently destructive.*

I believe it would be better if the gun on this type of system were larger in caliber, approximately 152 mm, and mounted on a KV-2 tank—the M10.[1]

Meanwhile, the situation with the KV-7 was becoming rather delicate. As the first assault tank prototype was undergoing firing trials, preparations were underway at Factory No. 200 to begin mass production of the hull. On December 30, 1941, Factory No. 200's chief engineer, L. I. Eyranov, signed off on the specifications for manufacturing a preproduction batch consisting of 20 hulls. We do not know for sure how many hulls the factory manufactured, but judging by subsequent events, the technical specifications in Chelyabinsk did not place a limit on the number. The GABTU faced an unpleasant fact: the assault tank had gone from being a high-priority task to an experimental program, and something needed to be done with the hulls that had been built. In all fairness, this rarely happened in the Soviet tank industry, in contrast to the situation with the Germans, where Krupp regularly turned out turrets for canceled tanks.

The situation with the KV-7, however, was not that hopeless. The triple gun system was a failure, but that did not mean the effort was wasted. The superstructure for the KV-7 that had been developed for three relatively small tank guns was entirely suitable for mounting howitzers. The idea of mounting a 122 mm howitzer was dropped because there was a plan to place a similar weapon in a normal turret on a KV-9 tank. That left two larger guns: the 152 mm howitzer model 1938 (M-10) and the 152 mm gun-howitzer model

[1] TsAMO RF, collection 38, series 11355, file No. 668, p. 3

ML-20 152 mm corps-level gun-howitzer mod. 1937. Produced by Factory No. 172, this gun proved highly suitable for arming heavy SP guns (TsAMO).

1937 (ML-20). Also, the idea of mounting the BR-2 152 mm gun on a vehicle was not going away.

It should be noted that two enterprises were designing heavy SP guns at the same time in early 1942. The Bauman Institute of Mechanical Engineering in Moscow (now named the Bauman State Technical University (MGTU)) was tasked by the People's Commissariat of Arms to work on conceptual designs for self-propelled guns, including bunker busters, armed either with the BR-2 (SA-BR-2) 152 mm gun or the B-4 (SU-B-4) 203 mm howitzer. The second enterprise was Factory No. 221 of the People's Commissariat of Arms, the manufacturer of the BR-2 gun and B-4 howitzer. In March 1942, the factory's design bureau offered designs for the BR-33P and BR-33G SP guns. Both designs were based on assemblies from the T-34 medium tank. According to the documentation, the BR-33P would be equipped with the BR-2 gun, and the BR-33G with the B-4 203 mm howitzer. Upon review of the designs, it was decided not to manufacture them because they did not meet the requirements for bunker busters. That seems a little strange, because

ML-20 in travel position (TsAMO).

the initial task was to mechanize corps-level artillery, not develop systems for destroying enemy fortifications by direct fire.

Compared with these designs, the idea of developing a bunker buster using the KV-7 hull looked much more reasonable. At the time, development of the twin 76 mm gun system assigned by the State Defense Committee's January 6, 1942, Decree No. 1110ss was a higher priority task. Yet at the same time the requirement for an upgraded version of the KV-7 was issued, S. G. Ginsberg also drafted a requirement for a 152 mm SP gun based on the KV-7 chassis:

The 152 mm SP howitzer shall be designed using the KV-7 tank and shall be an artillery weapon for close-quarters destruction of bunkers in fortified regions.

I. Combat weight of the SP gun: 50–55 tonnes

II Armor:

Armor protection for the hull and system: same as the KV-7 tank

III. Armament:

1. 152 mm howitzer: 1

Twin gun traverse angles: +/-7.5°

Elevation angles: +12° -5°

2. Number of DT machine guns

a) In the bow: 1

b) In the rear of the fighting compartment: 2

Machine gun traverse angle: 30°

Machine gun elevation angles: +15° -5°

IV. Basic load:

1. Projectiles for the 152 mm howitzer: at least 30

2. Number of machine-gun drums: at least 40

V. SP gun crew: 6

VI. SP gun hull.

The SP gun hull shall be the same as that of the KV-7 tank, except for parts directly associated with installation of the howitzer.

VII. Fighting compartment and armament installation

1. The fighting compartment must allow for convenient placement of the gun crew and have instruments for 360° observation.

2. The fuel tanks may be located on the bottom of the fighting compartment to increase the amount of ammunition that can be carried and its convenient location.

3. To increase the rate of fire and facilitate loading of the howitzer, it is desirable to at least partially mechanize the loading process (feeding the projectile and charge).

ML-20 152 mm corps-level gun-howitzer mod. 1937 in firing position. In combat, the ML-20 was frequently fired at targets, including enemy tanks, within direct line of sight (TsAMO).

VIII. The tank's mobility, engine, suspension and communications equipment must be similar to that of the KV-1.

Note: the factory may alter and supplement this operational requirement to improve the design in coordination with the People's Defense Commissariat, the Armor Directorate of the Red Army and the People's Commissariat of the Tank Industry.[2]

In the development plan for 1942 approved by People's Commissar of the Tank Industry Malyshev on January 21, the system would proceed under the number 59. According to the plan, the Kirov Factory (ChKZ) would be responsible for the bunker buster's chassis, and the Ural Heavy Machinery Plant would answer for the artillery system. The design drawings were expected by March 15, the prototype by May 1, and the production drawings by May 10. The amount allocated for the project was 300,000 rubles. That was not a large sum compared with the amount allocated for Project 212. However, it involved modifying existing KV-7 assault tank hulls, not developing a vehicle from scratch.

This project produced a mixed reaction at the GAU. People there continued to insist on developing a "BR-2 152 mm gun on a chassis incorporating assemblies from the KV tank." The idea of developing an SP gun based on the KV-7 was considered lacking. That is evident, for example, from the letter GAU's chief, Col. Gen. of Artillery N. D. Yakovlev, and GAU Military Commissar Kozlov wrote to L. P. Beria, Deputy Chairman of the Council of People's Commissars of the USSR on March 25, 1942:

Our experience in this war and the war with Finland has revealed the following characteristics of modern military operations:

1. *Massive use of highly mobile armored and mechanized equipment;*
2. *In-depth reinforcement of strategic lines with reinforced concrete bunkers and earth-and-timber emplacements.*

These circumstances have given rise to new requirements regarding the mobility of artillery of all calibers and purposes and its capability for conducting direct fire.

The mobility of equipment used to tow artillery lags far behind the mobility of modern tanks. The average speed of artillery prime movers is no greater than 10–12 km/h and agricultural tractors are no faster than 5 km/h, while tanks are capable of speeds in excess of 40 km/h.

In addition, corps-level and heavier artillery pieces are completely open, making it difficult to use them for the close-quarters destruction of bunkers.

We need to develop highly maneuverable artillery systems that are also adequately protected against short-range fire.

This can be self-propelled artillery incorporated into armored auxiliary-propelled hulls that share components with tanks currently in production.

[2] TsAMO RF, collection 38, series 11355, file No. 668, pp. 157–158.

Foreign armies possess mobile armored self-propelled guns.
I believe we need to have three types of self-propelled artillery systems:

1. *Self-propelled artillery for destroying bunkers.*
2. *Self-propelled artillery for destroying tanks.*
3. *Self-propelled assault artillery for supporting mechanized forces.*
4. *Self-propelled antiaircraft guns.*

Development of the following self-propelled systems must be organized at industrially capable artillery and tank factories:

1. *A bunker buster mounting the BR-2 152 mm gun on a chassis incorporating assemblies from the KV tank.*
2. *A tank destroyer: 85 mm antiaircraft gun model 1939 on a chassis incorporating assemblies from the T-34 tank.*
3. *A self-propelled assault system: ZIS-3 or USV 76 mm gun on a chassis incorporating assemblies from the T-60 and T-70 tanks.*
4. *A self-propelled antiaircraft system: 37 mm automatic antiaircraft gun on T-34 and T-60 or T-70 tanks.*

Operational requirements for development of these prototypes have been sent to the factories and the People's Commissariat of the Tank Industry, but not all of the projects stipulated in the GAU's plan have been acknowledged.

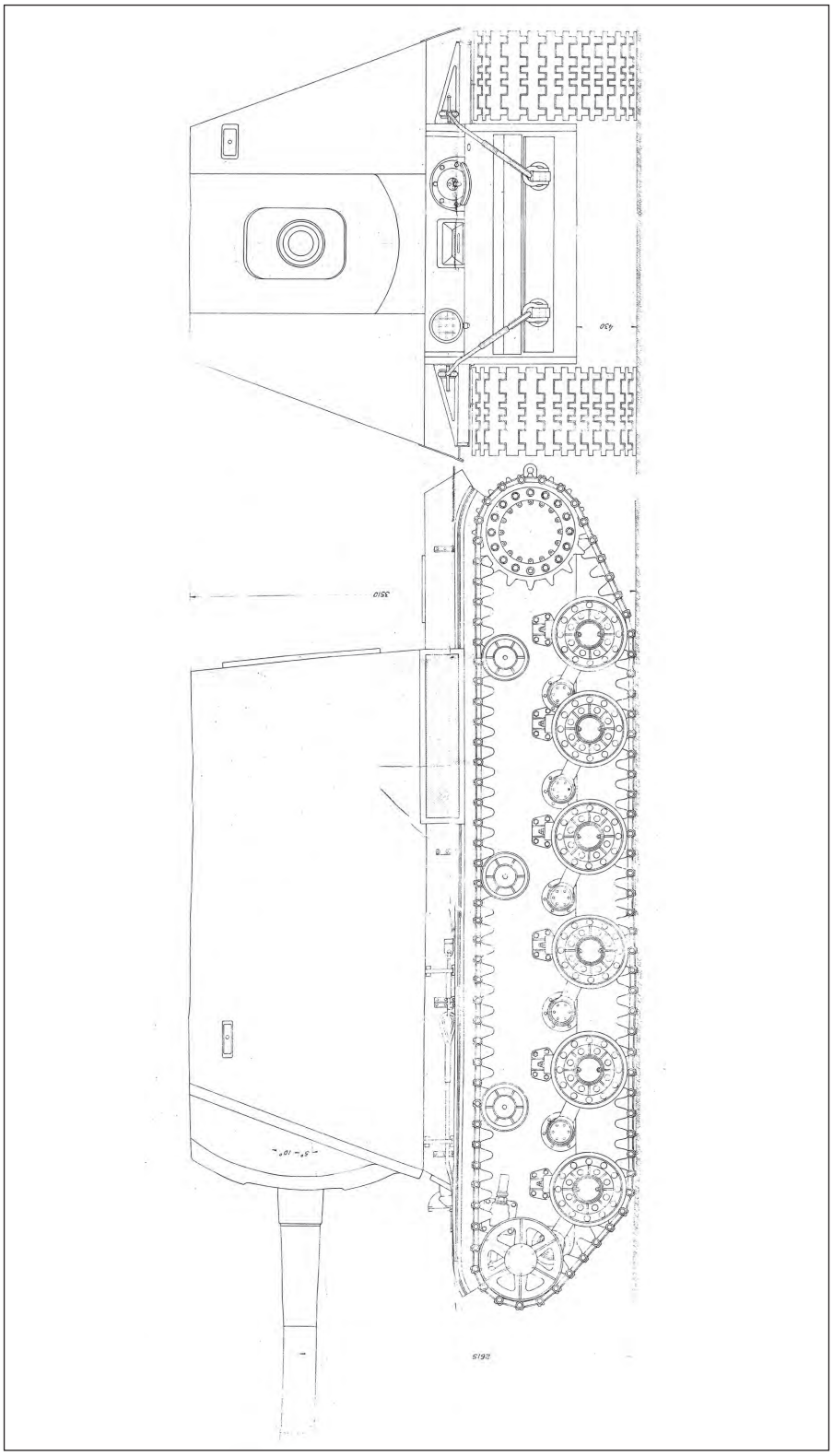
The People's Commissariat of the Tank Industry has decided not to arm the bunker buster with the BR-2 152 mm gun, but rather to equip it with the ML-20 gun-howitzer, which is significantly less capable of penetrating concrete and armored turrets.

In addition, the People's Commissariat of the Tank Industry is refusing to develop tank destroyers, citing development of the 85 mm tank gun for the KV tank as the reason.

Given the urgent need for development of these self-propelled systems, I hereby request that Comrade Malyshev, People's Commissar of the Tank Industry, be ordered to undertake these projects.[3]

However, the desires of the artillerymen in this case were at cross purposes with a number of obvious facts. Project 212 had been shut down by the spring of 1942, and the Chelyabinsk Kirov Factory had no plans to revive it. The same was true of the KV-3, the chassis used for the development of the bunker buster. Even if the Council of People's Commissars insisted on this SP gun, there was absolutely no way a prototype could be built or the system could be put into production. Revival of production of the BR-2 152 mm corps-level gun was also unrealistic at that time. Whether the GAU liked it or not, therefore, the only option at the time was to develop a bunker buster based on the KV-7. In addition, although the ML-20 152 mm gun-howitzer proposed as the weapon for the new bunker buster was one-third shorter than the BR-2, it was still a very formidable weapon.

[3] TsAMO RF, collection 81, series 12038, file No. 113, pp. 4–6.



Factory drawing of U-19 heavy SP gun (TsAMO).

On April 15, 1942, the GAU's Artillery Committee met in plenary session to discuss the development of self-propelled artillery. In addition to members of the Artillery Committee, it was also attended by S. A. Ginsburg as the representative of the People's Commissariat of the Tank Industry who oversaw self-propelled artillery issues. The plenary session came to the following decisions:

1. *We hereby confirm that the requirements of the Artillery Committee of the Main Artillery Directorate of the Red Army concerning the need to have the following types of self-propelled gun systems in the inventory of the Red Army are correct:*
   1) Self-propelled guns for destroying bunkers;
   2) Self-propelled guns for destroying tanks;
   3) Self-propelled assault guns for supporting motorized infantry;
   4) Self-propelled antiaircraft systems for escorting tank and motorized forces.
2. *We consider it necessary to supplement the Red Army's armament system with a self-propelled howitzer for combating earth-and-timber emplacements and concentrations of enemy personnel.*
3. *We believe it necessary to assign factories to manufacture the following self-propelled systems:*
   1) Self-propelled assault guns:
      a) A USV or ZIS-3 76 mm division-level gun on a universal chassis incorporating assemblies from the T-70 tank.
         Assign this project to Factory No. 37 (of the People's Commissariat of the Tank Industry), to be assisted by Factory No. 9 (of the People's Commissariat of Arms).
      b) M-30 122 mm howitzer model 1938 on a T-34 chassis.
         Assign this project to Factory No. 183 (of the People's Commissariat of the Tank Industry) and Factory No. 8 of the People's Commissariat of Arms).
   2) BR-2 152 mm bunker busters based on a special chassis incorporating assemblies from the KV tank.
      Assign this project to the Kirov Factory (of the People's Commissariat of the Tank Industry), to be assisted by Factory No. 221 (of the People's Commissariat of Arms). In view of the fact that chassis for this system are very difficult to obtain, we consider it advisable that this project be limited to system design.
      For the time being, only mount the 152 mm gun-howitzer model 1937 in a KV-7 tank hull. Assign this project to the Kirov Factory (of the People's Commissariat of the Tank Industry) and Factory No. 172 (of the People's Commissariat of Arms).
   3) Self-propelled antiaircraft systems:
      a) Installation of the 37 mm automatic antiaircraft gun model 1939 on a universal chassis incorporating assemblies from the T-70.

Assign this project to Factory No. 37 (of the People's Commissariat of the Tank Industry), to be assisted by Factory No. 4 (of the People's Commissariat of Arms).

b) Install the 25 mm automatic antiaircraft gun model 1940 on the same universal chassis.
Assign this project to Factory No. 37, with assistance from Factory No. 172 (of the People's Commissariat of Arms) (Comrade Loktev's design bureau).

4. Due to the inability to rapidly obtain a special chassis incorporating assemblies from the T-34 tank for the 85 mm system with 360° traverse called a tank destroyer, discontinue further work on this project.

5. In order to accelerate the manufacture of self-propelled models according to paragraph 3 of this decree, we hereby request that Comrade Malyshev, People's Commissar of the Tank Industry, and Comrade Ustinov, People's Commissar of Arms, instruct the directors of the above-named factories to urgently conclude contracts with the GAU.

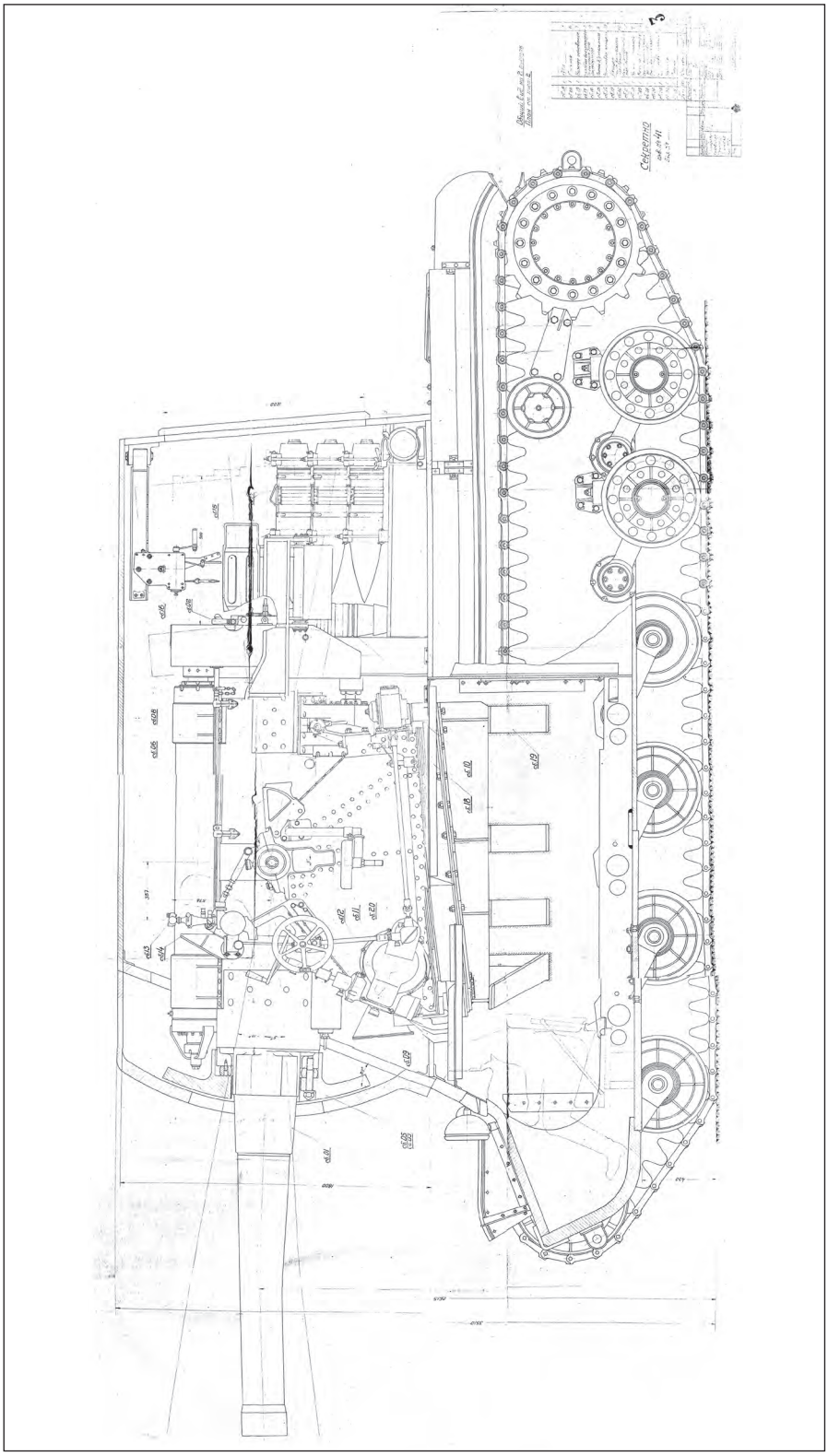
6. In order to increase the inventory of self-propelled artillery, we consider it sensible to modify captured vehicles for use as self-propelled guns mounting domestic arms.[4]

Thus, the idea of building an analog to SP gun 212 was shelved. It is true that the ML-20 could not, like the BR-2, "gnaw away" two-meter concrete walls, but it was in mass production. As far as cooperation on an SP gun based on the KV-7 was concerned, changes were made. In place of Factory No. 172, work on the gun was assigned to the Ural Heavy Machinery Plant. Cooperation between the Ural plant and the Chelyabinsk Kirov Factory continued. The project that had been underway in Sverdlovsk since the winter of 1942 was assigned the factory designation U-18. As with the U-13 and U-14, installation of the ML-20 in the KV-7 was overseen by L. I. Gorlitsky.

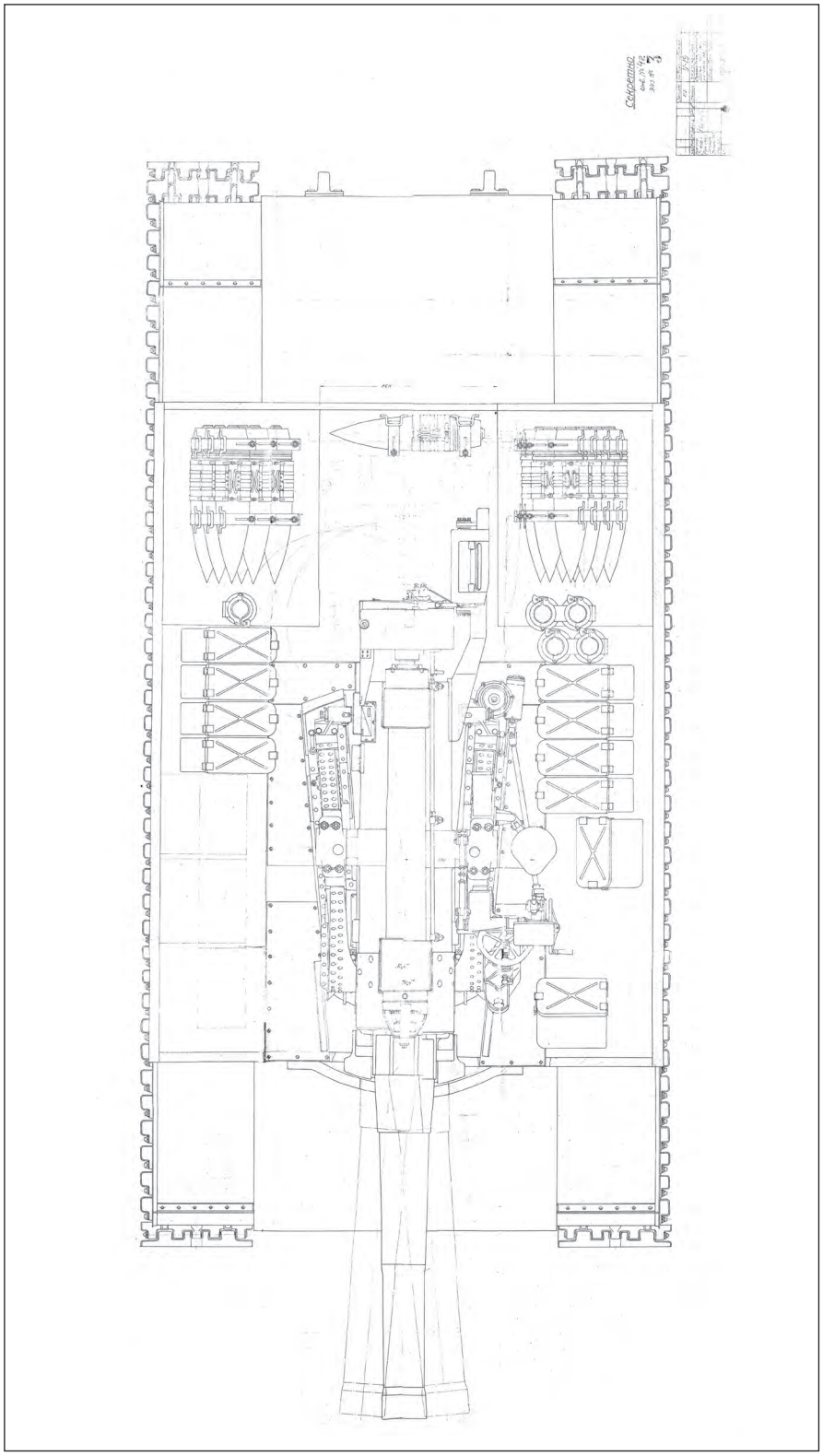
Under assignment from Kotin, Gorlitsky had been supervising a different heavy SP gun project, unrelated to t U-18, since April 1942. Another curious fact is that this project, which was assigned the factory designation U-19, had been sent to GAU and GABTU on August 12, 1942—three weeks before the U-18. And that was done despite the fact that installation of the ML-20 on the KV-7 was a high-priority task, and U-19 had not been mentioned. Moreover, a broad description of the U-19 dates back to May, and the drawings to mid-June of 1942. It is possible that this system was a response to the persistent demands of artillerymen for an "iron fist" to destroy bunkers by direct fire. This line of thinking is encouraged by the fact that the U-19 concept is highly reminiscent of Factory No. 221's bunker buster projects and efforts by the Bauman Institute of Mechanical Engineering.

The U-19 project involved mounting a 203 mm howitzer model 1931 (B-4) on a KV-1 tank chassis. The primary mission of this SP gun was to destroy fortifications that less powerful systems could not handle. Like the KV-7, the base KV-1 tank underwent minimal modification: its turret platform was removed, its engine compartment bulkhead made removable, and its fuel

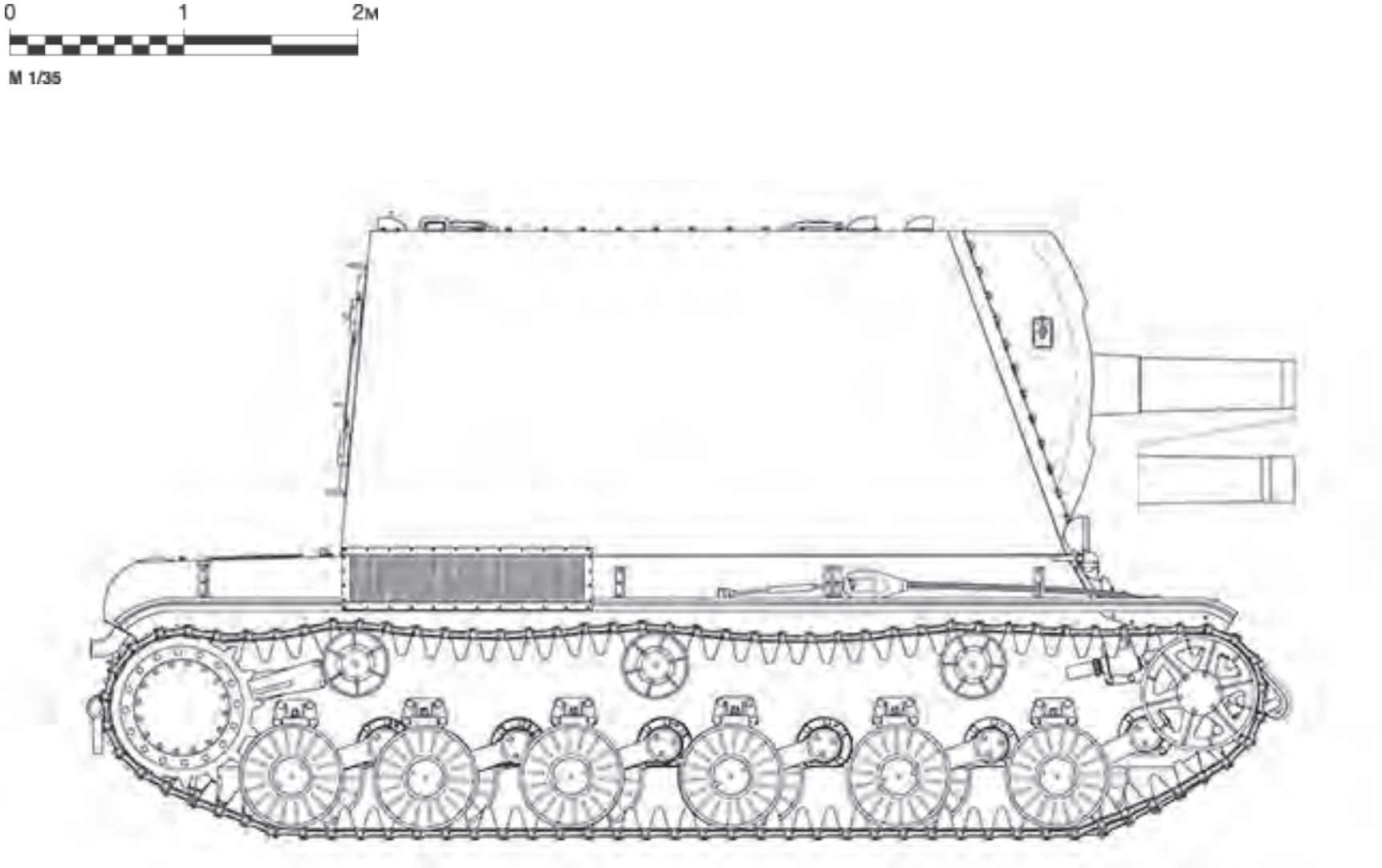
[4] TsAMO RF, collection 81, series 12038, file No. 113, pp. 11–14.



Sectional drawing of U-19 SP gun (TsAMO).



Drawing of the U-19 heavy SP gun, section through the fighting compartment (TsAMO).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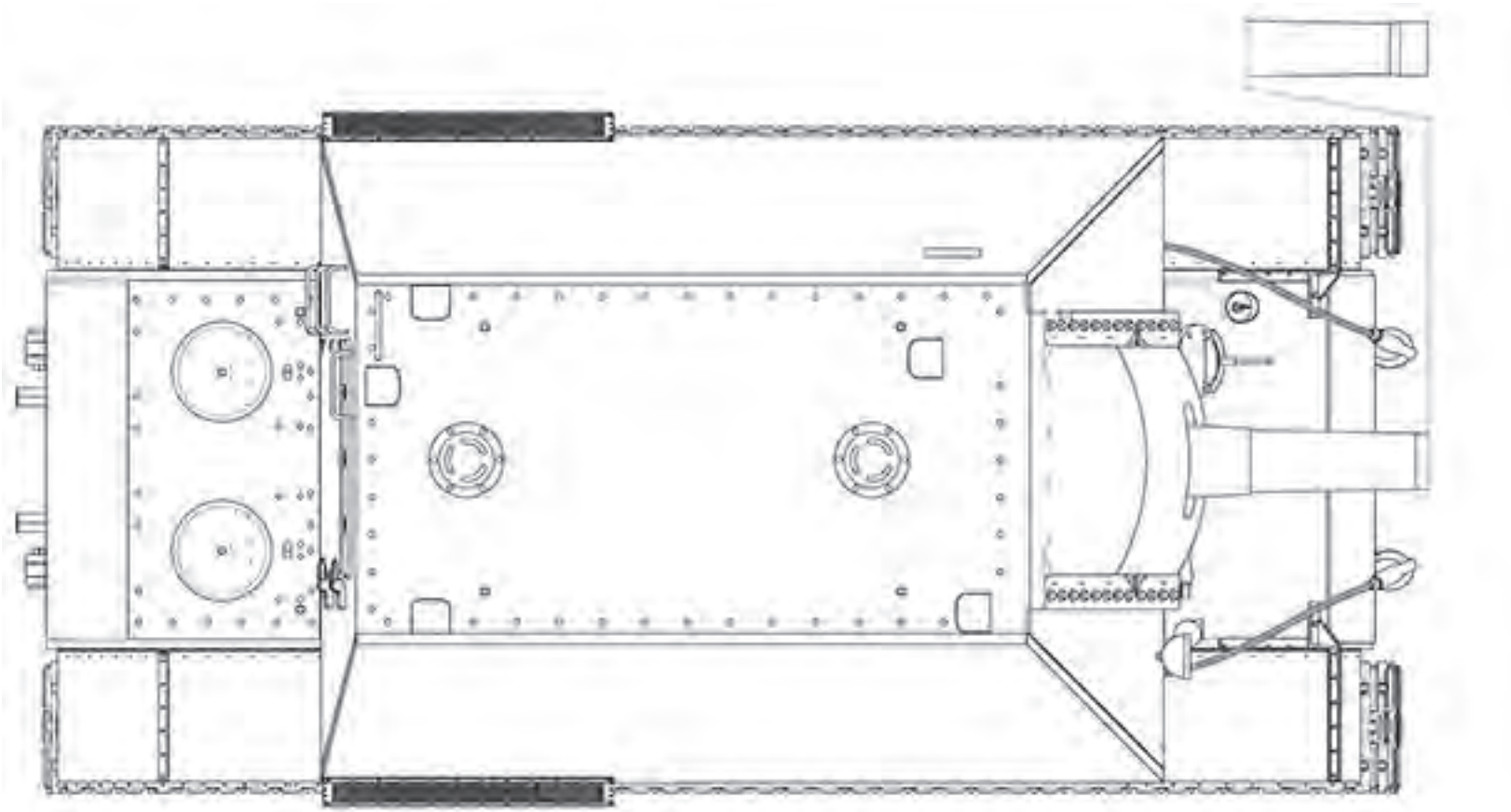
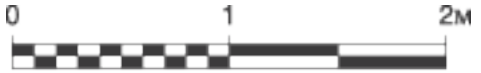


U-19 heavy SP gun, 1:35 scale drawing.



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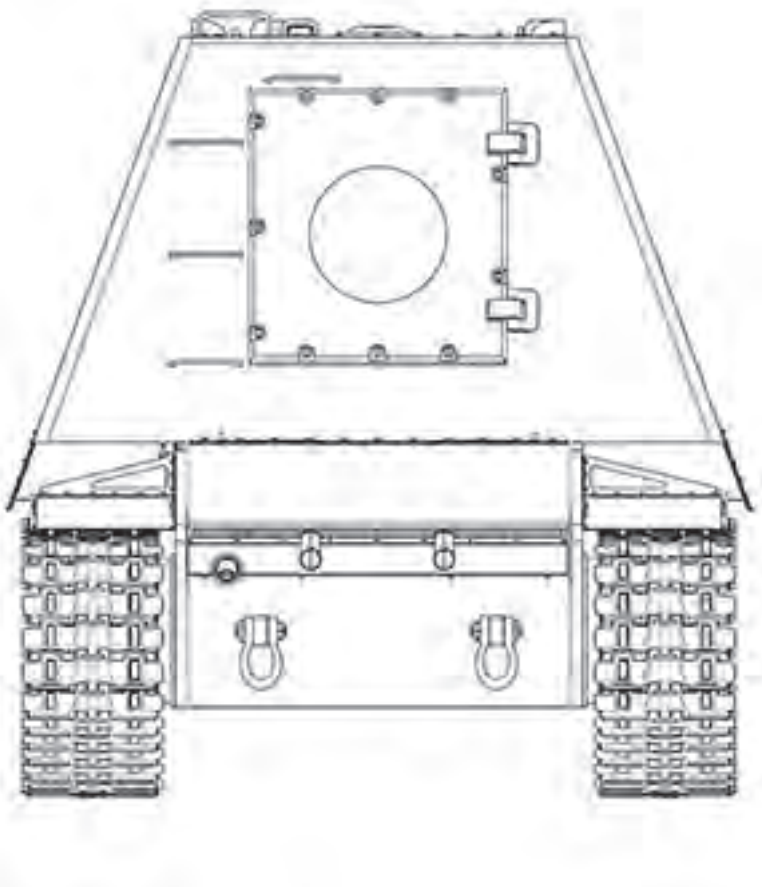
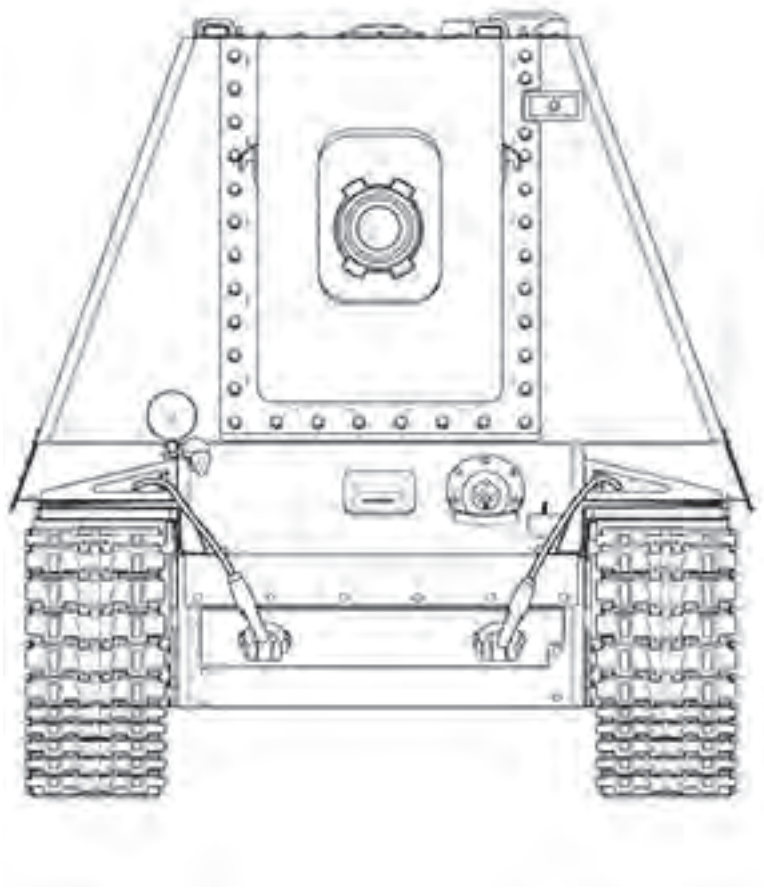
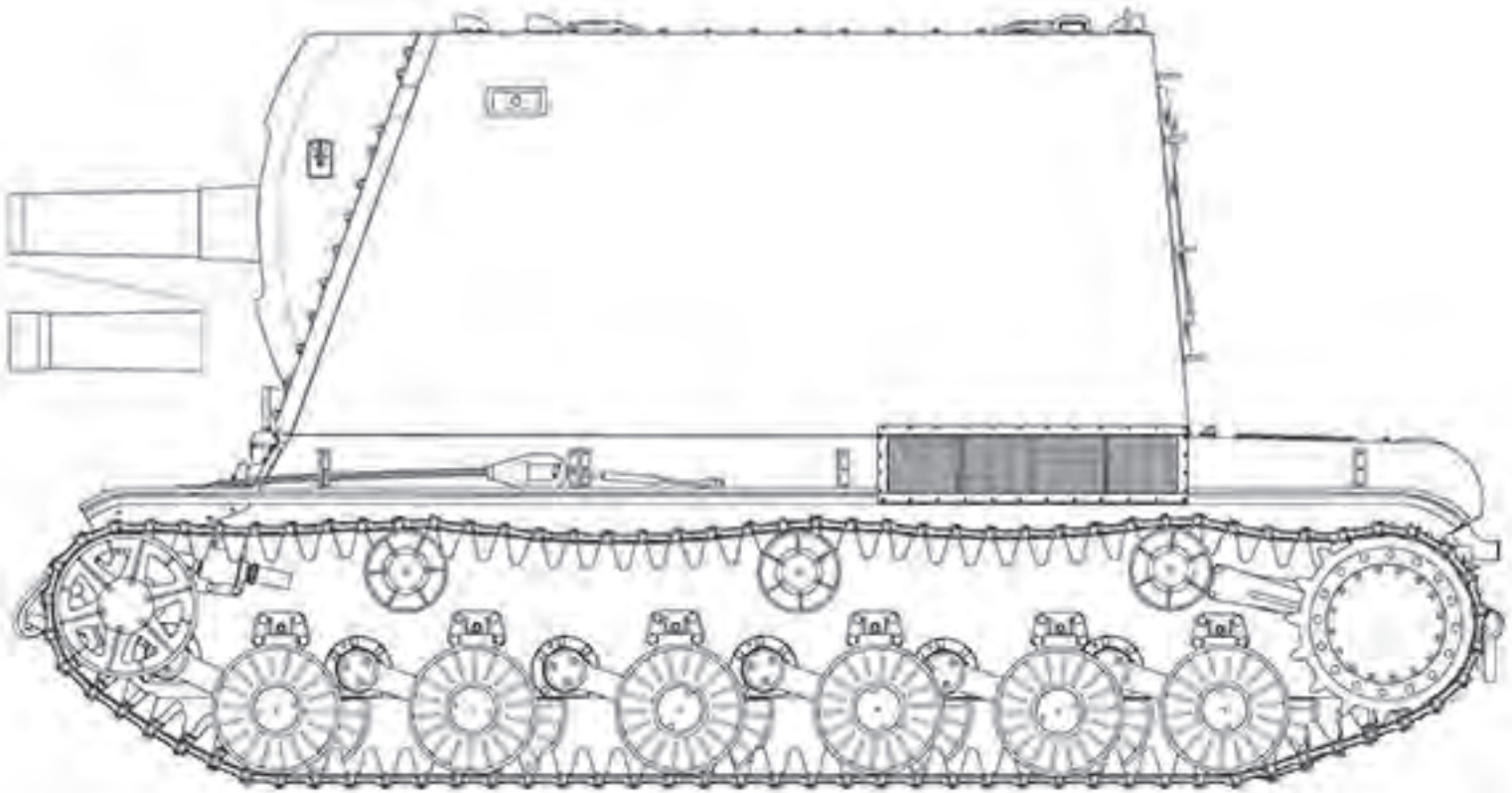






U-19 heavy SP gun, 1:35 scale drawing.

tanks and air intakes changed. The tipping parts and top carriage of the B-4 203 mm howitzer were adopted without modification in order to keep costs down. The turret was replaced by a massive superstructure that completely covered the gun, which was installed in the fighting compartment. The superstructure partially covered the top of the engine compartment, potentially making it difficult to service the engine. The superstructure's front plate was 75 mm thick, and it had 60 mm of armor on the side, 40 mm on the rear, and 30 mm on its roof. For installation of the howitzer barrel, the superstructure had a large hatch in its rear that included an access hatch for the crew. The design called for the roof to be removable. The front of the howitzer was protected by a massive mantlet 75 mm thick. Because the main mission of the U-19 was destruction of enemy fortifications, the elevation angle was limited to 10°. The gun's traverse angle was also kept to a minimum—no more than 4.3° to each side, which matched the specification for the B-4 howitzer.

The military's requirement that the chassis design changes be kept to a minimum while providing decent armor protection resulted in a very odd machine. The U-19 was calculated to weigh an estimated 66,190 kg, which exceeded even the SP gun 212A's design parameters. Considering that the actual combat weight of manufactured models was usually somewhat greater than the design weight, the U-19 had the potential of becoming the heaviest Soviet SP assault gun, surpassing the armored version of the SU-14 for this dubious honor. In addition, putting the B-4 203 mm howitzer in an enclosed superstructure gave the system a height of 3510 mm, which was all of 50 mm lower than the armored version of the SU-14. The developers of the U-19 understood very well that these dimensions would make the SP gun an excellent target for the enemy. From the very beginning, therefore, the concept called for it to be escorted by conventional tanks.

The extremely mixed outcomes of the design process led to an appropriate conclusion. On September 9, 1942, the Ural Heavy Machinery Plant's chief engineer, M. G. Umnyagin, received a letter signed by the chief of the GABTU's Armor Directorate, Eng. Col. S. A. Afonin, that stated the following:

In response to your letter No. 3707/48s of August 24, 1942, regarding the U-19 self-propelled gun project with a 203 mm howitzer on the KV-1 chassis, I hereby inform you of the following:

1. *With the U-19 weighing 66 tonnes and with retention of the KV-1 tank transmission, the V-2K engine does not reliably support movement of the SP gun at the assigned speeds. In addition, the KV-1 tank transmission and suspension are designed for a vehicle weighing 40 tonnes and cannot perform reliably when the weight is increased to 66 tonnes.*
2. *The SP gun would be a highly visible target due to its height (3.51 m) and the great width of the upper part of the vehicle hull (the fixed turret).*

3. *The armor protection of the turret is weaker than that of a conventional KV-1; therefore, it would not provide the necessary armor protection for the crew when receiving fire from close range.*
4. *If the running gear is disabled, the gun can only be fired within a narrow sector (9°) because the U-19 does not have a rotating turret.*
5. *The large weight of the vehicle appears to make towing of disabled vehicles from the battlefield problematic.*
6. *The SP gun's mobility would be low, judging by its power-to-weight ratio (9 hp per tonne) and ground pressure (98 kg/cm²).*

Accordingly, I believe it would be inadvisable to continue working on the design for the U-19 self-propelled gun.[5]

Some paragraphs in the document are puzzling because projects like the 212 did not weigh less, had no better protection, and would be no less challenging to tow from the battlefield. Nevertheless, another bunker buster that the artillerymen wanted sank into oblivion without even reaching the mockup stage. The U-18 had no better luck, but for entirely different reasons.

Development work on installing the 152 mm howitzer in a superstructure on the KV-7 was delayed for a variety of reasons. The conceptual design was not finished until August 4, and it was proposed a month later—on September 3, 1942. A team of designers at the Ural Heavy Machinery Plant led by Gorlitsky tried their utmost to meet the military's requirements while minimizing modifications to the KV-7. The reason for that is clear from the description of the U-18:

The self-propelled gun with the ML-20 152 mm gun is intended for destroying enemy bunkers and earth-and-timber emplacements.

The design objective for this self-propelled gun was to make maximum use of mass-produced assemblies from the KV tank and the ML-20 gun.

The most suitable base chassis for this system is the KV-7 tank. The Kirov Factory in Chelyabinsk has several dozen hulls with turrets for this tank that were intended for installation of one 76.2 mm and two 45 mm tank guns.

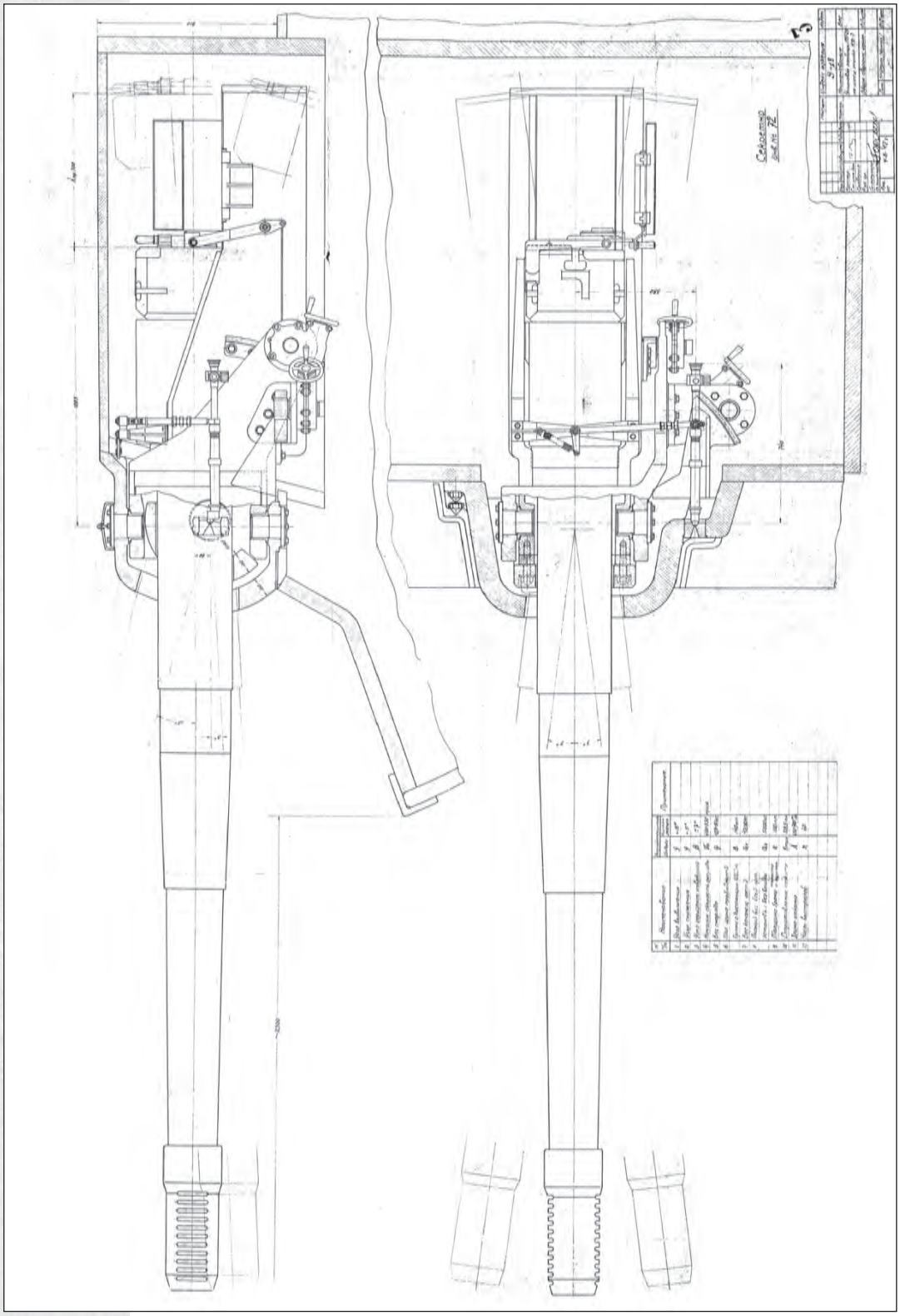
The regular tipping parts of the ML-20 gun did not fit in the existing KV-7 turret. Therefore, only the barrel and breech mechanism were taken from the ML-20 gun. The cradle and recoil mechanisms have been redesigned to have a shorter recoil length, which made it possible to fit the ML-20 system in the existing KV-7 turret.

The mounting parts were also redesigned. This solution presented advantages with respect to the turret weight and, especially, the system's height.[6]

The U-18's artillery system comprised only 13 assemblies, and the KV-7 hull and superstructure were not modified. It appeared that the military's requirements were fully satisfied and the system could be put into service, especially since extra hulls were available. But a problem arose from an unexpected corner.

[5] TsAMO RF, collection 38, series 11355, file No. 937, p. 88.

[6] TsAMO RF, collection 38, series 11355, file No. 937, p. 127.



U-18 heavy SP gun on KV-7 assault tank chassis (TsAMO).

On September 24, 1942, the Ural Heavy Machinery Plant's chief engineer, M. G. Umnyagin, received a letter signed by Eng. Col. Kovalev, chief of the 6th Department of the GABTU's Armor Directorate:

In response to your letter No. 3655/48s of September 4, 1942, concerning the U-18 self-propelled gun project, I hereby inform you that a similar project proposed by Comrade Petrov between September 12 and September 14, 1942, was discussed at a meeting of the Technical Committee of the Council of the People's Commissariat of Arms.[7]

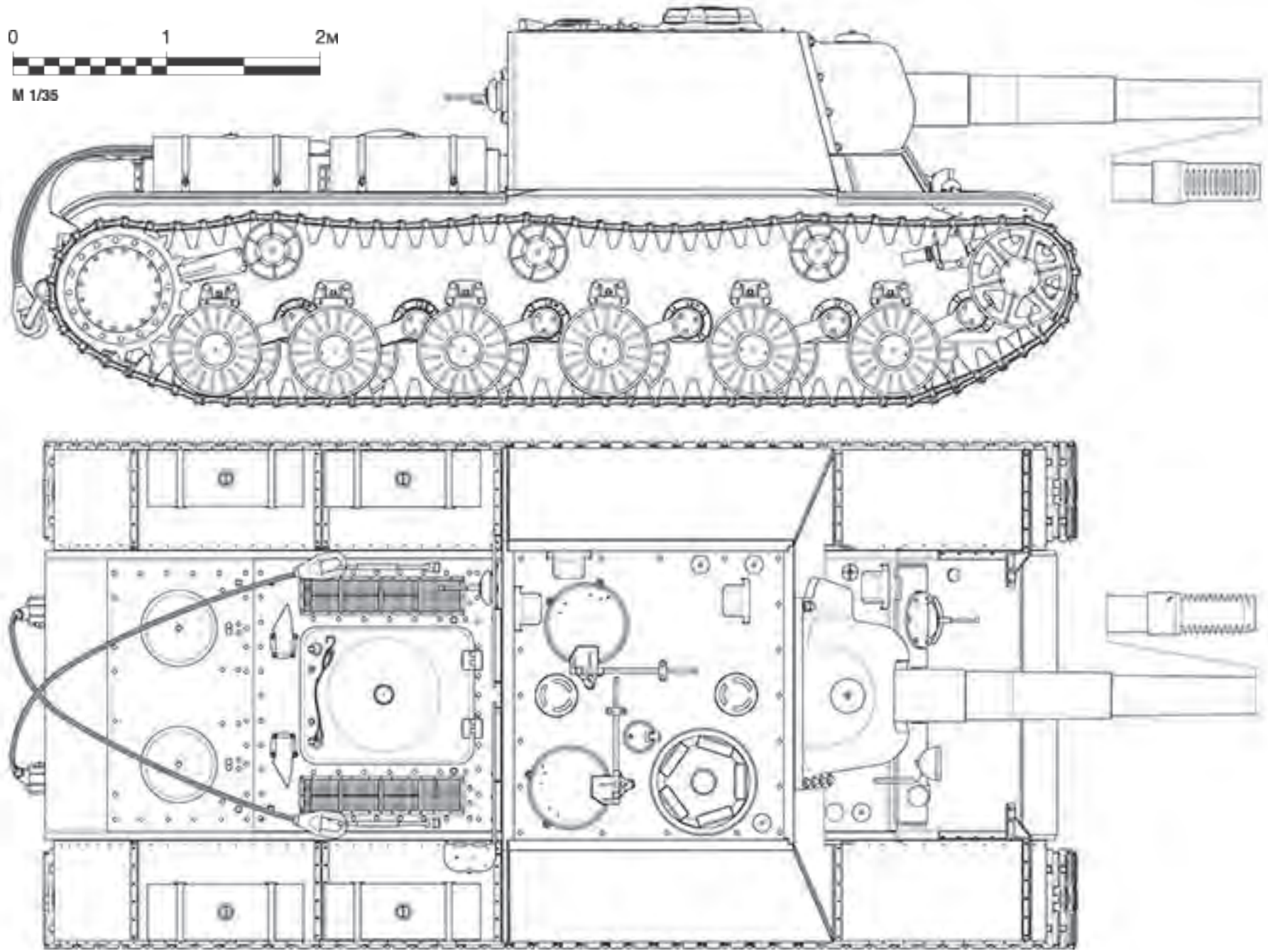
That put an unexpected end to the history of heavy SP gun development by the Ural Heavy Machinery Plant's design bureau. Gorlitsky worked on no more heavy self-propelled systems. How did Petrov happen to get at cross purposes with Gorlitsky?

In February 1942, artillery production was transferred from the Ural Heavy Machinery Plant to the People's Commissariat of Arms Factory No. 8, which had been evacuated to Sverdlovsk in the fall of 1941. B. A. Fradkin stayed on as its director. In March 1942, Factory No. 8's design bureau developed the ZIK-1 85 mm tank gun for the T-34 and KV-1 tanks. The ZIK-1 thus remained a project, but it became the first project of the design bureau headed by F. F. Petrov. Not one system with the ZIK designation (named after the Kalinin Factory) was ever put into service, but by 1943 the creations of Factory No. 9 acquired from Factory No. 8 in the fall of 1942 had begun destroying the enemy. These were the famous tank and self-propelled guns D-5 (SU-85, KV-85, and the initial T-34-85), the D-25 (IS-2, ISU-122, and IS-3), and the D-10 (SU-100), as well as the D-1 152 mm howitzer. The creations of Petrov's OKB-9 design bureau beat out the handiwork of the famous designer V. G. Grabin in competitions. But that would come later. In 1942, the team in the chief designer's department at Factory No. 8 was working in many different areas.

It so happened that a direct competition began in the summer of 1942 between Factory No. 8's design bureau and Ural Heavy Machinery Plant's design bureau for several projects, including a heavy SP gun. The situation was made particularly poignant by the fact that Gorlitsky's design bureau was located on the fifth floor of the Ural Heavy Machinery Plant's administration building, and Petrov's design bureau was on its fourth floor.

Exactly when KB-3 of the chief designer's department at Kalinin Factory No. 8 began working on the competitor to the U-18 is not known. According to documentation, task No. 5400072 for designing the "installation of the tipping parts of the 152.4 mm howitzer model 1937 (ML-20) in the KV-7 tank..." was issued by the GAU's Artillery Committee on June 4, 1942. This date is somewhat at variance with a letter from GAU Artillery Committee chief Col. Gen. V. I. Khokhlov to Prof. E. A. Satel, chairman of the Technical Council of the People's Commissariat of Arms. That letter was also dated June 4, 1942 and read in part:

[7] TsAMO RF, collection 38, series 11355, file No. 937, p. 124.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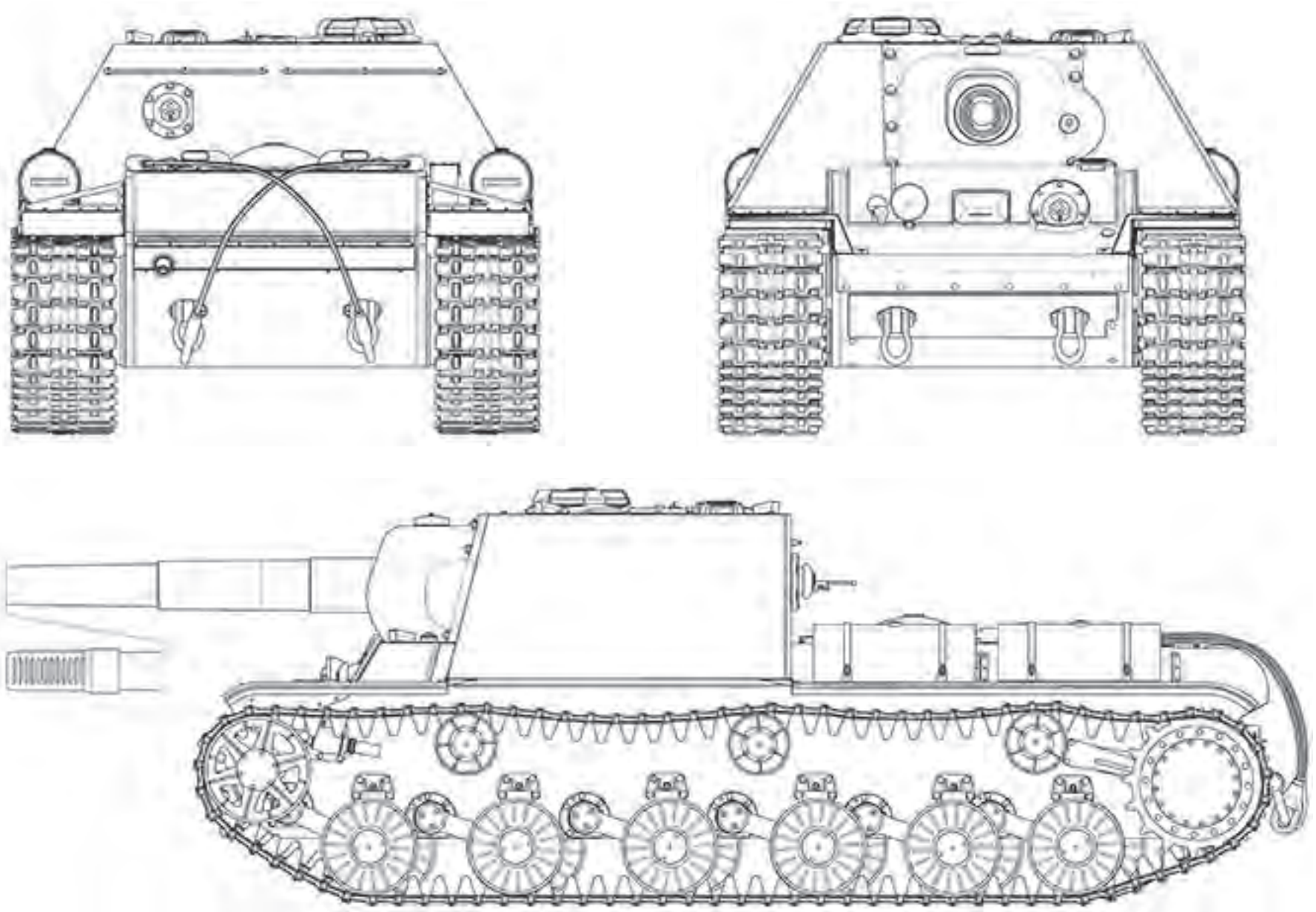
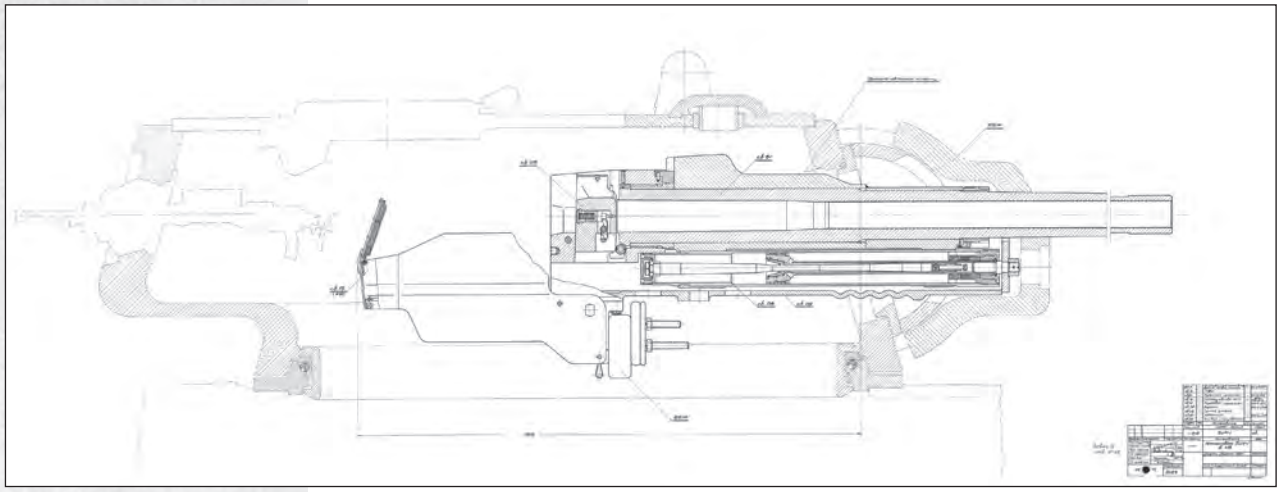


U-18 heavy SP gun, 1:35 scale drawing.



ZIK-1 85 mm tank gun, spring of 1942. This version was designed for mounting in the KV-1 tank turret (SA).

The design department of Factory No. 8 is currently developing conceptual designs for the following self-propelled howitzers:

a) The M-30 122 mm division-level howitzer for installation in a T-34 tank;

b) The U-11 122 mm tank howitzer for installation in a T-34 tank;

c) The ML-20 152 mm gun-howitzer for installation in a KV-7 tank.

The timeline for development of these self-propelled systems, both the conceptual designs and the follow-on development stages, have not been established; they are working at their own initiative.

In view of the great importance of and urgency associated the development of self-propelled howitzers as a means of suppressing and destroying earth-and-timber emplacements and concrete bunkers, Factory No. 8 must be given strict deadlines, specifically for completion of the conceptual designs by June 15, 1942, and their submission to Moscow for consideration by the Red Army's GAU Artillery Committee in conjunction with the People's Commissariat of Arms and the People's Commissariat of the Tank Industry.

A decision will be made and a general plan for implementation of these self-propelled systems will be drawn up after due consideration.

I hereby request that the director of Factory No. 8 be issued the appropriate instructions.[8]

In other words, Factory No. 8's design bureau had been involved in the heavy bunker buster project since the spring of 1942. As was the case with the U-18, the factory's design bureau had been working on mounting the ML-20. Work on the chassis was assigned to the Chelyabinsk Kirov Factory. In contrast to the U-18, on which correspondence is almost entirely lacking, the Factory No. 8 project designated the ZIK-20 was much discussed in both the GAU and the GABTU. Work on the heavy SP gun was led by T. A. Sandler, Factory No. 8's chief designer (prior to the evacuation he had headed up the quality control department at Factory No. 8). The absence of

[8] TsAMO RF, collection 81, series 12038, file No. 90, pp. 106–107.

any reference to the designation ZIK-20 in correspondence caused confusion later. According to GAU Artillery Committee documents dating from the second half of 1943, the projects of the Ural Heavy Machinery Plant and Factory No. 8 came to be perceived as a single entity, and that perception was reflected in subsequent correspondence and the Ural Heavy Machinery Plant's summary report. As a result, many researchers saw the ZIK-20 as the U-18, and much confusion arose because no graphic materials existed for the two SP guns.

The GAU also attempted to assign development of the much-desired bunker buster fitted with the BR-2 to Factory No. 8. This is particularly evident from a letter that A. A. Goreglyad, Deputy People's Commissar of the Tank Industry, wrote to GAU chief Col. Gen. N. D. Yakovlev on June 23, 1942:

In response to your letter No. 538884 of April 23, 1942, I hereby inform you of our agreement to accept for implementation part of the experimental work on self-propelled artillery that you have proposed.

The self-propelled gun projects you mention have undergone a preliminary workup at factories supervised by our Commissariat, allowing us to clarify their possible implementation as follows:

<...>

3) Kirov Factory. The manufacture of a prototype self-propelled 152 mm gun-howitzer model 1937 (ML-20) using a type KV-7 hull can be accepted.

As regards your proposal to design a 152 mm self-propelled gun mounting the BR-2 gun, we consider even design work on this project to be inadvisable inasmuch as manufacture of this type of self-propelled gun would be an unrealistic undertaking for the near future.

The People's Commissariat of Arms must be instructed to manufacture two models of the 152 mm gun model 1937 with muzzle velocity increased to 750–780 meters per second by lengthening the barrel and introducing a muzzle brake.

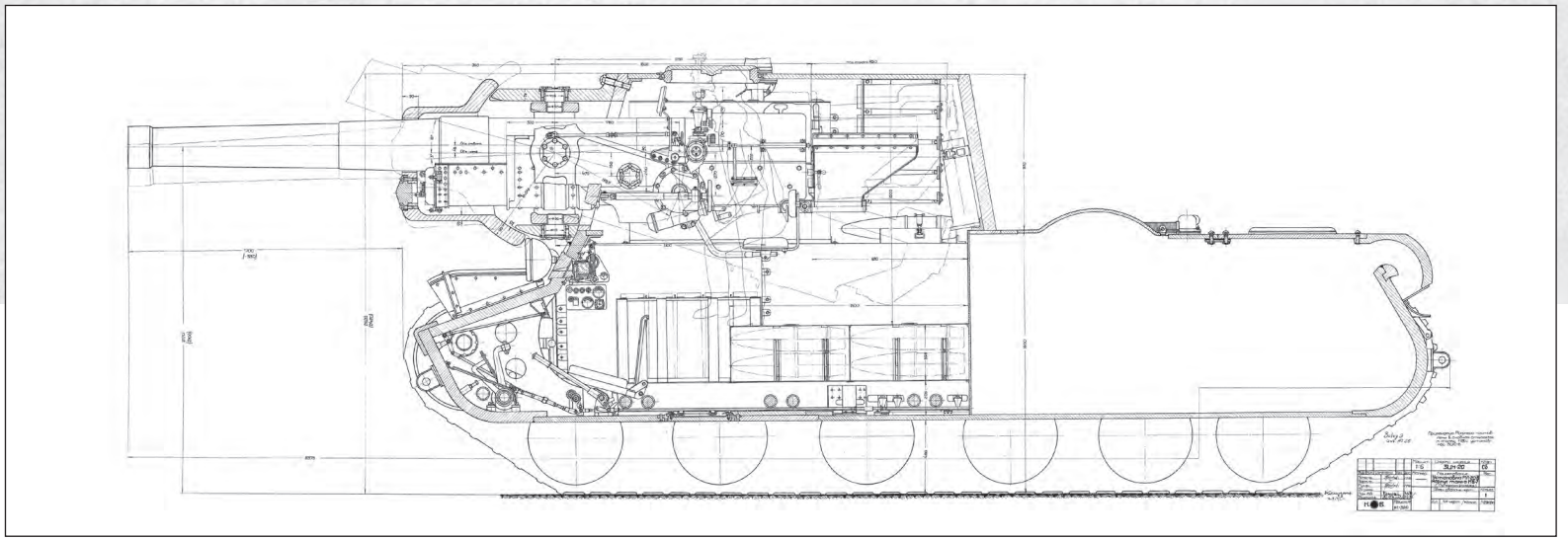
This version has been developed by the artillery design bureau of Factory No. 8 (Chief, Comrade F. F. Petrov).

To speed up the work and improve communications with the artillery design bureau, we consider it necessary to request that the People's Commissariat of Arms assign the design work associated with the artillery systems and their modification for self-propelled artillery to Factory No. 8's design bureau (Chief, F. F. Petrov), with factories of the People's Commissariat of Arms to manufacture the artillery systems for the self-propelled guns at its discretion.

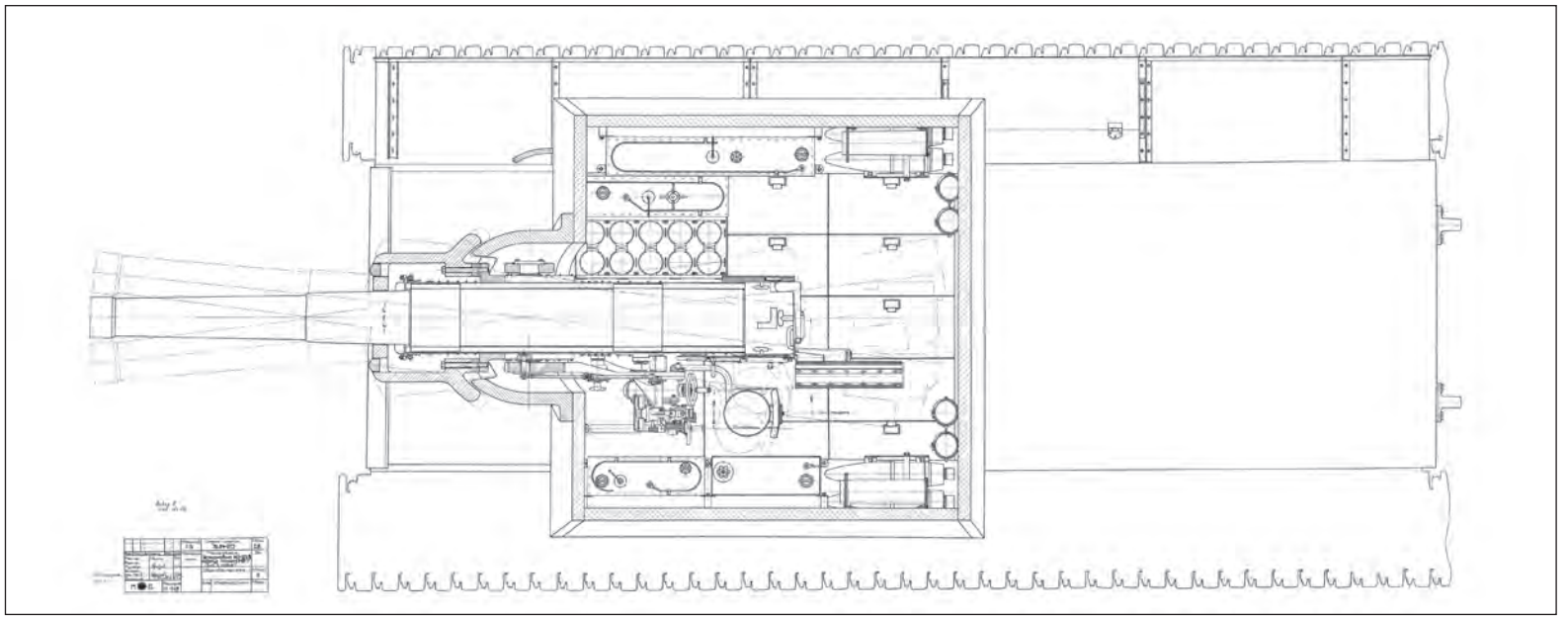
Upon receipt of your approval of these developmental self-propelled artillery projects, we will instruct the factories to implement them.[9]

Goreglyad's proposal played a cruel joke on Factory No. 8's design bureau. In addition to the ZIK-20, Petrov's design bureau was working on a

[9] TsAMO RF, collection 81, series 12038, file No. 90, pp. 137–138.



Sectional drawing of ZIK-20 SP gun (TsAMO).



Top view drawing of ZIK-20 SP gun. Its crew of six had very cramped working conditions (TsAMO).

number of SP gun projects of all types at the same time. They included the ZIK-5 25 mm SP air defense gun on a chassis incorporating assemblies from the T-60 (a copy of Factory No. 37's SU-32), the ZIK-7 76 mm SP gun on a chassis incorporating assemblies from the T-70 (a copy of Factory No. 37's SU-31), and the ZIK-10 and ZIK-11 122 mm SP guns on the T-34 chassis (similar to the U-35 under development at the Ural Heavy Machinery Plant's design bureau). And that list leaves out its impressive number of gun projects, from antitank guns to corps-level artillery! With a workload like that, it is not surprising that ZIK-20 development was significantly delayed. In fact, the 152 mm bunker busters completely disappeared from the development plans of the GAU and the GABTU after mid-summer. However, some progress was being made by the end of the summer. On August 14, 1942, Khokhlov sent a letter to Yakovlev:

According to the GAU Artillery Committee's development plan, installation of the 152 mm gun-howitzer model 1937 on a chassis incorporating assemblies from the KV-7 tank should be completed in 1942.

The People's Commissariat of Arms and the People's Commissariat of the Tank Industry accepted these projects and assigned them to Factory No. 8 (Sverdlovsk) and the Kirov Factory (Chelyabinsk).

The design is now complete.

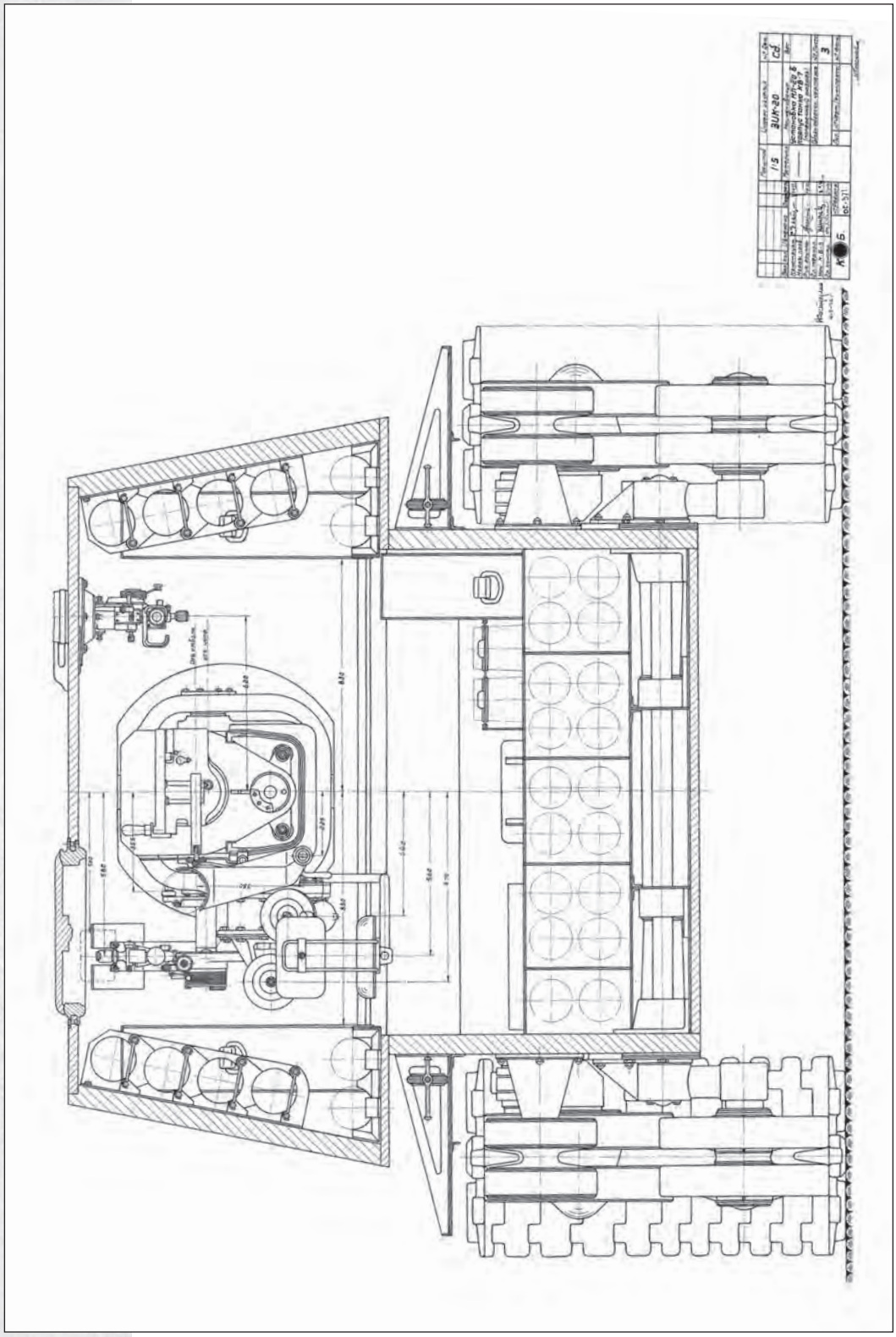
For manufacture of the prototype of the 152 mm self-propelled howitzer, I hereby request that you instruct the Chief of the GAU's Artillery Equipment Supply Office, Maj. Gen. of Artillery Sokolov, to send Factory No. 100 (Chelyabinsk) one 152 mm gun-howitzer model 1937 without a limber and with the gun and battery kit of spare tools and accessories by September 1 of this year.[10]

However, it was clearly too early to issue that instruction. First of all, the first ZIK-20 drawings would not be ready until early September and had not yet been reviewed by the GAU's Artillery Committee. Second, the bunker buster as it was taking shape differed greatly from the U-18, in terms of both the gun and the fighting compartment. That is evident from the system description:

The following issues received particular attention during development:

1. *Keep the design and location of the KV tank units and mechanisms and the artillery system parts and units unchanged as much as possible.*
2. *Make the operations of the artillery crew with the gun as convenient as possible within the existing dimensions of the tank and thereby increase its rate of fire.*
3. *Increase the number of rounds and make their location as convenient as possible from the standpoint of increasing the rate of fire.*
4. *Increase the artillery system's traverse and elevation angles as much as possible.*
5. *Minimize any weight increases to the artillery system and thus the total weight of the tank.*

[10] TsAMO RF, collection 81, series 12038, file No. 90, p. 150.



Transverse sectional drawing of ZIK-20 SP gun. Dual-rack stowage clearly reduced the fighting compartment's height (TsAMO).

6. Develop the best armor protection for both the artillery system and the gun crew, thus enabling the tank to be used for close-quarters direct fire on the enemy's fortified lines and strongpoints.

7. Minimize the line-of-fire height. A height of 2170 mm has been achieved in this project, exceeding the line-of-fire height of the 76.2 mm gun in the KV tank with small turret by only 70 mm.

8. Facilitate assembly in a cooperative work environment to fulfill the task.

We mounted the ZIK-20 tank gun on a KV tank using a welded fixed turret of prismatic shape.

<...>

The turret wall thickness was taken to be 75 mm. Thus, in our understanding, we took the KV-7 tank as the base chassis; that is, not some prototype of the tank, but in the belief that any KV tank with a fixed turret is a KV-7 type tank.

The total weight of the "KV-7" tank together with the ZIK-20 system will be approximately 53 tonnes, i.e., it will be about 4 tonnes heavier than the KV tank with a small turret.

<...>

IV. Main features of the ML-20 howitzer system

1. The ZIK-20 152.4 mm tank howitzer was produced using the tipping parts of the ML-20 152.4 mm howitzer with a modified cradle, replacing the elevation and traversing mechanisms, and establishing constant recoil by attaching a counter-rod and removing the variable recoil mechanism and muzzle brake.

2. The design changes listed in paragraph 1 were made entirely by modifying the field gun into a tank gun, adding armor, and bringing the system into balance. The installation involves removal of the muzzle brake for reasons explained below.

3. The ballistics of the ZIK-20 152.4 mm tank gun are the same as for the 152.4 mm howitzer model 1937.

4. The ZIK-20 152.4 mm tank gun fires time-fuzed, high-explosive, and concrete-piercing shells.

5. The relatively powerful munitions, the strong armor (up to 90 mm in thickness), and the sight mechanisms that support both direct and indirect fire enable the ZIK-20 gun on the KV tank to be used for the following purposes:

a) Destruction of bunkers and trenches both at short range and from cover;

b) Engagement of enemy mechanized infantry units when operating as self-propelled artillery;

c) Suppression of enemy artillery fire.

<...>

VIII. General observations about the project

In the absence of a specific Operational Requirement for mounting the ML-20 on the KV tank, this project is based on existing performance specifications for similar models, with due consideration given to features specific to the ML-20 system.

Concerning the modifications made to the artillery system and several items inside the tank, the following can be said in conclusion:

1. *We deem it necessary to remove the muzzle brake from the system; retaining it for a tank gun would be a mistake.*
2. *All changes to the cradle were made for the sole purpose of converting the field gun to a tank gun.*
3. *A practical loading test may show that the loading tray is unnecessary. Given the system's small angles of elevation (15°) and the low height of the gun's axis above the floor, and without a cradle extending beyond the breech face, which usually hinders loading, the crew will find loading easier without a tray, which would take time to readjust.*
4. *From a strength standpoint, the recoil mechanism parts are surely reliable (considering that firing will be done without a muzzle brake).*

In practice, we adopted a constant recoil equal to the short recoil of the ML-20, thus eliminating the variable recoil mechanism. The front cradle cover could also be removed or the counter-rod attachment altered. However, resolution of this issue depends on the number of vehicles manufactured. If the number produced is small, the old hatch cover will be used. If the number produced is large, the counter-rod should be modified, which will reduce and simplify a number of cradle and recoil mechanism parts, and then the armor for the cradle can be made more compact.

An issue with the sight needs to be addressed.

We do not believe the decision to select and install the standard model 1927 sight is straightforward.

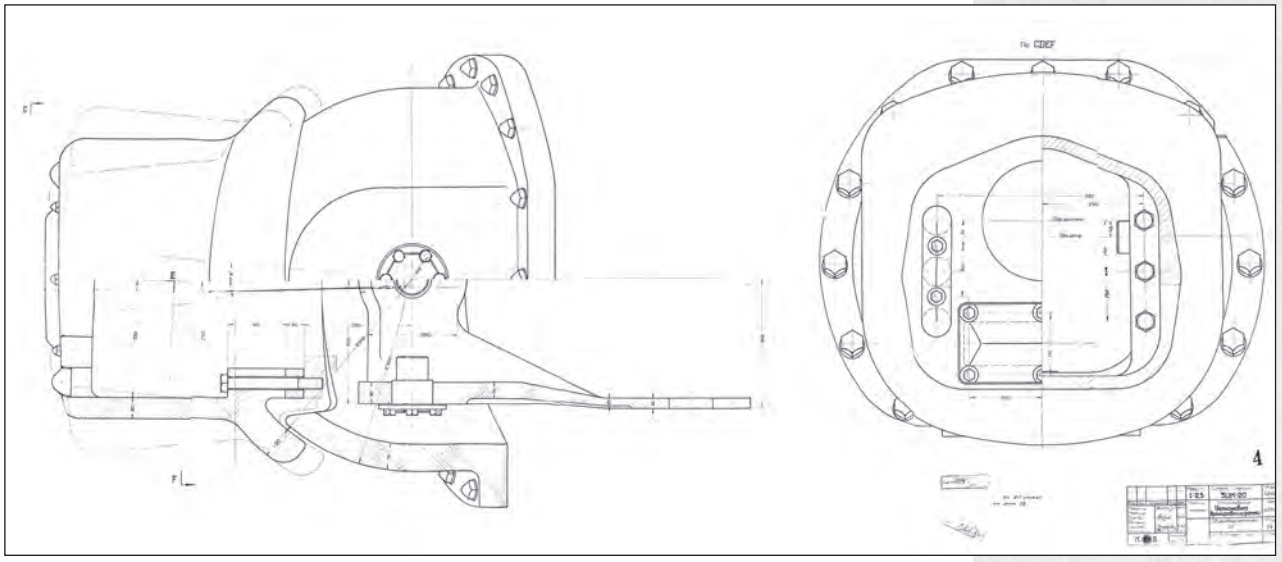
To give such a powerful system the capability of both direct and indirect laying, we believe it should have both a conventional sight and a panoramic sight such as the TOP tank gun sight.

The use of a TOP-type sight would make it possible to meet the important requirement for reducing the size of the sighting slit.

To resolve this problem, the factory needs to acquire drawings for current models of elongated tank sights. [11]

Thus, rather than simply installing an ML-20 in the hull of the KV-7, Factory No. 8's design bureau was essentially proposing a new SP gun based on the KV-1. In addition, the ZIK-20 howitzer being mounted in the SP gun required even more modifications than the ML-20 under Project U-18. The SP gun's superstructure was 17 centimeters higher than the KV-7, and the vehicle created by Factory No. 8's design bureau weighed more than a KV-2. Given the completely new superstructure, the KV-7 hulls in Chelyabinsk were unusable.

[11] TsAMO RF, collection 81, series 12038, file No. 117, pp. 3–14.

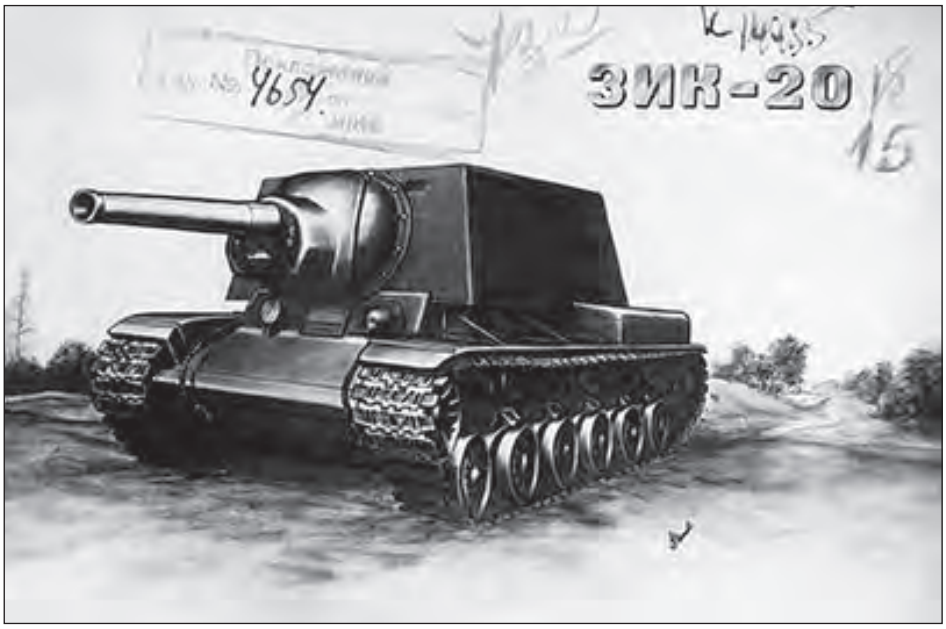


Factory drawing of the ZIK-20 SP gun's mantlet (TsAMO).

The ZIK-20 project was reviewed at a meeting of the Technical Committee of the People's Commissariat of Arms on September 15. Projects of the armor department at the Bauman Institute of Mechanical Engineering were also reviewed at the meeting. They included self-propelled mounts for the I-13-52 57 mm antitank gun and the B-4 203 mm howitzer. As designed, the SP gun with the B-4 had two ZIS-5 engines, and it had a top speed of all of 6.5 km/h.

The ZIK-20 was the meeting's main topic of discussion. Factory No. 8 design bureau chief F. F. Petrov reported on the project. His report included an explanatory note, drawings, and engineering analyses. The idea of eliminating the muzzle brake, which would give away the SP gun's position during firing, was approved, but a suggestion was made to use a loading tray like the one on the SG-122 SP gun. Although Petrov raised the telescopic sight issue, the design did not include one (in contrast to the U-18, which had included a TOP from the outset.) In addition, mounting the ML-20 on the ZIK-20 rather than on the U-18 would locate the gun further forward, which threatened to increase the load on the front road wheels.

The layout of the fighting compartment generated many more questions from those present at the meeting. The sides of its superstructure were less sloped than those of the KV-7, which reduced the likelihood shells would ricochet. Although the height of the fighting compartment from the floor to the roof was 1895 mm, the crew would have to work in very cramped conditions. The double-row rack for shells on the floor took up 395 mm and would be very inconvenient to use. In addition, the attachment of racks to the sides of the superstructure increased the risk that the basic load would explode if the superstructure were struck by enemy shells. The decision to locate fuel tanks along the sides of the vehicle was questioned. A number of



Factory drawing of the ZIK-20 SP gun (TsAMO).

questions regarding the effectiveness of the fighting compartment ventilation and defense of the vehicle from the rear, which did not even have a submachine gun port (in contrast to the U-18, for which a stern-mounted DT machine gun was planned).

The exchange of views on Factory No. 8's design led to the following conclusion:

1. *The ZIK-20 project for a self-propelled gun mounting the ML-20 152 mm gun-howitzer model 1937 on a KV tank with a fixed turret proposed by Kalinin Factory No. 8 was particularly interesting as a practical solution to the problem of developing a heavy self-propelled gun with good armor protection to serve as a bunker buster.*
2. *The design is satisfactory and essentially correct from a technical standpoint, but it has a number of flaws, including the following:*
   a) *The problem of proper placement of shells in the tank has not been solved satisfactorily;*
   b) *Even though the crew space is reasonably roomy, the design falls short in terms of supporting a maximum rate of fire with convenient placement of shells and proper loading tray design, nor does it ensure adequate ventilation of the fighting compartment.*
3. *We concur with some of the modifications the design makes to the tipping parts of the ML-20 system, specifically the manufacture of new trunnion and rear rings and a new elevating arc, and we also concur with shortening the cradle frame and eliminating the muzzle brake from the barrel.*

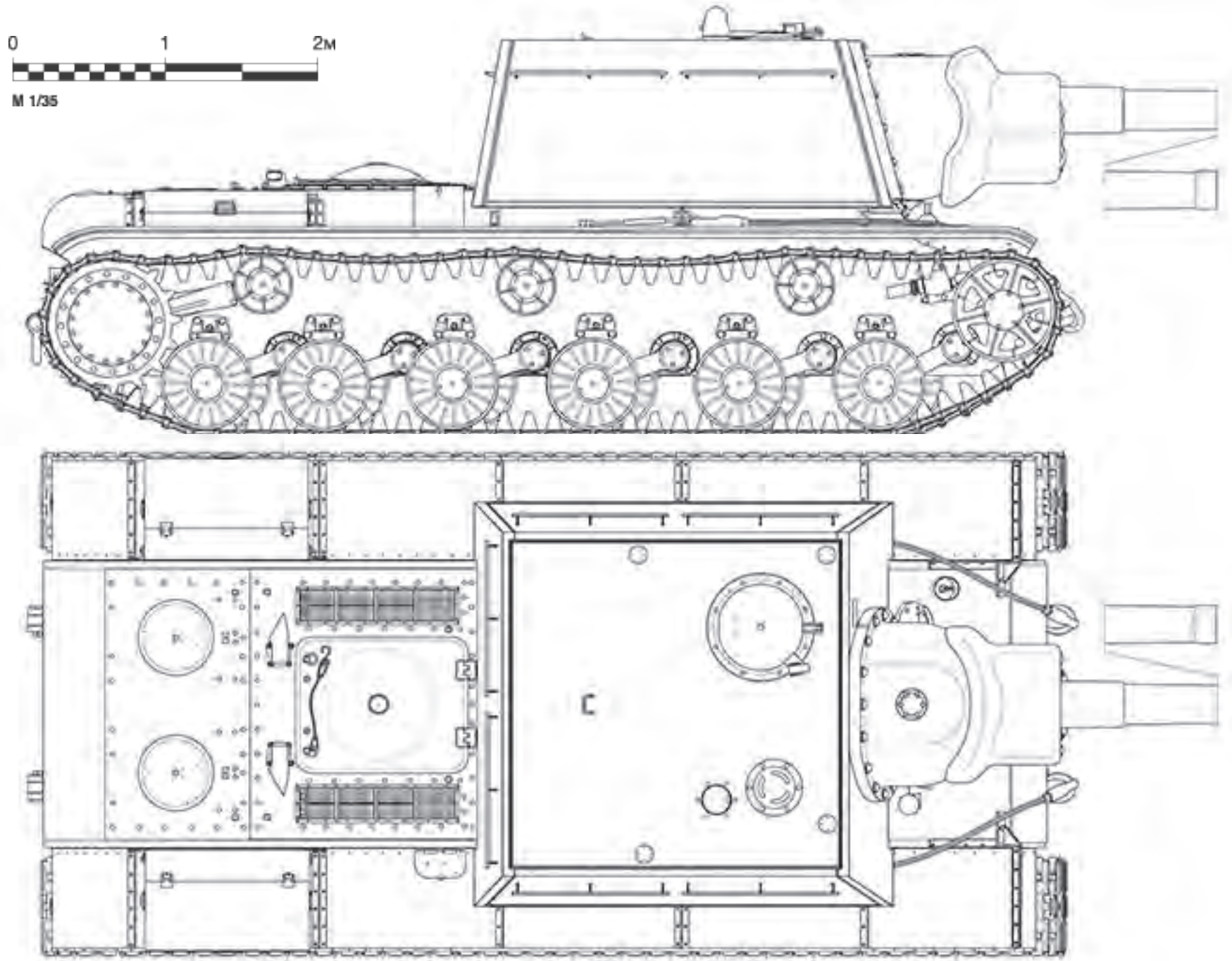
4. *We concur with Comrade Petrov's proposal to replace the existing counter-rod with a spindle-type counter-rod, along with changes to the recoil mechanism parts connected to the counter-rod. This would eliminate the cradle cap.*
5. *In developing the engineering drawings, the design bureau of Factory No. 8 must consider the following remarks by those present at the meeting.*
   a) The loading tray: instead of the one proposed, use the loading tray from Factory No. 592's 122 mm assault gun.
   b) Modify the way the ammunition is stored, paying particular attention to facilitating the work of the gun crew.
   c) Keep the standard sight for firing from cover and use the elongated TOP for direct fire.
   d) To allow natural ventilation and move shells into the turret, provide a hinged hatch in the rear of the turret and make it as large as possible.
   e) Provide for mounting a machine gun in the rear wall of the turret.
   f) If possible, provide a ball bearing in the bottom support of the gun traversing mechanism.
   g) Increase the floor-to-ceiling height to 1600–1650 mm, instead of 1500 mm as designed.
6. *After the design is reviewed by the GAU's Artillery Committee, a joint decision to continue development work on the project, prepare engineering drawings, and manufacture a prototype should be made.*

   Because a number of design issues need to be finalized, including the proper location of the ammunition and fuel tanks and simplification of the manufacturing process for the turrets, hatches, etc., and because assignment of lead for manufacture of the system as a whole depends on collaboration between artillery and tank factories, the Technical Department of the People's Commissariat of the Tank Industry of the USSR must be engaged to make the final decision.
7. *Allow the design bureau of Factory No. 8 to continue working to improve the design in accordance with the remarks and to develop engineering drawings.*

The chief designer of Factory No. 592, Comrade Sinilshchikov, should immediately send Factory No. 8 the drawings for the 122 mm assault gun's loading tray. [12]

P. F. Solomonov, chief of the Artillery Committee's 2nd Department, who by that time had been promoted to Engineer Major, was engaged in tracking the ZIK-20 project after September 20, 1942. As had happened in late 1941, he had to visit the factories in order to personally supervise implementation of the new designs. He stopped first in Chelyabinsk, where he met with Kotin (who then was also serving as chief designer at the People's Commissariat of the Tank Industry) and designers from Experimental Plant No. 100 of the People's Commissariat of the Tank Industry:

[12] TsAMO RF, collection 38, series 11355, file No. 693, pp. 65–66.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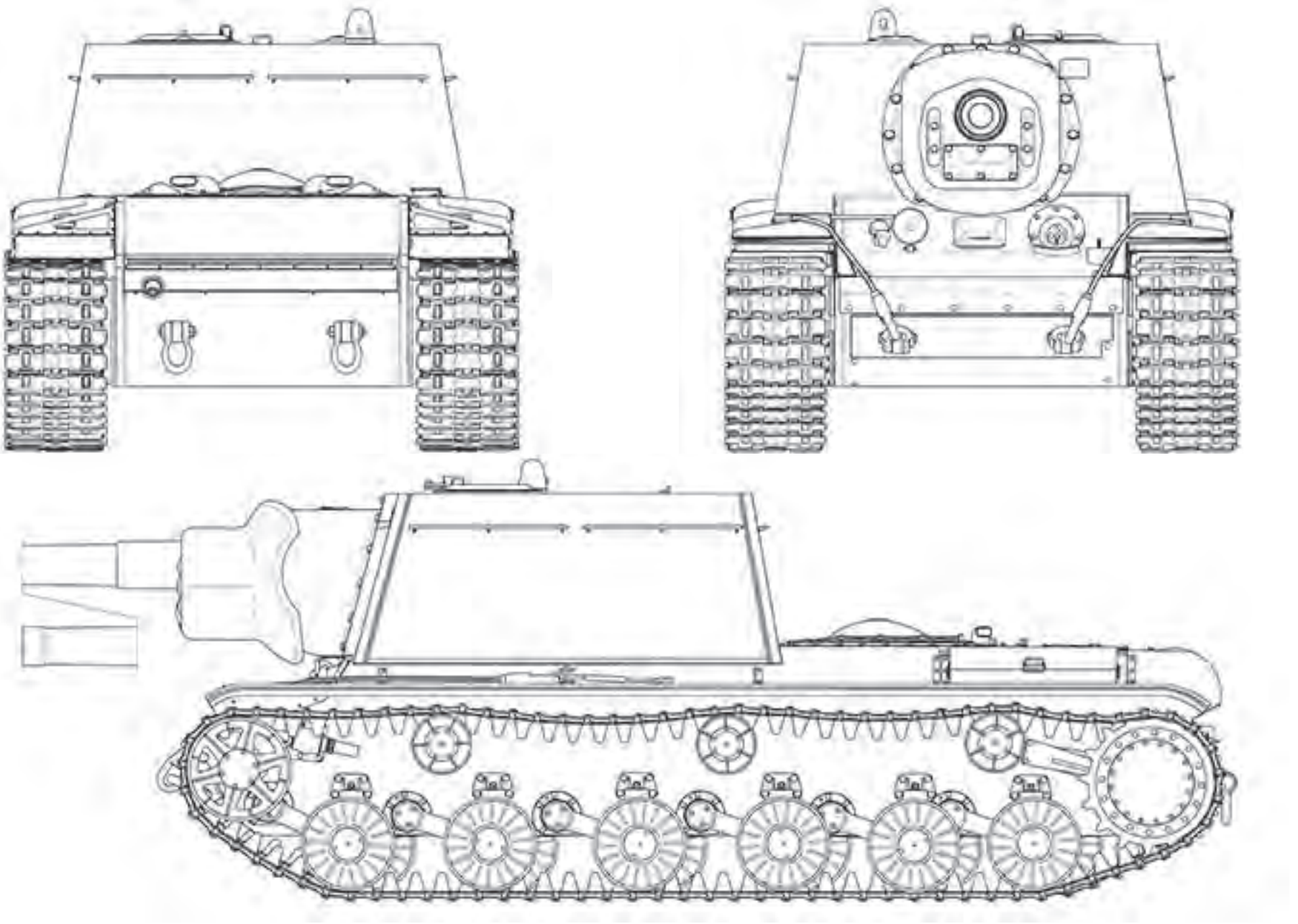


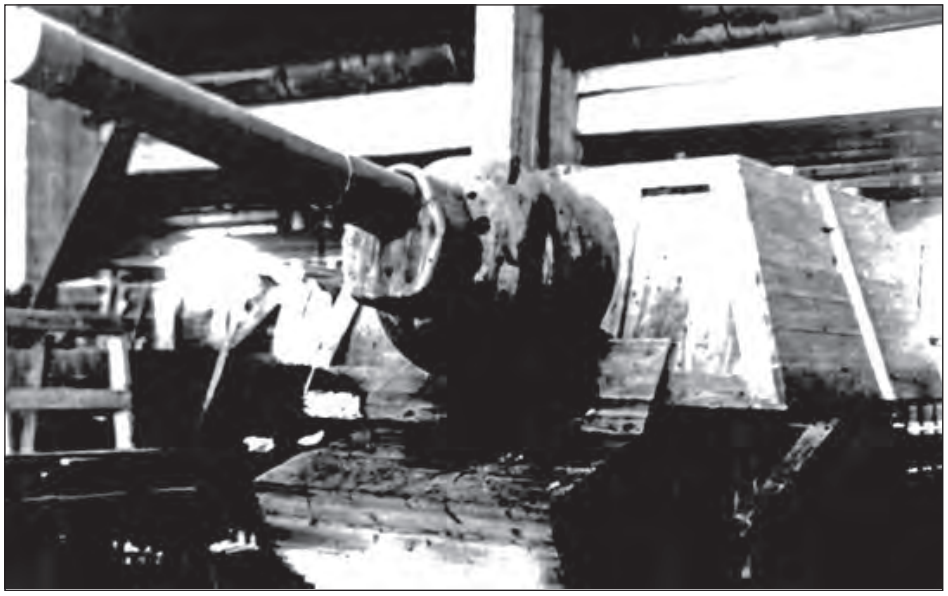
ZIK-20 heavy SP gun, 1:35 scale drawing.

The KV-1S heavy tank replaced the KV-1 on the production line in September 1942. The designers of SP guns based on the KV-1 chassis had to modify their designs for the new chassis (TsAMO).

At this meeting and in negotiations with Comrade Kotin, the following decision was made: by order of the Artillery Committee, Factory No. 100 and the Kirov Factory are to manufacture a self-propelled chassis and mount an artillery package and fighting compartment equipment on it. To integrate the work done at the two factories, the Kirov Factory must send two designers to Factory No. 8 in Sverdlovsk. The factory needs to be given an updated operational requirement, because the issue of full utilization of the KV-7 hull has not been made sufficiently clear. Since it has been proposed to make the hull larger overall than the KV-7, the designers at Factory No. 100 (whose design bureau chief is Comrade Yermolayev) believe it would be better to equip the lightened hull of the KV-1S with the prism-shaped turret that has been designed.

Then the Ural Heavy Machinery Plant should make the hull; the Kirov Factory's production shops should install the engine, transmission, and running gear; and Factory No. 100 should install the artillery package and manufacture and install the ammunition racks. Drawings of the hull with the turret are being developed at KB-100 from sketches made by Factory No. 8 and the Kirov Factory.

Agreement must be reached in the People's Commissariat of the Tank Industry and an order elaborating on the existing agreement must be obtained from the People's Commissar with an appropriate assignment of work and establishment of deadlines.



Wooden mockup of the ZIK-20's gun system and superstructure, fall 1942 (SA).

The conclusion of a contract with the factory must be delayed until the wooden mockup is approved and the overall design is refined. [13]

When Solomonov arrived in Sverdlovsk, he reviewed the drawings and issued the necessary instructions to the designers regarding modifications approved by the Technical Council of the People's Commissariat of Arms. It was decided during the meeting held at Factory No. 8 to require the factory to finalize the drawings by October 25 and manufacture a wooden mockup of the system. A team of model makers and carpenters was detailed to construct the model by personal order of Factory No. 8 Director B. A. Fradkin. A designer named A. G. Usenko was assigned to oversee construction of the model. In order to ensure the project had enough designers and draftsmen, arrangements were made to return Factory No. 8 employees engaged in harvesting and logging operations.

Since Factory No. 8 lacked clear specifications for manufacturing a prototype of the system, Solomonov began drafting an operational requirement. This operational requirement, which was signed on September 25, 1942, was based on both the operational requirement for the bunker buster dating from April and on remarks about the ZIK-20 project:

I. Definition

1. The 152 mm self-propelled howitzer is a self-propelled gun made from the tipping parts of the 152 mm corps-level howitzer model 1937 (ML-20) mounted on a KV-tank chassis with a fixed prism-shaped installation.

[13] TsAMO RF, collection 81, series 12038, file No. 32, p. 119.

II. Tactical role

2. *The 152 mm self-propelled howitzer is intended for supporting mechanized and infantry units breaking through enemy defense lines and is used to destroy defensive fortifications, combat enemy artillery and tanks, and conduct artillery fire on assembly areas of counterattacking enemy groups.*
3. *The 152 mm self-propelled howitzer primarily executes fire by direct laying at close range while moving from point to point in short jumps. Fire is occasionally conducted from cover; firing from the move is expected to be rare.*

III. Specifications

4. *The self-propelled howitzer will be manufactured with minimal modifications to the service model of the KV tank (152 mm howitzer model 1937 and the KV-7 tank).*
5. *The vehicle's overall dimensions—width, height, and line-of-fire height—must be as close as possible to the same dimensions on the KV-1 tank. The height of the tank and the line-of-fire height must not increase by more than 100 mm.*
6. *The vehicle together with ammunition, crew, and fuel must weigh 45–50 tonnes. It is desirable that this weight be met.*
7. *The main technical characteristics of the self-propelled howitzer are as follows:*

   Caliber: 152 mm
   Angles of elevation: from -2° to +15–20°
   Angles of traverse: +/-5° to +/-6°
   Aiming rate: from 30 to 45 min. per flywheel rotation
   Maximum recoil distance: no more than 850 mm
   Resistance to recoil: no more than 30–35 t
   Maximum rate of fire: 8 rds/min, including relaying the gun.
   Effort on flywheels: 3 kg while turning
   Basic load: 30 rounds

IV. Performance requirements

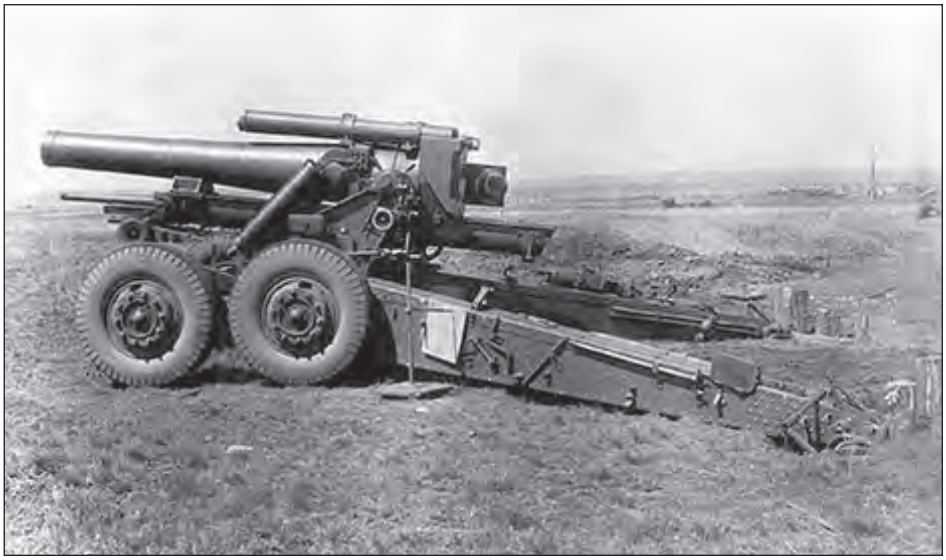
8. *The howitzer is served by a crew of 6: commander, driver-mechanic, gunner, loader, breechblock operator, radio operator/machine gunner.*
9. *The tipping parts armor must allow free access for servicing the recoil mechanisms.*
10. *The gunner's fighting compartment: the seat and the location of the gun laying mechanism flywheels and sight eyepiece must support easy and fatigue-free laying of the howitzer on a target both while on the move and while stationary. The effort required to operate the firing handle must not exceed 8 kg; it would be desirable to have the firing control on the elevation mechanism handle.*
11. *The tank commander's fighting position must be equipped with the KV-1S commander's cupola.*

12. *The howitzer must be equipped with a folding tray/barrier for preparing shells for firing that automatically locks the firing mechanism until loading of the howitzer is complete. The design of the folding tray must facilitate the loader's job while requiring a minimum expenditure of muscle energy.*
13. *The fighting compartment height at the work positions of the breechblock operator and the loader must be at least 1700 mm.*
14. *The ammunition storage rack must be strong and non-warping, and it must allow free and easy removal of rounds in order to achieve the highest rate of fire.*
15. *The placement of rounds in the ammunition storage rack must conform to the division of labor during loading between the breechblock operator and the loader: the loader prepares and places a projectile in the chamber, and the breechblock operator opens and closes the breech and inserts the case into the chamber.*
16. *The hand ejector, fuze wrenches, and rammer must be attached to the turret walls.*

V. Requirements for the turret and its equipment

17. *The rear wall of the turret must have a hatch for the crew, for loading ammunition and for ventilating the turret interior in specific types of combat.*
18. *The turret walls must have openings with armor plugs for firing submachine guns and supplemental vision slits for observing the surrounding environment. It is desirable to have a ball mount for a DT tank machine gun in the rear turret wall.*
19. *The personal weapons of crew members must be located in secure and convenient racks near their work positions.*
20. *The turret roof near the commander's position must have a port for signaling with rockets and a hatch in the rear for combat using hand grenades.*
21. *The turret illumination must support firing the weapon and monitoring the gun.*
22. *Radio and telephone communications in the tank shall be accomplished using a standard tank radio and a tank intercom.*
23. *Turret armor: at least 90 mm on the front and 50 mm on the front and sides; it is desirable to have the side walls sloped 30° from the vertical.*
24. *The commander's position must facilitate use of a map and plotting board.*
25. *Each crewmember must have a comfortable seat for rest and for use while on the move. The seats of the breechblock operator and loader must be capable of being folded against the walls and must not interfere with them during combat.*
26. *The turret interior must have places for a first-aid kit, emergency rations, and drinking water.* [14]

[14] TsAMO RF, collection 81, series 12038, file No. 33, pp. 7–9.



U-3 203 mm corps-level heavy howitzer during testing, spring of 1942.

It appeared that the project for a 152 mm SP gun based on the KV tank chassis that had been stalled for half a year and had disappeared from the development plan had finally begun to move forward. Despite the fact that the base chassis was now the KV-1S rather than the KV-1, the overall SP gun concept had not changed, and the timetable was entirely achievable. Unfortunately, matters did not proceed as planned. Representatives of the Chelyabinsk Kirov Factory did travel to Factory No. 8 and became acquainted with the design documentation for the ZIK-20, and work on the project came close to reaching a practical stage. Another factor was that construction of the model stalled, and an event that had a serious impact on the entire project occurred at the very end of October. State Defense Committee Decree No. 2457ss of October 30, 1942, split Factory No. 8 into two enterprises. The first, Factory No. 8, was required to engage in antiaircraft production. The second enterprise became Factory No. 9, responsible for howitzer artillery and tank guns. L. R. Gonor became director of the new factory; P. I. Maloletov was appointed party organizer; and F. F. Petrov was made chief of Factory No. 9's design bureau.

The splitting of the factory affected the timeline for constructing a full-scale mockup of the superstructure, but it had no impact on the activities of Factory No. 9's new design bureau. Back in October, before the factory was split, Petrov had led a major effort to design a number of artillery systems.

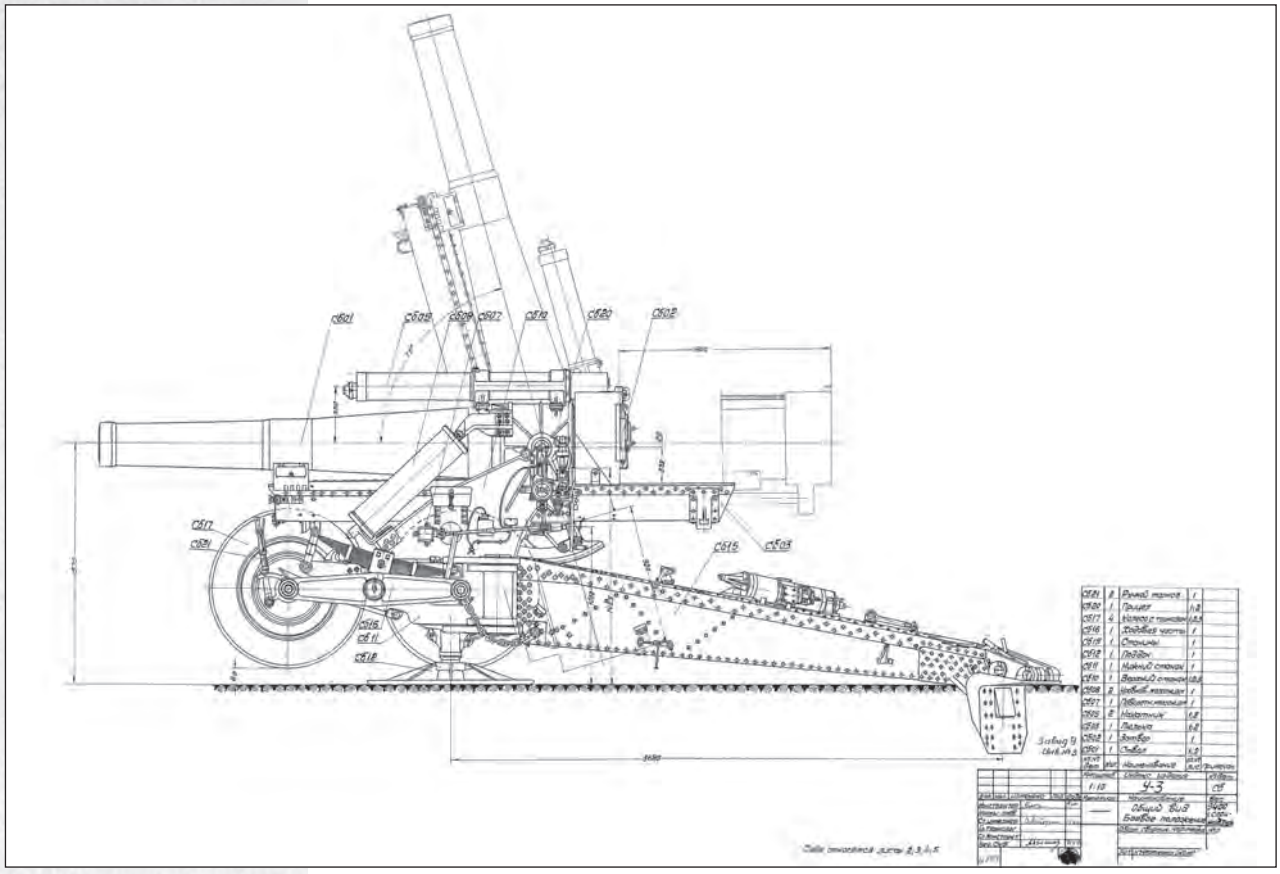
Work to fine-tune the 203 mm U-3 corps-level howitzer designed by V. N. Sidorenko had been underway at the Ural Heavy Machinery Plant since 1939. The U-3 project surfaced again in the spring of 1942: between May and June, it underwent comparison testing with its main competitor—the BL-39 203 mm corps-level howitzer designed at Factory No. 172. The test resulted in a proposal to finalize the howitzer and a recommendation

U-3 203 mm corps-level heavy howitzer elevated to 45 degrees. This gun was developed to replace the B-4 howitzer and was proposed several times for installation in an SP gun (TsAMO).

to place it in service with the Red Army. However, neither the U-3 nor the BL-39 went into production. The situation with the BR-2 152 mm gun that the artillerymen so desired to mount on a vehicle based on the KV chassis was no less sad.

Petrov's proposals were bold; their basic idea was to place the barrels from heavier systems on the carriages of the M-30 122 mm howitzer and the ML-20 152 mm gun-howitzer. He proposed six projects in all; however, only two of them were of interest. The reason is clear from the project description:

U-3 203 mm corps-level heavy howitzer in travel position (TsAMO).



Factory drawing of U-3 203 mm corps-level heavy howitzer (SA).

Placement of the BR-2 152 mm gun model 1935 and the U-3 203 mm howitzer on the ML-20 carriage, however, significantly increases the weight on the wheels, but there can be no doubt about the combat utility of these systems for the following reasons:

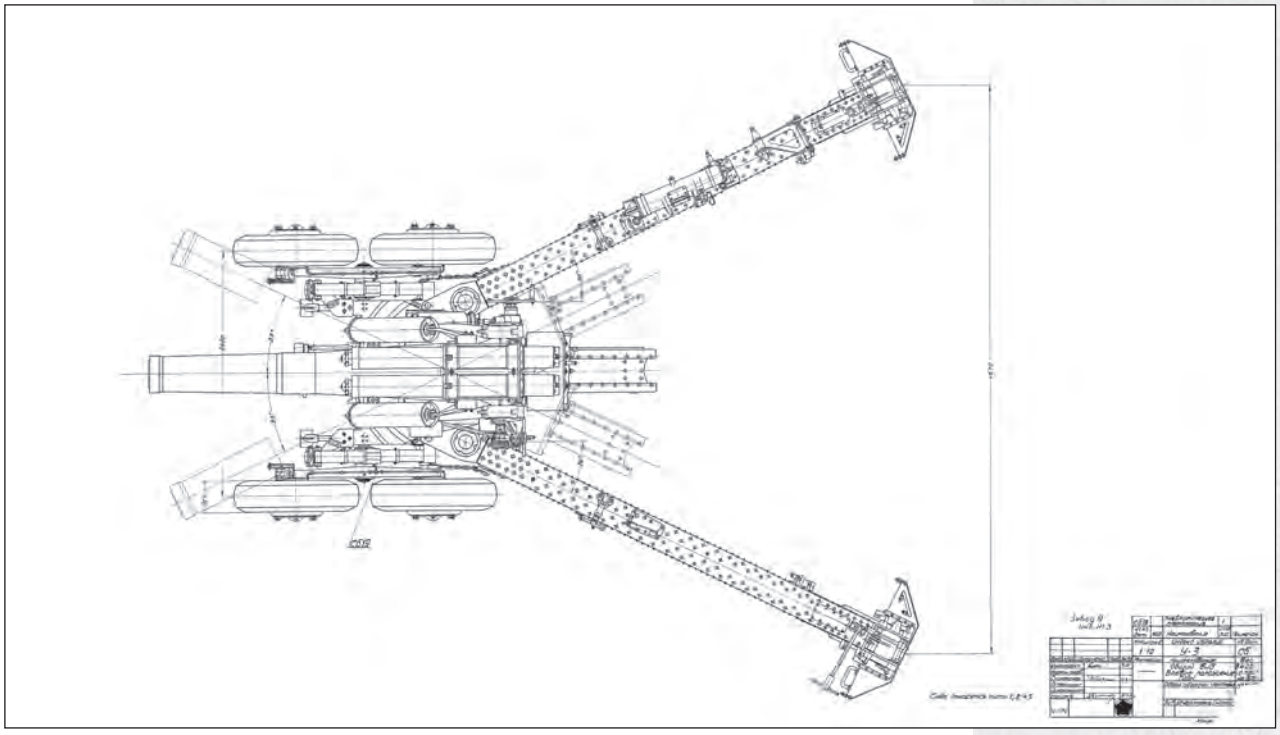
a) Not even the ML-20 152 mm gun-howitzer model 1937 or the A-19 122 mm gun model 1931/37 can currently traverse swampy terrain freely. Their bottom carriage and trails become badly bogged down. But this carriage, even with the extra load from the BR-2 gun or the U-3 howitzer, moves well over other types of ground, including plowed fields.

b) ML-20 is currently being converted from 1250x300 cast wheels to twin KMP 1250x200 wheels, which will reduce ground pressure.

c) The springs in both systems are being strengthened, which poses no difficulty because the ML-20's spring leaves are simply being enlarged.

<...>

An even more striking result is obtained if, on the one hand, the 152 mm gun model 1935 is combined on the ML-20 carriage with a monobloc barrel and a cast breech having a combat weight of 9000 kg and a travel weight of 9800 kg, and, on the other hand, the same gun on the B-4 203 mm howitzer carriage is



Factory drawing of U-3 203 mm corps-level heavy howitzer (SA).

combined with a triple-layer barrel with a combat weight of 18,260 kg and a travel weight of 24,000 kg.

Both the service/combat and industrial/economic benefits of this are particularly high.

If the BR-2 152 mm howitzer is placed on the ML-20, then installation of the gun with restricted traverse in a KV tank becomes entirely possible without modifying the tank.

Under our ZIK-20 project to mount it on a KV tank, the installation would use almost the entire cradle and all mounting parts from the ML-20.

The weight of the self-propelled gun would increase relatively little—1800 kg.

In any event, this solution for developing a self-propelled gun is significantly simpler than the approach taken before the war, which involved developing a new and larger chassis for the BR-2 based on the KV tank. [15]

Petrov's idea appeared a bit bold, to put it mildly, only when viewed from the sidelines. As the experience gained in building the M75 107 mm antitank gun demonstrated, the ML-20 carriage was fully capable of mounting heavier systems. As it later turned out, the same could be said of the M-30 howitzer's carriage. Of the six proposals, only one became metal. The M-10 152 mm howitzer on the M-30 152 mm howitzer carriage was placed in service with the Red Army as the D-1 howitzer during the summer of 1943. The debut

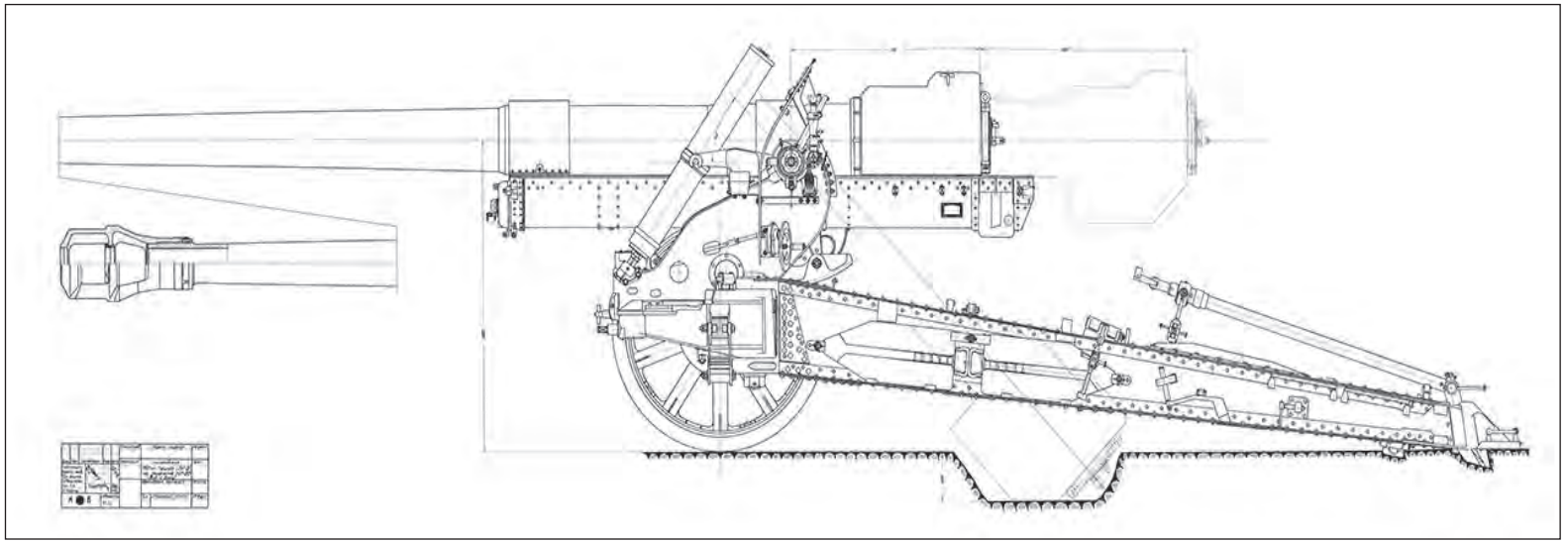
[15] TsAMO RF, collection 81, series 12038, file No. 269, pp. 7–8.

Installation of BR-2 152 mm gun on the ML-20 gun-howitzer carriage, a Factory No. 8 design, October 1942 (TSAMO).

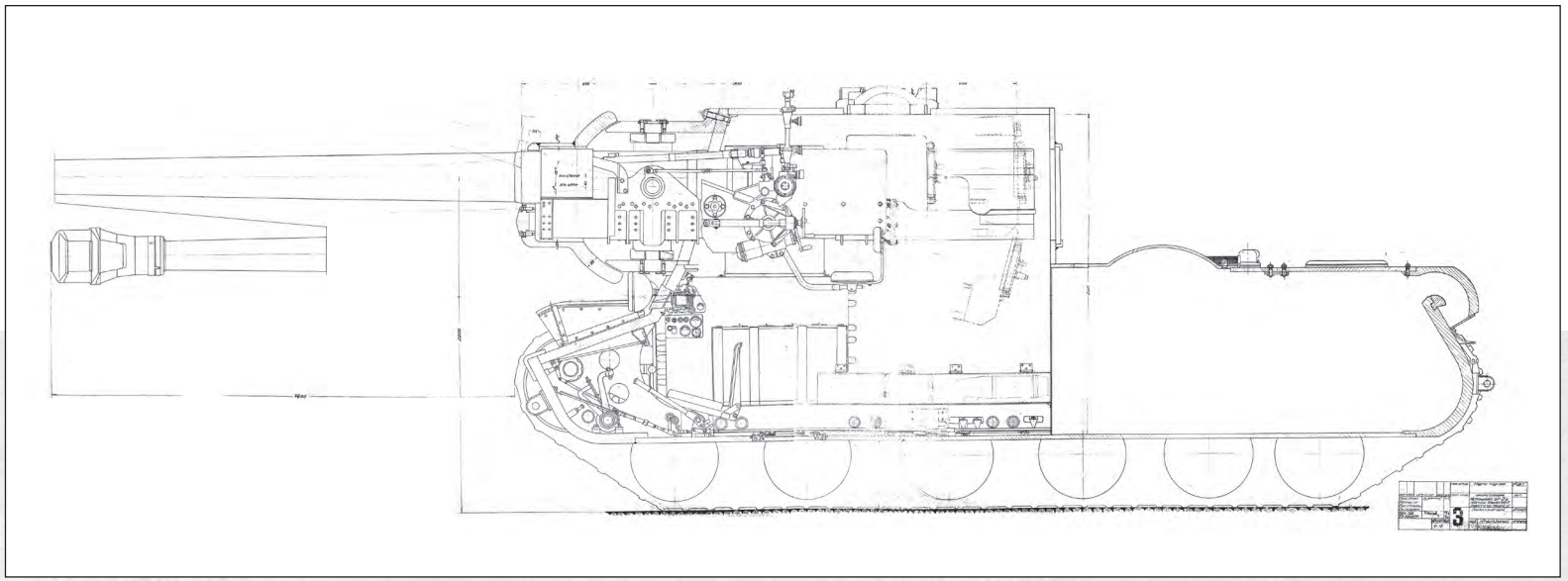
design of Factory No. 9's design bureau has been so successful that it is still in service in a number of countries

Factory No. 9's design bureau had another project in addition to these six gun systems. Petrov's idea for mounting the BR-2 in the ZIK-20 was translated into a conceptual design. It was no less valuable for being based on the version of the ZIK-20 revised as suggested by the Technical Council of the People's Commissariat of Arms. The SP gun had a rear hatch, telescopic sight, a rack for stowage of ammunition in a single layer on the floor, and the commander's cupola from the KV-1S. In addition, the BR-2 installation project included ZIK-20 specifications based on both the KV-1 and the KV-1S.

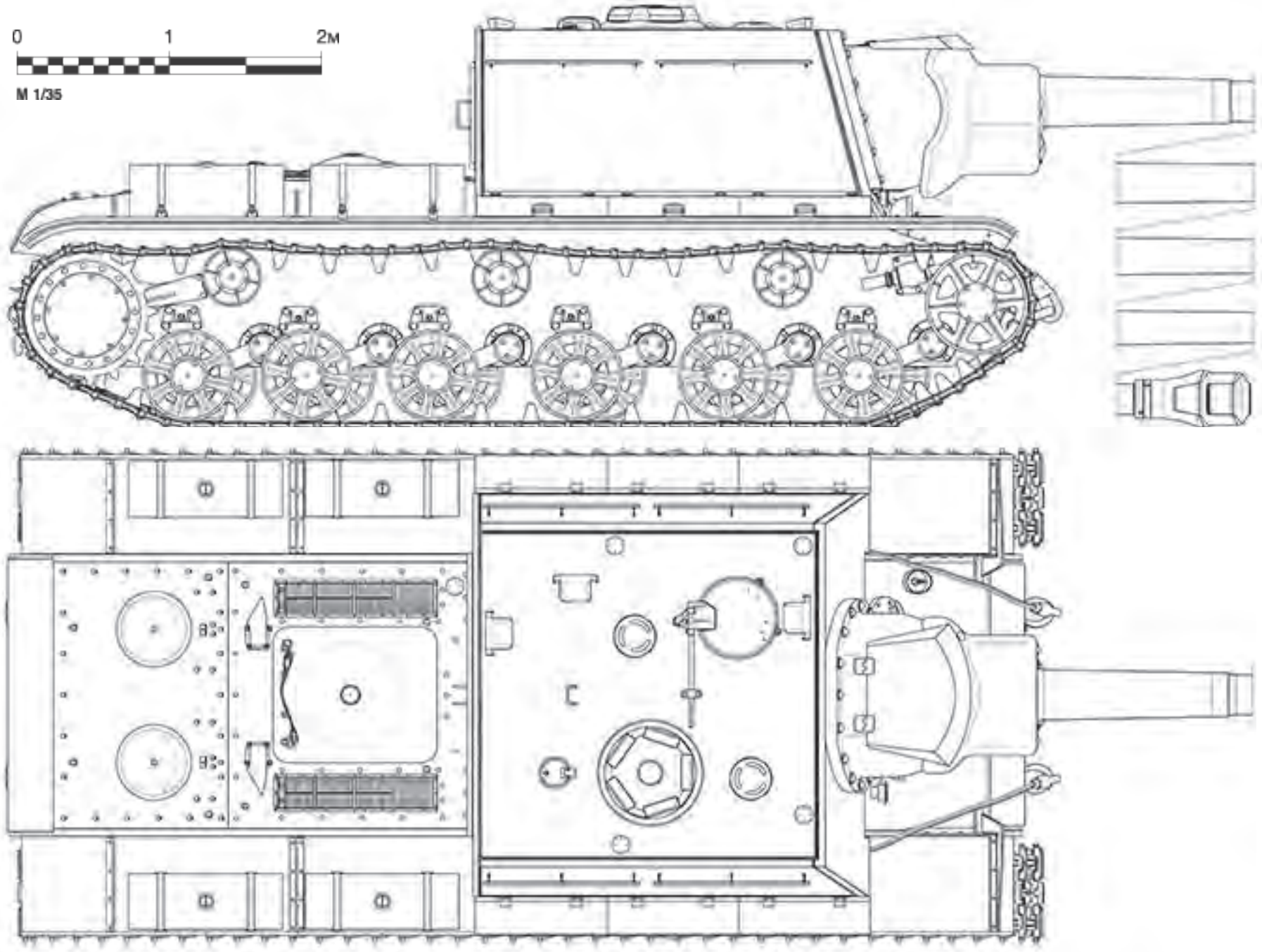
1. *The Technical Council of the People's Commissariat of Arms and the GAU's Artillery Committee have approved the ZIK-20 project for mounting the ML-20 152 mm gun-howitzer model 1937 on a KV tank with a fixed (welded) turret. The drawings for this installation are almost finished.*
   If the BR-2 152 mm gun is mounted on the ML-20 carriage, the barrel of the BR-2 gun with a muzzle brake made of armor steel can easily be placed on the ML-20's cradle.
   The barrel would only require modification of the cast breech. Its weight would increase and its weight distribution would change. The modification



Factory drawing of BR-2 152 mm gun on the ML-20 gun-howitzer carriage (TsAMO).



Factory drawing of BR-2 152 mm gun on the ZIK-20 SP gun (TsAMO).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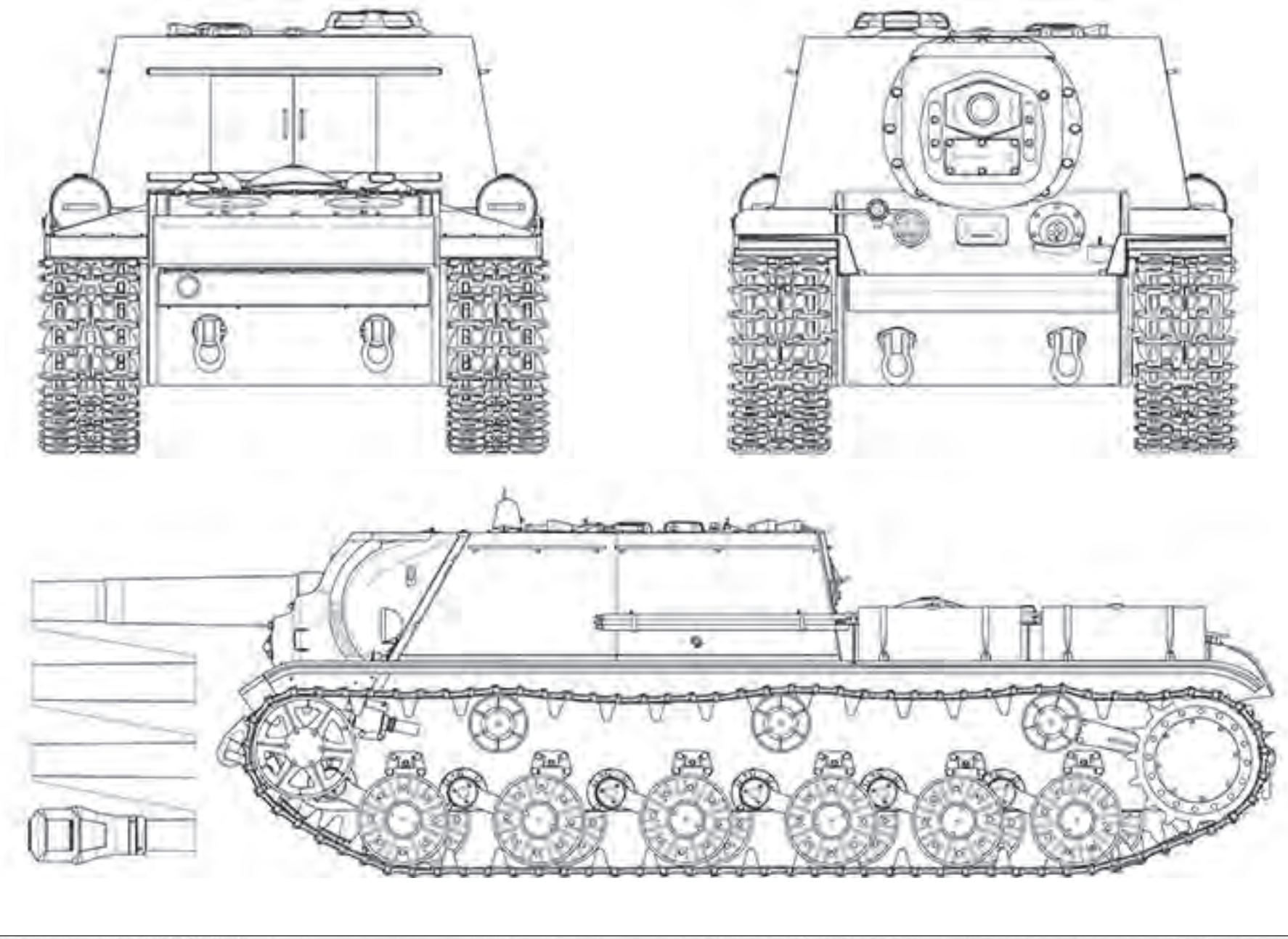


BR-2 152 mm gun on the ZIK-20, 1:35 scale drawing.

would be required to achieve balance and provide the needed firing angles.
Only the profile of the recoil throttling rod would change as compared with the tank-mounted ML-20.

2. *This installation would result in a self-propelled gun with the following characteristics:*

Parameter	GAU's operational requirement	ML-20 152 mm gun-howitzer model 1937	BR-2 152 mm gun Model 1935
1. Caliber, mm	152	152	152
2. Shell weight, kg	49	43.5	49
3. Muzzle velocity, m/s	880	600	880
4. Charge type	Bagged	Separate loading	Bagged
5. Weight of entire SP gun using: a) KV tank b) KV-1S tank	 Not more than 65 t Not more than 65 t	 53 t 46 t	 55 t 48 t
6. Number of shells	47	30–40	40–47
7. Displacement of center of gravity relative to a KV tank	-	360 mm	390 mm
8. Armor thickness: a) Glacis b) Side c) Turret	 60 mm 60 mm 60 mm	 KV: 75 mm, KV-1S: 60 mm KV: 75 mm, KV-1S: 60 mm 75 mm	 KV: 75 mm, KV-1S: 60 mm KV: 75 mm, KV-1S: 60 mm 75 mm
Traverse angle	+/-4°	+/-6°	+/-5°
Elevation angle	+16°, -3°	+15°, -3°	+15°, -3°
Distance barrel extends beyond vehicle	-	1700 mm	3000 mm
Line-of-fire height	-	2190 mm	2206 mm

3. *As the table and the drawing of the KV tank installation show, the BR-2 installation differs little from the ML-20 installation in the same tank, but it is more than twice as powerful.*
It is necessary to accept the greater extension of the gun barrel forward of the tank as compared with the ML-20 because we are dealing with such a powerful barrel, which, together with the muzzle brake, is about 8000 mm long.
If there is a need to develop a self-propelled gun of this type, this solution is the most practical, the simplest, and the most constructive and technically correct of all the alternatives.
4. *Since the BR-2 152 mm gun shares a carriage, cradle, breech, and recoil mechanisms with the 203 mm howitzer, placing the BR-2 on the ML-20 tank cradle also offers the opportunity, as needed, of placing the B-4 203 mm*

howitzer's monobloc barrel on this cradle with similar modifications and, of course, it would be even easier to place the U-3 203 mm howitzer in a tank. [16]

The idea of mounting the BR-2 on an ML-20 cradle was entirely feasible; moreover, similar projects were implemented in 1944. On the other hand, it was much more important towards the end of 1942 to complete work on the ZIK-20 superstructure, and the situation with that project was far from rosy. The transfer of SP gun projects to Factory No. 9 delayed work on the design even more. The situation was aggravated by the fact that the model shop at the new factory was less capable. As a result, the full-scale wooden model of the ZIK-20 was not finished until December 15.

A review of the design documentation and model were scheduled for January 3, 1943, by decision of Col. Gen. of Artillery Yakovlev, Chief of the Main Artillery Directorate; Zaltsman, People's Commissar of the Tank Industry; and Ustinov, People's Commissar of Arms. It took place at the Chelyabinsk Kirov Factory, and it went beyond a simple finding based on the model to involve competition with projects proposed by the Kirov Factory's design bureau. Competition to the Sverdlovsk SP gun emerged from Chelyabinsk because the ZIK-20 design was delayed and collaboration between the two factories was lacking.

[16] TsAMO RF, collection 81, series 12038, file No. 269, pp. 20–21.

CHAPTER 6. Birth of the *Zveroboy*—the "Beast Killer"

Just when the Chelyabinsk Kirov Factory began working on a heavy SP gun is not known for certain. All we can be certain of is that the Kirov Factory did not originate the design of the ZIK-20's competitor. Moreover, no matter what project was placed in service, it would have to be produced in Chelyabinsk. The originator of work on the heavy SP gun at the Chelyabinsk Kirov Factory is clear from Factory No. 100's report covering the period from September 15 to October 1, 1942:

The KV-7 tank

The tank with twin artillery systems has been rejected. The GAU suggested that the Kirov Factory mount a single ML-20 artillery system on this vehicle. The system has arrived at Factory No. 100. The designers are preparing drawings for this installation, after which they will begin constructing a wooden model for presentation to the GAU commission.[1]

L. S. Troyanov headed up design of the SP gun. Lev Sergeyevich was the most experienced Soviet designer of all those working on self-propelled artillery. He began with the SU-5, which was based on the T-26; then came the SU-14, the T-100U, and the T-100Z. It should be noted that Troyanov's initial development was not an analog of the ZIK-20. According to N. F. Shashmurin's memoir, the initial SP gun concept was faithful to the GAU's requirement for a "bunker buster based on a chassis incorporating assemblies from the KV tank:"

Concerning development of the SU-152. It mattered which chassis we used for the task. Our team was joined by Engineer L. S. Troyanov, who produced a conceptual layout on a chassis with eight pairs of road wheels and used components from the KV-1S tank.

The year 1942 was drawing to a close. Clearly, that design solution was sheer nonsense. The only solution we liked was one that retained the KV-1S chassis. Kotin came to my office and drew a picture—a 152 mm gun mounted on a KV-1S. Instead of a turret, it had a KV-7-type superstructure. That, of course, was the only proper solution. He gave us an assignment: "Determine the feasibility of that option by 3:00 AM." He left a sketch of the gun that G. N. Rybin had brought him from F. F. Petrov. We had a layout ready by morning. The designers were N. T. Fedorchuk and M. I. Zeltser. We ended up with a severely overloaded

[1] TsAMO RF, collection 38, series 11355, file No. 938, p. 251.

front suspension and a gun that stuck out too far in front. No other ideas came out of a meeting of the lead designers. The main burden of fulfilling this task fell on the team led by V. I. Tarotko and the artillerymen under F. F. Petrov. The KV-1S vehicle and primary production were retained. The total amount of work involved in designing and manufacturing the SU-152 prototype wasn't excessive, and it was ready a month later.

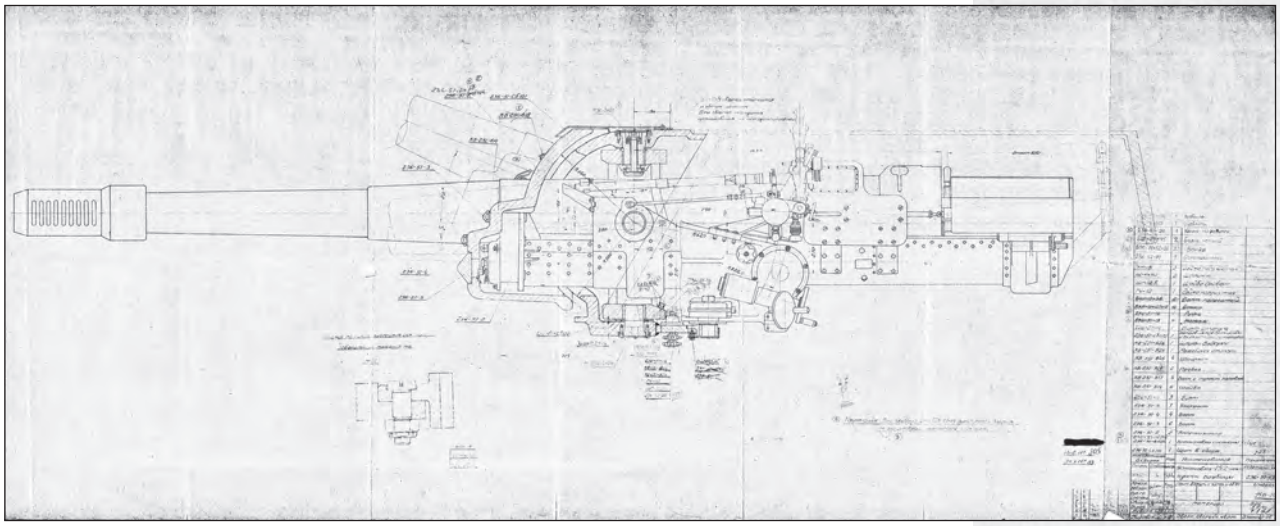
L. S. Troyanov, lead designer of the Chelyabinsk bunker buster (V. Len).

The documentation largely bears out Shashmurin's description. Unfortunately, little correspondence remains from this period (November–December 1942). It is possible that some documents, including Troyanov's initial design, have been retained in GAU files that have yet to be declassified. Incidentally, Shashmurin clearly understated Troyanov's role in the project: he is listed as "Senior Project Engineer" on the system drawings. The 1:10 scale wooden model and the design documentation for the SP gun were produced towards the end of December 1942. The project was assigned the designation KV-14, and the drawings were given the number 236 (in the summer of 1943, the project began being called Object 236). Correspondence dating from early 1943 also occasionally included references to the designation SU-14.

As mentioned previously, the SP gun models were scheduled to be displayed on January 3, 1943. A. A. Goreglyad and Zh. Ya. Kotin (of the People's Commissariat of the Tank Industry) and P. F. Solomonov (of the Main Artillery Directorate) were authorized to evaluate the projects. It is interesting that the Kirov Factory's SKB-2 submitted not one project, but two, each based on a different hull. The following conclusions were drawn from the examination of the projects:

1) *The project that Factory No. 9 submitted for review was more complete (to include engineering drawings) than the Kirov Factory project.*

Factory drawing of the ML-20 152 mm gun-howitzer mounted on the KV-14 (TsAMO).



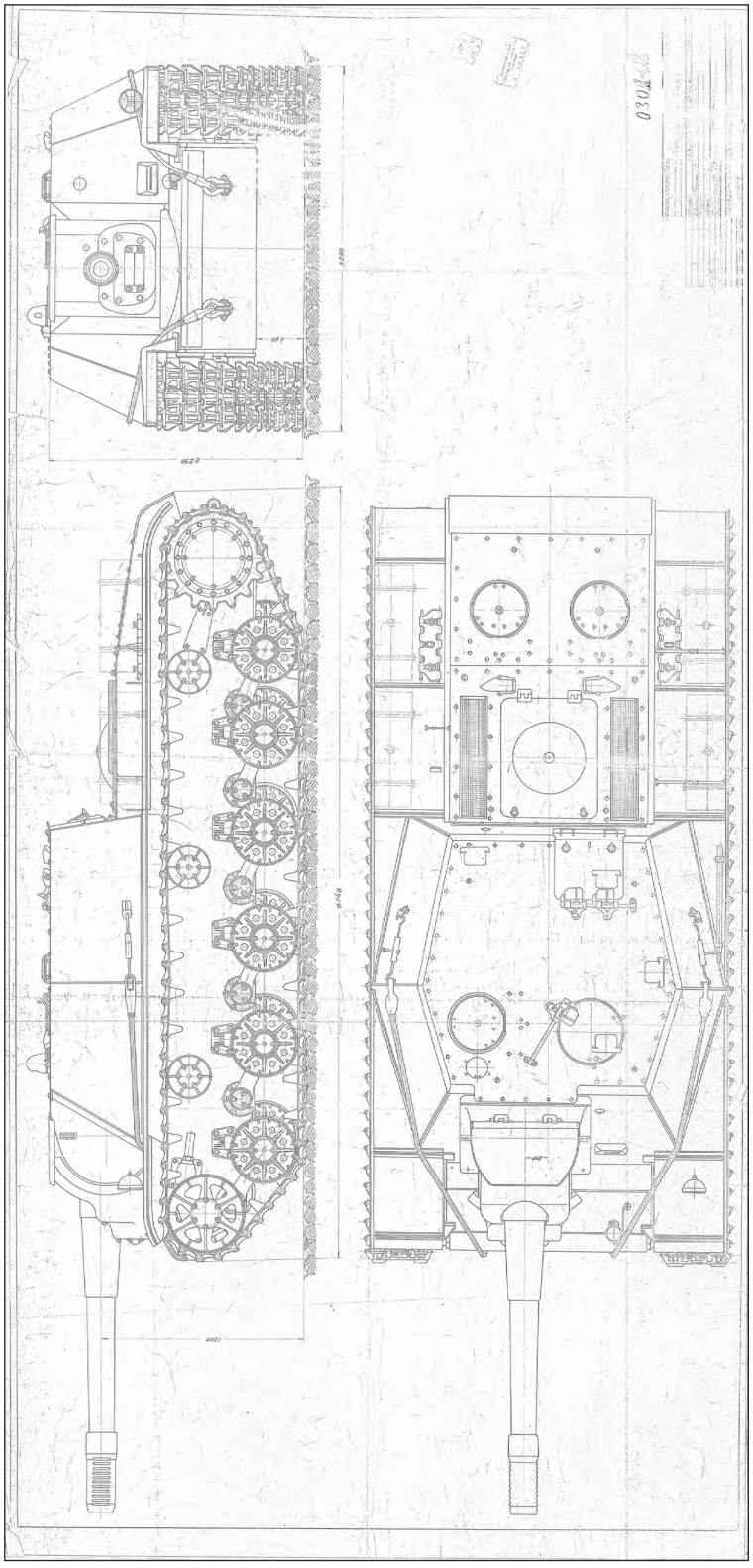
2) *Factory No. 9's project required significant modification of the 152 mm gun-howitzer model 1937 (removal of the muzzle brake, a new recoil mechanism, etc.), which was inconsistent with GAU's operational requirement.*
3) *The weight of the SP gun designed by Factory No. 9 has increased to 47.5–48 tonnes, and it is larger.*
4) *The correction of the above-listed deficiencies (paragraphs 2 and 3) required major modifications and revision of the engineering drawings of both the hull and the system.*
5) *Engineering drawings have been only partially completed for the Kirov Factory's two versions of its project, and some assemblies (e.g., the frame, the trunnion ring, and the elevation mechanism) required significant modification. For example, the elevation mechanism was taken from the ZIS-5 and did not meet the strength requirements.*
6) *The Kirov Factory's first version (which lengthens the hull by 450 mm) caused problems with full-scale production because its side plates could not be manufactured on Factory No. 200's unit-type machine tools. In addition, the placement of the three front road wheels (which increased the spacing between them) was controversial because it reduced the vehicle's mobility, especially in swampy terrain and during the spring and fall thaws.*
7) *The Kirov Factory's second version introduced the fewest modifications in full-scale artillery and tank production and was sensible in terms of its shape, fighting compartment layout, weight, and dimensions, but it required a large number of drawings to be revised.*

The Commission concluded that work on the Kirov Factory's second version should proceed, and that engineering drawings should be prepared and checked by constructing a wooden mockup.[2]

Needless to say, Petrov was very upset by this outcome. After Factory No. 8 was split in two, the main task of Petrov's design bureau was development of tank and howitzer systems, and the ZIK-20 became something of a burden. In addition, as already mentioned, the system was going to be produced in Chelyabinsk anyway. Even after the KV-14 project won out, Petrov's role in the SP gun did not diminish greatly, because he had developed the ML-20 gun-howitzer that was to be mounted on the Chelyabinsk vehicle. The ML-20 modification minus muzzle brake proposed in the fall of 1942 was more suitable, but at that point it was much more important to have as little impact on the design as possible in order not to delay production of the KV-14.

The Commission's decision finally put into motion a mechanism that began inexorably ticking down to the start-up of production on the heavy SP gun. The very next day after the display, Stalin signed State Defense Committee Decree No. 2692 "On Manufacture of a Prototype 152 mm Self-Propelled Gun Based on the KV-1S Tank Chassis," which established a deadline for building the prototype:

[2] TsAMO RF, collection 38, series 11369, file No. 78, pp. 72–73.

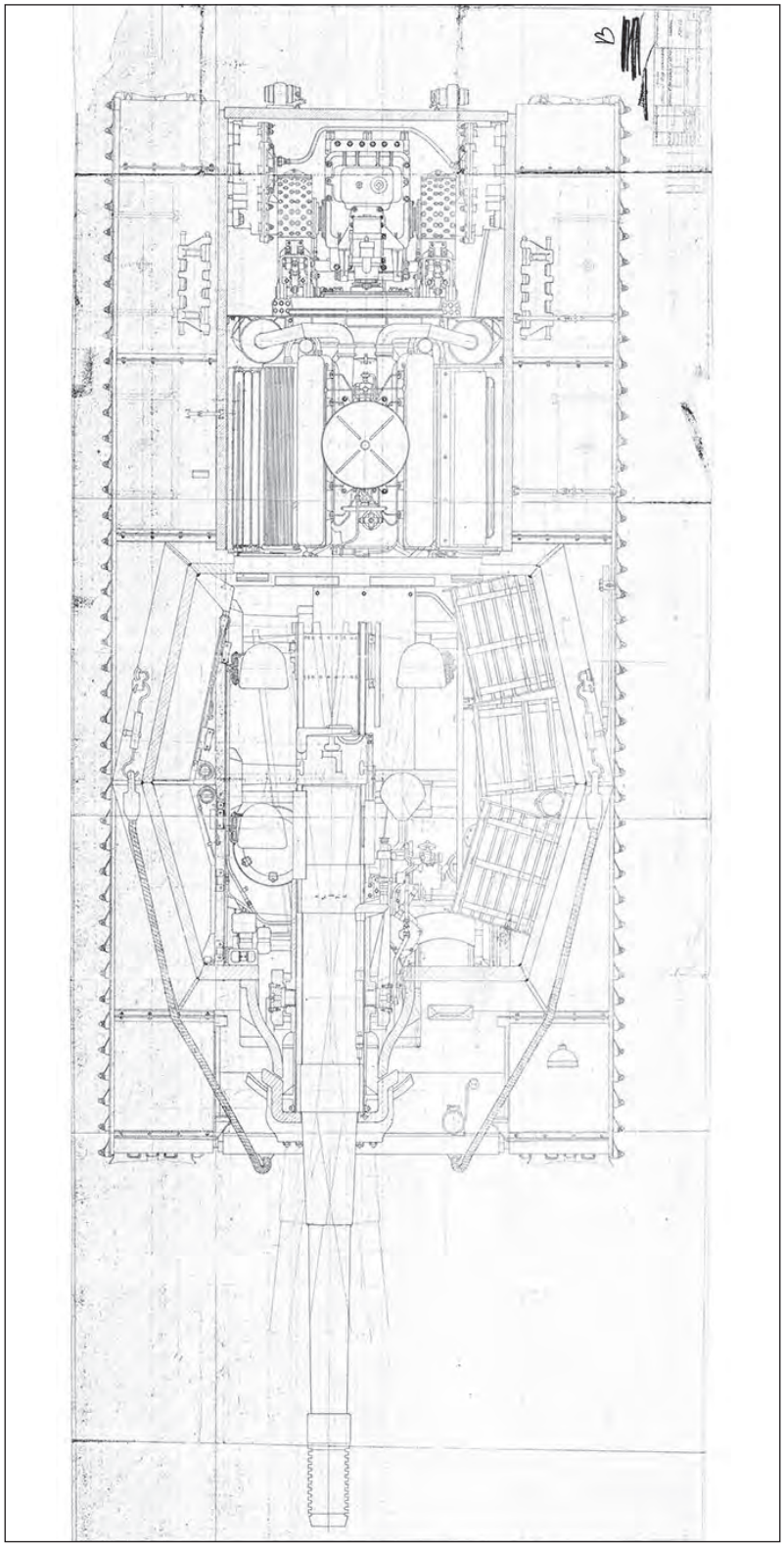


Factory general view drawing of the KV-14 SP gun, January 1943 (IZh).

1. *The People's Commissar of the Tank Industry (Comrade Zaltsman), the director of the Kirov Factory (Comrade Goreglyad), the director of Factory No. 200 (Comrade Shcherbakov), and the chief designer of the People's Commissariat of the Tank Industry (Comrade Kotin) shall manufacture a prototype of a self-propelled gun with a 152 mm gun-howitzer model 1937 (ML-20) based on the KV-1S tank chassis and provide it for proving-ground tests by January 31, 1943.*
2. *The People's Commissar of Arms (Comrade Ustinov), the director of Factory No. 172 (Comrade Vykhovsky), the chief designer of Factory No. 172 (Comrade Gurenko), and the chief designer of Factory No. 9 (Comrade Petrov) shall manufacture and provide to the Kirov Factory a 152 mm gun-howitzer model 1937 (ML-20) adapted for mounting on a KV-1S tank chassis by January 23, 1943.*
3. *The overall development of the project, the modification of the 152-millimeter gun-howitzer model 1937 (ML-20) for mounting on the vehicle, and the allotment of mounting-part production to factories shall be done at the Kirov Factory jointly by designers of the People's Commissariat of the Tank Industry and the People's Commissariat of Arms, with the involvement of the following GAU engineers: Eng. Col. Komarov and Eng. Maj. Solomonov.*
4. *The following basic characteristics of the 152 mm SP gun based on a KV-1S tank chassis shall apply to the design:*
    a) *The combat weight with ammunition, fuel, and crew shall not exceed 45.5 tonnes;*
    b) *The vehicle shall have at least 20 rounds of ammunition on board;*
    c) *The armor thickness of the fighting compartment shall be 60 mm;*
    d) *The thickness of the frontal armor of the fighting compartment shall be 60–75 mm;*
    e) *The height of the fighting compartment shall be at least 1700 mm*
    f) *The rate of fire shall be 3–4 rounds per minute.*

By January 6, 1943, the chief of the GAU (Comrade Yakovlev) shall issue an operational requirement to the People's Commissariat of the Tank Industry for guidance in manufacturing the prototype.

5. *The Main Artillery Directorate, the Main Directorate of the Chief of Artillery, and the Main Armored Forces Directorate shall organize and carry out proving-ground tests on the prototype at the artillery range near the city of Chelyabinsk over a 7-day period beginning the day it arrives at the test range.*
6. *The chief of the Directorate of Fuels and Lubricants (Comrade Kormilitsin) shall support the tests with fuel at the request of the GAU.*
7. *The results of the tests shall be reported to the State Defense Committee within three days after completion.*
8. *The People's Commissariat of the Tank Industry (Comrade Zaltsman) and the People's Commissariat of Arms (Comrade Ustinov) shall immediately*



Factory drawing of KV-14 without the engine compartment cover and superstructure (IZh).

KV-14 SP gun prototype, late January 1943 (TsAMO).

begin production engineering for the 152 mm self-propelled gun so that mass production can begin as soon as the prototype is approved.[3]

The Chelyabinsk Kirov Factory's deadlines for drafting the documentation and manufacturing the prototype were tight, but realistic. The SU-12 and SU-35 SP guns had been developed at a similar pace two months prior to that, and their developers had more or less met their deadlines. The Kirov Factory's team was now facing the same task.

Meanwhile, events were proceeding precisely on schedule. On January 5, I. M. Zaltsman, People's Commissar of the Tank Industry, issued Order No. 6ss "On Manufacturing the Prototype of the 152 mm Self-Propelled Gun Based on the KV-1S Tank Chassis." According to the order, Chief Designer Zh. Ya. Kotin was to issue the drawings for the system by the 10th. Factory No. 200 was to supply a finished hull for assembly by January 18, and the deadline for manufacture of the KV-14 was set for January 25. Plans called for factory testing of the SP gun to be complete by the 29th and for it to be provided for proving-ground tests on February 1. The modified ML-20 gun-howitzer was to be received for installation in the KV-14 on January 23.

As stated in the decree, on January 6, 1943, GAU Artillery Committee Chairman V. I. Khokhlov (who by that time had been promoted to Lieutenant

[3] RGASPI, collection 664, series 2, file No. 119, pp. 203–204.

General of Artillery) sent off two copies of the operational requirement for the "152 mm self-propelled gun based on a KV-1S tank chassis." He sent the requirement, which had been approved by GAU Chief Col. Gen. of Artillery N. D. Yakovlev, to the Kirov Factory and to People's Commissar of the Tank Industry I. M. Zaltsman:

I. Role

1. The 152 mm self-propelled gun is intended for destroying bunkers, earth-and-timber emplacements, and other strong field fortifications by direct fire from close range during breakthroughs of enemy defenses, as well as for combating enemy artillery and shelling his rear areas.

II Main specifications

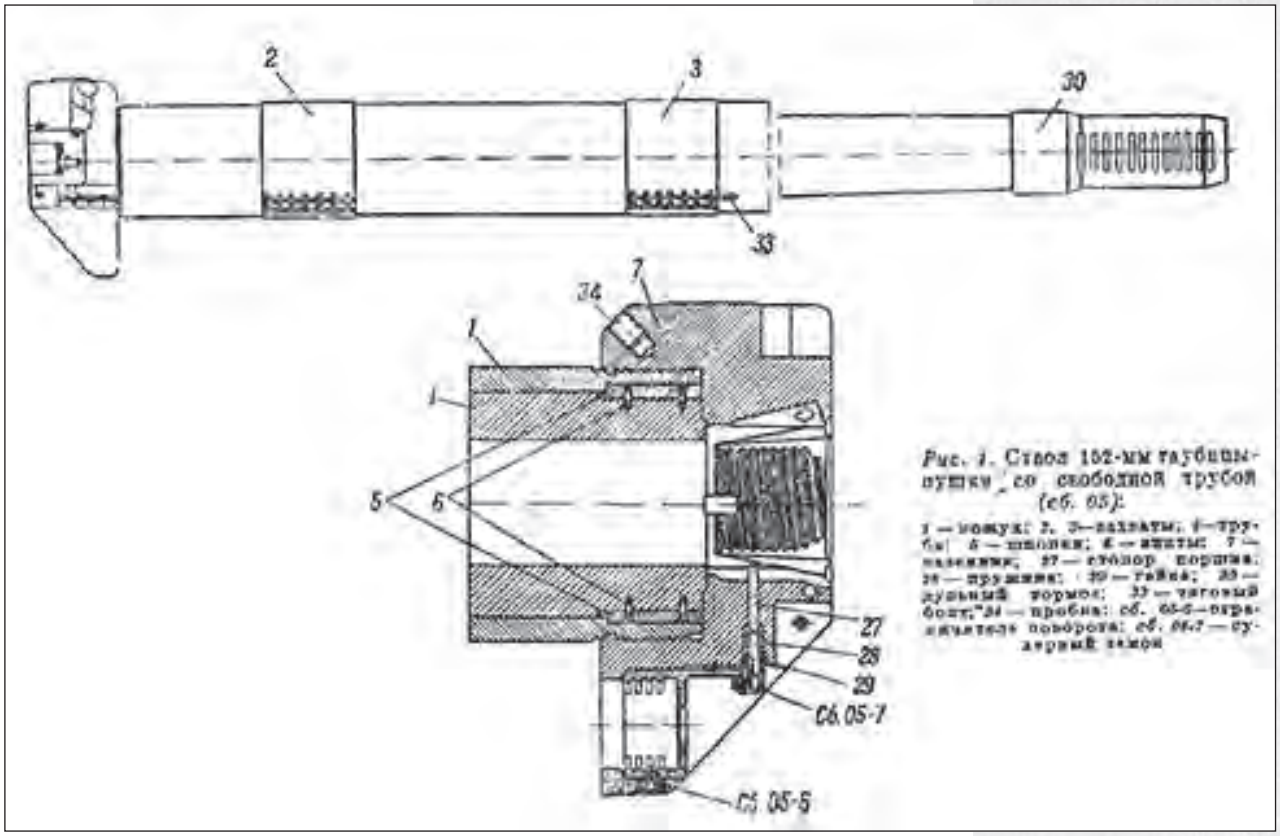
1. The self-propelled gun is to be produced by installing the tipping parts of the 152 mm gun-howitzer model 1937 in a fixed turret that, in turn, is to be mounted on a KV-1S tank chassis.

2. The weight of a fully-fueled self-propelled gun with ammunition and crew must not exceed 45.5 tonnes.

3. The thicknesses of the fixed turret armor plates must be as follows:

a) Front: 60–75 mm;

ML-20S gun-howitzer barrel (YuP).



b) Equivalent to that of the KV-1S tank on the side and rear, i.e., 60 mm;
c) Top: 20 mm

4. *The basic load of the self-propelled gun must comprise at least 20 rounds.*
5. *The height of the fighting compartment above the floor must be at least 1700 mm.*

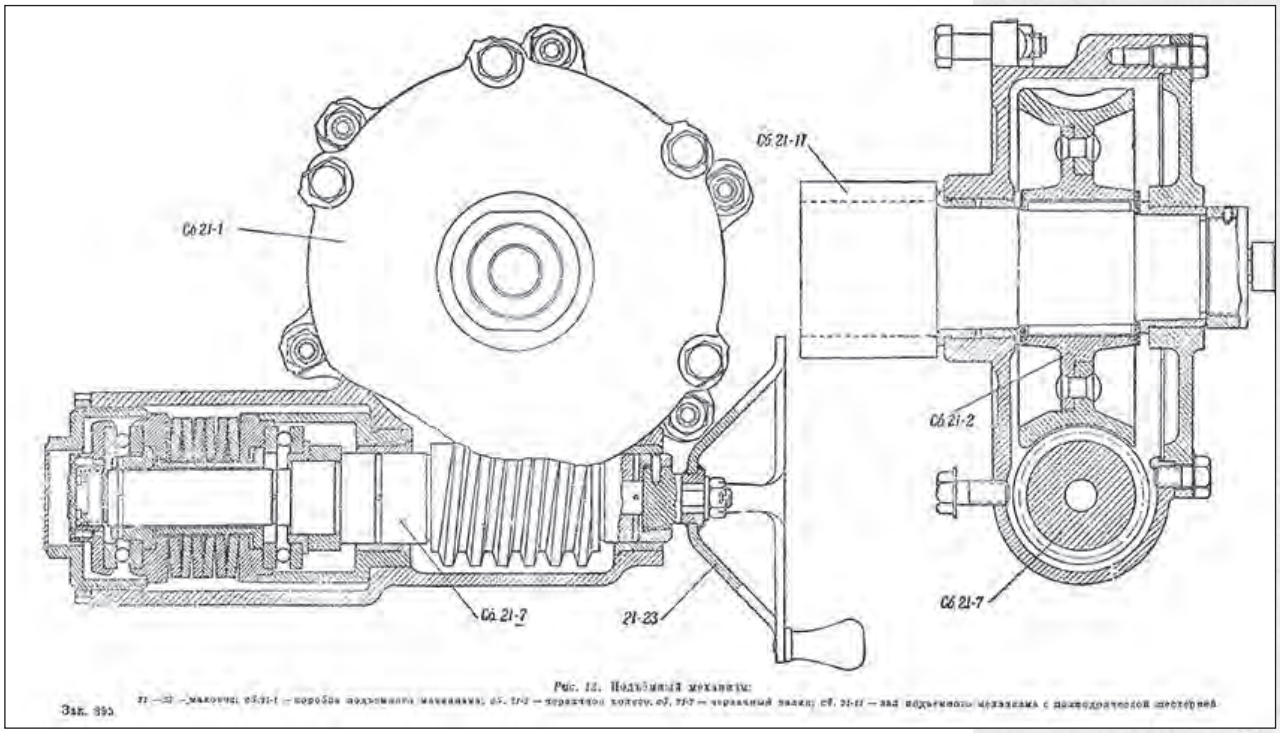
III. Artillery system specifications

The self-propelled gun must meet the following specifications:

1. *Angles of fire:*
   a) Elevation: from -3° to +20°
   b) Traverse: 6° to each side
2. *The practical rate of fire with correction of aim: 3—4 rounds per minute.*
3. *Constant recoil: 850 mm (achieved by appropriate securing of the counter-rod)*
4. *The effort required to operate the gun laying mechanism flywheels must not exceed that of the gun-howitzer in service, namely:*
   a) Elevation: 8 kg;
   b) Traverse: 5 kg.
5. *The sights must support both direct fire from unconcealed positions and indirect fire from cover. A sight must be installed such that the panoramic sight's objective lens extends above the turret roof. Install a headrest to facilitate the work of the gunner.*
6. *Loading gear: a special tray like that used in the 122 mm self-propelled gun produced by Factory No. 592.*
7. *Firing gear: hand- and foot-operated*
8. *Barrier*

   To protect the gun crew from recoiling parts, a special barrier must be provided that does not hinder loading.
9. *Balance*

   The muzzle brake may be removed from the barrel in order that the effort required to operate the gun laying mechanism flywheels does not exceed that on the model 1937 gun-howitzer, provided such is supported by calculations of the strength of the recoil mechanisms. In this case, the mounting parts of the gun must be designed for greater recoil resistance.
10. *The position of the traversing mechanism flywheel relative to the panoramic sight eyepiece and the gunner's seat must be such that it facilitates the job of the gunner without removing his eye from the eyepiece. The existing traversing mechanism may be replaced with a helical mechanism.*
11. *The traversing mechanism flywheel may be replaced by a naval hand-wheel.*
12. *The recoil mechanisms that extend outside the turret must be shielded by a turret thickness of 30—35 mm, and the frontal part must be*



ML-20S gun-howitzer hoisting device (YuP).

shielded by 75 mm of armor. The front must have a hatch for access to the recoil mechanisms.

13. *The howitzer installation must support easy loading at all allowable angles of elevation and traverse.*
14. *The tipping parts must be capable of being secured in the travel position from inside the vehicle to prevent the gun from moving vertically or horizontally.*
15. *SP gun crew: 6:*
    a) gun commander; b) gunner; c) loader; d) breechblock operator; e) radio operator; f) driver-mechanic

IV. Hull and vehicle requirements

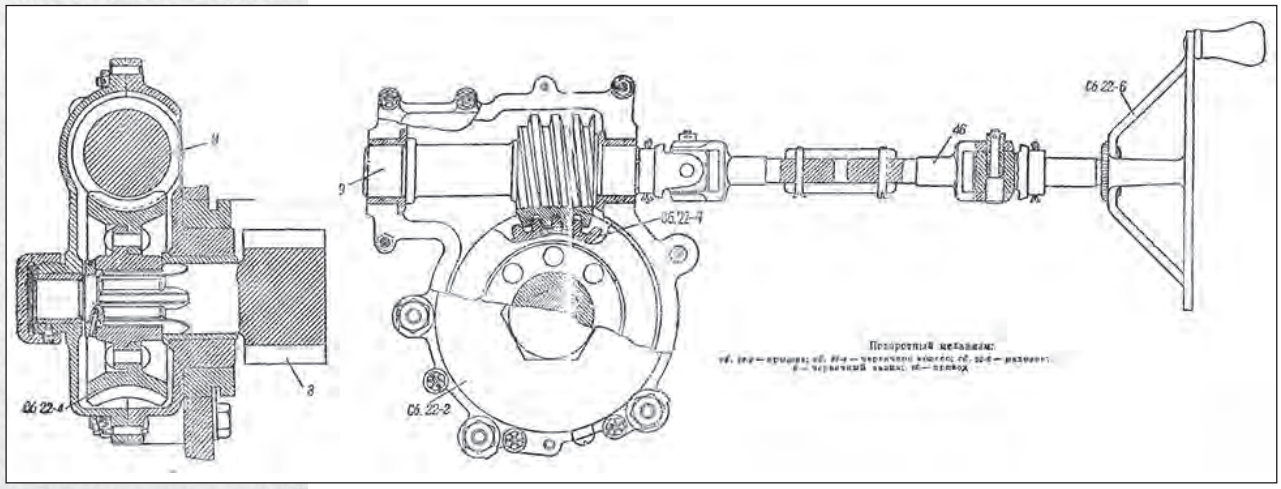
1. *The fixed turret that replaces the rotating turret must be strong and support easy and safe servicing of the gun and the required rate of fire.*
2. *The space over the tracks must be used to create a spacious fighting compartment.*
3. *The ammunition storage rack must be strong and support free and easy removal of round components in order to achieve the required rate of fire.*
4. *The placement of rounds in the fighting compartment must be consistent with the division of labor between the loader and the breechblock operator: the loader prepares and inserts a projectile into the chamber,*

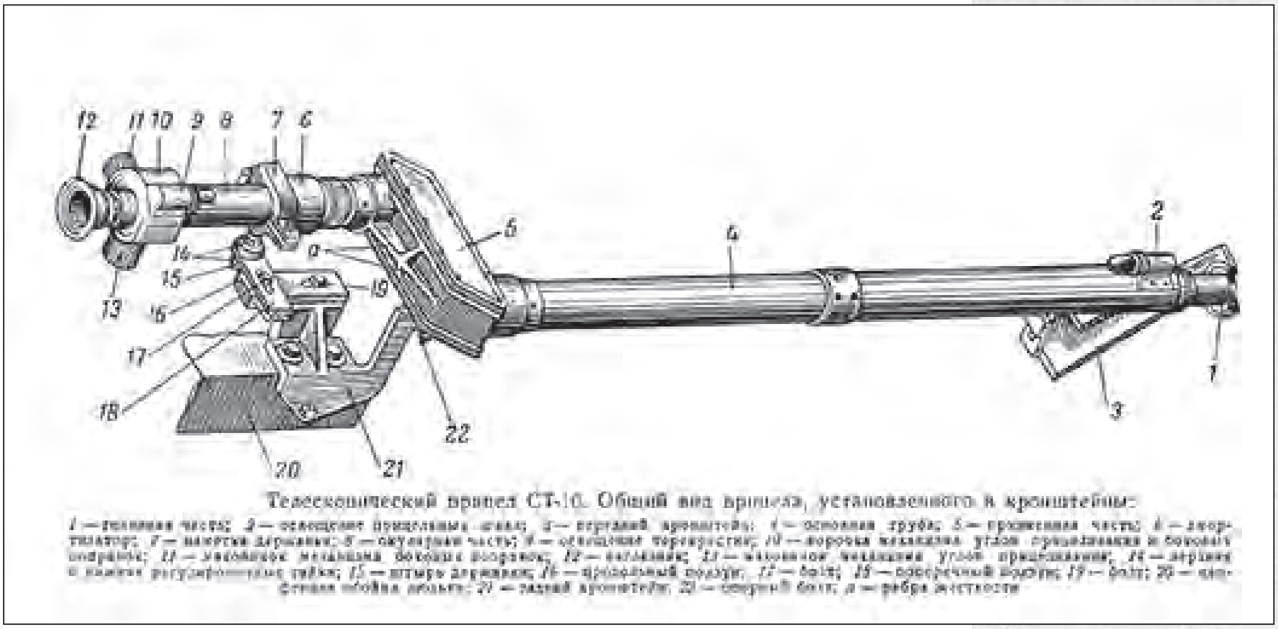
and the breechblock operator opens and closes the breech and inserts the case.

5. *The rear part of the roof and the rear of the fighting compartment must have a hatch with doors that open for entry and exit by the gun crew and for loading ammunition.*
6. *There must be a ventilation port with a cover that closes in the rear part of the fighting compartment for ventilation.*
7. *The mantlet must overlap gaps at all angles of elevation and traverse.*
8. *The rear walls of the turret and the front plate must have openings with armor plugs for firing the PPSh submachine guns.*
9. *Install a PTK panoramic sight for use by the commander to observe the battlefield and adjust fire. Provide a hatch in the roof of the firing compartment in front of the PTK for manually wiping the prism head. This opening will also be used for signaling with flags and discharging the flare gun.*
10. *Provide observation slits in the front and side walls of the fighting compartment as additional means of monitoring the terrain.*
11. *Provide each gun crew member with a seat for use while the vehicle is in motion.*
12. *The following communications equipment must be installed:*
    a) *For external communication: a 9-R radio;*
    b) *For internal communication: a TPU-3F intercom system.*
13. *Fighting compartment lighting must enable firing with the hatches closed.*

    Sight scales not illuminated by the roof light and the panoramic sight crosshairs must be illuminated separately and be powered by the vehicle electrical system.
14. *The interior of the fighting compartment must have places for securing the spare parts, tools, and accessories (SPT&A) kit needed during*

ML-20S gun-howitzer traversing mechanism (YuP).





ST-10 telescopic sight mounted on the KV-14 (YuP).

firing; cabinets for the crew's dry rations; and a tank for drinking water.

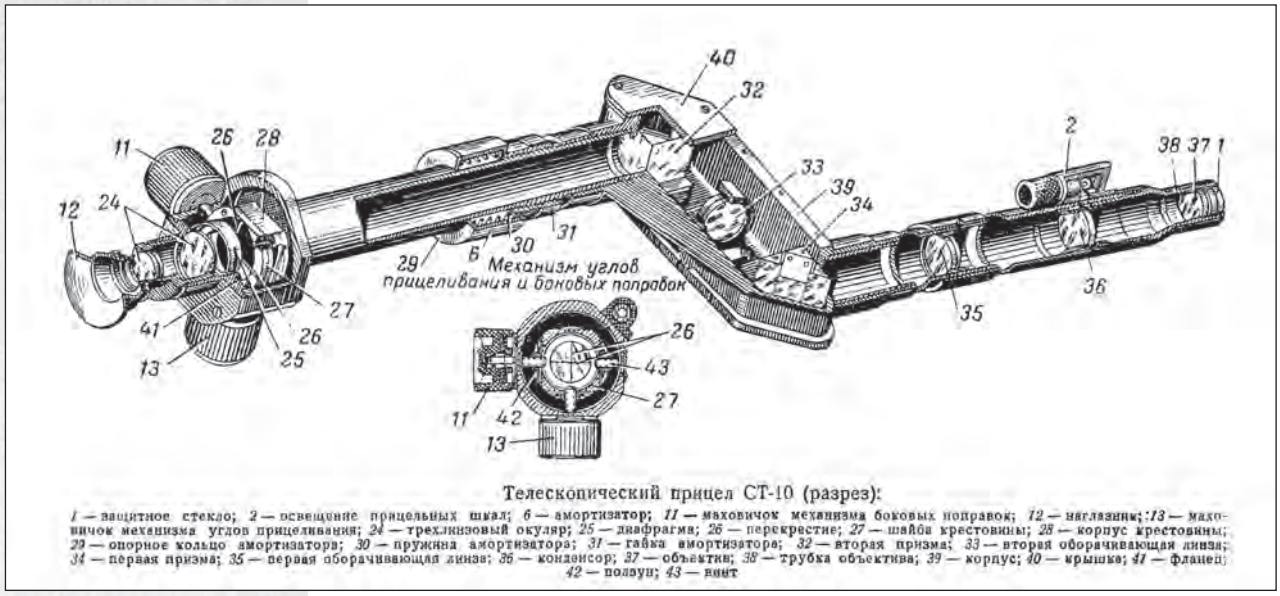
15. *In addition to its artillery ordnance, the vehicle must be equipped with two PPSh submachine guns with 1500 rounds and 10 hand grenades, and means of securing them in the fighting compartment must be provided.*
16. *A special rack must be mounted on the vehicle outside the fighting compartment to carry the following items:*
    a) A vehicle-transportable SPT&A kit for the vehicle;
    b) Entrenching tools: ax, saw, crowbar, shovels (2), pickaxe.

V. Combat specifications for the self-propelled gun

1. *The self-propelled gun fires from a stationary position or from short halts. Firing on the move is allowed as an exception.*
2. *The self-propelled gun must be at least as accurate as the tabular accuracy of the 152 mm gun-howitzer model 1937 that is in service.*
3. *The self-propelled gun must be stable when fired at all elevation and traverse angles, on side slopes, and on uphill and downhill slopes.*
4. *The handling characteristics of the self-propelled gun, including its mobility, trafficability, etc., are determined by the KV-1S tank chassis with its weight increased to 45.5 tonnes.*

VI. Additional guidance

During project development and prototype manufacture, retain as much as possible of the production facilities for the 152 mm gun-howitzer model



Телескопический прицел СТ-10 (разрез):

1 — защитное стекло; *2* — освещение прицельных шкал; *6* — амортизатор; *11* — маховичок механизма боковых поправок; *12* — наглазник; *13* — маховичок механизма углов прицеливания; *24* — трехлинзовый окуляр; *25* — диафрагма; *26* — перекрестие; *27* — шайба крестовины; *28* — корпус крестовины; *29* — опорное кольцо амортизатора; *30* — пружина амортизатора; *31* — гайка амортизатора; *32* — вторая призма; *33* — вторая оборачивающая линза; *34* — первая призма; *35* — первая оборачивающая линза; *36* — конденсор; *37* — объектив; *38* — трубка объектива; *39* — корпус; *40* — крышка; *41* — фланец; *42* — ползун; *43* — винт

ST-10 telescopic sight (cross-section) (YuP).

1937 and the KV-1S tank. Shortcuts that interfere with established production lines shall not be allowed. Only changes that are absolutely necessary shall be permitted. The howitzer recoil mechanisms shall be used without change.[4]

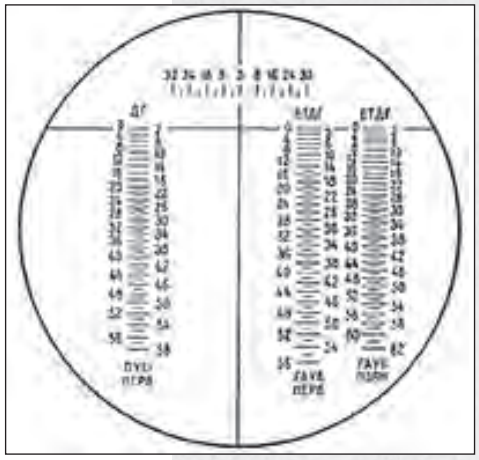
Work got underway at SKB-2 as soon as they received the operational requirement for the SP gun. According to reports received by GABTU, the first drawings for building the prototype were provided on January 8, and the last on the 10th. The flowchart for the parts was ready the following day. Meanwhile, work on the model was already underway. Models of the system's mantlet were finished on the 14th, and the TV-14 model as a whole was done on the 17th. The model was approved that same day. On January 19, Factory No. 200, which was producing the hull, had the plates for the superstructure ready and began installing them on the KV-1S hull that same day. The completed hull for the prototype arrived the next morning from Factory No. 200. Assembly began that same day: alignment of the engine and the transmission was completed, and the balancing arms and torsion bars were installed.

At the same time, Factory No. 172 was preparing to manufacture the self-propelled version of the ML-20 152 mm gun-howitzer. To facilitate use of the documentation, on January 11, 1943, the self-propelled version of the gun was renamed the ML-20S (the designations ML-20-S and ML-20s were also used). The system was mounted on a frame with armor protection and a massive mantlet. The mantlet had a special opening with a cover for performing maintenance on the recoil mechanisms. A hydraulic pump was used for adding fluid to the recoil devices. The front hull plate of the KV-14

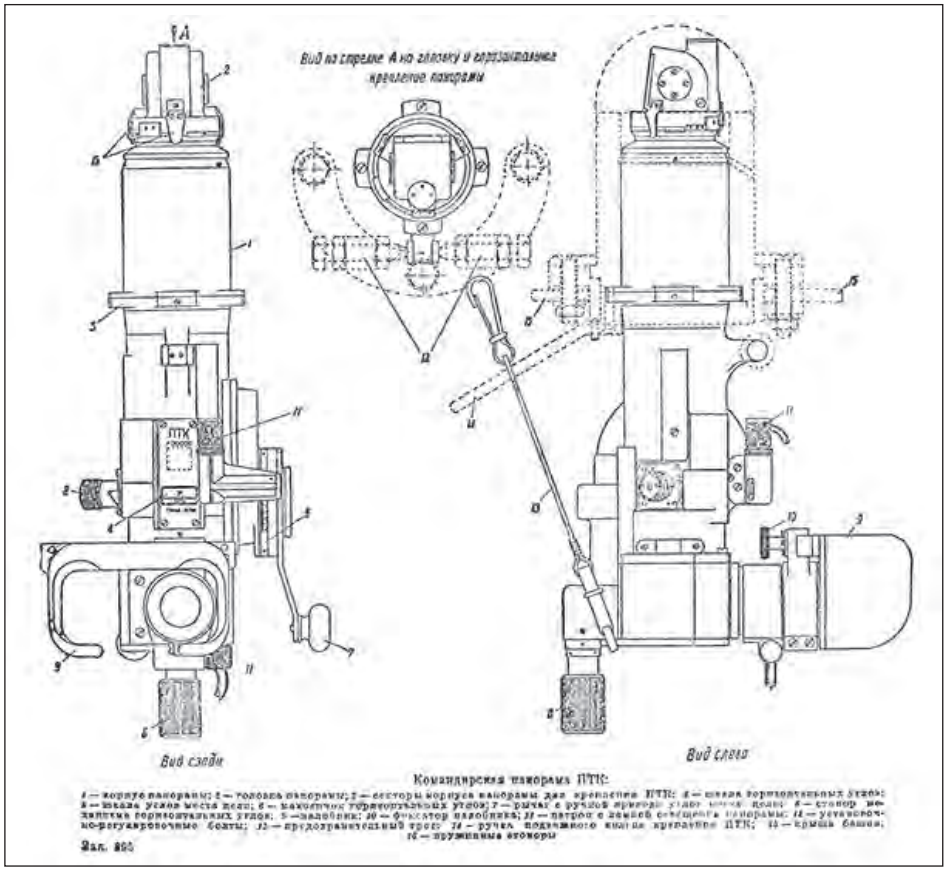
[4] TsAMO RF, collection 81, series 12038, file No. 33, pp. 318–319.

had a special recess where the pump was placed while the recoil mechanisms were being serviced. Because removal of the muzzle brake would require a great deal of work, the barrel was left unchanged.

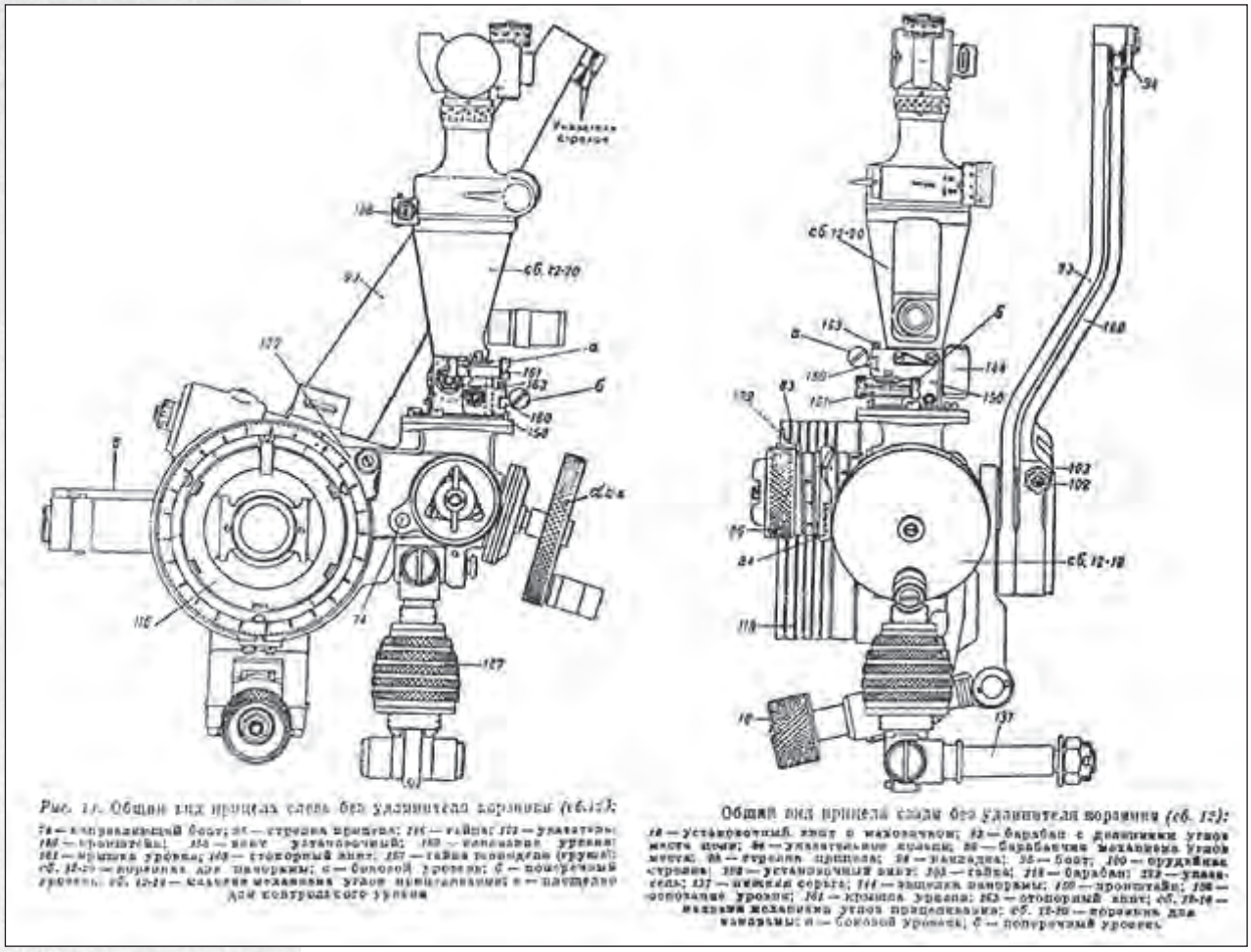
The main modification made to the towed version of the ML-20S was the installation of the T-9 (TOD-9) telescopic sight, which had originally been developed for the KV-2 heavy tank. The T-9 was a modified KT-1 (a casemate telescopic sight) for casemate emplacement of the DOT-4 and included a prism, which gave it its characteristic "elbow." The Hertz panoramic sight (PG-1) was retained for firing from cover. As specified by the requirement, the rollback mechanism was removed and the counter-rod was fixed in the short recoil position. Sector-type elevation and traversing mechanisms with worm gears were added. In addition, a loading tray was attached to the carriage to facilitate loading.



ST-10 sight reticle. Upgraded model with scales for the BR-540 concrete-piercing shell introduced in August 1943 (YuP).



PTK commander's sight installed in the SU-152 (YuP).



Panoramic sight mounted on the SU-152 for firing from cover (YuP).

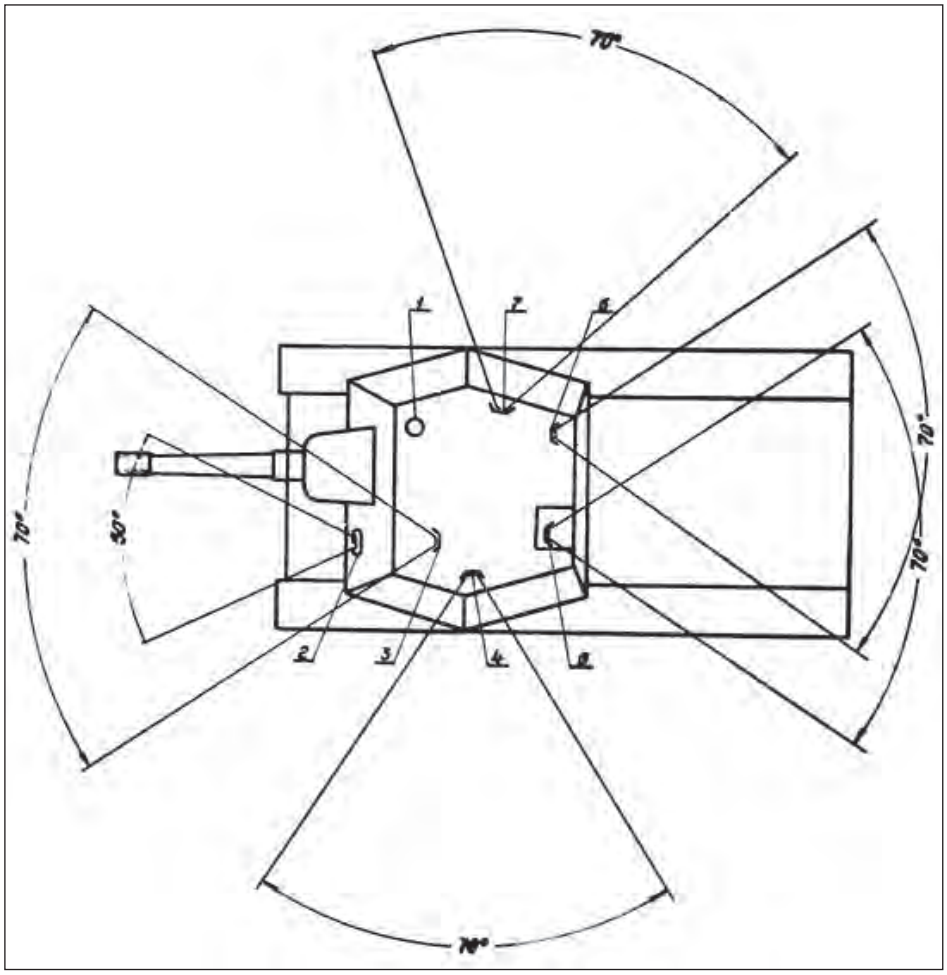
It should be noted that the use of the T-9 sight from the KV-2 was a temporary solution. The system assembled for installation on the KV-14 prototype was equipped with a T-10 sight with scales inscribed for the ML-20's ballistics. However, time was needed to begin manufacturing the T-10, so the first KV-14's were equipped with a T-9, which were readily available after production of the KV-2 ended.

The system underwent factory testing at Factory No. 172's test range on January 21. In all, 58 rounds were fired, 5 with reduced charge, 3 with a full charge, and 50 with supercharge. The system functioned without a hitch during testing; the shift in elevation during firing was two thousandths of a degree. No warping was found after the proof tests, and the effort required to operate the flywheels was within normal limits.

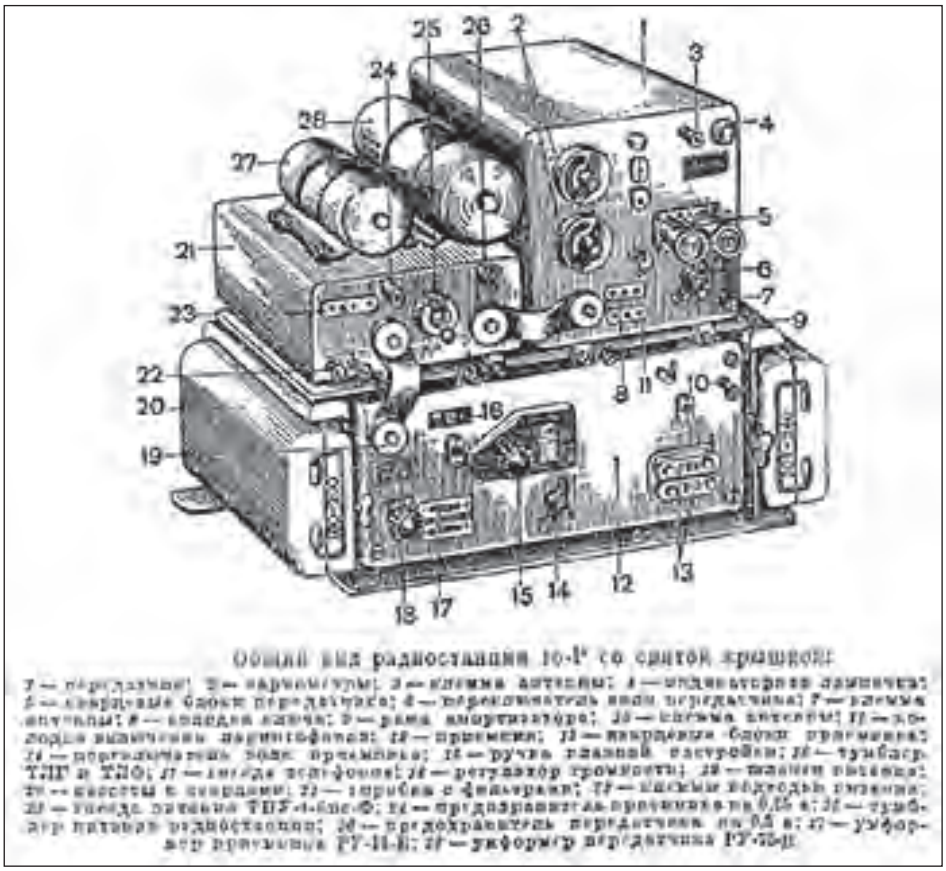
Assembly of the KV-14 prototype was essentially finished by the morning of January 23. The only delay was due to the gun system, which arrived that evening. Mounting of the gun took all night, and the work of assembly

ended the next day, earlier than expected. As expected, when assembly was complete, the KV-14 with serial number 3011 was sent off for factory tests, which concluded on January 29. Exactly a year had passed since Ginsberg signed the operational requirement to mount a 152 mm howitzer in a KV-7.

In developing the KV-14, the SKB-2 team took maximum advantage of its experience in building the KV-7. The height of the superstructure remained unchanged, but the interior space was increased by moving the front plate much further forward as compared to the KV-7. As on the KV-7, a special skirt was added to the lower part of the mantlet to prevent the system from jamming on the upper front plate of the hull. For improved ballistic protection, the side plates of the superstructure were angled in both the vertical and the horizontal planes. On the one hand, this solution increased the probability of a ricochet, but on the other, it cut into the interior space. In accordance with the requirement, submachine gun ports were installed in the superstructure's front and rear plates, and a double hatch was installed in the rear for loading



KV-14 vision block visibility diagram (TsAMO).



10-F radio set installed in the SU-152 SP gun (YuP).

ammunition and for crew access to the fighting compartment. In addition to the rear hatch, there were hatches in the superstructure roof for entry by the loader and commander (the commander's hatch had a signal port). In addition, a PTK panoramic sight was mounted in front of the commander's hatch. Vision blocks with mirrors similar to those used in the KV-1's turret were installed to improve visibility around the superstructure. Four vision blocks were originally planned, but a vision block for observation to the right was added to the prototype and the production vehicles and was used by the breechblock operator. For a variety of reasons some of the vision blocks were located relatively far from the edge of the superstructure roof, creating large blind zones around the vehicle.

In developing the new SP gun, its creators had to deviate somewhat from the operational requirement. According to specifications, the KV-14 crew was supposed to consist of six men, but the fighting compartment had no room for the radio operator. That problem was solved by combining the functions of the commander and radio operator. The 9-R radio was placed in front of the commander's position. In addition, the size of the fighting compartment prevented use of the standard fuel tanks from the KV-1. Instead, fuel tanks with

a total capacity of 480 liters were placed along the sides of the superstructure. That location greatly increased the risk that they would be struck by enemy shells, but with such a compact layout, there was no other place to locate the fuel tanks. Some deviations from the Kirov Factory design bureau's initial design were also required. The GABTU required that tanks and SP guns be equipped with handrails for riders to hold onto. Handrails were not originally part of the KV-14 design, but the prototype had them.

The strict specifications regarding the fighting compartment's interior dimensions meant the designers had a hard time finding a place to put the ammunition. The main ammunition storage rack was located on the left side of the superstructure, and some of the rounds were located under the gun. With this arrangement, getting at the second group of shells proved challenging, but there was no other place to put 20 rounds. On the other hand, the fighting compartment was relatively spacious. Considering that the average height of a tanker was 160–170 cm, the crew could stand inside the KV-14 without bending. The overall height of the vehicle was 2450 mm;

Front view of KV-14 prototype (TsAMO).

Right side view of the KV-14 prototype. Construction of the SP gun was set for February 23 (TsAMO).

in other words, it was on a level with the T-34 and 20 cm lower than the KV-1S. In addition, to ease movement of crewmembers within the fighting compartment, the commander, loader, and breechblock operator had folding seats.

All things considered, the Chelyabinsk vehicle was unique. No other army had a weapon system with its combination of relative compactness, good armor protection, and powerful weaponry. Instead of the narrowly

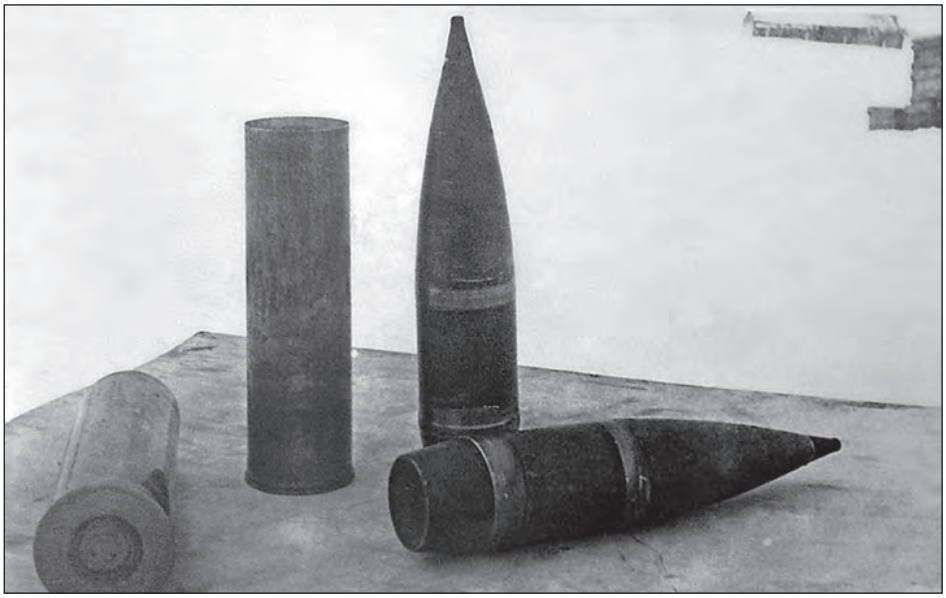
Left rear view of the KV-14 prototype with hatches open (TsAMO).

Left side view of the KV-14 prototype (TsAMO).

specialized machine for attacking fortifications that the artillerymen wanted, they got a general-purpose assault SP gun that went down in history as the "Beast Killer." However, the KV-14 would not acquire its reputation as the scourge of German armor until the summer of 1943; first, it had to undergo proving-ground tests, which were scheduled for early February.

According to the test program, the KV-14 was to traverse a difficult 200 km route, and plans called for the ML-20 to fire 296 rounds. The testing took

Rear view of the KV-14 prototype (TsAMO).



KV-14 ammunition (TsAMO).

place at the Chebarkul Test Range. In fact, the route from Chelyabinsk to the test range and back constituted the road test. It did not travel 200 km, however, because the distance to the test range was 85 km, and it traveled 88 km on the road back.

The trip to the test range took place under very harsh conditions. Not only was the highway covered with snow, the outside temperature was -42°C. On top of that, there was water in the fuel, which caused the engine to stall frequently. As a result, it took the KV-14 13 hours to cover the 85 kilometers.

The firing program was cut short: instead of 296 rounds, 234 were fired, of which 100 were supercharges. The firing for durability revealed no warping in the gun or the mounting parts.

An average of 2.8 rounds per minute was achieved during the rate-of-fire test using the first row of the storage rack. This was below the specified rate, but it was not bad for such a high-caliber gun. Firing was carried out with the hatches closed and the engine running. Depending on the rack used, reloading took from 16 to 30 seconds. The SP gun recoiled 70 to 250 mm during firing, and the stern or bow dropped 10–80 mm. The test program also included firing from short halts. A series of firing from halts at ranges of 800, 600, 400, and 200 m was carried out. Five rounds were fired after each halt. Firing accuracy was acceptable, especially for an SP gun intended for engaging enemy fortifications. It should also be considered that the vehicle was a prototype, and not all of the bugs had been worked out of its individual assemblies by that point in time.

When the firing trials were complete, the KV-14 was driven back to Chelyabinsk. At -16°C, the outside temperature was quite reasonable for early January. As before, the highway was snow-covered, which increased

fuel consumption to 4 kg per kilometer. Nevertheless, the vehicle covered the 88 km return route much more quickly—in 6.8 hours. It reached an operating speed of 13 km/h and a cruising speed of 20 km/h. There were no failures in the engine or transmission during either trip. The mechanism securing the gun in travel position worked properly. No special tests were performed during the trip to the test range and back because the SP gun's chassis was the same as that of the KV-1S. In all, the entire test cycle took five days—from the 1st through the 5th of February, 1943.

A commission headed by GAU Artillery Committee chief V. I. Khokhlov (who at that time held the rank of lieutenant general) drew the following conclusions on the basis of the test results:

The 152 mm self-propelled gun prototype presented for testing satisfies the operational requirement except for rate of fire, during which the maximum value achieved was 2.8 rounds per minute in the third series of 10 shots using shells and cases from the nearest storage rack with the gun in optimum position, compared to 3–4 rounds per minute as required by the operational requirement.

We concur with reducing the crew size to four men since external communications by radio can be assigned to the gun commander.

The accuracy of fire by the self-propelled gun obtained both as a result of its special definition and during firing from short halts per the rate-of-fire requirement was completely satisfactory.

The gun mounting parts, all of its mechanisms, and the vehicle's hull and assemblies are durable during both firing and during travel. Inspection of the marked assemblies revealed no warping.

Ammunition fired by the KV-14 during testing (TsAMO).

KV-14 undergoing test firing. For safety reasons, the first few rounds were fired without the crew in the superstructure (TsAMO).

The self-propelled gun's stability during firing is satisfactory: the backward movement is reversible in the overwhelming majority of cases, and no separation of the tracks from the ground was observed.

Misalignment of aim was insignificant, and was no more than two mils in the horizontal plane on the aiming circle. There was no misalignment in the sight settings.

The ride characteristics of the self-propelled gun were the same as for the KV-1S tank's running gear.

Servicing of the gun, both during preparation for firing and during firing, was satisfactory.

The vehicle and gun assemblies are accessible, both during preventive maintenance and during halts while on the road.

The sights are in convenient locations.

The 152 mm self-propelled gun is well-designed. The spacious roof of the fighting compartment and the armor design make it possible to assemble the gun and the vehicle separately and install the fully assembled gun in the vehicle together with all of its components. The gun is well balanced: little effort is required to operate the laying mechanism flywheels.

The gun opening in the firing compartment is well protected at all elevation and traverse angles. The illumination in the fighting compartment and the driver's compartment is completely satisfactory. The gun commander is provided with vision devices and both internal and external communications equipment. The SPT&A kits for both the gun and the vehicle have been developed, and the prototype equipped with a vehicle-transportable kit.

Loading ammunition into the vehicle through the hatch is convenient.

VI. Design flaws

A. Items requiring correction for the first production run

The firing and road tests revealed a need to make the following design modifications to the self-propelled gun:

1. *Prevent cases from catching on the breech face when they are inserted into the bore from the loading tray.*
2. *Make it easier to remove ammunition stacked on the upper shelves.*
3. *Mount a sight in front of the driver for coarse aiming of the vehicle at targets.*
4. *Install a Luch-type device for illuminating the gun sight.*
5. *Move the traversing mechanism mount that interferes with the driver.*
6. *Include a manual screw-type ejector in the gun's SPT&A kit (1 ea.) for extracting swollen cases without exiting the vehicle.*
7. *Add a step to facilitate entering and exiting the fighting compartment.*
8. *Install a barrier to protect the oil tank fittings from being damaged when removing shells from a shelf.*
9. *Relocate items in the artillery SPT&A kit (panoramic sight, ejectors, fuze wrenches, rammer, etc.) to place them close at hand for the crew members that need to use them in combat.*

B. Items requiring additional design work

1. *Better facilitate servicing of the gun during combat and increase the rate of fire. To achieve this, the Commission recommends the following approaches:*

This photo was shot during firing: the SP gun is clearly moving backwards (TsaAMO).

a) Extend the rear turret plates to match the maximum size of the front plates.
b) Attach the storage rack for all shells to the left rear side turret plate by lengthening the rear plates to match the front.
c) Attach the storage rack for the cases on the right side of the fighting compartment to enable assignment of the loading of cases to the breechblock operator.
d) Design the gun to have a sliding wedge breechblock.
e) Relocate the fuel and oil tanks inside the fighting compartment as a result of the change in the turret size and ammunition location.

Alter the tank sizes, abandoning the use of production items.

2. *Move the traversing mechanism housing to the right in order to improve working conditions for the driver.*
3. *Replace the steering clutches with a planetary steering mechanism.*
4. *When manufacturing the KV-1S tank's hull and turret of high-hardness armor and replacing its mirrored vision blocks with the MK-4 or T-80, make the appropriate changes in the self-propelled gun drawings, as well.*
5. *Make all changes to the self-propelled gun drawings needed for manufacture and testing of the first self-propelled gun production run.*

VII. Conclusion

1. *The self-propelled gun mounting the 152 mm gun-howitzer model 1937 on a KV-1S chassis developed by designers at the Kirov Factory*

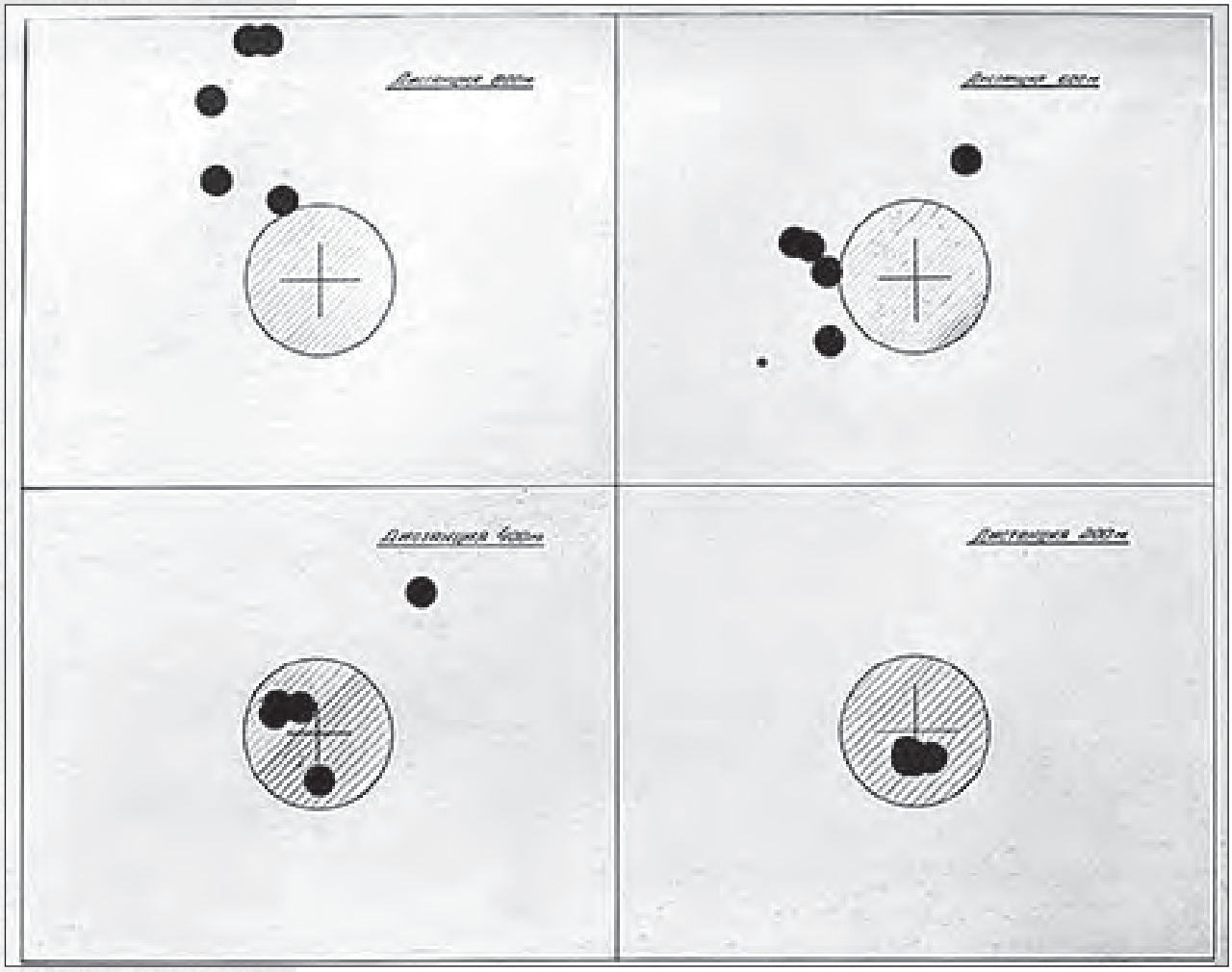
Test firing from cover (TsAMO).

Nighttime firing tests (TsAMO).

of the People's Commissariat of the Tank Industry and Factories No. 172 and 9 of the People's Commissariat of Arms, with its artillery system manufactured at Molotov Factory No. 172 and its chassis manufactured at the Kirov Factory under the People's Commissariat of the Tank Industry, has met the requirements for this type of self-propelled artillery and has passed proving-ground tests.

2. *It is hereby recommended that this self-propelled gun be placed in service with Red Army artillery and that mass production of the system begin with changes made in accordance with paragraph A of section VI of this report.*
3. *It is hereby recommended that the Kirov Factory of the People's Commissariat of the Tank Industry and Factories No. 172 and 9 of the People's Commissariat of Arms develop a draft self-propelled gun project with the changes stipulated in paragraph B of section VI of this report and present it to the Artillery Committee for review by March 15 of this year.* [5]

[5] TsAMO RF, collection 81, series 12063, file No. 11, pp. 66–71.



Results of firing at a target from short halts (TsAMO).

Thus, the Red Army finally got its first mass-produced heavy SP gun. On February 9, 1943, Stalin signed State Defense Committee Decree No. 2859ss, "On a Plan for Producing Tanks, Self-Propelled Guns, and Tank Diesel Engines During February 1943." Among the combat vehicles to be produced in February were 30 KV-14's. That, however, was only the beginning: on February 14, Stalin signed State Defense Committee No. 2883ss, "On Production of SU-14 Self-Propelled Guns, KV-1S Tanks, and Armored Hulls for Them During February and March 1943." That date marks the birth of the SU-152:

For purposes of implementing State Defense Committee Decree No. 2859ss, dated February 9, 1943, as regards production of SU-14 152 mm self-propelled guns in February 1943 and ensuring their production in March 1943, the State Defense Committee decrees that:

1. *The People's Commissar of the Tank Industry (Comrade Zaltsman), Kirov Factory Director Comrade Dlugach and Factory No. 200 Director Comrade Shcherbakov shall:*
   a) *Immediately begin mass production of the SU-14 152 mm self-propelled gun and armored hulls for it in accordance with the drawing of the prototype that was provided to the State Commission on January 30, 1943, for testing, taking into account the Commission's remarks made in the test report dated February 7 of this year.*
   b) *Ensure the manufacture of SU-14 self-propelled guns and KV-1S tanks at the Kirov Factory in February 1943 in accordance with State Defense Committee Decree No. 2859ss of February 9, 1943, and in March 1943 in accordance with State Defense Committee Decree No. 2693ss of January 4, 1943, as partially amended in the following quantities:*

	(number of units)	
	February 1943	*March 1943*
SU-14 SP guns	*30*	*75*
KV-1S tanks	*75*	*50*

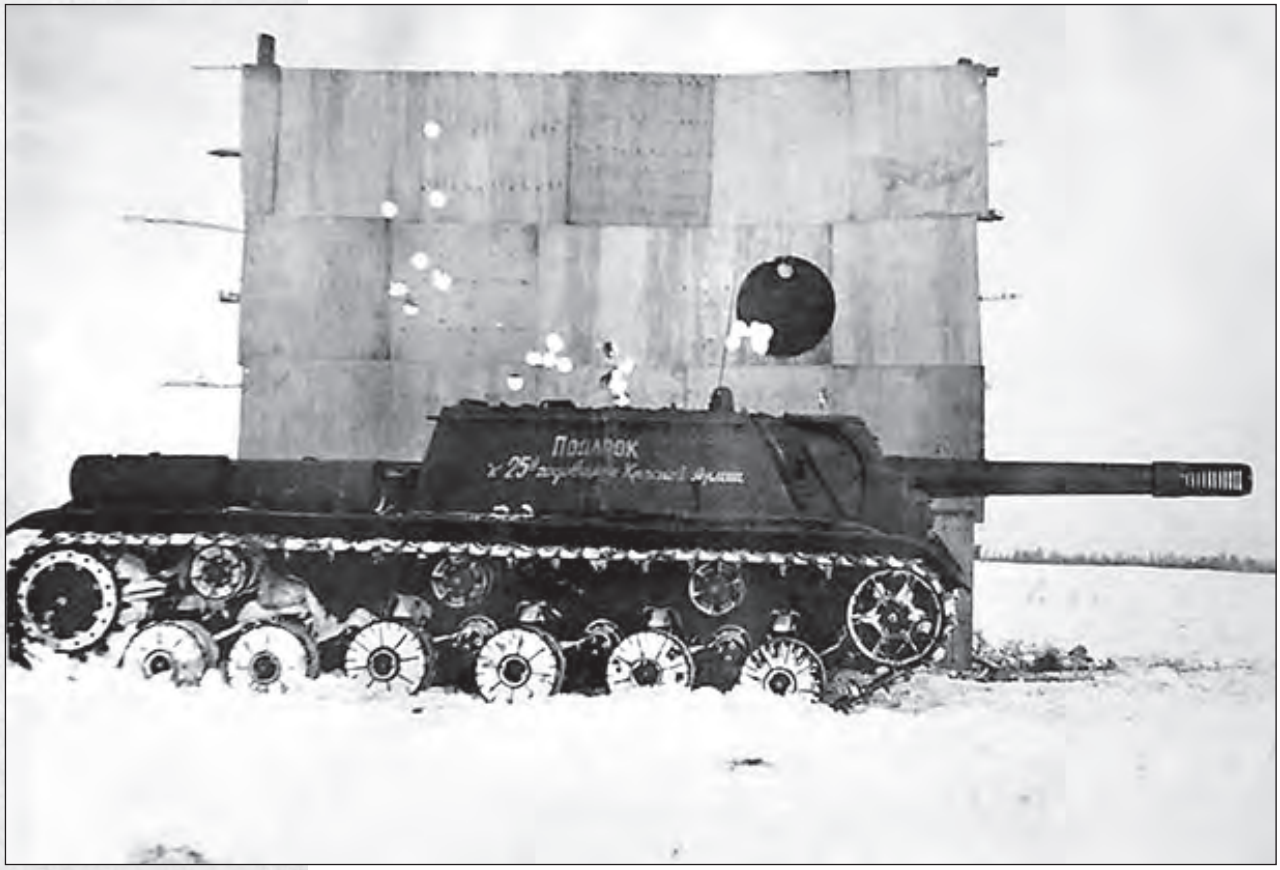
The KV-14 during a driving test (TsAMO).

also manufacture armored hulls for the SU-14 SP guns and KV-1S tanks in February and March 1943 as follows:

	(number of units)	
	February 1943	*March 1943*
SU-14 armored hulls	*35*	*100*
KV-1S armored hulls	*75*	*40*

2. *The head of the Red Army's Main Artillery Directorate (Comrade Yakovlev) shall, by March 20, 1943, approve the drawings and specifications for the SU-14 self-propelled gun with the flaws identified in February and March 1943 corrected for manufacture of the first batch.*
3. *The People's Commissar of Arms (Comrade Ustinov), Factory No. 172 Director Comrade Bykhovsky, and Factory No. 69 Director Comrade Kotlyar shall:*
   a) Deliver to the Kirov Factory of the People's Commissariat of the Tank Industry for the SU-14 self-propelled gun ML-20 guns with frame, elevation and traversing mechanisms (from Factory No. 172), and

The SP gun next to its target after firing tests (TsAMO).



optics (from Factory No. 69) (in accordance with the delivery for the SU-14 prototype) in the following quantities:

	Total	From the 1st to the 10th	From the 10th to the 15th	From the 15th to the 20th	From the 20th to the 28th/ 31st
February	*50*	*-*	*5*	*15*	*30*
March	*75*	*25*	*12*	*13*	*25*

b) Manufacture frames in February 1943 at Factory No. 172 of the People's Commissariat of Arms in numbers sufficient to ensure deliveries of ML-20 guns to the Kirov Factory;

c) Send a group of 10–15 designers and riggers in February and March 1943 to the Kirov Factory to assist in the installation of the ML-20 guns.

4. *In February 1943, the People's Commissar of the Tank Industry (Comrade Zaltsman) shall produce Bessemer steel castings at Factory No. 40 of the People's Commissariat of the Tank Industry for a preproduction batch of frames for the ML-20 gun and deliver them to Factory No. 172 by February 22, 1943.*
5. *The People's Commissar of Arms (Comrade Ustinov), together with the head of the Red Army's Main Artillery Directorate (Comrade Yakovlev), shall test the Bessemer steel frames in February 1943 and decide on their suitability for use on the ML-20 gun for the SU-14 self-propelled gun.*
6. *When the People's Commissar of Arms and the head of the Red Army's GAU come to a decision regarding the feasibility of using Bessemer steel to manufacture the ML-20 frames, the People's Commissar of the Tank Industry (Comrade Zaltsman) shall arrange for them to be cast in March and April 1943 at Factory No. 40 of the People's Commissariat of the Tank Industry and delivered to Factory No. 172 of the People's Commissariat of Arms in numbers appropriate to the production program for the ML-20 guns for SU-14 artillery systems at the Kirov Factory of the People's Commissariat of the Tank Industry.*

   The Bessemer steel cast frames for the ML-20 gun shall thereafter be manufactured at factories of the People's Commissariat of Arms.

   If ML-20 gun frames made of Bessemer steel cannot be used, beginning in March 1943 they shall be manufactured of special steel at factories of the People's Commissariat of Arms.[6]

Contract No. 1489-73 for delivery of SU-14 SP guns was concluded on March 18, 1943, between the Kirov Factory of the People's Commissariat of the Tank Industry and the GAU's Artillery Tractor and Self-Propelled Artillery Department Tractor Directorate. Under the contract, the Kirov Factory was to deliver 30 SP guns in February and another 75 in March. Each SP gun cost 265,000 rubles. The contract was backdated because the SU-14 had already been in production for two months.

[6] RGASPI, collection 664, series 2, file No. 135, pp. 5–7.

The rapid and efficient course of events from a 1:10 wooden model to mass production did not go unnoticed. On March 23, 1943, Izvestiya published the Decree of the Council of People's Commissars of the USSR, "On the Award of Stalin Prizes for: a) Outstanding Inventions and b) Fundamental Improvements in Production Methods during 1942." Among the winners listed in paragraph 8 were Zh. Ya Kotin, S. N. Makhonin, L. S. Troyanov, and F. F. Petrov, who received an award for "development of a new type of artillery weapon."


За трудовую доблесть

СТАЛИНСКИЕ ПРЕМИИ ЗОВУТ К НОВЫМ ДОСТИЖЕНИЯМ!

ЛАУРЕАТЫ СТАЛИНСКОЙ ПРЕМИИ

Front page of the March 26, 1943, edition of the factory newspaper For Labor Valor, which ran an article about the 1943 Stalin Prize winners at the Kirov Factory. The SU-152's developers are shown at the top, and the KV-1S's developers are at the bottom.

CHAPTER 7. The Monster from Chelyabinsk

The startup of SU-14 production at the Chelyabinsk Kirov Factory resulted in no unexpected problems. Unlike the SU-35 (SU-122) and the SU-12 (SU-76), the Chelyabinsk machine began production in a form virtually unchanged from that of the prototype. That was largely due to the fact that the KV-1S chassis was almost unchanged, and the same thing was true of the gun system. In addition, the designers had good ideas from the very beginning, and that kept the rework to a minimum.

A KV-14 SP gun from the first production run configured exactly like the prototype (IZh).

Front view of KV-14 SP gun from the first production run (IZh).

However, it would be incorrect to say that the SP gun had no problems. The test commission had pointed out some of the KV-14's shortcomings in its finding. The Kirov Factory sent similar reports to Eng. Col. Kovalev, chief of the 6th Department of the GABTU's Tank Directorate:

Some shortcomings of the fighting compartment:

1. *The loading tray for the shells and cases needs to be raised slightly because it is difficult to feed cases into the barrel.*
2. *The additional tray on the loader's side needs to be hinged so that it can be raised, because it interferes with the loader.*
3. *When the gun is traversed to the right or left, the position of the gunner or the breechblock operator, respectively, becomes tight.*
4. *At the extreme positions of the barrel, it becomes difficult to operate the traversing mechanism flywheel, and it interferes with the fuel tank.*
5. *The ammunition rack is in a bad position; it is difficult to use.*
6. *The gap between the gun tube and the mantlet is too large; bullets can enter.* [1]

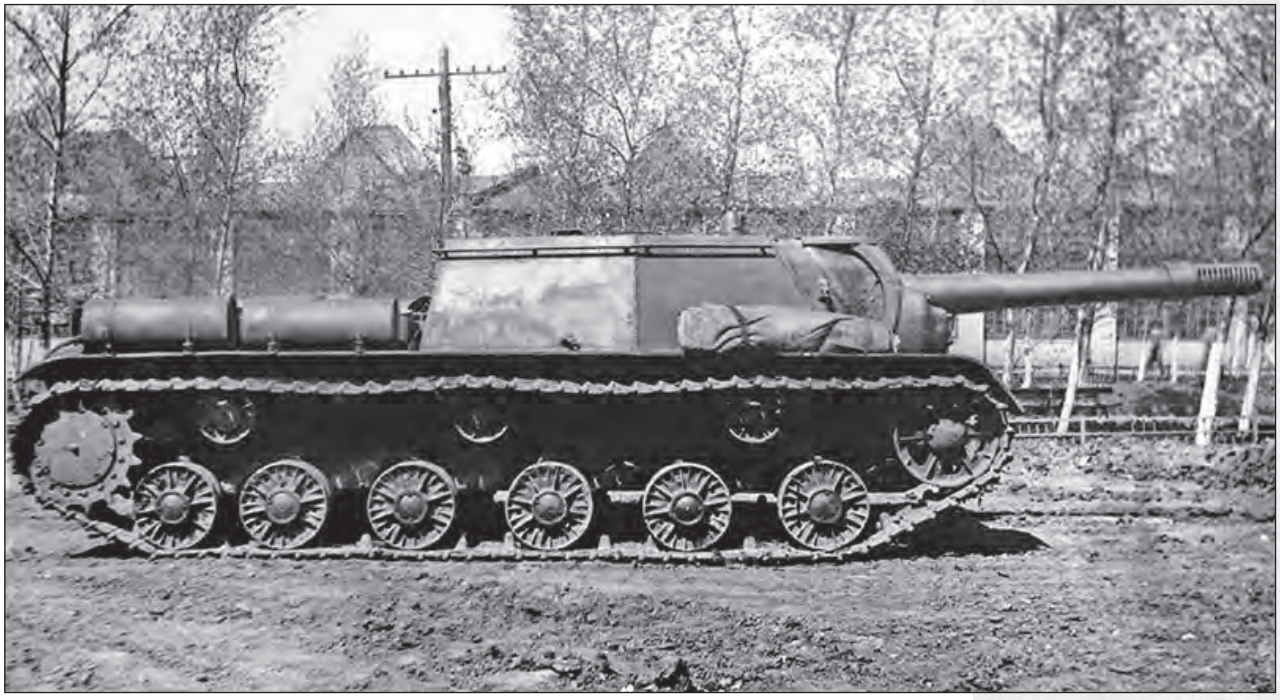
[1] TsAMO RF, collection 38, series 11355, file No. 1377, p. 59.

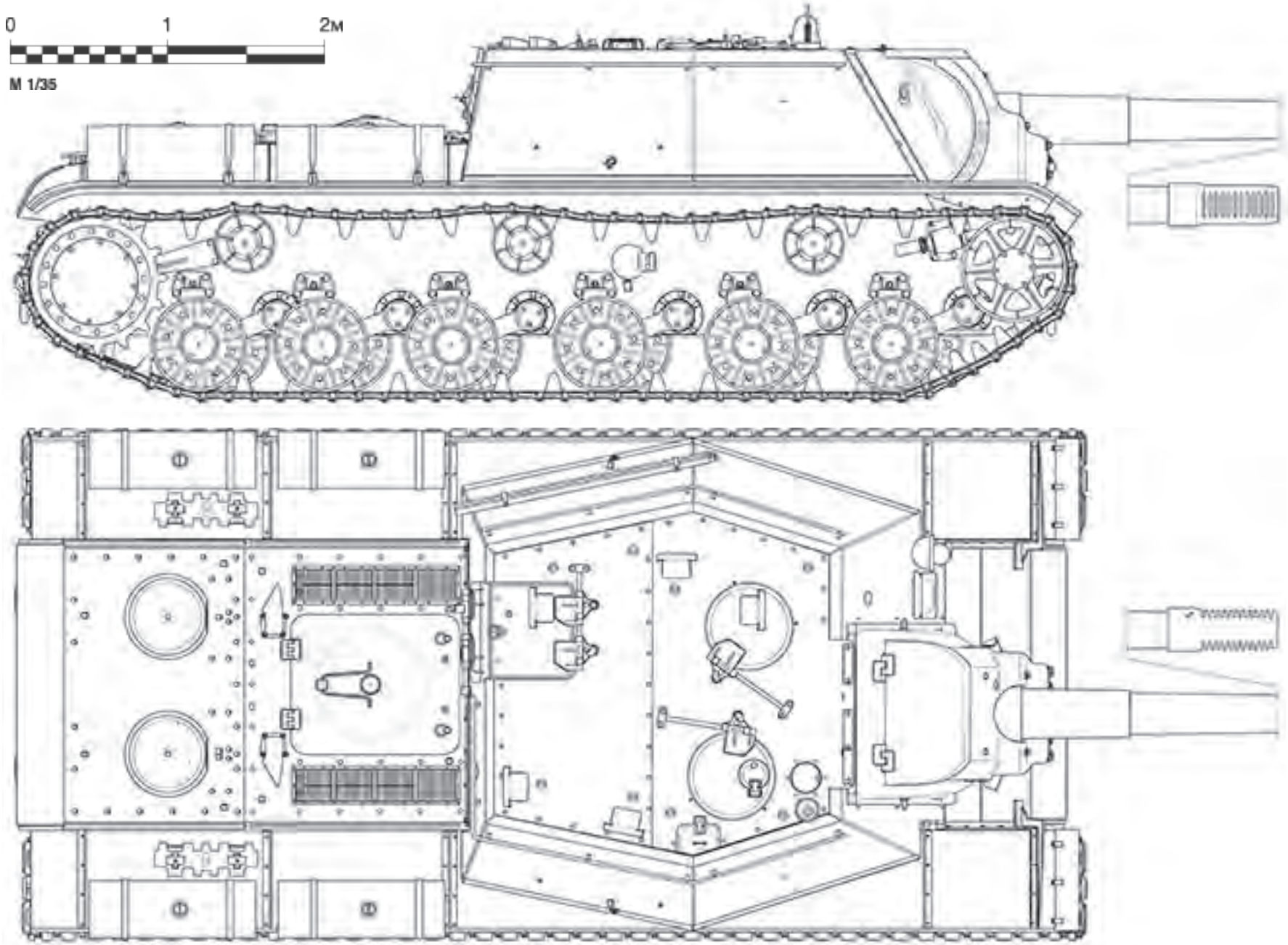
Some of these shortcomings required design changes that were too extensive, and they were not corrected before production began. Launching production of the KV-14 was a high priority task, so even the most important fixes were postponed to a later date. Moreover, even the development of technical documentation for approval by the GAU, which the factories were supposed to submit by March 20, 1943, was delayed. Repeated appeals by GAU representatives to the factory directors and People's Commissar of the Tank Industry Zaltsman were to no avail. Only a complaint to Molotov on April 12 produced results; the documentation was finally submitted five days later. The factories had put the plan B modernization program (expansion of the fighting compartment, an ML-20 with a sliding wedge breechblock, etc.) out of their minds as though it were a bad dream. Moreover, the first sketches of the ML-20 on the IS chassis (the future ISU-152) frankly show that the designers became aware of the fighting compartment expansion only in the fall of 1943.

Despite the fact that mass production of the SP gun generally began relatively smoothly, there were problems with some components. The gun system frames delivered for assembly frequently had size defects, requiring them to be adapted to fit in the mantlet, and that took additional time. Also, mishaps often occurred with deliveries of the gun SPT&A kits that accompanied the ML-20S systems from Factory No. 172.

There were also some mishaps in the beginning with the optics. As mentioned earlier, the T-10 telescopic sights were not being manufactured

Right-side view of KV-14 SP gun from the first production run. The vehicle did not yet have an attachment for a pickaxe on the right side (IZh).

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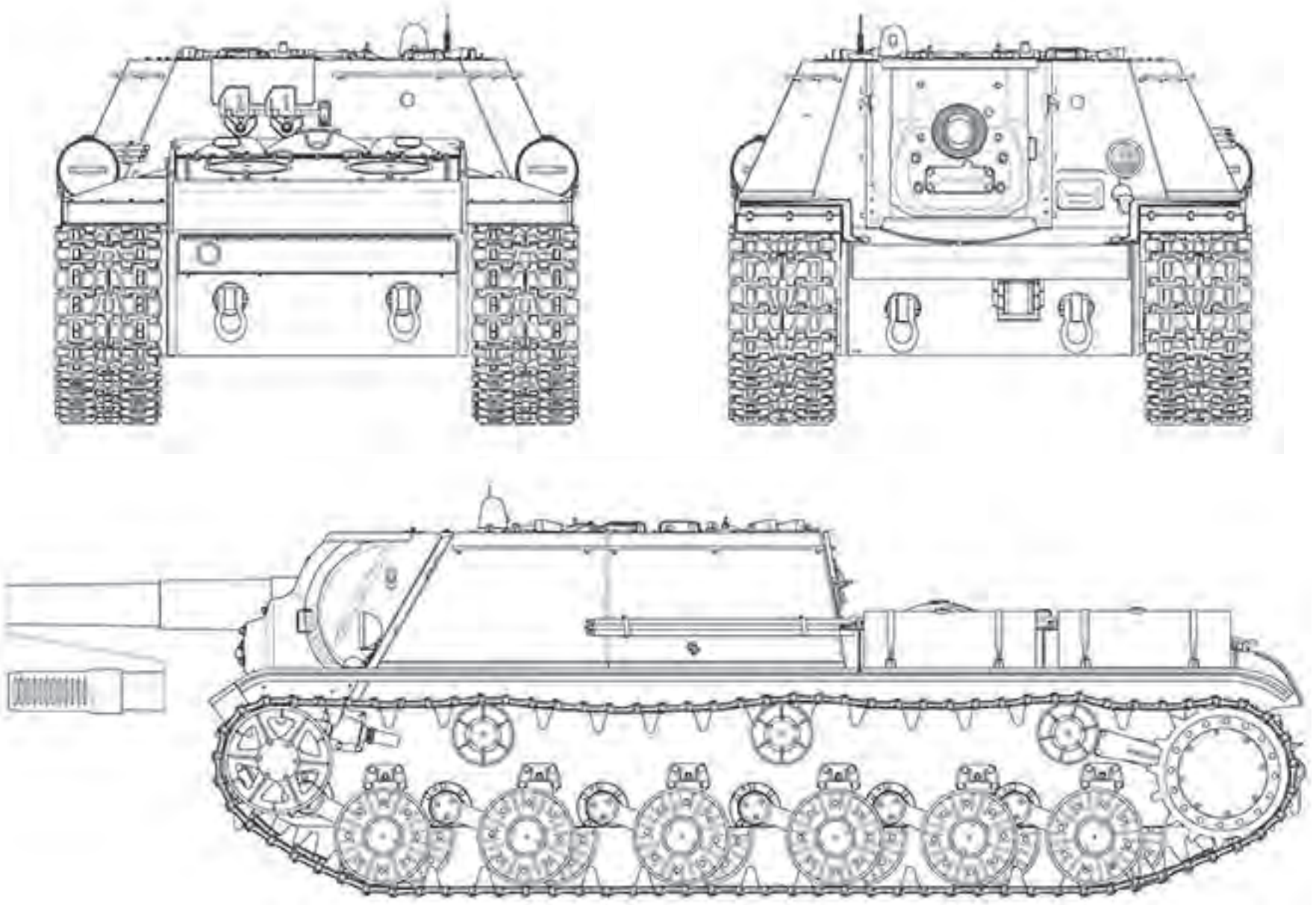


KV-14 SP gun from the first production run, 1:35 scale drawing.

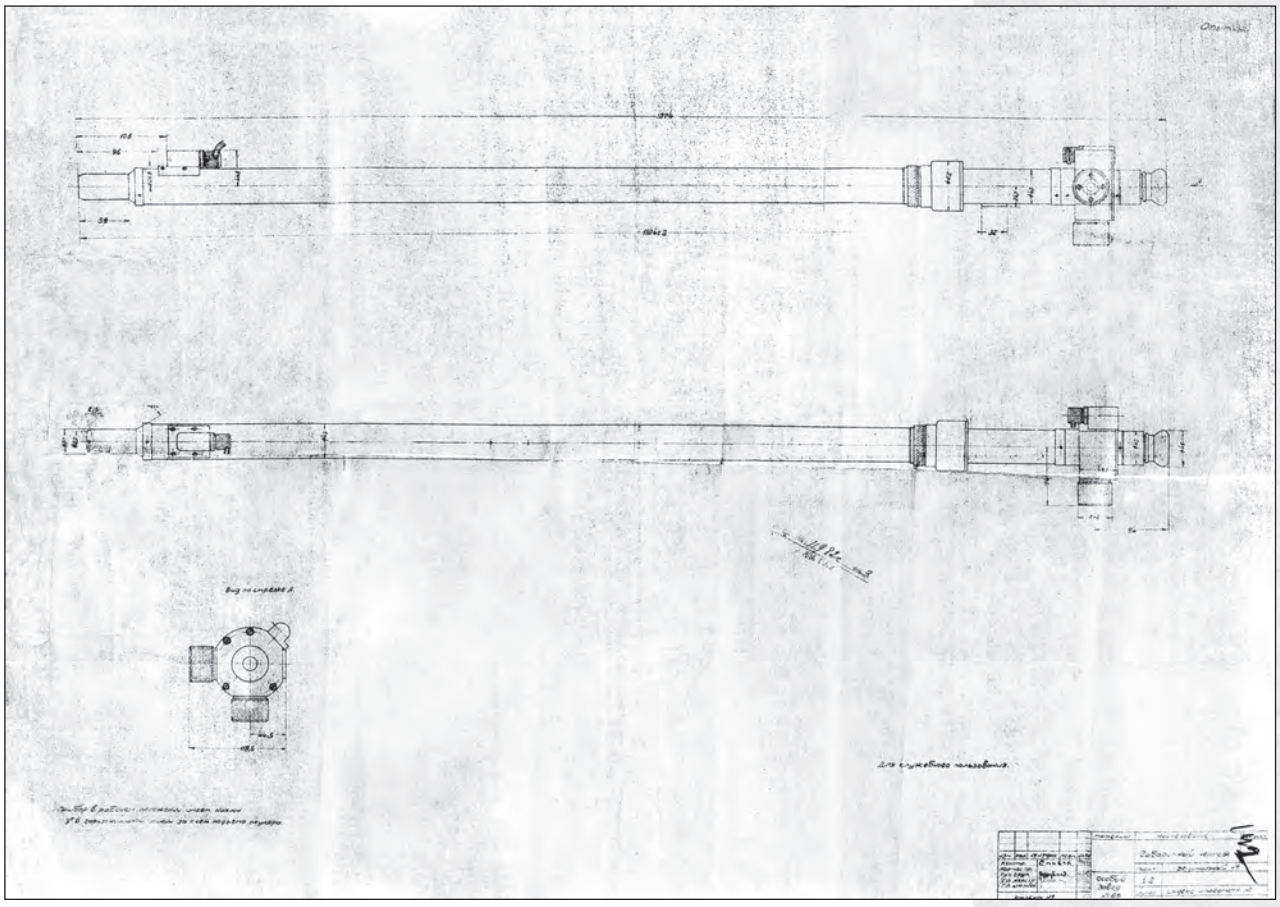
when the SP gun went into production, so the first TV-14's were equipped with T-9 sights from the KV-2. According to the plans, the first 20 T-9s were expected by February 20, 1943, and another 105 by March 5. The problem was that the T-9 still had the scales for the M-10T tank howitzer, whose ballistics were very different from those of the ML-20. There was also confusion about names: Factory No. 69 produced the 10T tank sight in addition to the T-10 sight, which had an elbow, and that meant there was a risk of a mixup occurring in deliveries to the factories. To avoid that, the T-10 sight was renamed the ST-10 (for "self-propelled telescopic").

It should be noted that the T-9 sight had been chosen out of necessity. According to correspondence with Factory No. 69, it was selected because it was the only suitable sight in production at the time. To simplify production, in June 1943 Factory No. 69 developed a sight with a similar name that was based on the ST-10 but had no elbow. The effort was led by Factory No. 69's lead designer, Finkelstein, one of the engineers who had worked on the TMFD-7 and TMFP-1 sights. On June 15, 1943, Factory No. 69's chief engineer, Skarzhinsky, sent a letter to the People's Commissariat of Arms in which he proposed replacing the ST-10 with the promising new sight.

The ST-10 sight (formerly the KT-1) is currently being used for the self-propelled gun.

The ST-10 sight was selected only because it was the sole available sight with the right characteristics and right length for the purpose.

Rear view of KV-14 SP gun from the first production run. The superstructure parts on SP guns from the first production run showed excellent workmanship (IZh).



Drawing of simplified ST-10 sight, June 1943 (TsAMO).

However, we could suggest a simpler, better designed, and better quality sight that would be less difficult to manufacture. Indeed, the sight's elbow, which contains two prisms and an erector lens, adds unnecessary parts that, regardless of their reliability, can cause problems with the sight's alignment and operation. They also reduce image quality because the system cannot be properly centered no matter how carefully they are assembled and aligned, especially since one of the prisms is not located in a parallel light beam. Also, manufacture of the elbow requires the expenditure of manpower, machinery, and nonferrous metals and other scarce materials that could better be used for other purposes.

We have developed a new sight (that has no elbow) based on the ST-10. Its length can be modified to meet your requirements, and it is more reliable, of better quality, and simpler than the existing sights.

Enclosed herewith is a dimensional drawing of the sight. I request that you instruct the Kirov Factory to develop a new mount for it and relocate the opening in the mantlet as appropriate. The factory can begin producing these sights immediately upon receipt of your consent. [2]

[2] TsAMO RF, collection 81, series 12063, file No. 11, p. 140.

An SU-152 produced between March and June 1943. A pickaxe is visible on the right side; the attachment for it appeared in March 1943 (TsAMO).

The People's Commissariat of Arms and the Main Artillery Directorate took an interest in Factory No. 69's idea, and a proposal to pursue development was sent to GABTU's Self-Propelled Artillery Office (USA GABTU). That, however, is where the history of the simplified version of the ST-10 ends. The Kirov Factory was completely unable to modify the mantlet and sight mounts at that time. Thus, the temporary solution in the form of the ST-10 became permanent. Moreover, the ISU-152 and ISU-122 SP guns that came later employed the same sight.

In addition to the sights, development was also underway on a program for using Bessemer steel to manufacture the system frame. According to People's Commissariat of Arms Order No. 08ss of February 16, 1943, the project was assigned to Factory No. 40 of the People's Commissariat of the Tank Industry, which had been Factory No. 592 of the People's Commissariat of Arms until early 1943. However, that enterprise was not up to working on frames at the time: it was preparing to produce T-80 light tanks. By February 27, the factory had received the design documentation for the frame, but production of the prototypes was delayed because it lacked coke, pig iron,

and foundry sand. The factory was unable to supply the first two frames for testing until March 27, and their workmanship was so poor that they were not tested. Factory No. 172 did not receive specifications for the frame until the end of May, and only one of two frames was accepted for testing. Tests were performed, during which an ML-20S system mounted on a Bessemer steel frame fired 200 rounds. The tests revealed no warping of the frame after firing, so manufacture of the component using Bessemer steel was considered a success.

Because various units and assemblies were in short supply during February 1943, 15 KV-14's were produced instead of 30. During March, 90 systems rather than 75 were scheduled to be produced; 15 went to make up for the February shortfall. The systems were being turned out under difficult conditions: only 23 KV-14's had been completed as of March 28. A lack of tracks was holding up production. The 90-vehicle production quota was met through truly heroic efforts during the remaining three days of the month. The Chelyabinsk Kirov Factory experienced this kind of production crisis often over the next several months.

It is also worth noting that the new SP guns only began reaching troops in the field in April—the systems had a large number of different kinds of defects, and that had an impact. In the beginning, many of the flaws were actually discovered only after the vehicles reached the troops. For example,

Experimental Bessemer steel frame for the ML-20S system manufactured at Factory No. 40 in March 1943 (TsAMO).

the 1536th and 1537th SP Artillery Regiments identified defects in seven vehicles. Ten were discovered by the 1538th SP Artillery Regiment and twelve by the 1539th SP Artillery Regiment. All of this delayed the new SP gun's debut on the front lines until July 1943. The KV-14 was not the only system haunted by such problems; virtually all Soviet SP guns had manufacturing defects that held up their delivery to troops in the field.

The first modifications to the SU-152 design (as the SP gun began to be called in late April 1943) were introduced in March 1943. Initially, the modifications were high-priority improvements that had resulted from the tests conducted on the prototype. External changes worth mentioning include the coarse aiming sight on the driver-mechanic's vision block. It consisted of a bar welded in the middle of the observation slit. A simplified handrail design was one of the more identifiable changes. The handrails on the first SU-152's were connected, but in March they were made separate, which simplified production. The cover over the system's fixed mantlet was also simplified. Whereas previously it had been somewhat rounded in shape, now it was made more angular. Pickaxes were attached to the right rear side of the superstructure.

Although the SU-152 hulls were produced by just one factory, the external appearance of the SP guns varied slightly. In the beginning, the superstructure plates were cut quite precisely, but by March their appearance

Left-side view of an SU-152 produced between March and July of 1943 (TsAMO).

Front view of an SU-152 produced between March and July of 1943. A coarse sight was welded to the driver-mechanic's vision hatch (TsAMO).

left something to be desired. The rear hatch, which had originally been somewhat rounded, began having a very rough shape. Little effort was going into the superstructure's sides: they were made such that frequently the edges of the plates extended above the roof level, cutting off the view from the periscopic vision devices. The protruding edges were cut away locally so that the devices could be used. Not all SP guns had such "embellishments." The edges of the plates could be at different heights, making each vehicle somewhat unique. In addition, until about the summer of 1943 at least two types of caps were used for the bogie brackets. In addition to the convex caps that had been used on the Chelyabinsk KV's since 1941, some vehicles received flat caps of simplified design. They appeared on the KV-1S in early 1943. Another distinguishing feature of some SP guns was a counterweight that was sometimes attached to the mantlet. The counterweight was not a feature of a particular production run; it could be found on vehicles produced on almost any day.

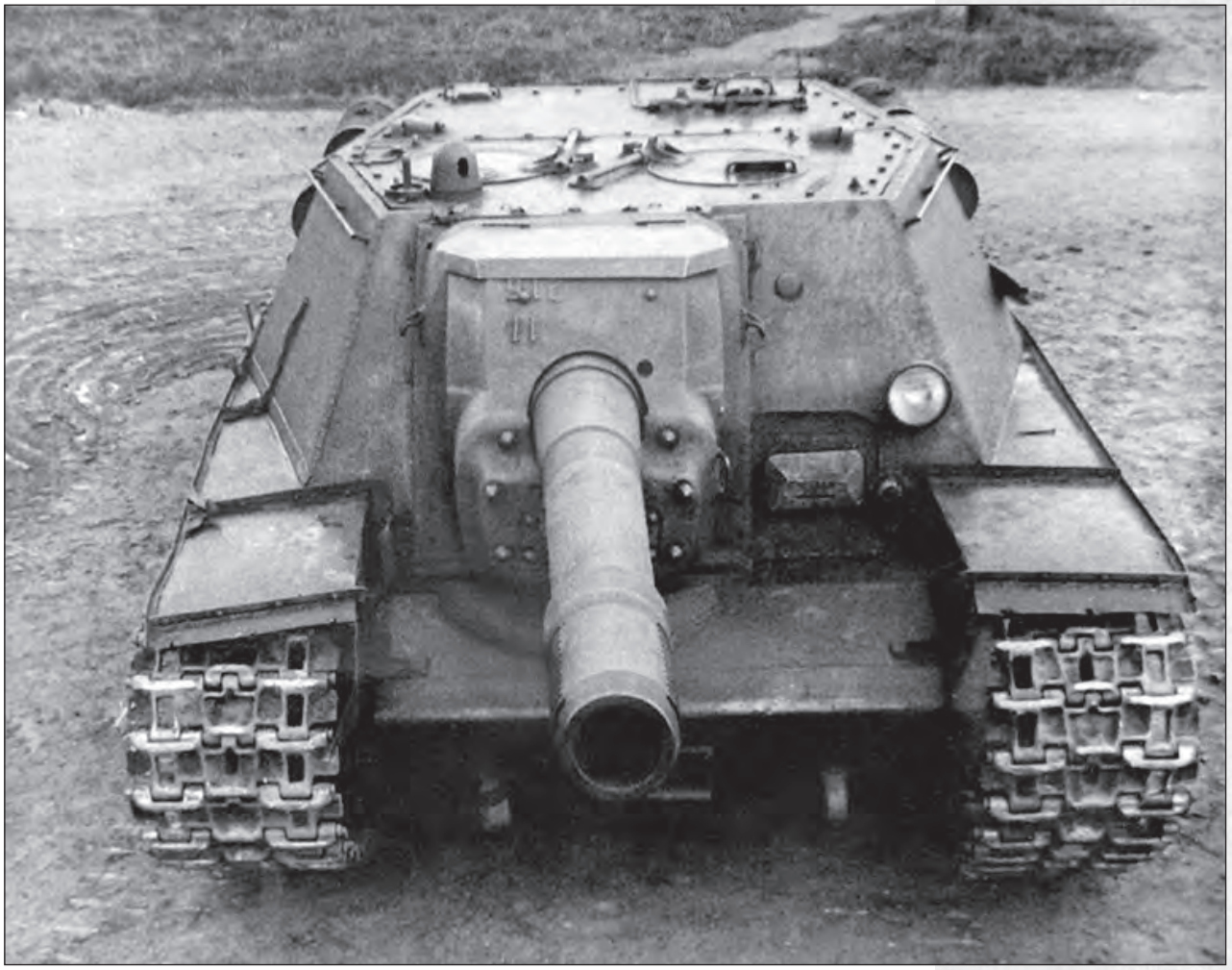
Rear view of the SU-152 produced between March and July 1943. The hand grab design had been simplified, and the edges of the superstructure and rear hatch were more roughly finished (TsAMO).

Meanwhile, there were problems with component supplies in April. SU-152 assembly was held up by delays in deliveries of the artillery systems and wiring harnesses for the Luch illumination device. Due to a lack of rounds for testing the carriage, strength tests had not been performed on the gun system mount. Only the engineering had been considered during acceptance. A total of 31 vehicles were accepted by April 24 because of all of the problems with suppliers. Despite all the delays, the factory was able to fulfill the April plan for 75 vehicles, but it expected more problems the following month. Only five SU-152's had been completed as of May 25, 1943, and the factory workers could offer no encouraging news. Factory No. 200 was the chief cause of failure this time; it had delivered only 28 hulls by May 25. There were serious problems with backlogged transmissions and other assemblies. This meant that a total of 25 SU-152's were completed instead of 75. In addition, a number of SP guns that needed to be studied for correction of defects had accumulated at the factory. Things were no better at the beginning of June: according to reports by military representatives at the factory, it had assembled only 36 SP guns by the 10th, but not a single one of them had been completed and accepted. The reason was that a large number of engines and transmissions

had been rejected because they were breaking down. The situation could not be reversed until the end of the month, and 84 vehicles were accepted instead of 75. In addition, the plan called for the factory to repair 15 SU-152's that it had produced previously.

While SU-152's were being produced in Chelyabinsk, events at the front were gradually causing adjustments to be made to their original role. Two German heavy Pz.Kpfw. VI Tiger Ausf. E tanks were captured on January 18, 1943, near Worker's Settlement No. 5. One of them underwent testing in late April by being fired on with antitank and tank guns, and with division- and corps-level artillery. The test results clearly showed that the Germans possessed a tank that could not be defeated by the majority of antitank weapons and division-level artillery. The heavy tanks that had been expected in 1941 were finally at the front. The question now became how to combat them.

Front view of SU-152 superstructure roof. The roof over the fixed armor system has obviously been simplified (TsAMO).



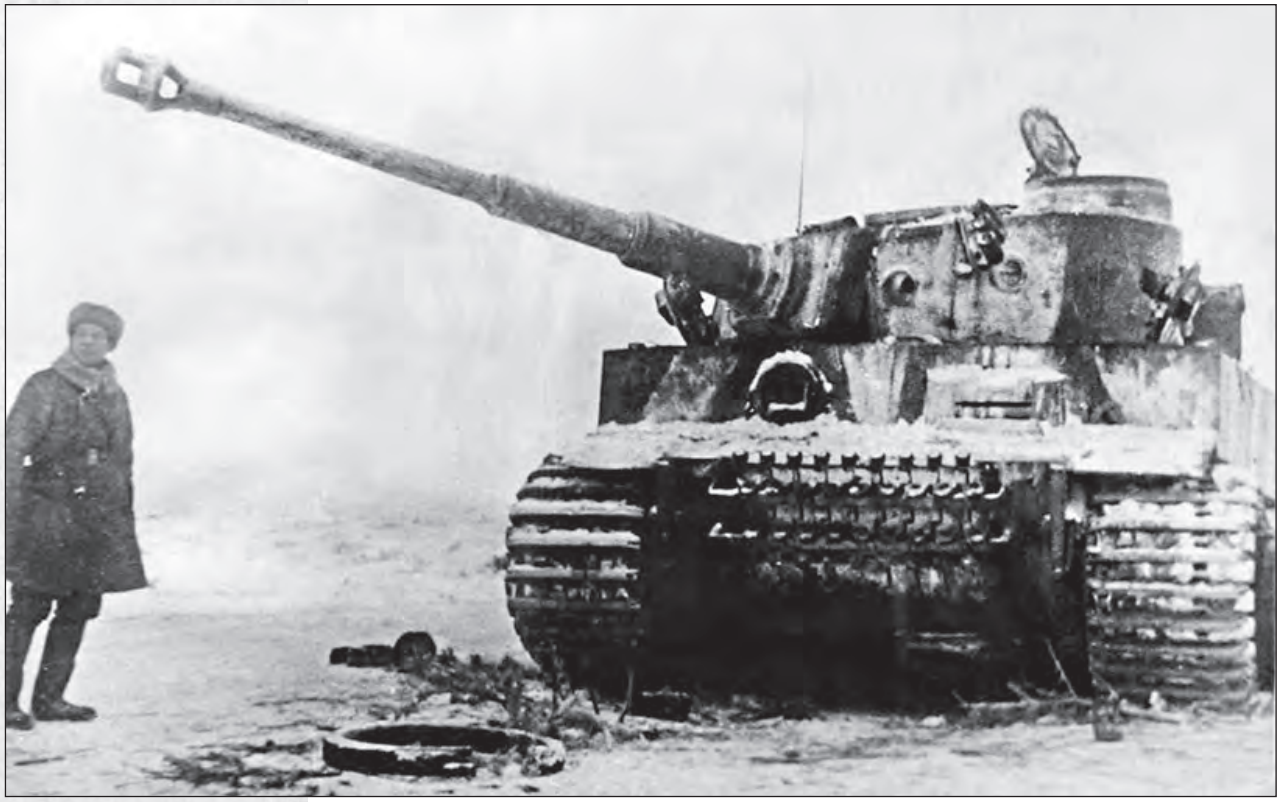
Even before the Tiger had been tested, the Chelyabinsk Kirov Factory had been tasked to install the tipping parts of the A-19 122 mm gun-howitzer in the SU-152 superstructure. The job was simplified by the fact that the A-19 and the ML-20 had identical carriages. Their barrels constituted the main difference between them. Plans called for the 122-millimeter heavy SP gun prototype to be finished by May 10, 1943, but that was not done for a variety of reasons.

While design work was being done to install the A-19 122 mm gun in the SU-152, GAU and the People's Commissariat of Arms initiated projects to develop an armor-piercing shell for the ML-20 152-millimeter gun-howitzer. This munition, which was developed by the summer of 1943, was assigned the designation BR-540. GAU Artillery Committee Chairman Khokhlov wrote GABTU about the introduction of the new munition in his letter of June 14, 1943:

Concerning the addition of the armor-piercing tracer shell to the SU-152 SP gun's basic load, the Artillery Committee of the GAU of the Red Army considers it necessary to inform regimental commanders of the following:

1. The cylindrical section of the armor-piercing tracer shell hull bears the following marking in black paint: BR-540.

German Pz.Kpfw. VI Tiger Ausf. E tank captured near Worker's Settlement No. 5 on January 18, 1943. This tank forced GAU and GABTU to develop weapons to counter it (TsAMO).



One type of bogie bracket cap used on SU-152's during the spring and summer of 1943 (YuP).

2. In addition to its marking, the armor-piercing tracer shell differs from the concrete-piercing howitzer shell in that it has a shorter warhead.

3. The armor-piercing tracer shell may only be fired using a special charge in a case bearing the marking: "Charge, special, BR V0 = 600 m/s."

4. Firing the shell using a full variable charge is strictly prohibited.

5. If no special charge is available, the shell may be fired using a full normal charge of a new device minus one equilibrium bag (base + 7 equilibrium bags).

*6. When firing the armor-piercing tracer shell, the scale inscribed on the left half of the ST-10's field of view with the following inscriptions must be used for laying the gun:**

ДГ
ПУШ
ПЕРВ

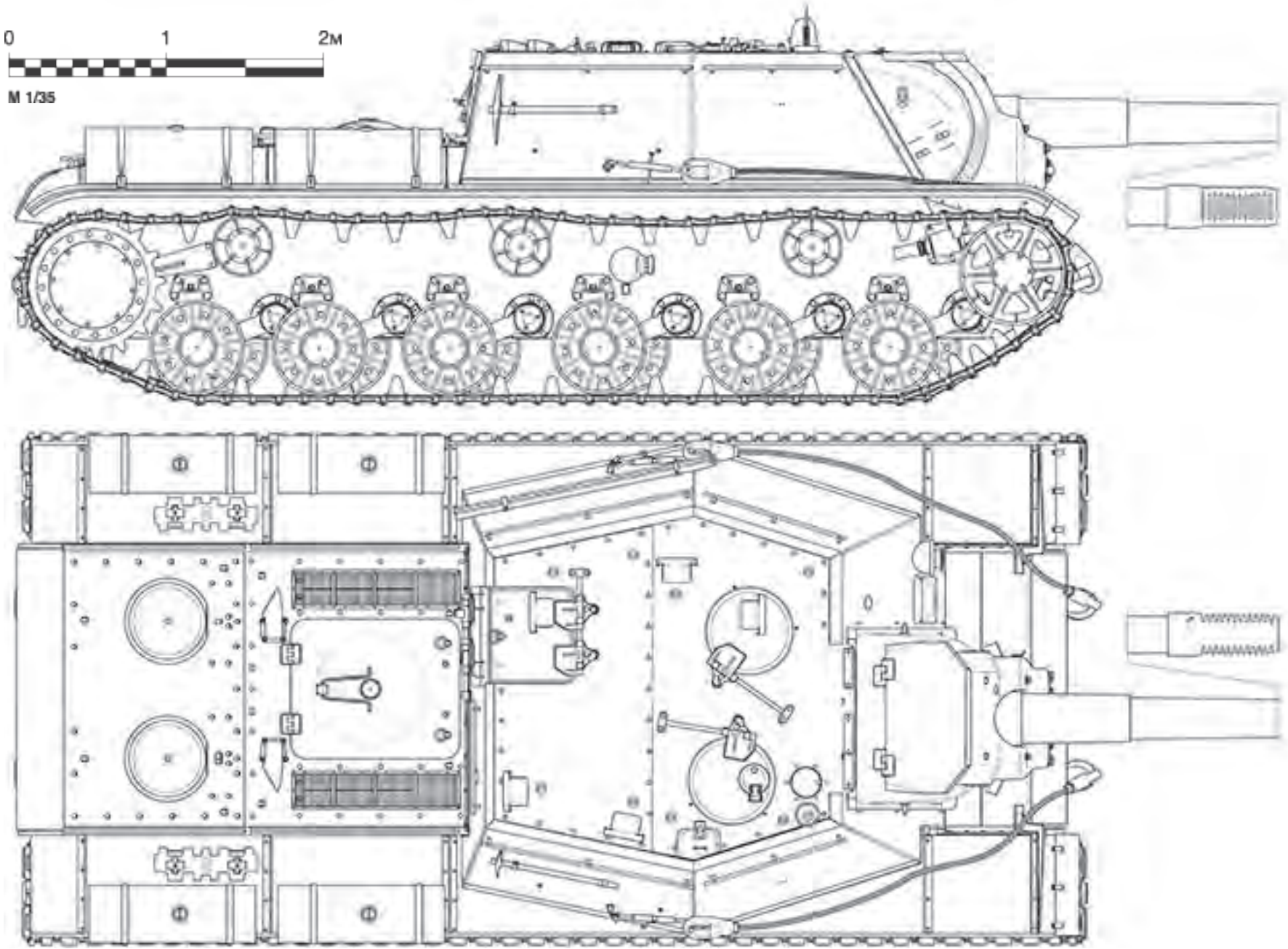
7. Use only the panoramic sight when laying the gun for firing the long-range high-explosive fragmentation shell with reduced variable charge.[3]

However, deliveries of the DR-540 armor-piercing shells were delayed. The SU-152's first engagements took place with the standard basic load; forces in the field did not get the armor-piercing shells until August 1943.

Meanwhile, production of SP guns continued as usual. Since the second quarter of 1943 ended with the SU-152 behind schedule, the SP gun production quota for the third quarter was adjusted. Instead of 75 vehicles, the July plan called for 80 SP guns, and the numbers increased to 84 SU-152's

*DG *(abbreviation for cannon)*
PUSH
FIRST

[3] TsAMO RF, collection 81, series 12063, file No. 11, p. 127.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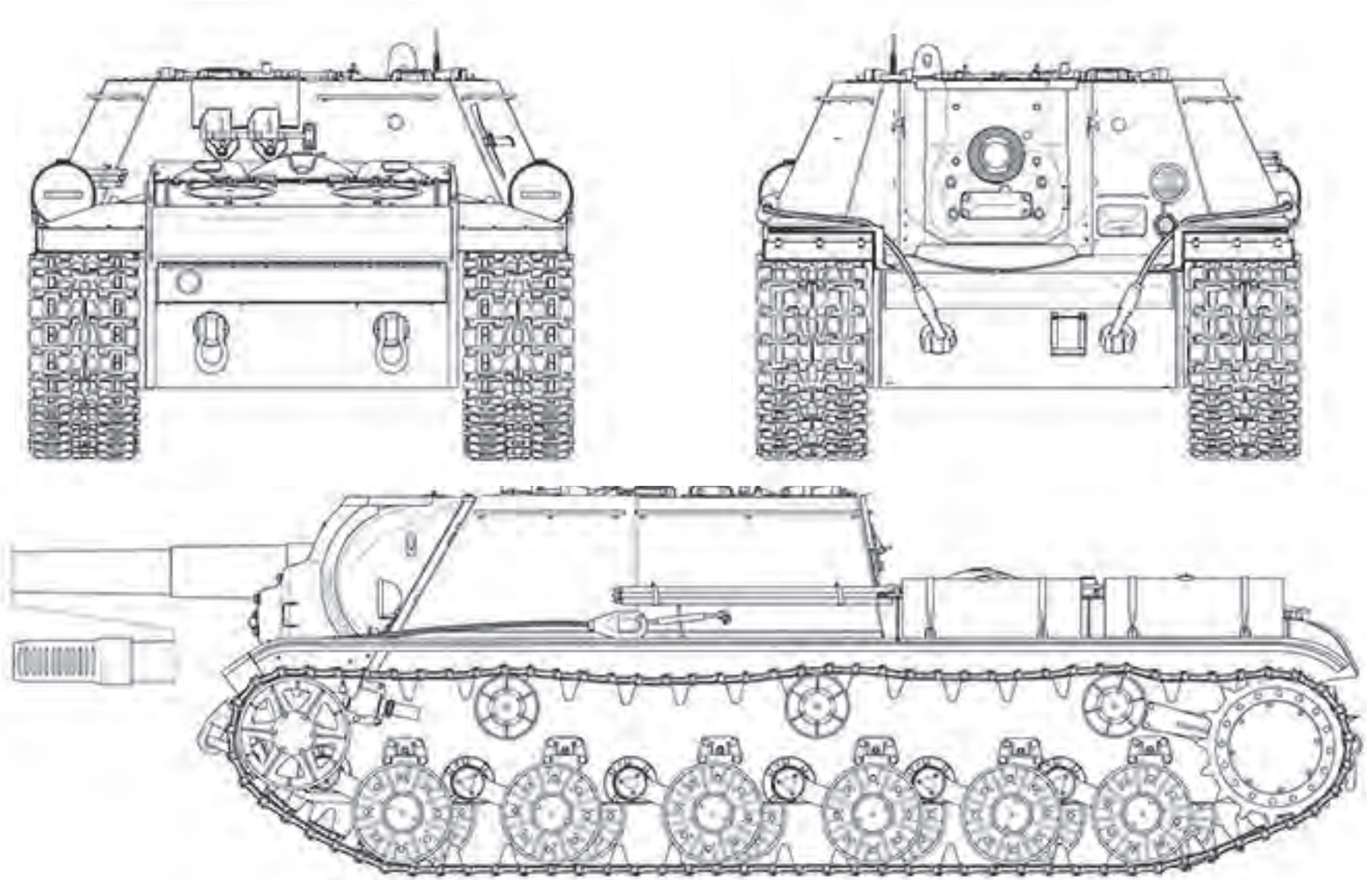
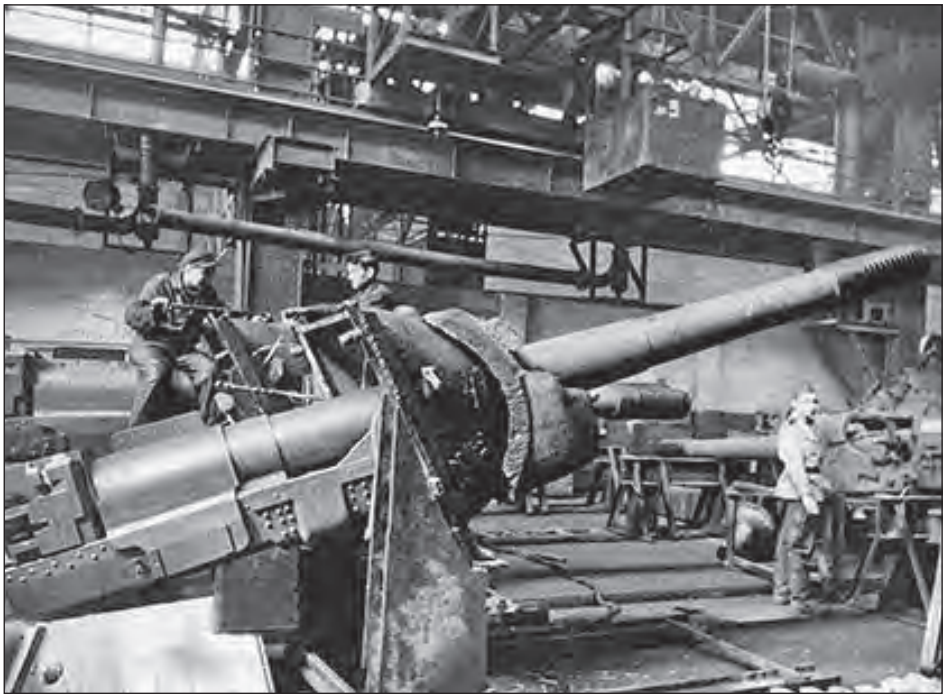


SU-152 SP gun as manufactured between March and July 1943, 1:35 scale drawing.



An ML-20S ready for mounting on an SU-152, Chelyabinsk, summer 1943 (RGAKFKD).

per month in August and September. In addition, a contract between the Kirov Factory of the People's Commissariat of the Tank Industry and the GAU's Artillery Tractor and Self-Propelled Artillery Department reduced the price of each SU-152 to 250,000 rubles.

By July 10, 1943, only 10 of the 80 SU-152's had been accepted. This time, however, the situation was under control: according to the schedule of the People's Commissariat of the Tank Industry, full-scale production of SP guns was planned for the second half of the month. By the 20th, 36 vehicles had been accepted, and the factory met its quota of 80 SU-152's by the end of July. Some modifications had been made to the vehicles produced late in the month. The handrail on the rear of the superstructure was strengthened and given three brackets. The SP gun received another design change in conjunction with the KV-1S. The exhaust stacks were altered and given a short, armored shield. The SU-152 was produced in that form until the end of September 1943.

August was a relatively calm month for the Chelyabinsk Kirov Factory. SP guns were not produced in a lump but were spread evenly over the month—28 vehicles by the 10th, 36 by the 15th, and the 84 set by the quota were delivered by September 1. However, there were some mishaps that only became apparent after the SP guns had been delivered to troops in the field. Sharonov, the Kirov Factory's military representative, accepted several dozen SU-152's with defective mantlets. The recoil mechanism keyhole was incorrect, which made it impossible to use the key to open the valve for filling

the recoil mechanisms with fluid. The defect was identified after the SP guns had been sent to the Moscow Self-Propelled Artillery Center. The flaw had to be corrected on site, using gas cutting equipment.

By August, a list of SU-152 design changes that needed to be made based on field operations had been drawn up. There was also a backlog of problems that had been pending since the winter of 1943. B. G. Vershinin, chief of the

Mounting an ML-20S on an SU-152 SP gun (RGAKFD).

Red Army's Main Armor Directorate, wrote the GAU's Artillery Committee about one of them on August 3:

According to the February 6, 1943, decision of the State Commission that tested the SU-152 prototype, the Kirov Factory and Factory No. 172 were required to move the traversing mechanism housing to the right in order to correct problems that made things difficult for the driver.

Six months have passed since this decision was made, but neither the Kirov Factory nor Factory No. 172 has made the change.

Moreover, as is apparent from Kirov Factory letter No. 2883 of July 24, 1943, that addressed, in part, the ML-20S howitzer's traversing mechanism, Factory No. 172 is behind schedule on completing the job, and the Kirov Factory and Factory No. 172 have not reached a joint decision regarding the needed design changes.

Since I believe the situation concerning correction of this flaw in the SU-152 is completely unacceptable, I hereby urge you to take the appropriate steps to

A newly built SU-152 in the factory, summer 1943 (RGAKFD).

A Chelyabinsk product at the factory's campus. The picture shows a T-34 in addition to the SU-152 (RGAKFD).

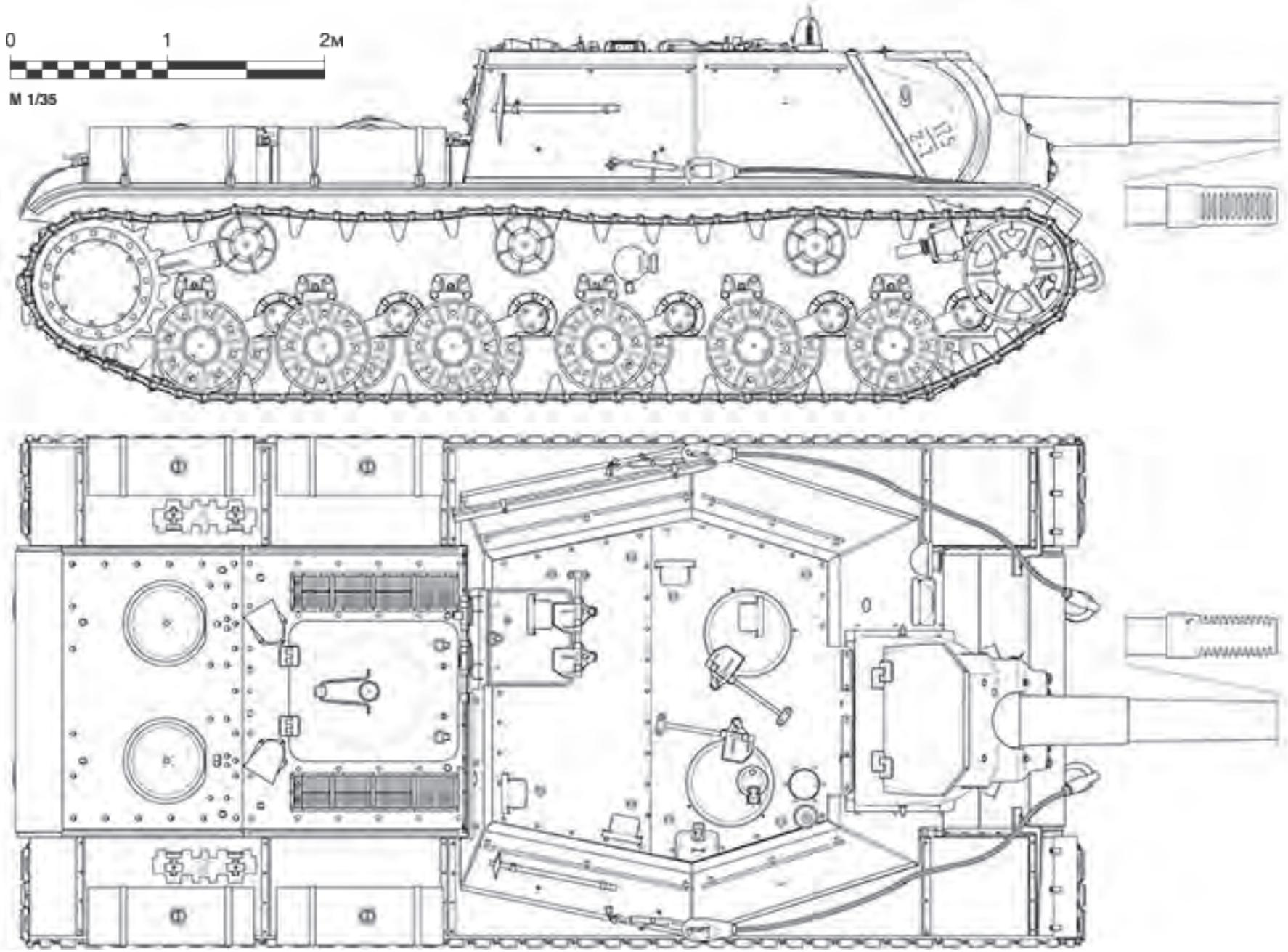
modify the ML-20S howitzer traversing mechanism as needed and immediately produce a prototype of the mechanism.

I request that Kirov Factory Dir. Comrade Zaltsman contribute to improving the location of the gun traversing mechanism and modifying it and develop the appropriate measures for improving the driver's operating conditions.[4]

However, the letter had no impact. The SU-152 continued to have ML-20S systems with the old traversing mechanism that pressed against the driver-mechanic's right shoulder and back at certain angles for the entire time it was in production. The mechanism was never shifted to the right, although this was done when the IS-152 (ISU-152) SP gun was designed.

Some changes regarding the location of the ammunition were considered. In August 1943, the BR-540 armor-piercing shell was added to the SU-152's basic load. USA GABTU Chief Eng. Col. N. N. Alymov demanded a 50/50 ratio of armor-piercing and high explosive rounds from the Chelyabinsk Kirov Factory. If the armor-piercing shell required a different storage rack design, it would have to be modified as quickly as possible. The

[4] TsAMO RF, collection 38, series 11369, file No. 74, p. 90.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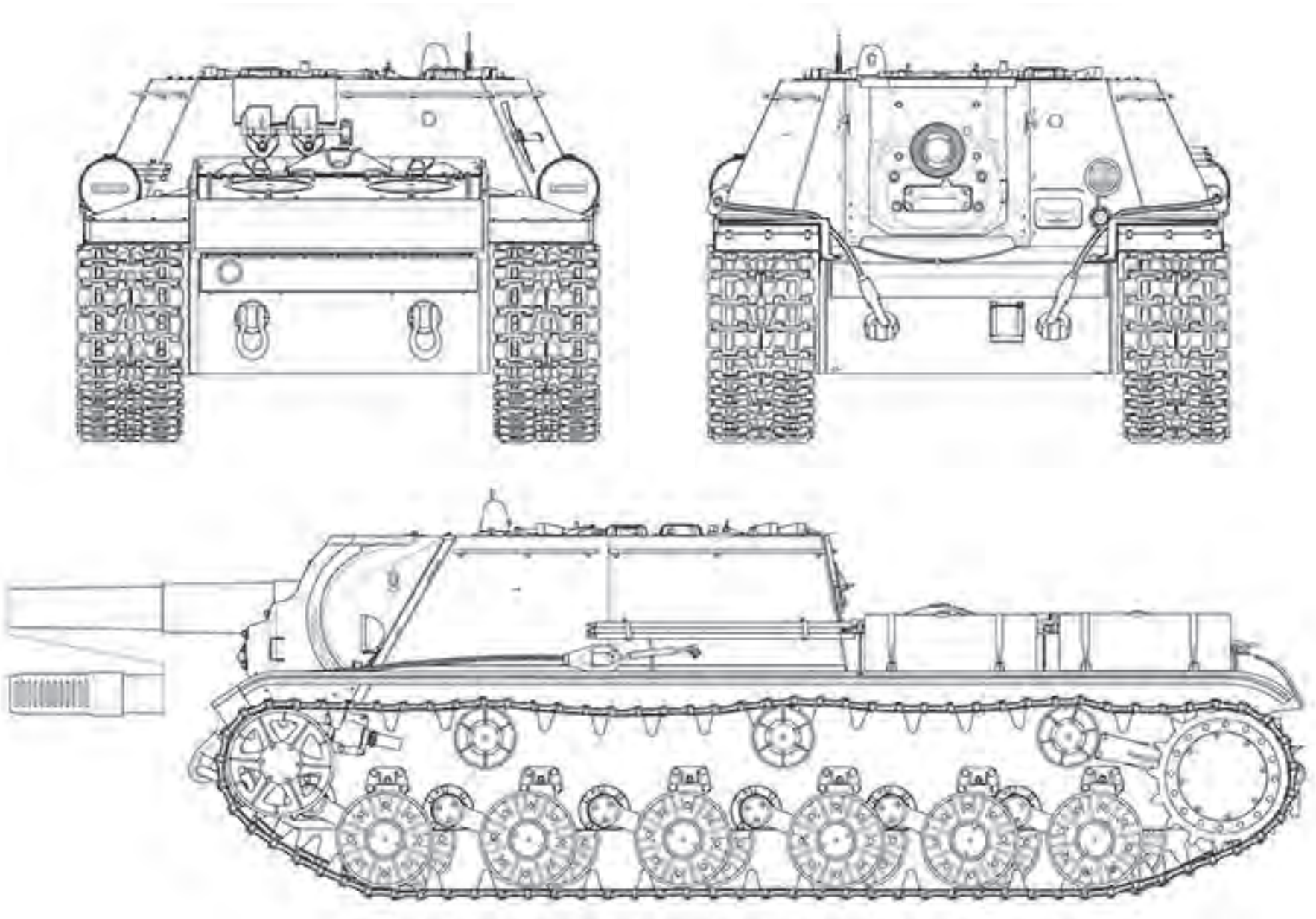


SU-152 as manufactured between July and September 1943, 1:35 scale drawing.

modifications were not required, however, but the workmanship of the storage racks needed to be improved. There had been cases in which 4–6 shells could not be placed in the storage rack due to poor workmanship. Also, in the field it was common to increase the basic load to 25 rounds. The problem was solved by placing the additional five rounds under the gun; the shells and charges lay on the floor, held in place by wooden blocks. A proposal was made to manufacture regular racks for the additional ammunition, but this was never done.

A heated discussion about the technical documentation for the SP gun took place between July and September 1943. Some of the conditions for accepting SP guns were changed. According to the specifications, each SU-152 underwent routine firing tests—three supercharged rounds were fired. Since no instance of failure during firing was recorded from February to August 1943, it was decided on August 24 that only every tenth vehicle would be test-fired.

Among the issues discussed were modifications to the SU-152 design:

1) *Group 06. Add a housing to protect the oil tank valve when removing shells from sleeves. The deadline for beginning production is October 1, 1943.*
2) *Group 04. On the fuel tank drawings, specify that an anticorrosion coating is to be applied to their inner surface after manufacture. The deadline is November 1, 1943.*

Modified exhaust stack shield introduced for the SU-152 and the KV-1S in late July 1943 (YuP).

Stalin inspecting and SU-152 and questioning the crew about working conditions. The Kremlin, September 8, 1943 (IZh).

3) Group 50. Eliminate the heads of bolts securing the fighting compartment roof from the field of view of the vision blocks with mirrors by replacing them with countersunk bolts. The deadline is September 15, 1943.[5]

The factory completed the drawings of the housing for protecting the oil tank by September 5. The problem with roof bolts in the field of view of the periscopic vision devices had been solved earlier, on August 30. Instead of replacing them with countersunk bolts, they were simply shifted to the side. The Chelyabinsk Kirov Factory rejected the requirement to give the fuel tanks an anticorrosion treatment on the grounds that no failures due to corrosion had been observed.

Things went smoothly for the Chelyabinsk Kirov Factory in September 1943. The first 36 SU-152's were delivered by September 10 and another 73 were delivered by the 20th, easily surpassing its quota of 84 SP guns. That month, however, Factory No. 172 "distinguished itself" by producing a number of vehicles with technical defects. On September 3, 1943, Eng. Col. Sharonov, senior military representative of the GABTU's Self-Propelled Artillery Office, sent letters to GAU and GABTU:

[5] TsAMO RF, collection 38, series 11369, file No. 78, p. 43.

I hereby report that the ML-20S guns submitted by Factory No. 172 have defects that have repeatedly been pointed out by the Kirov Factory's QC Department and the military acceptance office.

1. *The bracket with a hole that is used to mount the ST-10 sight is not in the right location.*
   During the inspection of the six systems numbered 8239, 8244, 8247, 8266, 8287, and 8241, a check of the location of the bracket for the vision blocks specially made by the Kirov Factory revealed that the hole in the bracket matched the drawing on only one system, No. 3241, whereas the holes in the brackets on the other systems were out of position along all coordinates.
   The shift in the location of the holes causes darkening of the field of view of the ST-10 sights
2. *Systems lack the Luch system when they are shipped by the factory. In the third quarter of 1943, the factory failed to meet its quota by 40 systems.*
   The shortfall of Luch devices is delaying timely submission and shipment of SU-152's to the front.
3. *The bubbles in sight levels sometimes break during assembly of the system, as well as during tactical drills.*

The lack of replacement levels is also delaying delivery of the self-propelled guns.

I have received no answer to my message to the regional engineer of Factory No. 172 concerning these problems.

I hereby request your guidance concerning the issues I have raised.[6]

The SU-152 underwent additional changes in late September; these modifications were the last to occur in the production cycle. A border was placed around the submachine port in the superstructure's rear plate. Much more significant changes were made to the superstructure roof, and these modifications are still causing disputes.

Reports about the SU-152 from the front made it known that a large quantity of powder gases accumulated inside the fighting compartment during firing, "poisoning" the crew. This became known both at GABTU and at the highest level. Stalin himself asked about a solution to the problem during a display of new armored vehicles at the Kremlin. N. S. Popov and V. I. Petrov wrote about the episode in their book "Without Secrets" *(Bez tayn i sekretov)*.

The armored vehicles that had been brought to Moscow were housed at Cherkizovo Station in workshops of a factory that had been evacuated to the East. From here, on August 5, 1943, the men from the Kirov Factory watched the firing of the first salute celebrating the Red Army's victory in the battle on the Kursk Salient. And on August 8, experimental tanks were sent under their own power to the Kremlin for display to government officials. They were placed not far from

[6] TsAMO RF, collection 38, series 11369, file No. 79, p. 31.

the Tsar Cannon, facing the Supreme Soviet building. Not long after, members of the State Defense Committee led by Stalin came out onto the square. Among them were V. A. Malyshev, People's Commissar of the Tank Industry, and Col. Gen. Ya. N. Fedorenko, armored forces commander. Responding to Malyshev's description of the vehicles' combat capabilities, Stalin pointed to the 122 mm gun and said that it was quite impressive and well suited for a heavy tank.

That conversation took place next to the pacesetting IS-2 tank. Next, the Supreme Commander walked up to the ISU-152 SP gun. He obviously knew that the SP guns, which were called "beast killers" in the Battle of Kursk, had acquitted themselves well in combat. Approaching the vehicle, he suddenly climbed up onto its hull without the help of a ladder and, looking into the open commander's hatch, asked how matters stood with ventilation of the fighting compartment. Someone had obviously told him that the crews in some of the first vehicles produced were being poisoned. Test driver K. Ye. Yegorov quietly answered him: "Exhaust gases do enter the vehicle, but improved ventilation has been developed for these guns. It passes three times as much air through, and the danger that the turret will fill with smoke or powder gases has been completely eliminated."

Stalin was completely satisfied with the driver-mechanic's competent answer and never asked any of the engineers about that again.

An SU-152 produced in October 1943. The vehicle was manufactured in this form until production ended (TsAMO).

Unfortunately, there are a number of inaccuracies in this account, which has been cited many times. To begin with, neither an IS-2 nor an ISU-152 could have been in Red Square on August 8, 1943. The first ISU-152 prototype entered testing in October 1943, and testing on the IS-2 (IS-122) began after that. Stalin's comment on the D-25 gun is nothing more than artistic license on the author's part. The display actually included a production version of the SU-152 that had been produced in August, the KV-85 prototype (Object 239), the IS prototype with a D-5T (Object 240) 85 mm gun, an SU-85, and an SU-76M (SU-15M). The author was not only confused about the types of armored vehicles on display, he also got the date of the display wrong. Here is what People's Commissar of the Tank Industry Malyshev wrote about the event in his journal:

September 8, 1943

Today, Comrades Stalin, Molotov, Voroshilov, Beria, and Shcherbakov examined the new IS, KV-85, SU-152, SU-85 and S-76 tanks and SP guns at the Kremlin.

Comrade Stalin himself climbed up on the IS tank and the SU-152 and SU-85 (Comrade Stalin got on the tanks first). He asked detailed questions about the advantages of the new tanks, especially the IS and the SU-85.

He delivered a rebuke because the SU-152 didn't have a fan in the fighting compartment. I promised that one would be installed within seven days.

He questioned why the IS tank with its thicker armor and more powerful gun doesn't weigh more than the KV. I showed Comrade Stalin both tanks and pointed out to him that the IS tank is smaller than the KV and said that made it possible to reduce the weight. Comrade Stalin said: "That's good."

He said we need more vehicles like the SU-85. "It's a light and agile vehicle with good mobility, and it will do a good job of beating up the German Tigers and Ferdinands," Comrade Stalin said.

"I was impressed that at his age Comrade Stalin was able to so easily climb up on the tanks without help. He questioned the drivers and artillerymen about whether the vehicles were easy to operate, did they feel crowded, didn't they choke on the gases, etc."

The Chelyabinsk Kirov Factory had not worked on developing fans for the SU-152's roof before the display. The issue was not mentioned in the list of required design improvements for the SP gun. In short, Stalin himself initiated it. On September 10, 1943, a letter over Alymov's signature addressed to the senior military representative of the Self-Propelled Artillery Office of the Red Army's Main Armor Directorate (USA GBTU KA), Eng. Col. Markin, arrived in Chelyabinsk:

I hereby bring to your attention that, beginning on September 23, 1943, all SU-152 self-propelled guns produced must have exhaust fans.

You are required to report when this is done.

An SU-152 produced in October 1943. Vents are clearly visible in the superstructure roof (TsAMO).

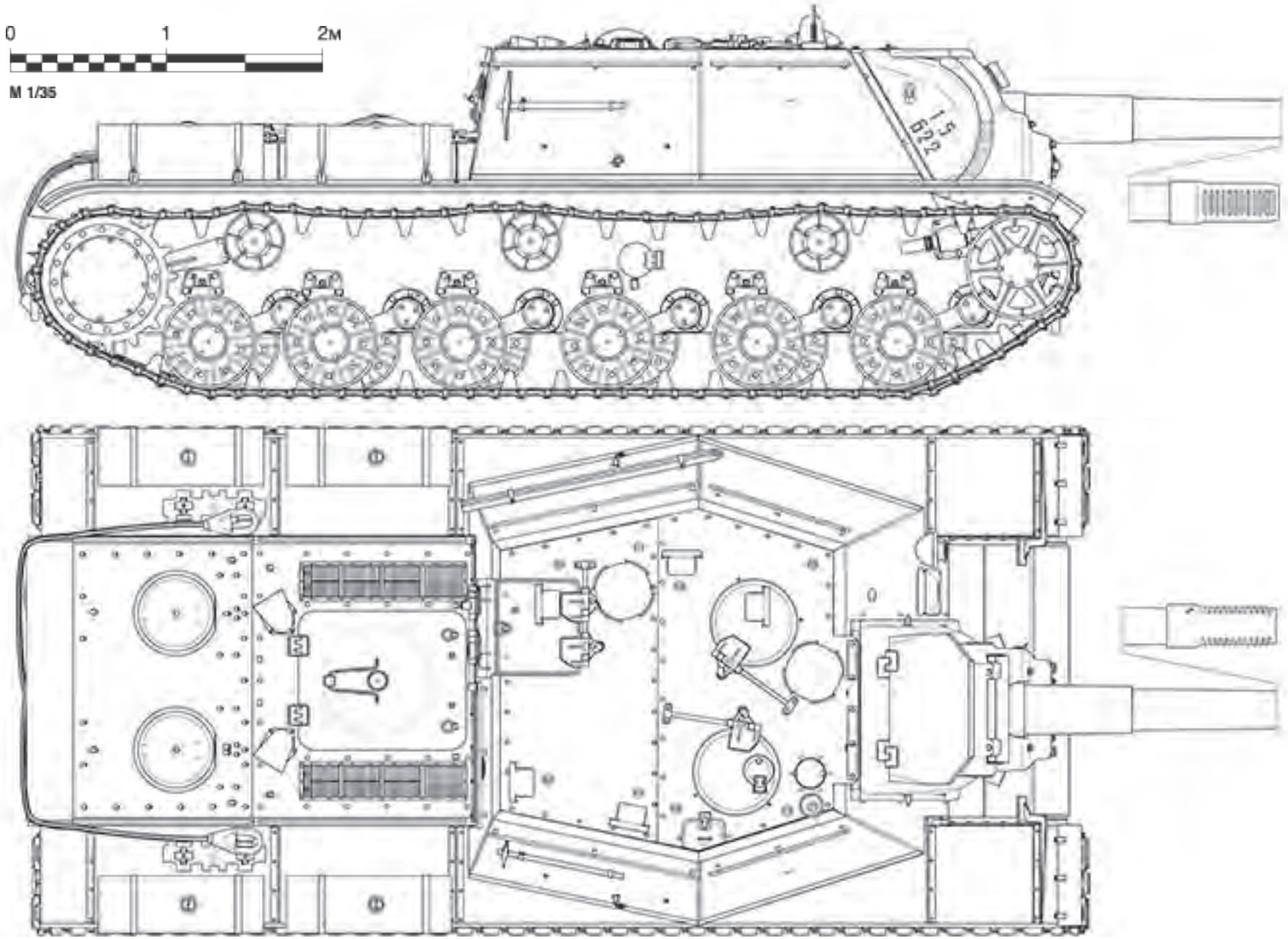
The factory management will receive an order to this effect from the People's Commissar of the Tank Industry.[7]

It is safe to say that this urgent task was completed on schedule. The last vehicles produced in September had fans in their roofs, and SP guns continued to be manufactured with fans until production ended.

Thanks to good management, SP gun production at the Chelyabinsk Kirov Factory proceeded like clockwork. September's quota of 84 vehicles was met on schedule. However, this well-oiled mechanism would soon stop functioning. The IS-152 (ISU-152) SP gun went for testing in October 1943. State Defense Committee Decree No. 4504 "On the IS-152 Heavy Self-Propelled Gun with the ML-20s Gun-Howitzer," dated November 6, accepted the new SP gun into the inventory. The IS-2 heavy tank, which served as the basis for the ISU-152, had been commissioned previously, on October 31, 1943. Thus the era of the KV heavy tanks and the SP gun based on it had come to a close.

The Chelyabinsk Kirov Factory began production engineering for the ISU-152. On the day the new SP gun was commissioned, an order

[7] TsAMO RF, collection 38, series 11369, file No. 78, p. 45a.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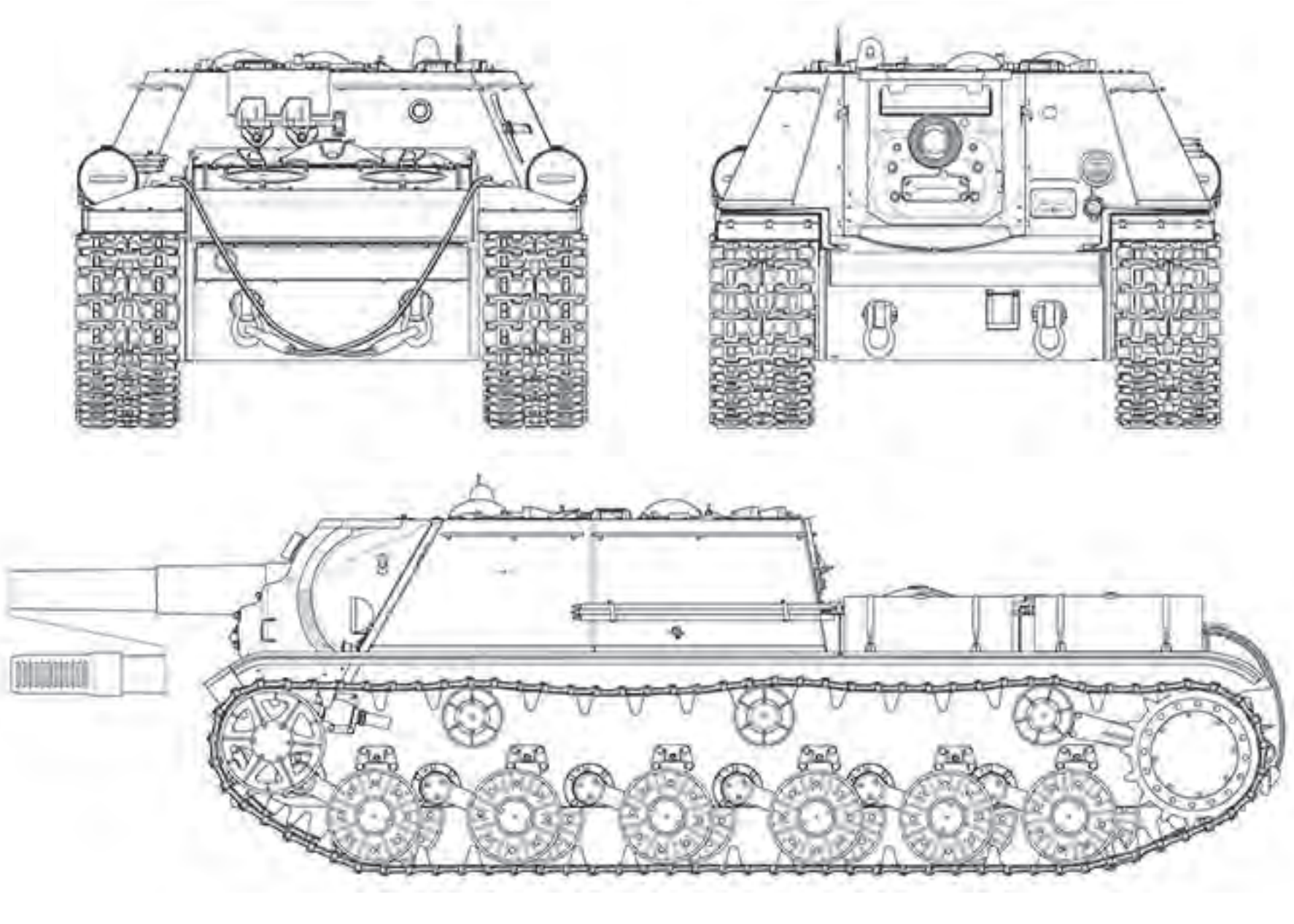


The SU-152 SP gun as manufactured between September 1943 and February 1944, 1:35 scale drawing.

An SU-152 produced on the birthday of the Komsomol, late October 1943. The name "General Rokossovsky" is visible on the superstructure (RGAKFD).

discontinuing production of the SU-152 was issued. The production plan for the vehicle was cut to 42. The last SU-152's had been manufactured by November 20, and five ISU-152's had been delivered in Chelyabinsk by the end of the month. Some mishaps occurred because the factory was forced to produce the old vehicles while setting up to produce the new ones. A number of parts intended for the ISU-152 were made of the new grade 40 steel, and because engineering analyses of parts made of the new steel had been done incorrectly, there were numerous instances of breakage. However, the breakages were corrected based on results from company-level exercises.

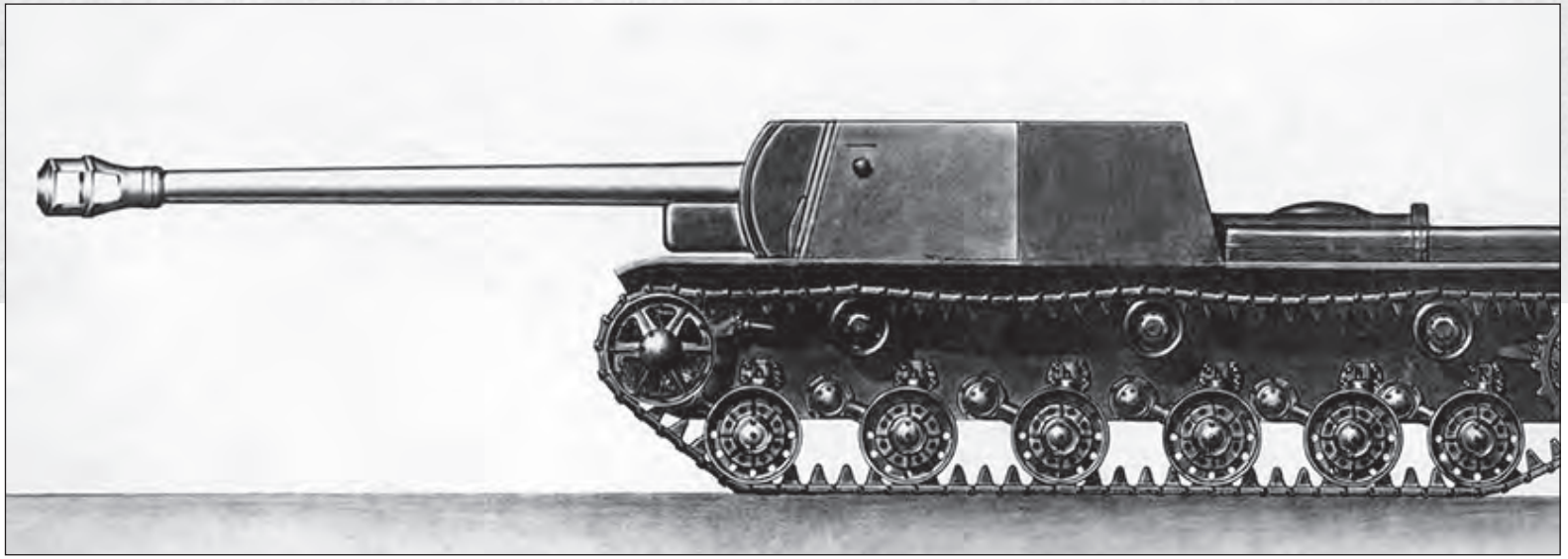
The Chelyabinsk Kirov Factory delivered the last SU-152's after production had ceased. Interestingly, these vehicles were not listed in the factory's reports, but they are found in the reports on factory deliveries of SP guns that were sent to Stalin, Molotov, and Beria every five days. According to those reports, the Chelyabinsk Kirov Factory delivered four SU-152's in December 1943 and the last two production vehicles in late January 1944. Including the prototype, a total of 670 SU-152's were produced.

CHAPTER 8. Thicker, Longer, More Powerful!

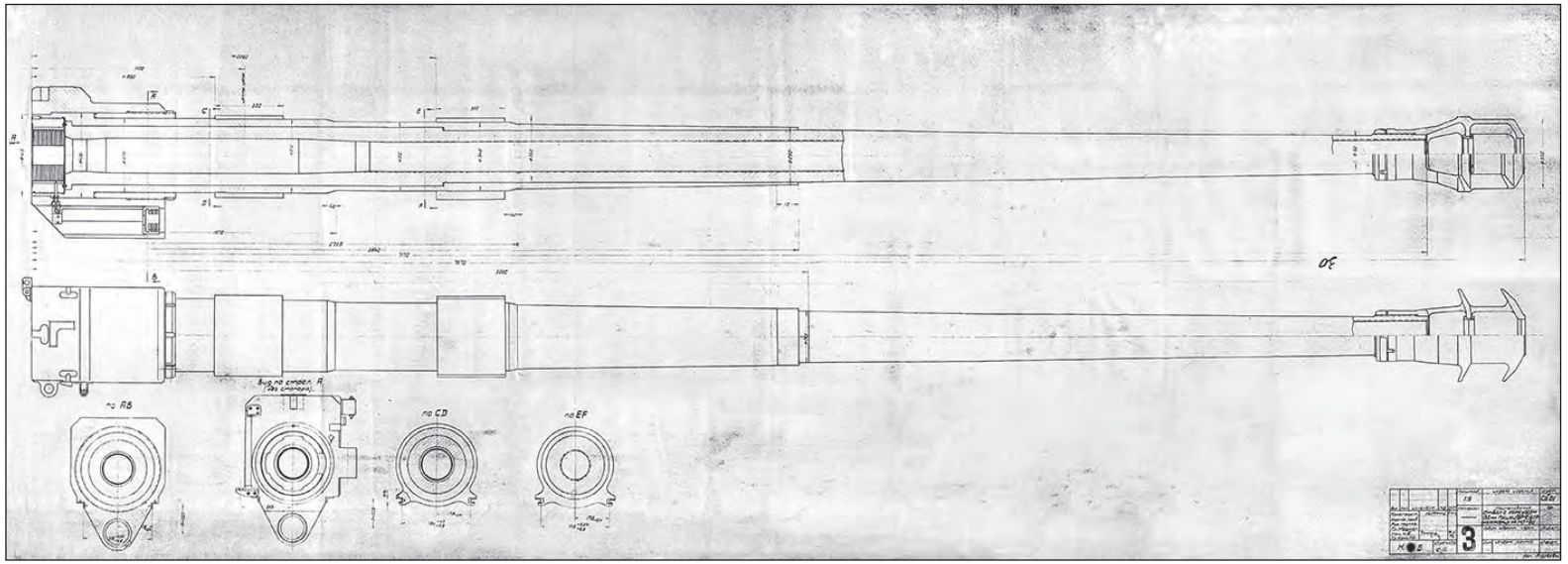
The adoption of the KV-14 did not mean that the military had finally come to a decision about the gun system needed for a bunker buster. The ML-20S was one quarter weaker than the BR-2 that the artillerymen continued to dream about. However, several things had occurred by the winter of 1943 that finally killed the BR-2 SP gun idea. People's Commissariat of Arms Factory No. 221, the developer and producer of the BR-2 and other heavy guns, was heavily bombed in August 1942, and then it became the site of one of the bloody battles for Stalingrad. Efforts to rebuild the factory got underway in the spring of 1943, but the Soviet Union could forget about heavy guns for a long time to come.

Nevertheless, one project to mount a BR-2 on the KV-14 still took place. This project, for which only a sketch remains, was developed by a team at Factory No. 9's design bureau under the direction of F. F. Petrov. No textual data on the project has been preserved, but the project by and large was a continuation of the idea of installing a BR-2 in the ZIK-20 SP gun that dated back to October 1942. As with the ZIK-20, they took the barrel from a BR-2 that had been modified to fit on an ML-20 cradle. A dual-chamber muzzle brake was added to the barrel to reduce recoil. Judging by a similar project to mount the BR-2 on the ZIK-20, the combat weight of the KV-14 with a heavier gun would have been 2 tonnes greater, which would have been acceptable. The later projects for the ISU-152-1 and the ISU-152-2 with the BL-8 and BL-10 guns show that Petrov's concept of rearming the SU-152 with a BR-2 was quite feasible. However, the project did not get beyond the conceptual design stage.

As mentioned above, mounting a BR-2 on the ZIK-20 chassis was not the only concept Petrov had come up with. He also floated the idea of putting the barrel of the U-3 203 mm corps-level howitzer on an ML-20's elevating mechanism. Matters did not proceed beyond the talking stage with the ZIK-20, but in 1943 Factory No. 9's design bureau decided to work up a conceptual design for mounting the U-3 on the KV-14 chassis. Some scholars have taken the sketches of this project to be for the U-19 SP gun, even though there is an interval of more than six months between the two vehicles. The barrel was the only difference between the U-3 and the installation of the BR-2 on the KV-14. To reduce recoil, the barrel was given a massive, dual-chamber muzzle brake. Unlike the KV-14 with the BR-2, this brainchild of Petrov raises several questions concerning implementation. The projectile for the U-3, which was



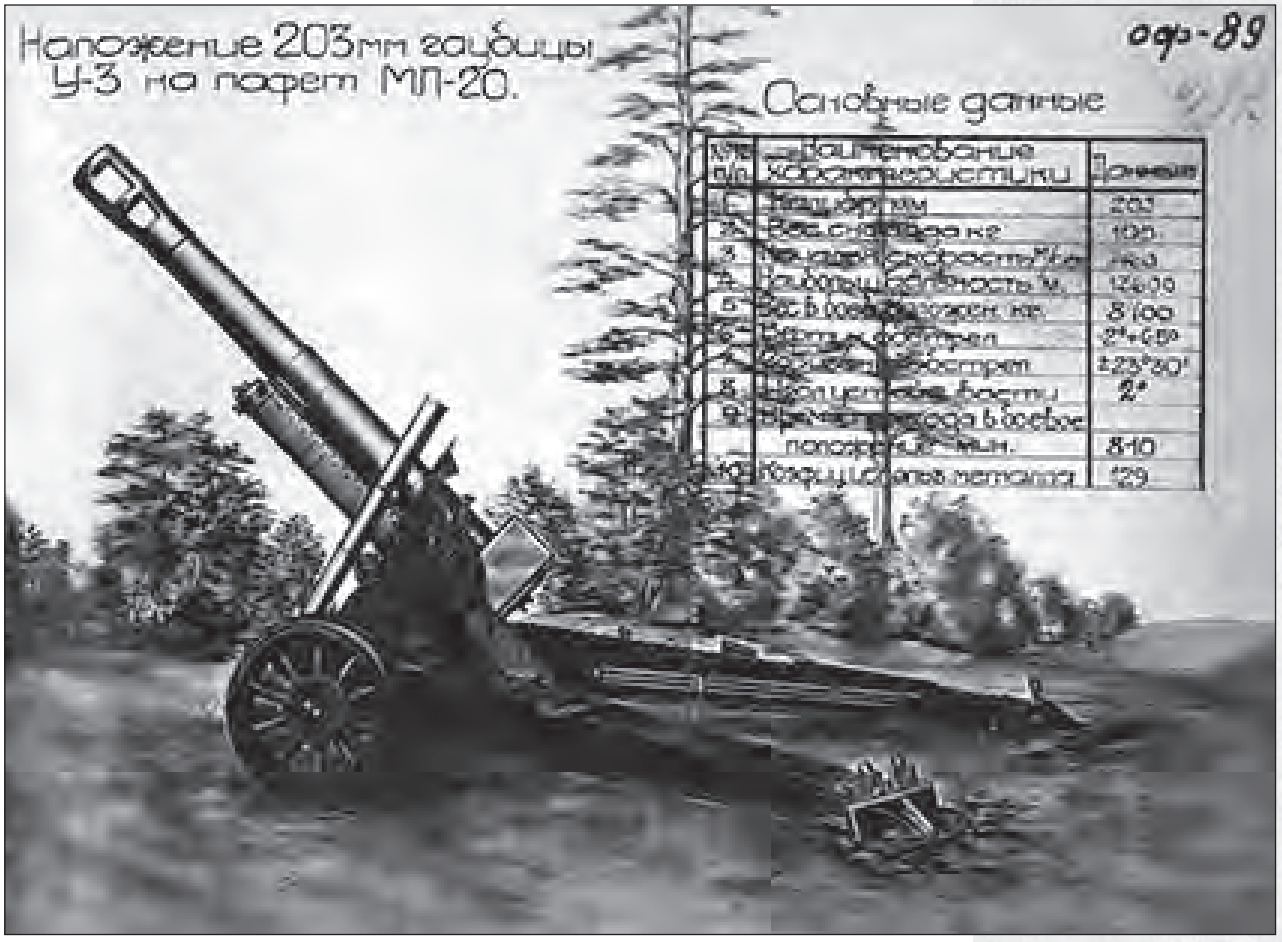
Conceptual drawing of the BR-2 152 mm gun mounted on the KV-14, spring of 1943 (SA).



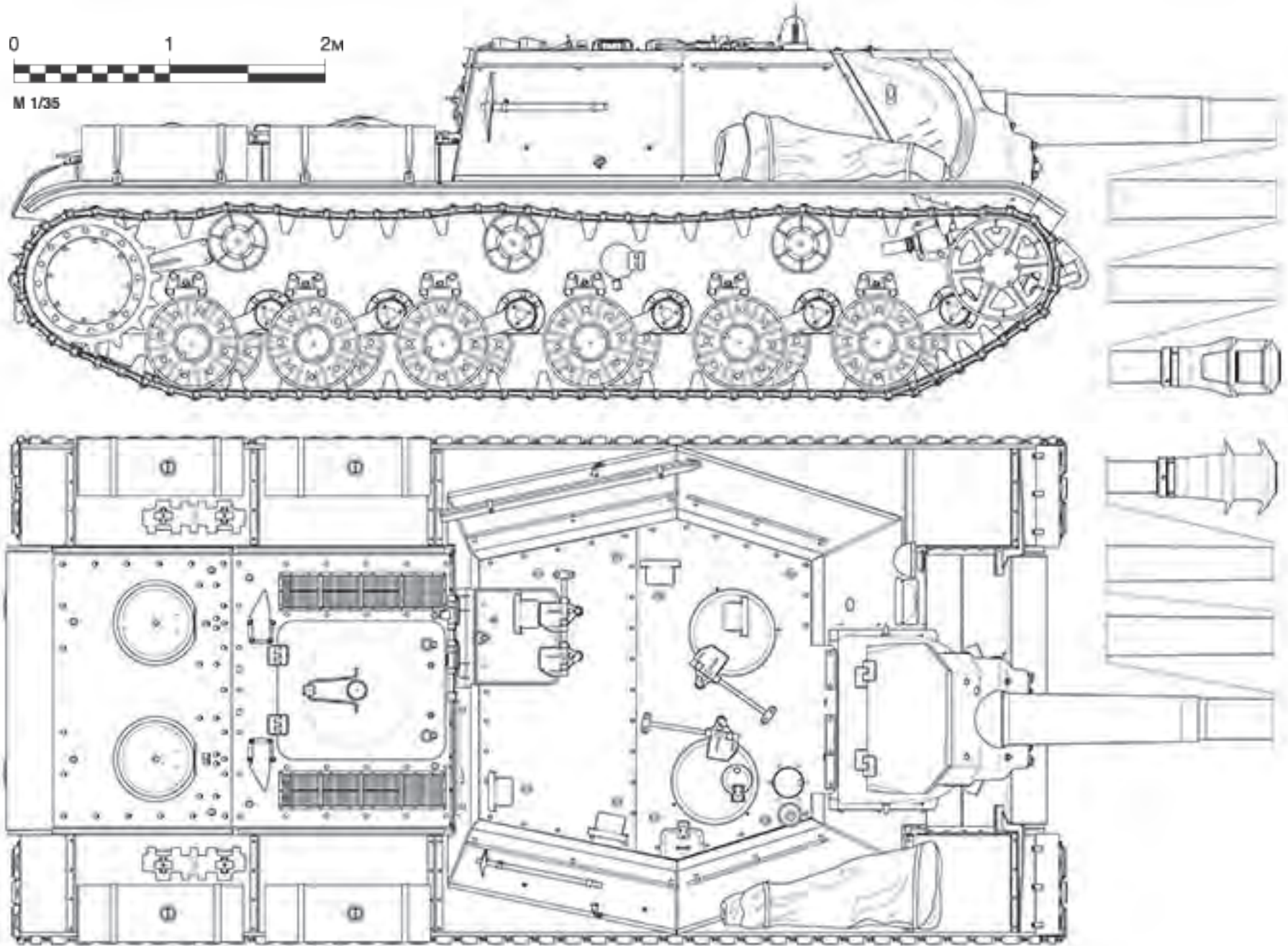
BR-2 152 mm gun barrel that plans called for mounting on the KV-14 (TsAMO).

identical to that of the B-4 203 mm heavy howitzer, weighed 100 kg. It is not entirely clear how the ammunition would fit in the KV-14's extremely narrow and low superstructure or, most importantly, how the loader would be able to load rounds into the chamber by hand. Given the low height of the KV-14's superstructure, it would hardly be possible to fit a crane like the one on the U-19 inside it. In addition, in 1943 the heavy U-3 203 mm howitzer's star had decidedly waned. The gun did not go into production, and that meant that the project's future had become even more hazy. The idea of putting a U-3 barrel on an ML-20 carriage also went unrealized, although they did receive instructions to manufacture a prototype in February 1943. An upgraded version of the U-3 howitzer that received the designation U-3 BM went unrealized. It was a U-3 with a barrel lengthened to give it the ballistics of the B-4.

For one reason or another, both projects sank into oblivion during the spring of 1943. Factory No. 9's design bureau never revisited the problem of installing heavy gun systems on a KV tank chassis. It concentrated on tank guns and systems for medium SP guns.



Conceptual drawing of the U-3 203 mm corps-level howitzer on the ML-21 gun-howitzer carriage, October 1942 (TsAMO).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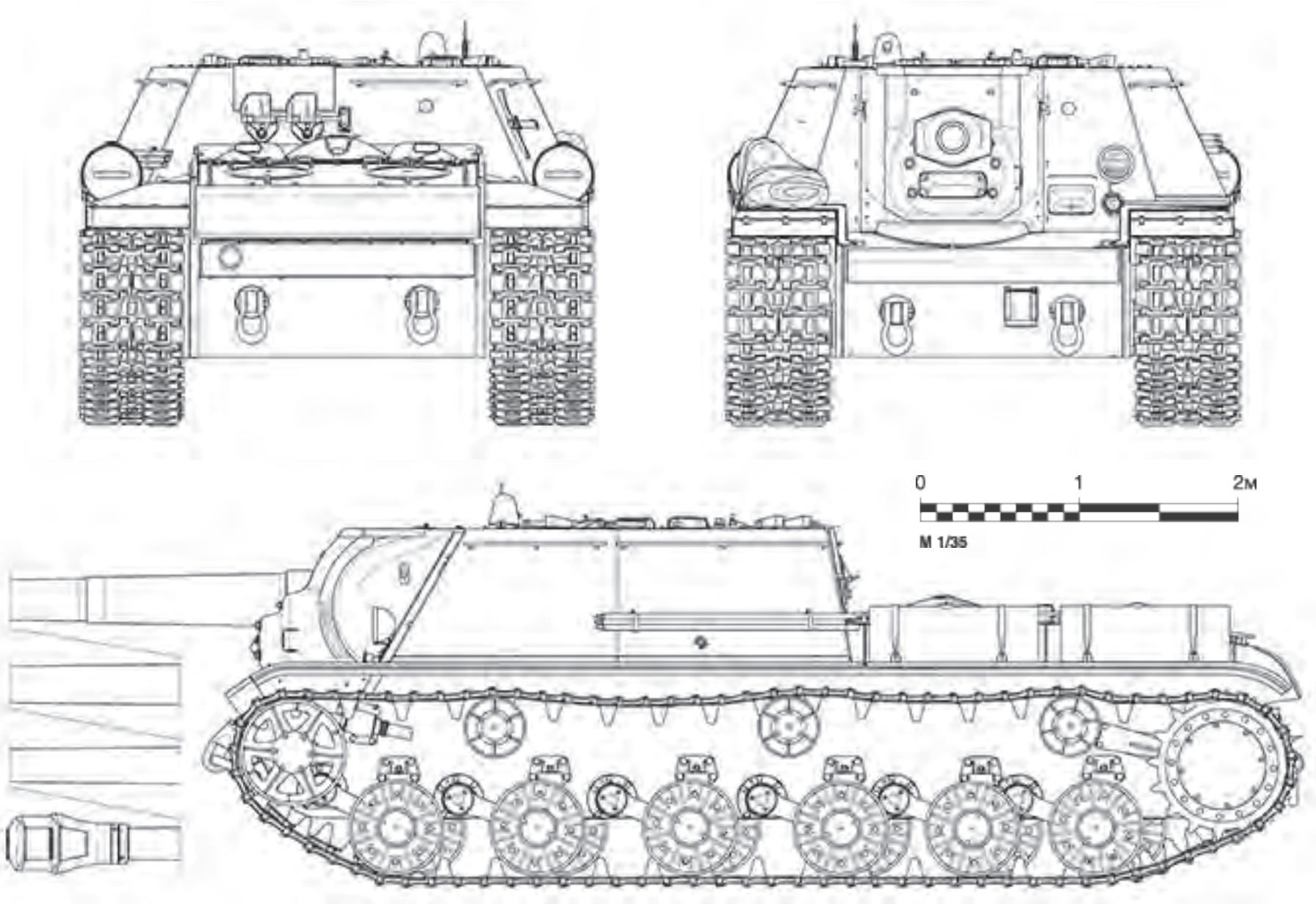
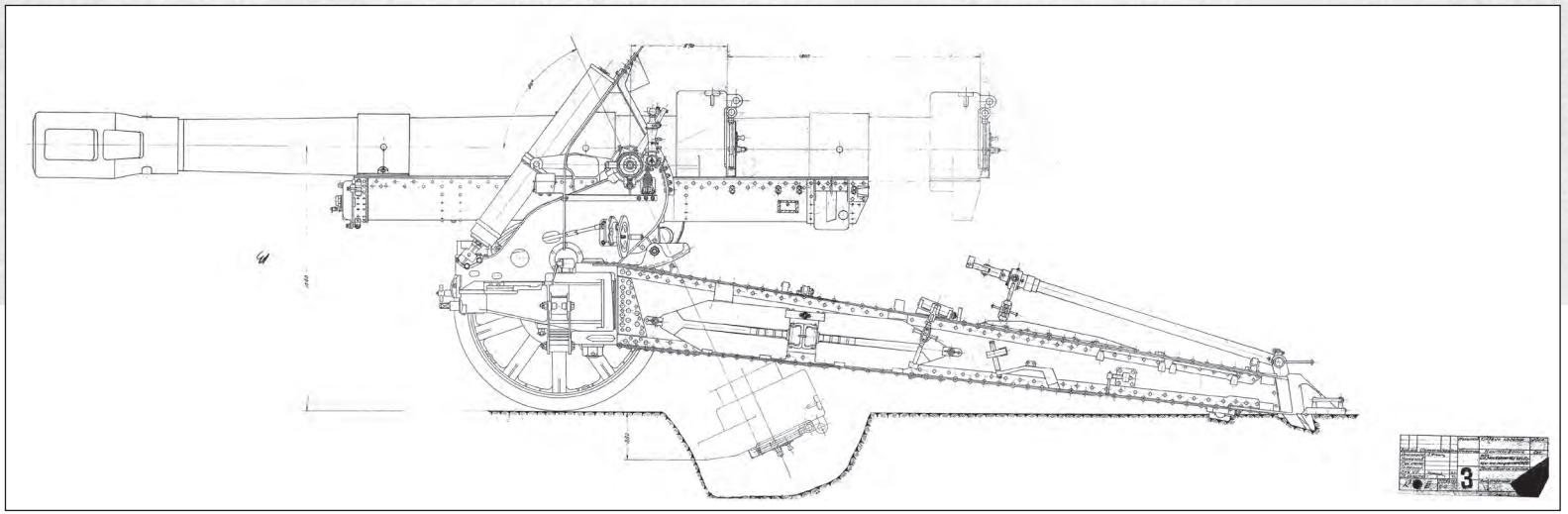
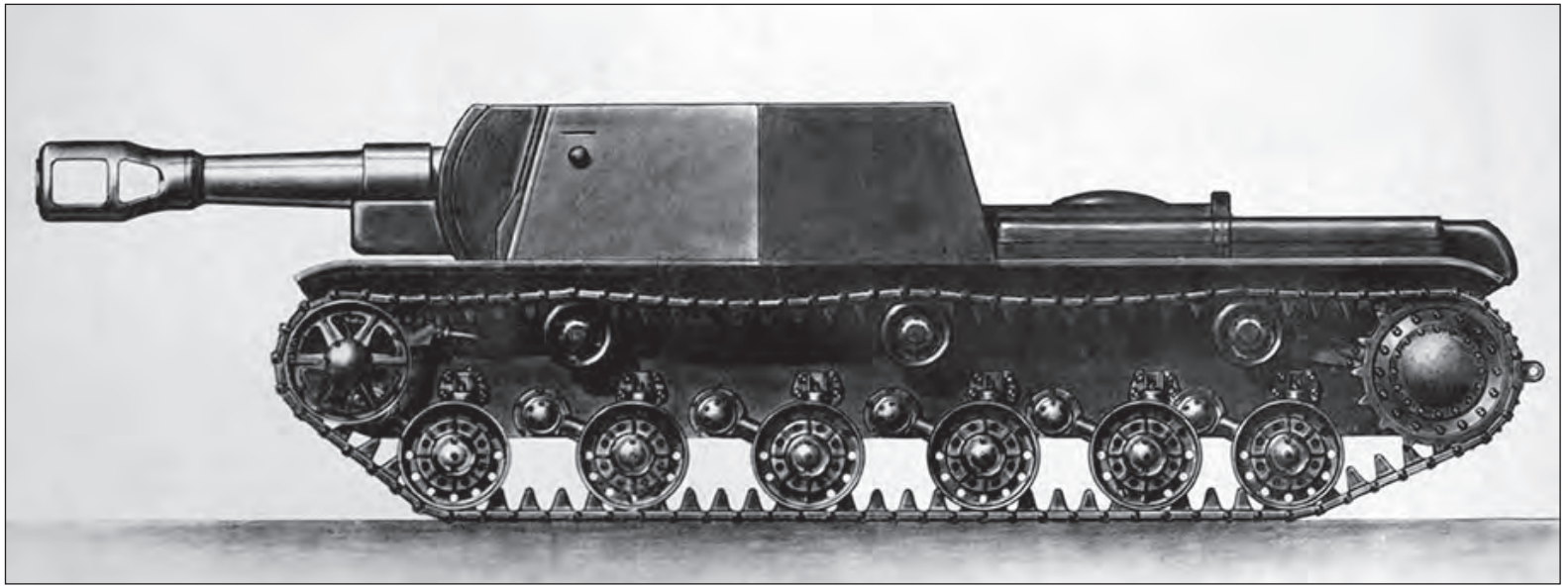


Reconstructed 1:35 scale drawing of the BR-2 152 mm gun mounted on the KV-14.



Factory drawing of the U-3 203 mm corps-level howitzer on the ML-20 gun-howitzer carriage (TsAMO).



Conceptual drawing of the U-3 203 mm corps-level howitzer mounted on the KV-14, spring of 1943 (SA).

Petrov's abandonment of the idea of installing a BR-2 and U-3 in the KV-14 did not mean that the issue was dead. As the saying goes, nature abhors a vacuum, and Factory No. 172 took Factory No. 9's place with a vengeance. This turn of events was logical: the Perm enterprise had developed and was the only producer of the ML-20. The factory's design bureau also explored numerous heavy artillery projects using that gun-howitzer's tipping parts.

In March 1942, Factory No. 172's design bureau began developing a 203 mm corps-level mortar. S. P. Gurenko spearheaded work on the system, which received the factory designation M-4. Red Army artillery had no system like that, making it an enterprising project. In developing the M-4, Gurenko's designers were guided by the following:

An artillery gun firing a powerful shell is an absolute necessity for destroying large enemy fortifications.

The 203 mm howitzer model 1931 (B-4) performs that mission.

However, the use of this howitzer in maneuver warfare is hindered by its relatively high weight and low mobility.

In addition, because these howitzers are no longer being produced, the front does not currently have the numbers of heavy howitzers that it needs.

There are three prototype light-weight 203 mm corps-level howitzers—the M-40, the BL-39, and the U-3. They were designed to meet GAU operational requirements, which stipulate that each should weigh over a third less than the B-4 howitzer.

Because they are more maneuverable than the B-4 howitzer, these models would be better suited to modern warfare.

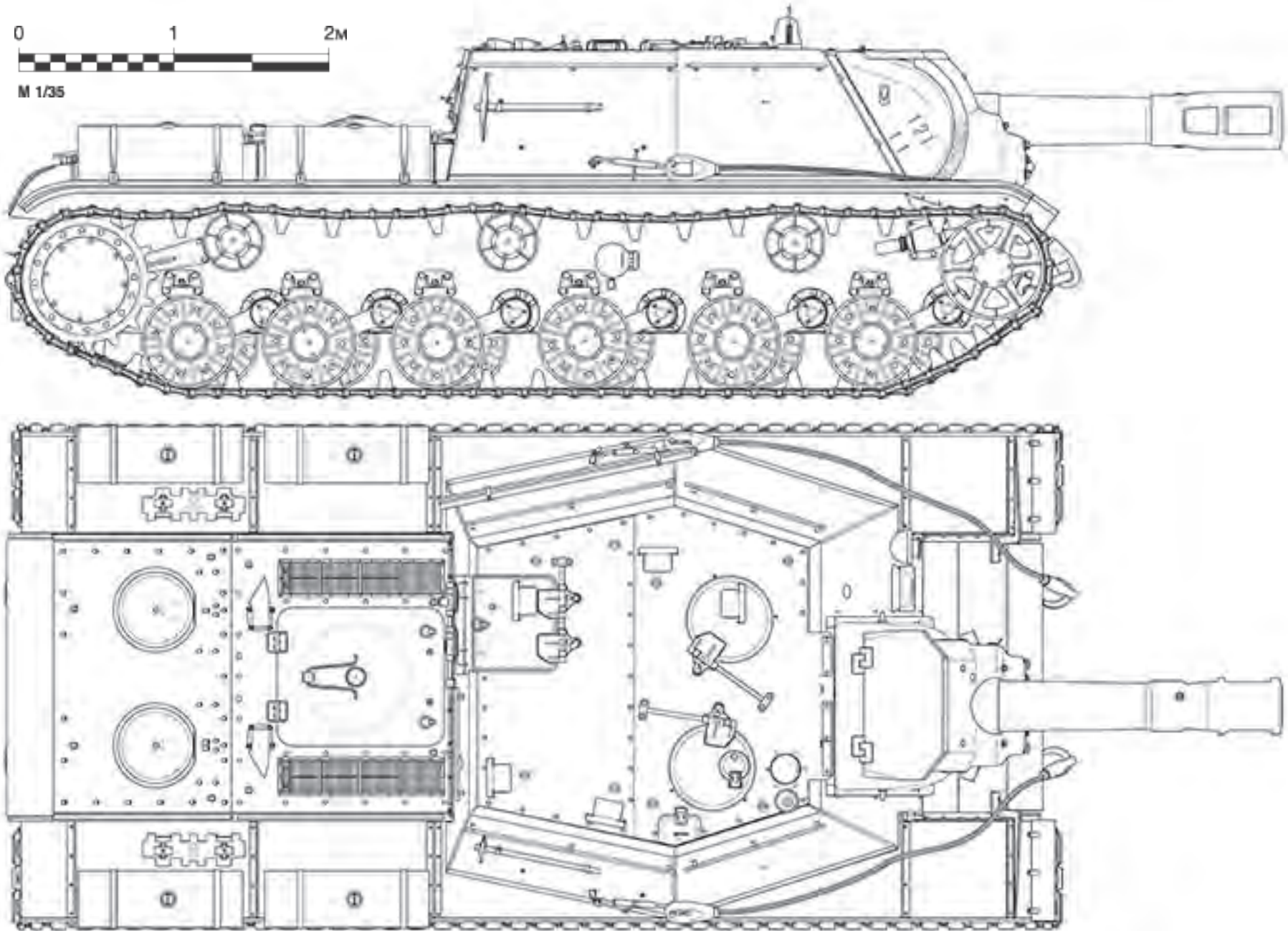
If any of these prototypes is accepted into the inventory, however, industry would face the problem of starting up an entirely new production line with all of the problems that entails, and those problems would be exacerbated by the wartime conditions. We cannot, therefore, expect a significant number of these machines to be produced in the near future.

The factory has an idea—supply a 203 mm howitzer that would be much lighter than the B-4 howitzer but would fire the same shell with a range of 8–10 km and would be based on the existing 152 mm gun-howitzer model 1937 (ML-20).

This howitzer, which would exhibit all the advantages of maneuverability and would be easy to mass-produce, would also have a sufficiently long range with the standard shell.[1]

In other words, Factory No. 172's design bureau decided to take a shortened B-4 howitzer barrel and mount it on the ML-20 gun-howitzer carriage. Unlike Factory No. 8's design bureau, which in October 1942 submitted only a conceptual design for a U-3 howitzer barrel on an ML-20 carriage, its competitors went much further. On May 14, 1942, the GAU's Artillery Committee issued a finding on the M-4 project that basically endorsed the idea. The first tests on the mortar took place from May 18 through 20, 1942, and involved an experimental carriage. A ballistic barrel made from the

[1] TsAMO RF, collection 81, series 12038, file No. 62, pp. 17–18.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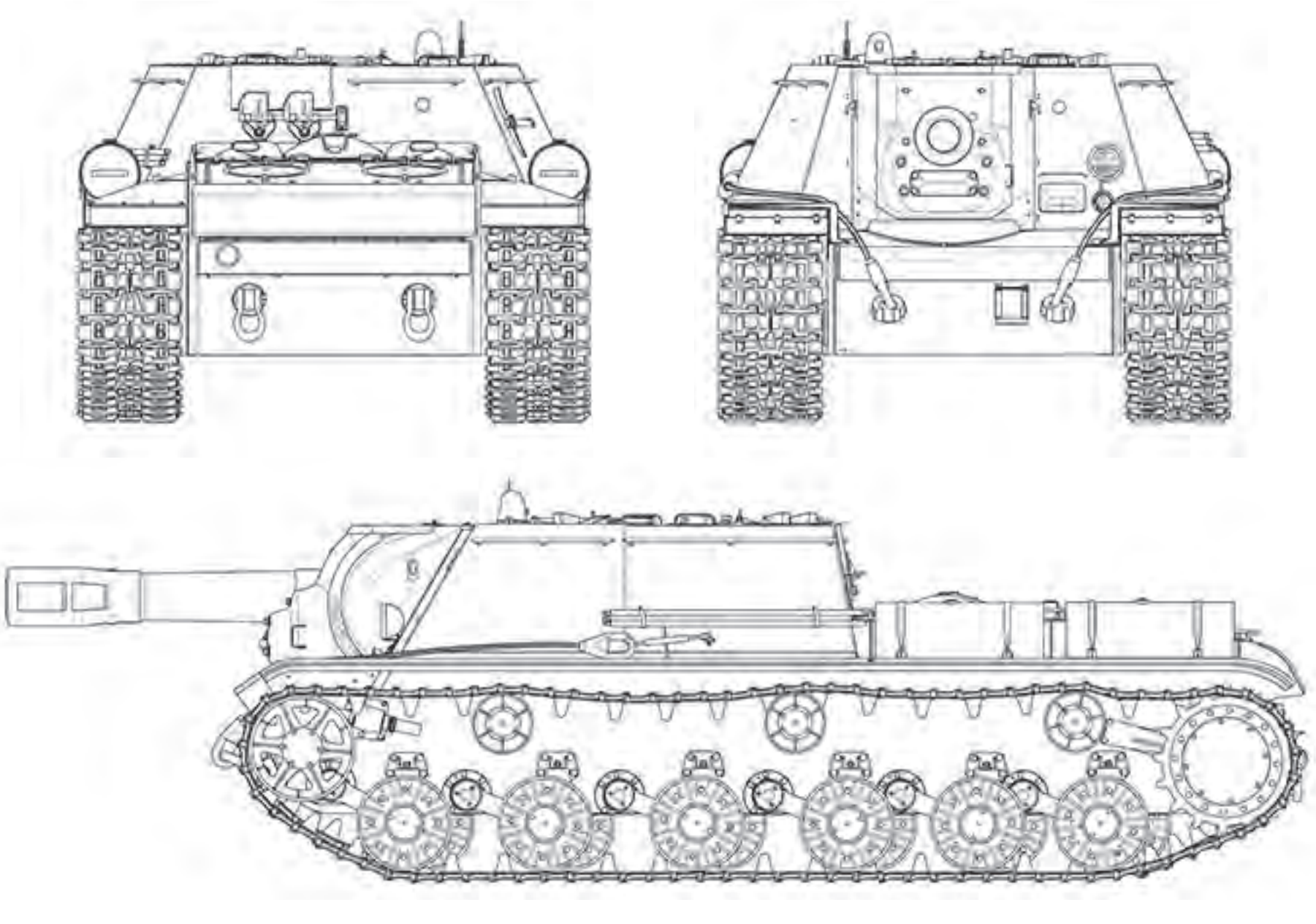
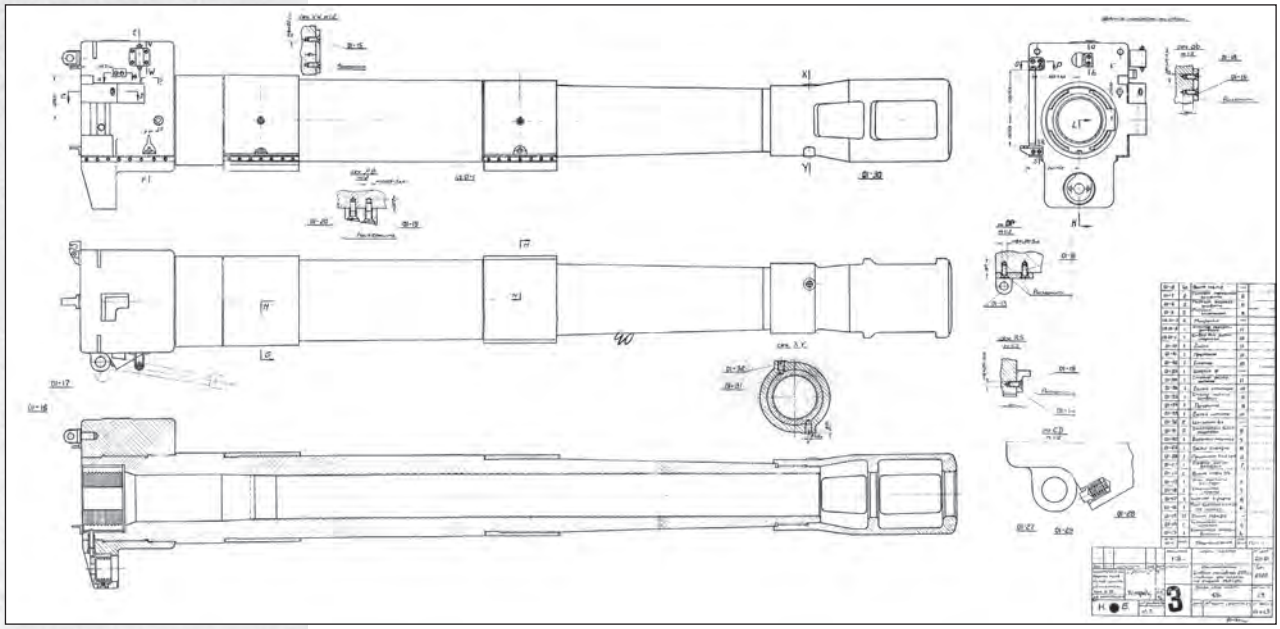


Reconstructed 1:35 scale drawing of the U-3 203 mm corps-level howitzer mounted on the KV-14.



Barrel of the U-3 203 mm corps-level howitzer that plans called for mounting on the KV-14 (TsAMO).

prototype M-40 203 mm howitzer's tube and the B-30 152 mm gun's breech mechanism was used for the test.

A small number of modifications were made to the ML-20 design for mounting the heavier and more powerful barrel. The top carriage was given a special fitting for attaching a purchase block and tackle for use in retracting the barrel for travel. The bottom carriage was given a limiter associated with the purchase block and tackle, also a small modification; and a trail was added to the design. The equilibrator was given a stronger spring, and the makeup of the SPT&A kit was altered somewhat.

A monobloc barrel was manufactured for the mortar in August 1942. The breech mechanism was taken from the B-4 howitzer with minor modifications. The tube was manufactured from scratch. The barrel was equipped with a massive slot-type muzzle brake to reduce recoil. The length of the barrel to the muzzle face was 3693 mm (18.2 calibers); with the muzzle brake added it was 4328 mm. For ammunition, the mortar used the normal shells for the B-4 203 mm howitzer. The shorter barrel reduced the muzzle velocity to 353 m/s.

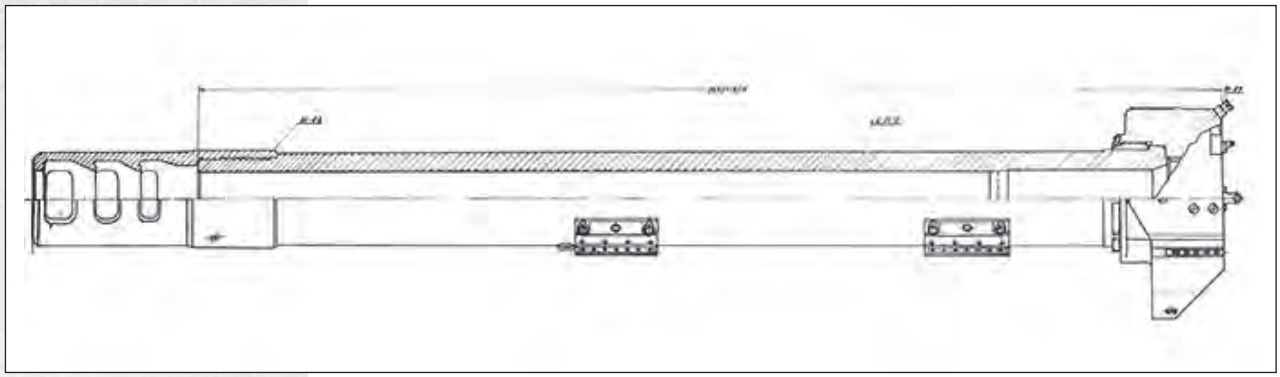
According to factory records, the M-4 mortar was developed to destroy field fortifications. The carriage enabled it to fire at angles from -2° to 65° and at ranges of 3 to 9.8 km. The M-4 weighed 8300 kg in travel position and 7500 kg when configured for combat, which exceeded the same figures for the 152 mm gun-howitzer by less than half a tonne.

The M-4 began factory testing with a monobloc barrel on August 25, 1942, and 71 rounds had been fired by September 18. It fired a total of about 100 rounds during testing. In addition, it underwent towing tests between

September 18 and October 21. In all, the M-4 traveled 400 km. No warping was detected during the tests. One defect did show up, but it was not due to design flaws. While climbing a slope, the prime mover towing the howitzer moved backwards and struck the left trail, bending the ammunition tray.

On November 5, 1940, the M-4 system was shipped to GAU's Gorokhovets Artillery Scientific and Technical Experimental Test Range (GANIOP)

M-4 203 mm in Factory No. 172's courtyard, 1942 (TsAMO).



M-4 203 mm mortar barrel (TsAMO).

M-4, ML-20, and A-19 guns on identical carriages (TsAMO).

(Ilyino Gorkovskaya Railroad Station) by order of GAU chief Col. Gen. Yakovlev. The technical documentation for the system accompanied it. The tests lasted from January 21 to March 13, 1943. During that time, the mortar fired 456 rounds and traveled 458 km over various types of snow-covered roads. The road tests were not without incident: while avoiding an oncoming vehicle on February 27, the Voroshilovets prime mover that was towing the mortar performed a maneuver that caused the M-4 to fall in a ditch, resulting in some damage.

Despite less-than-satisfactory accuracy and a number of flaws with the carriage, the test commission issued a positive finding on the gun on March 25, 1943:

When the defects noted above and indicated in this report are corrected, the M-4 203 mm mortar can be recommended for service with the Red Army.

The M-4 203 mm mortar is deserving of attention because it fires a powerful shell that can be effective against enemy fortifications, it is highly maneuverable, and it can be put into production quickly and rapidly manufactured in appropriate numbers for forces in the field.[2]

On June 12, 1943, Stalin signed State Defense Committee Decree No. 3564ss "On Preparation for Production of the M-4 203 mm Mortar." Factory No. 172 was to manufacture a batch consisting of four mortars for troop trials by September 1, 1943. Factory No. 172 manufactured the four mortars specified in the decree during September and October. One underwent extensive checkout testing between October 30 and November 10. A commission issued the following finding based on those tests:

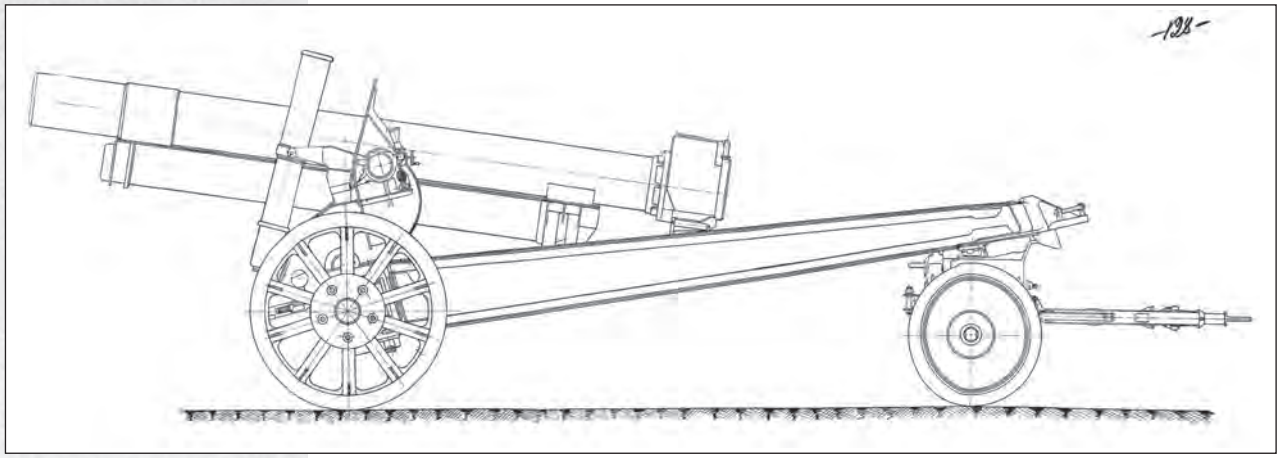
1. *The M-4 203 mm mortar No. 5/7557 successfully underwent extensive checkout testing during which it fired 207 rounds and traveled 275 km.*
2. *Based on the tests, the Commission believes that all four of the M-4 mortars that were manufactured by Factory No. 172 and underwent factory testing can be released for troop trials.*[3]

On November 25, the GAU Artillery Committee's chief decided that two M-4's would remain at the Gorokhovets Test Range and the other two systems would be transferred to the Gorokhovets Artillery Training Camp. Nevertheless, work on the mortar ground to a halt in early 1944. The M-4 suffered the unenviable fate of a prototype that did not make it into mass production.

Since things went well with development of the mortar, it was decided to use it as the gun for a self-propelled artillery system. This time, the work was not an initiative project. According to the records, the originator of the SP gun mounting the M-4 mortar was Maj. Gen. of A. A. Tolochkov of the Engineer Artillery Service, who at the time was chief of the experimental design sector of the Engineering Council of the People's Commissariat of Arms. OKB-172 coordinated with him on the preliminary specifications for

[2] TsAMO RF, collection 81, series 12038, file No. 233, p. 57.

[3] TsAMO RF, collection 81, series 12038, file No. 234, p. 59.

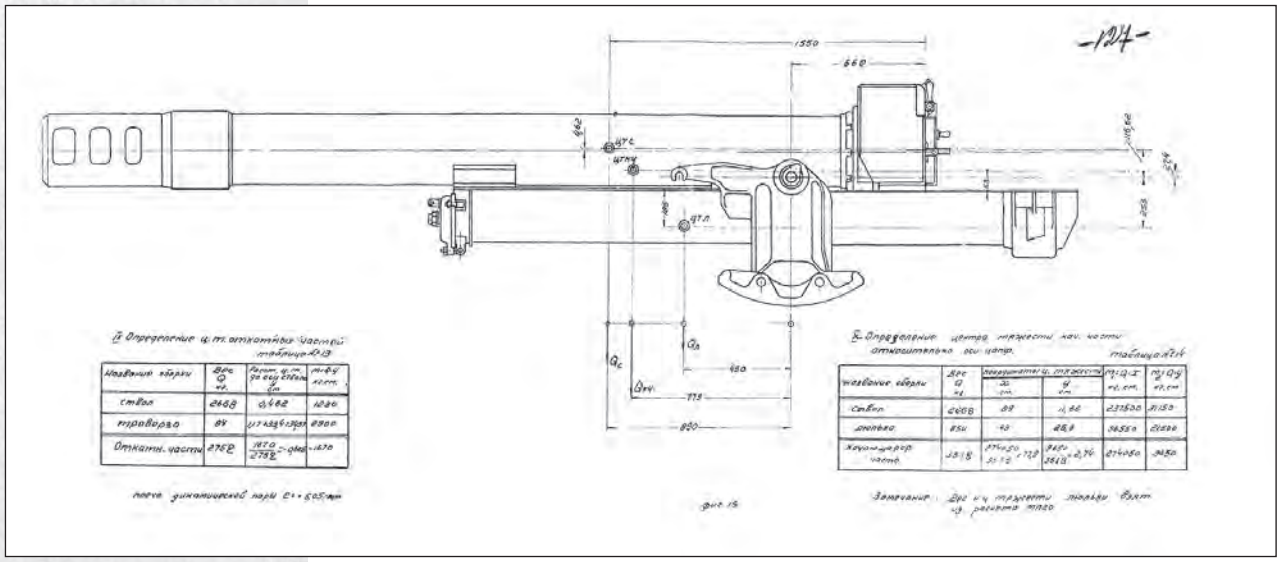


M-4 203 mm mortar in travel position (TsAMO).

the design. Exactly when the program to develop a heavy SP gun mounting the M-4 mortar got started is unclear. Judging by the dates on the project's technical documentation, the work was already underway in April 1943.

Satel, chairman of the Technical Committee of the People's Commissariat of Arms, and Lieut. Gen. Khokhlov, chairman of the GAU's Artillery Committee, were sent conceptual designs for two SP guns on May 12, 1943. The first was the SU-2-122, a twin-barreled M-30 122 mm howitzer mounted on a T-34 medium tank chassis. This huge double-barreled shotgun, which was supposed to be capable of firing salvos, required the T-34 chassis to be lengthened by one road wheel. Of greater interest to us, however, is the second design, which was assigned the factory designation

M-4 mortar tipping parts (TsAMO).

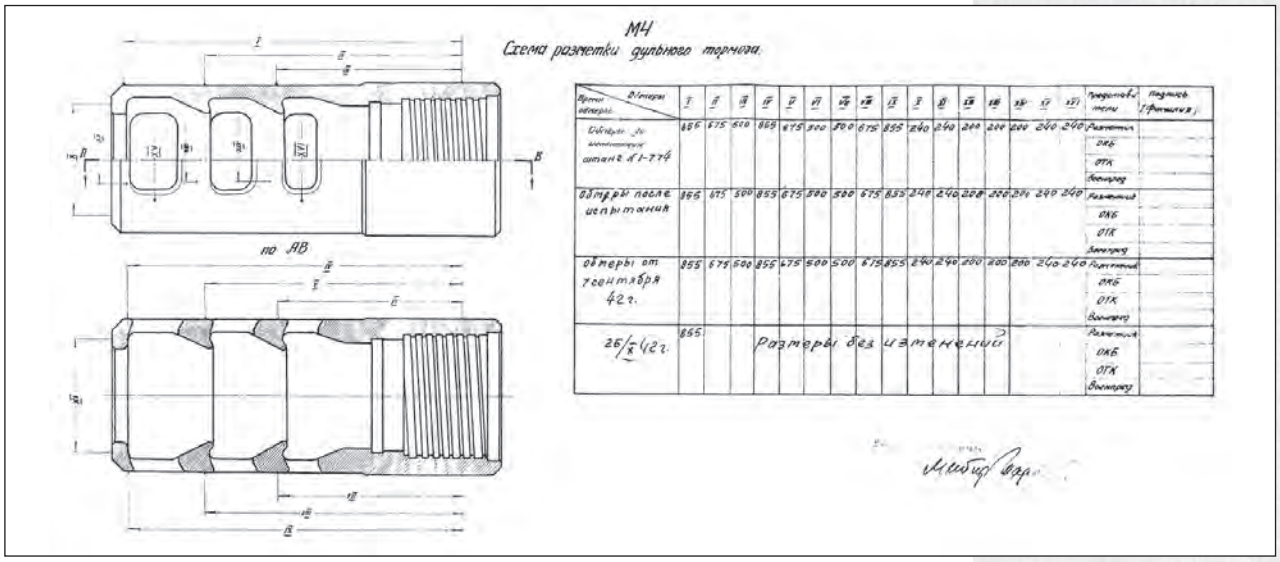


SU-203. According to its description, the following specifications guided the SU-203's development:

1. Design it along the lines of the KV-14;
2. Maximize the number of rounds it can carry;
3. Make it convenient for the crew to operate;
4. Simplify feeding and loading without requiring extensive effort and give it a rate of fire of approximately one round every 1—1.5 minutes;
5. Give the system together with its ammunition a weight of about 46 tonnes;
6. Make the standard telescopic sight mounted on the M-4 howitzer its main sight. For observation, use the PTK tank commander's panoramic periscope;
7. Armor thickness: glacis—70 mm, side—60 mm, top and sides 20—25 mm;
8. Secondary armament: antiaircraft machine gun. In addition, the armor must have small-arms ports with plugs.

The expression "along the lines of the KV-14" was highly appropriate for the SU-203, because A. F. Smirnov's team developed it (drawings for the SU-203 and the SU-2-122 show Smirnov as the project manager). The project retained the mantlet and fixed armor from the original SP gun project. Everything else was an entirely new SP gun based on the KV-1S chassis. Because the tasker for the project did not specify maximum use of the SU-152 superstructure design, the OKB-172's designers had freedom to maneuver. The result was an SP gun design that showed a great deal of thought had been given to the crew members' jobs.

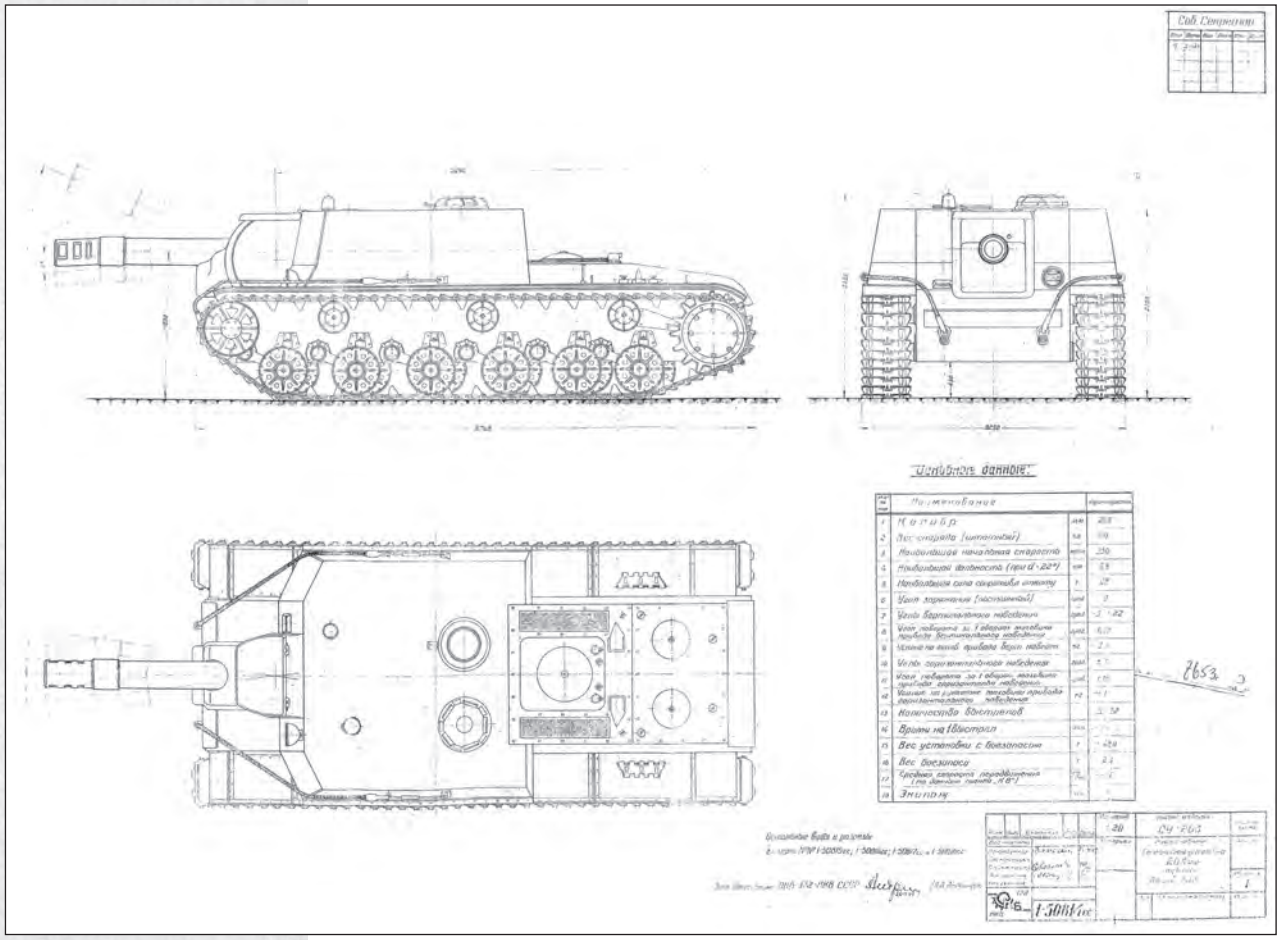
Dimensions of M-4 203 mm mortar muzzle brake (TsAMO).

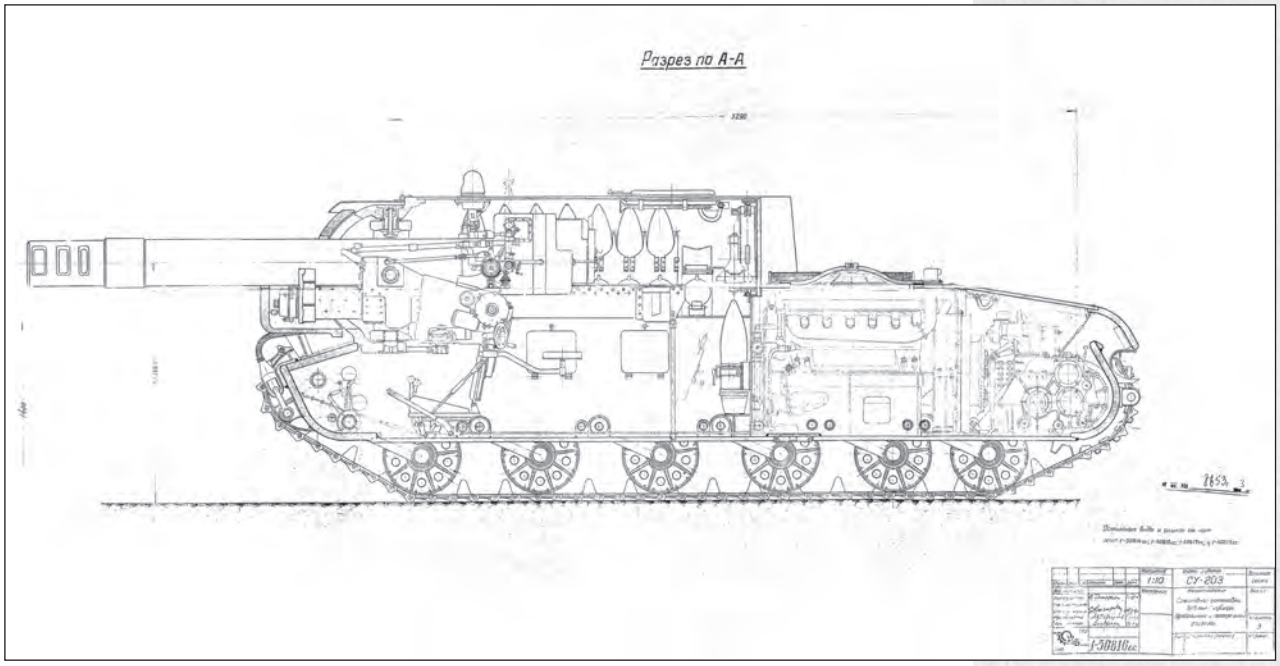


Because the M-4 mortar's laying mechanism left too little room for the driver-mechanic, his area was shifted to the right. To improve working conditions for the driver-mechanic, it was suggested that the gun mount be moved slightly to the left. However, it was considered possible that the driver-mechanic could be returned to his regular position, in which case it was proposed to modify the breech mechanism drive to make it more compact.

A simple solution was found for the problem of the commander's position, which was located just to the right of the gun in the SU-152—his function was combined with that of the gunner. A radio set was not included in the SU-203 on the principle that this made the idea of combining the functions of commander and gunner quite logical, especially since that did not reduce the crew size—it was given two loaders. The loader located on the left side of the gun enjoyed truly luxurious accommodations. He had a commander's cupola with five vision blocks taken from the KV-1S tank. The right-hand loader's spot was no less luxurious: he had a hatch with an integrated mount for the DT antiaircraft machine gun. The breechblock operator was given

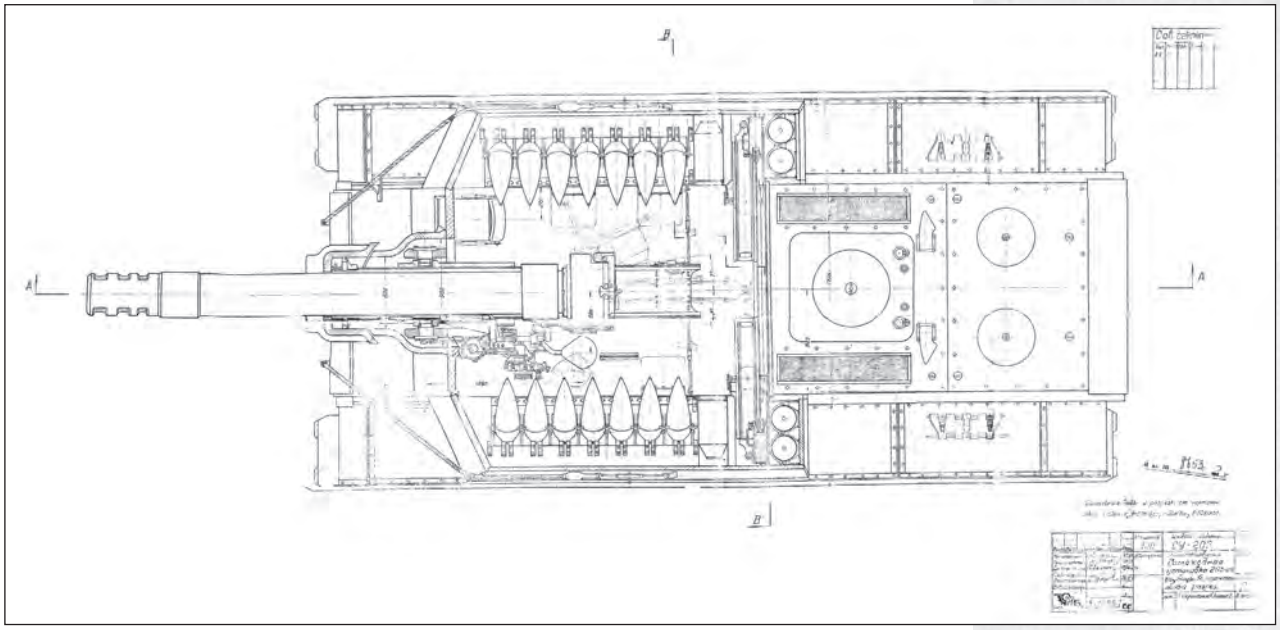
SU-203 203 mm self-propelled gun (TsAMO).





Cross-section of SU-203 SP gun (TsAMO).

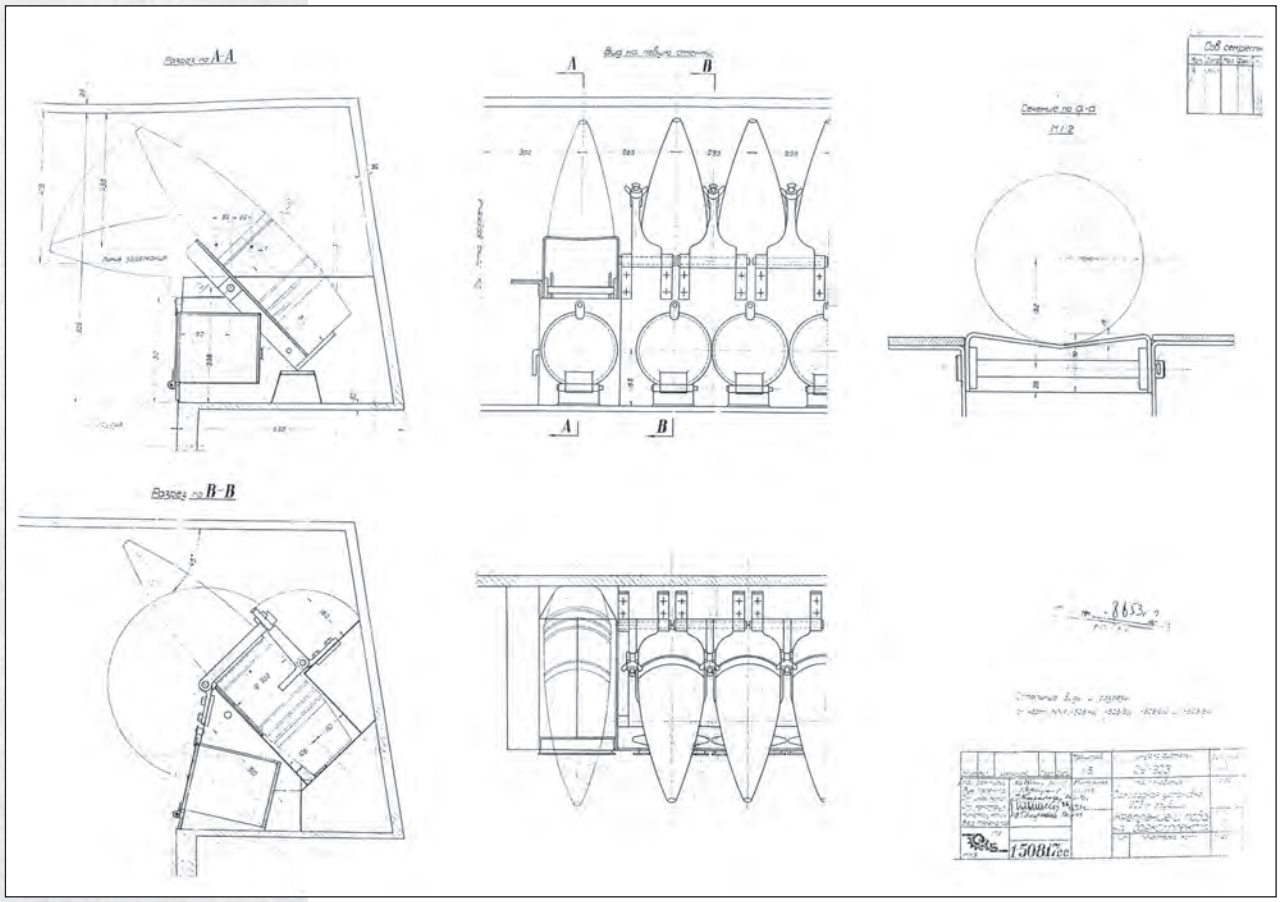
Sectional drawing of SU-203, top view (TsAMO).

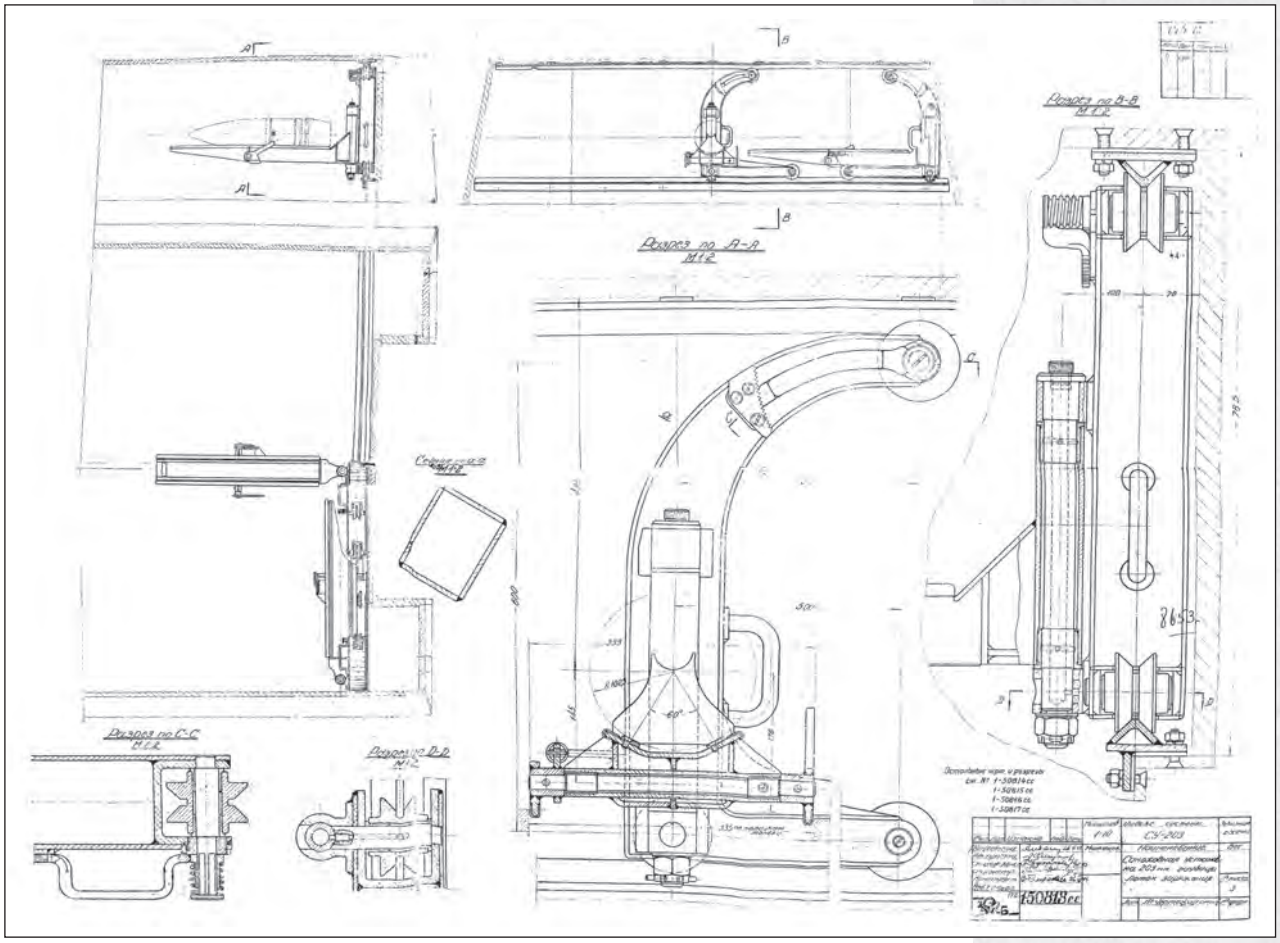


a PTK panoramic periscope. The commander had only an ST-10 telescopic sight coupled to the gun for use in firing from cover. Thus, the gunner was commander in name only.

The main group of 14 rounds was located in the sides (seven on each side), so the tanks on the right side had to be removed. A special mechanism was developed for removing the shells from the rack; their weight would have made them extremely difficult to remove without it. The outermost shell was taken during firing, and the next round rolled into the spot where it had been. The charges were located in individual canisters inserted in the ammunition racks. An additional two shells were located in recesses that extended outside the superstructure. Another two shells were placed in the reload trays as needed. These additional shells constituted secondary storage and needed to be transferred to the main storage rack as shells were removed from it. The dense placement of the ammunition meant the height of the SU-203's fighting compartment was just 10 cm higher than that of the SU-152. In addition to the ammunition, the increased height was required for the crane equipment (without which handling the 100 kg shells would have been

Shell placement inside the SU-203 (TsAMO).



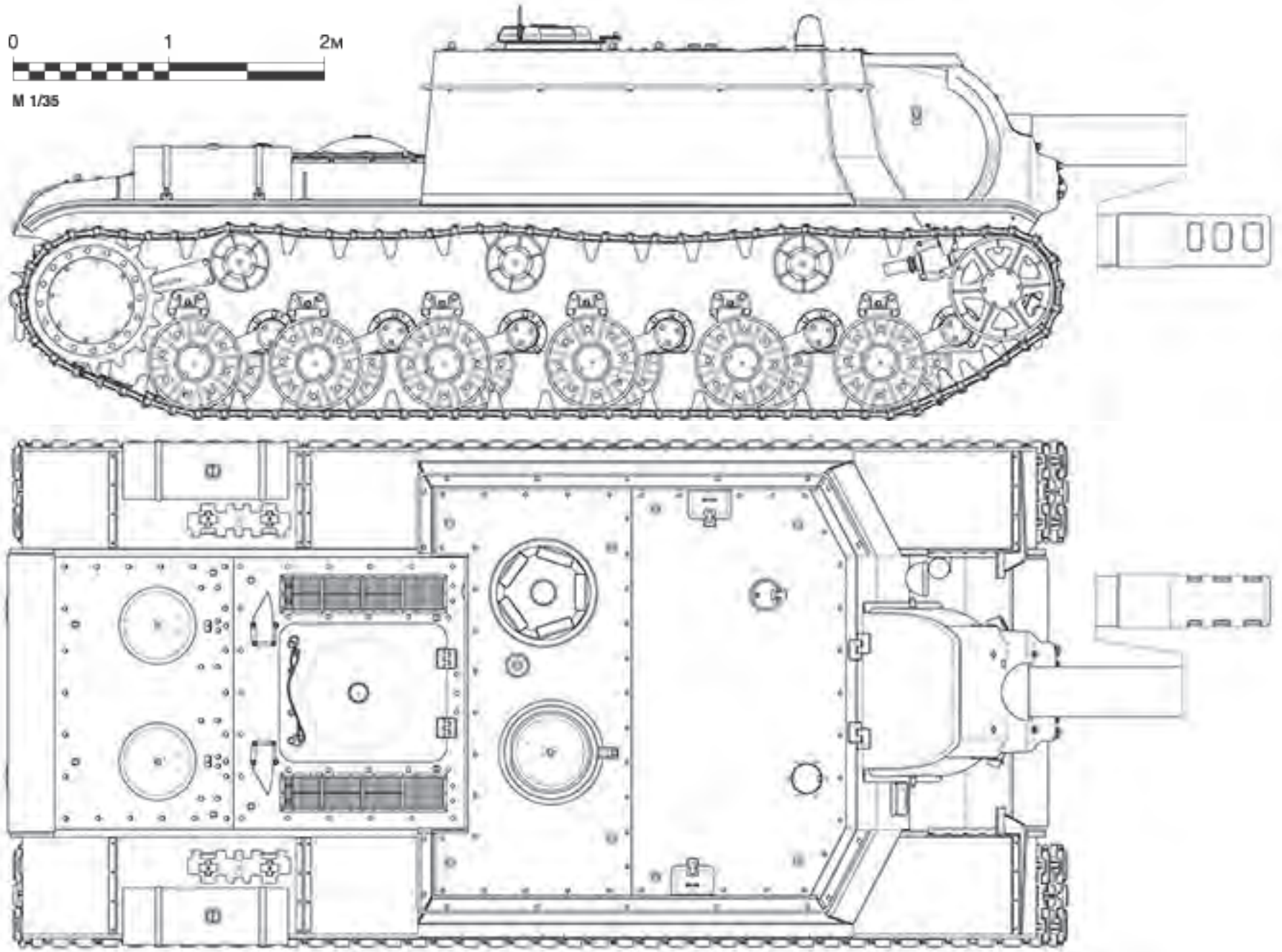


Crane that the SU-203 crew would use to load the gun (TsAMO).

extremely problematic). Smirnov's design team must be given its due; unlike the truly monstrous size and weight of the U-19, the SU-203 was as compact as possible and still had room to accommodate the crew in comfort.

The finding on the SU-203 project was approved on May 21, 1943. Unfortunately, it was not in the project's favor. There were no complaints about the SP gun's design as such; the problem lay elsewhere entirely. The main reason for the M-4's failure was the following:

The shell of the 203 mm self-propelled mortar submitted for review offers no firepower advantage over that of the 152 mm self-propelled gun-howitzer currently in the Red Army's inventory because the 152 mm projectile with its velocity of 600 m/s at impact penetrates a layer of concrete 1.4 m thick, and the 203 mm with its velocity of 350 m/s penetrates only 0.8 m; in addition, the rate of fire (theoretical—according to calculations) of the 203 мм mortar is 1.5 rounds per minute, whereas the practical rate of fire of the 152 mm SP gun-howitzer is 2.8 rounds per minute.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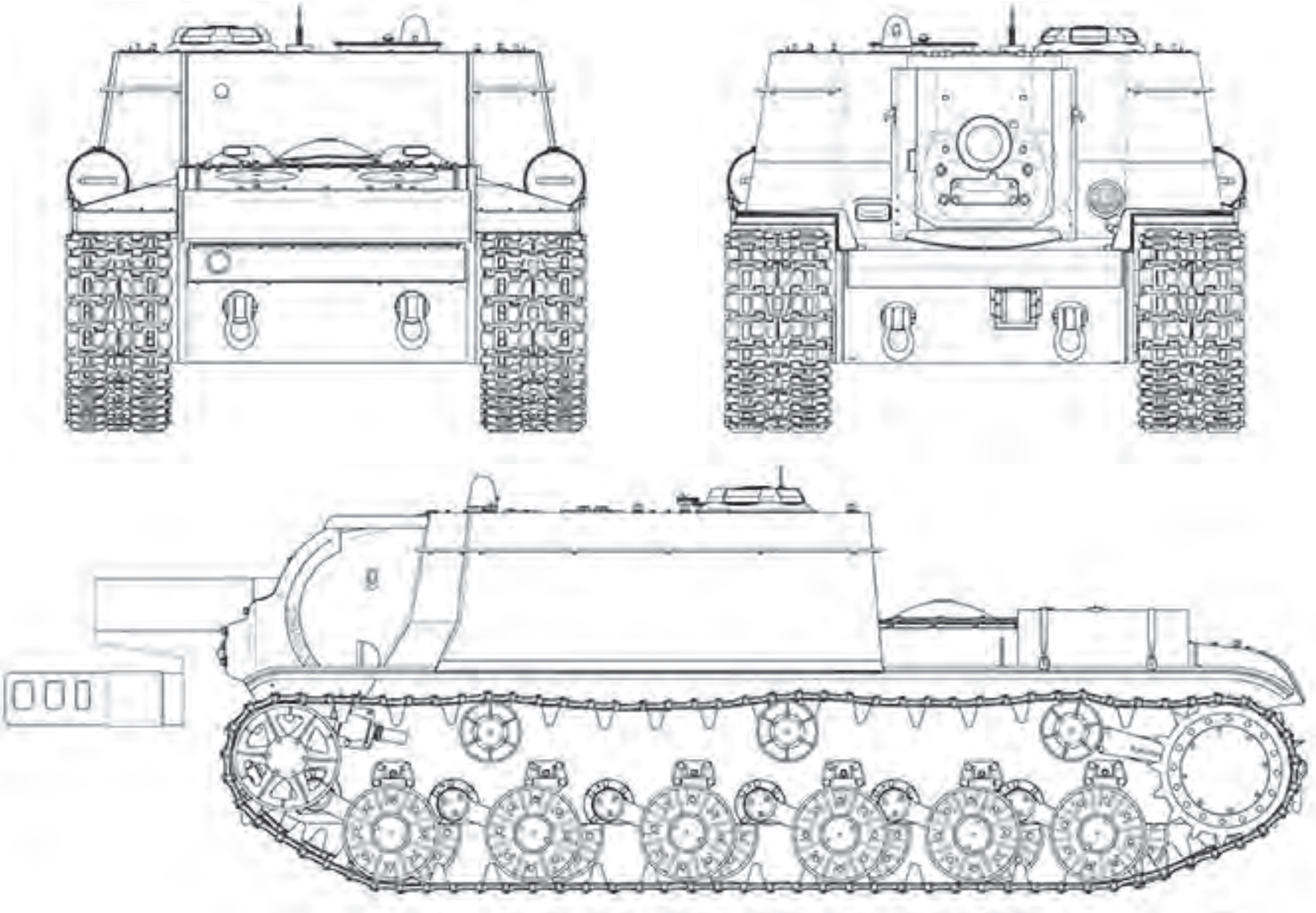


SU-203 SP gun, 1:35 scale drawing.

BL-39 203 mm howitzer during testing, spring 1942. This gun is the only one of its type not modified as a self-propelled version (TsAMO).

This will fully satisfy the requirement of the Field Service Regulations that prohibit the use of a large-caliber gun if a combat mission can be achieved with a smaller caliber gun.

Thus, the 203 mm self-propelled mortar should be considered a gun of the fourth type—a heavy, auxiliary-propelled gun.

For that, however, the following requirements must be met:

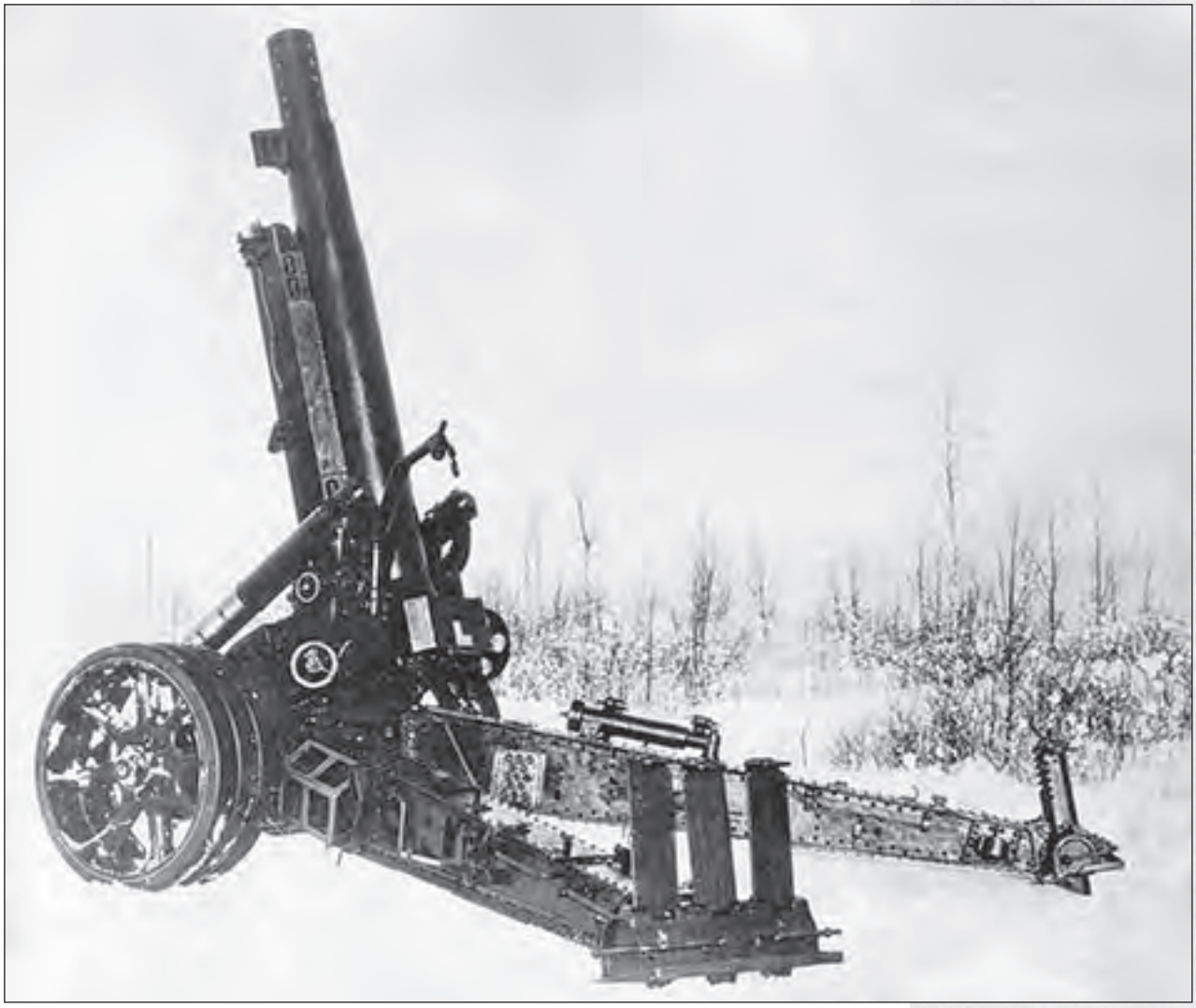
a) Remove the strong, elaborate mantlet;

b) Increase the elevation angle to 65°–70°.

Based on its review of the project, the Artillery Committee of the Main Artillery Directorate of the Red Army has come to the following conclusions:

1. *The 203 mm self-propelled gun must be considered a heavy, auxiliary-propelled gun.*
2. *The M-4 203 mm mortar is a low-power gun with low muzzle velocity and insufficient range.*

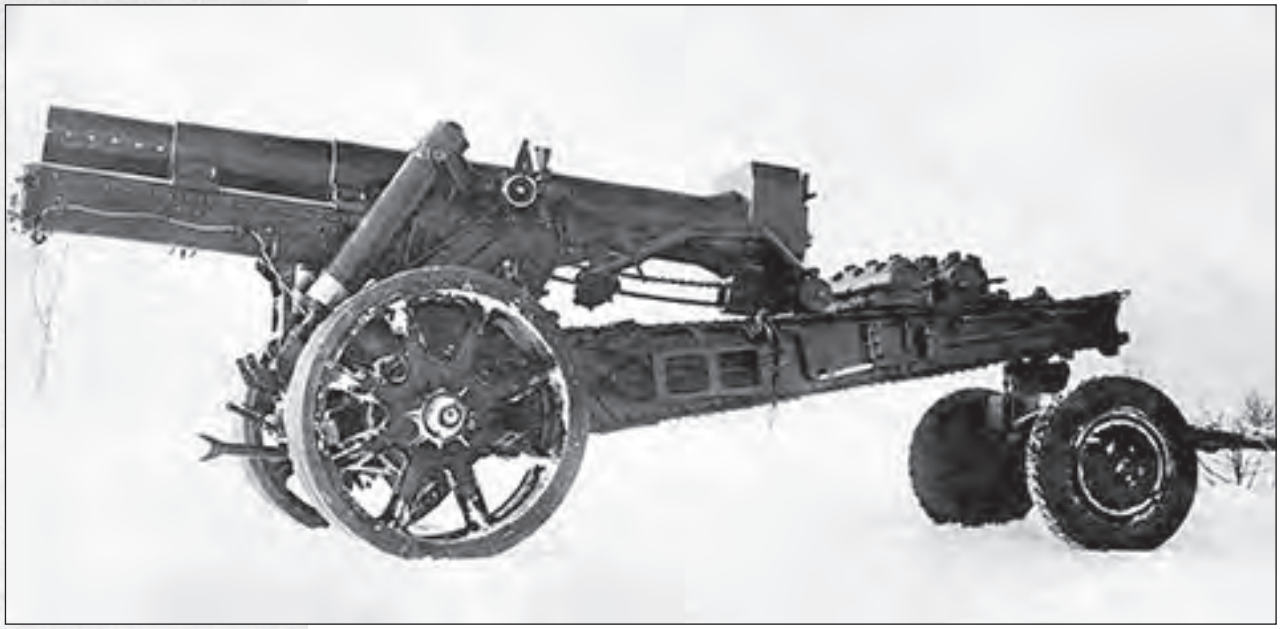
[4] TsAMO RF, collection 81, series 12063, file No. 11, pp. 104–105.



M-40 203 mm howitzer during testing, gun in firing position (TsAMO).

3. *The Artillery Committee believes it necessary to propose that OKB-172 develop the 203 mm howitzer model 1931 (B-4).*
4. *The OKB-172 of the People's Commissariat of Arms is to revise the design in order to eliminate the elaborate, strong mantlet and must limit itself to a light gun shield. Increase the elevation angle to 60–70°. The total weight of the system must not exceed the weight of the SU-152 152 mm self-propelled gun-howitzer, i.e., 45 tonnes.*[4]

Meanwhile, OKB-172 had two heavy corps-level 203 mm howitzers that used the same munitions as the B-4. One was the BL-39, which had been developed between 1938 and 1939 by the NKVD's Separate Technical Bureau (OTB) (which later became OKB-172). The NKVD's OTB was located in the



M-40 203 mm howitzer in travel position (TsAMO).

infamous Kresty Prison, and the gun's designator stood for nothing other than "Beria Lavrenty." This OTB was one of the infamous "sharashkas," R&D laboratories in the Soviet Gulag labor camp system where designers worked who had been sentenced to prison under various articles (primarily for subversive activities and as enemies of the people).

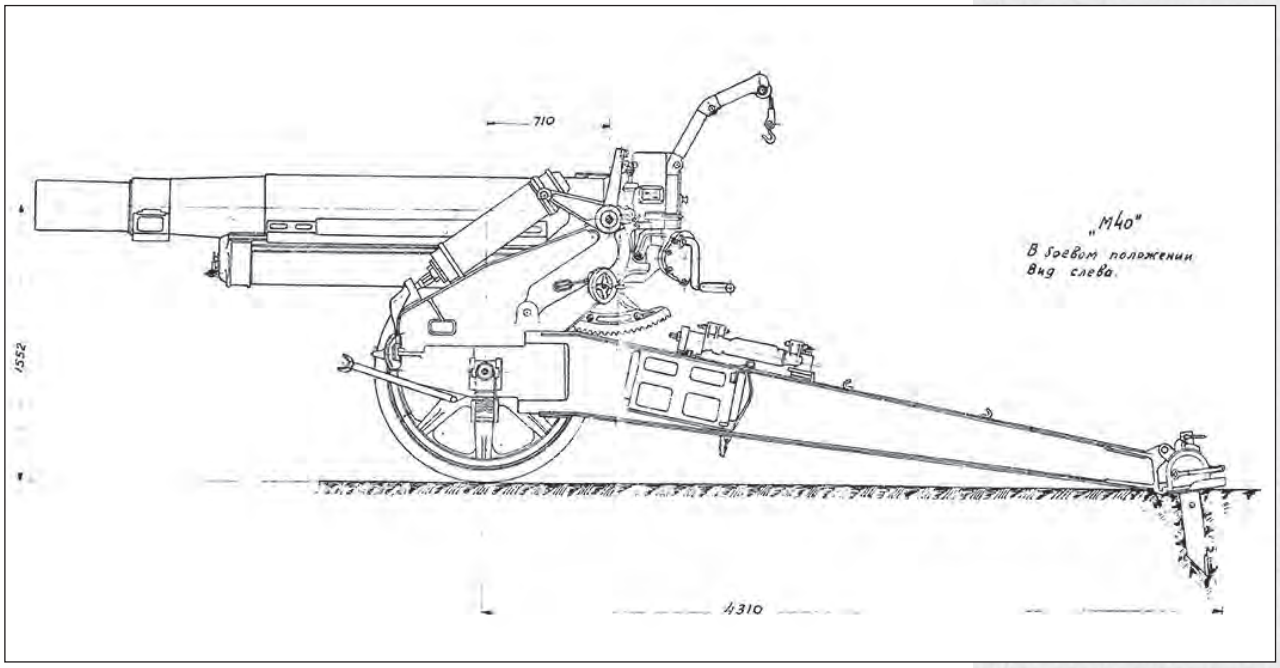
Between 1941 and 1942, the NKVD's OTB was evacuated to the city of Molotov (now named Perm), where it was renamed OKB-172. Work on the BL-39 continued, but now it was in competition with the M-40 corps-level heavy howitzer, which had been developed between 1938 and 1939 by Factory No. 172's design bureau. The BL-39 lost out in joint testing to the U-3, which, however, never went into production either.

The M-40 was also in an unenviable position. The howitzer could not pass proving-ground tests in 1940 because its wheels dug into the ground when it was fired. In 1942, therefore, the M-40 was considered, if not hopeless, at least a system that was being marginalized. The howitzer continued to be mentioned in correspondence dating from 1942, but on October 23, GAU chief Col. Gen. Yakovlev received a letter from the GAU's Artillery Committee that contained the following proposals:

1. Stop all work on the M-40 203 mm corps-level howitzer.
2. Compensation for actual costs based on the factory's accounting calculation as certified by GAU's regional engineer is within the contractual amount.[5]

Nevertheless, in the spring of 1943, the M-40 was the gun that Factory No. 172's design bureau used as the armament for its SP gun. The SP gun

[5] TsAMO RF, collection 81, series 12038, file No. 56, p. 247.



M-40 203 mm howitzer in fighting position (TsAMO).

assigned the factory designation M-17 was an ambitious project for the factory that had been approved by People's Commissar of Arms Ustinov. The design was submitted for review on June 5, 1943, i.e., two weeks after OKB-172's failure with the SU-203. Unfortunately, only a verbal description and engineering analysis of the gun remain.

The concept for the M-17 resembled the SU-203, and Factory No. 172 design bureau chief V. A. Ilyin headed up the effort to develop it. Minimal design changes to the KV-1S chassis were required, and the design made maximum use of parts from the SU-152's superstructure. The fixed mantlet, shield, and frame were taken unchanged from the production SP gun.

Unlike the SU-203, the M-17 was the same height as the SU-152: 2450 mm. The crew makeup remained the same, as did the radio equipment, superstructure hatches, and vision devices. To achieve a 3° angle of depression, the fighting compartment roof was designed to slant forward at the same angle. Also, to achieve the needed fighting compartment size, the sides were extended to the full width of the vehicle in the rear. The fuel tank was increased in size, and the second tank, which was located along the left wall of the fighting compartment, was made smaller. In order to reduce the M-17's combat weight, the thickness of the mantlet was reduced to 65 mm, the front plate of the superstructure to 60 mm, and the superstructure's sides and rear to 45 mm. That was supposed to make it weigh 45.8 tonnes. Another version under consideration retained the plate thickness of the SU-152's superstructure, giving it a combat weight of 46.8 tonnes.

The M-40 howitzer was chosen as the gun because its barrel was more suitable for use in the M-17. The design called for the M-40 barrel to be mounted on the ML-20S carriage, which underwent minimal modification. In addition, the M-40 barrel received a dual-chamber muzzle brake that was more than a meter long. The T-5 sight was used for direct laying.

According to the design, the basic load was to consist of 16 rounds. Shells were located in two magazines on the left side of the superstructure—nine in the rear and seven in the front. Charges were to be located in two iron boxes, one of which was located under the system, and the other in the right corner of the fighting compartment. The basic load also included 21 drums for the PPSh submachine gun and 25 F-1 hand grenades.

Following the design review, Eng. Col. Alymov, chief of the Self-Propelled Artillery Office of the Red Army's Main Armor Directorate (USA GBTU KA), and Eng. Lt. Col. Kovalev, chief of the 3rd Department of the USA GBTU KA, prepared a report that was dated June 25, 1943:

On review of the design, it was determined that:

1. *Manufacture of the 203 mm self-propelled gun based on assemblies from the SU-152 self-propelled gun currently in production is quite feasible.*
2. *The maximum use of assemblies from the mass-produced SU-152 self-propelled gun will enable inexpensive production of the proposed self-propelled gun to begin in the near future.*
3. *To reduce the total weight of the entire system, the armor thickness may be reduced in the M-17 design.*
4. *The basic load of the M-17 contains four fewer rounds than the SU-152 (16 rounds vice 20 in the SU-152), which is important because the 203 mm round is much more powerful than the 152 mm round.*
5. *Rate of fire—one round in 80 seconds can be considered acceptable for this caliber.*
6. *The placement of the ammunition in the fighting compartment and the ease with which a shell is loaded and rammed are well planned, but a practical test on a prototype is needed.*
7. *The total weight of 45.8 tonnes for this chassis is at the limit, and the prototype must not exceed it under any circumstances.*

Conclusions and suggestions

1. *The M-17 203 mm self-propelled gun is more powerful than the 152-millimeter gun.*
2. *For destroying enemy defensive fortifications, it would be advisable to have self-propelled guns armed with 203 mm guns in addition to SU-152's.*
3. *The weight of the M-17 self-propelled gun must not exceed the weight of the SU-152.*
4. *To verify the feasibility of using the 203 mm gun for self-propelled guns, I believe it advisable to build a prototype vehicle using Factory No. 172's design, incorporating remarks by USA GBTU KA, and submit it for testing by GBTU and GAU so that a final decision can be made.*[6]

[6] TsAMO RF, collection 38, series 11369, file No. 106, pp. 12–13.

These findings appeared to greenlight the project, and an SP assault gun with a 203 mm howitzer would finally take shape in metal. Or so they thought in the Self-Propelled Artillery Office—the artillerymen held an entirely different opinion. The main role of the M-17 was destruction of enemy fortifications, but some nuances emerged. Calculations for penetration by the M-40 howitzer's shell revealed that at a range of 2000 meters it was 4% better than the ML-20. The two rounds were equal at 1000 meters, and the M-40 was 6% better at 200 meters! And those were the ranges from which concrete bunkers would be fired on. Thus, the rationale behind the M-17 was called into question, as reflected in a letter from the GAU's Artillery Committee on July 26, 1943:

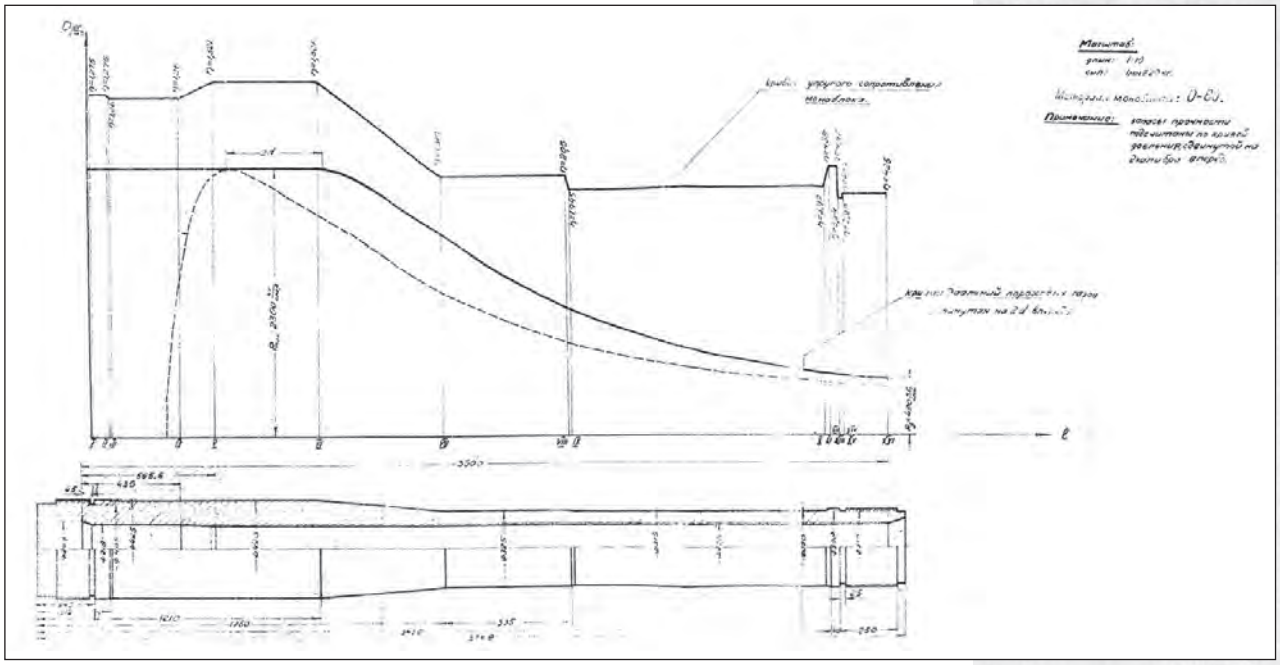
<...>

The advantage is negligible and does not justify bringing a new system into the inventory.

The concrete-piercing action of the projectile of both the 152 mm gun-howitzer and the M-40 203 mm howitzer is insufficient to destroy strong reinforced concrete structures. Achievement of this mission may only be possible with the B-4 203 mm howitzer model 1931 and larger calibers.

If the high-explosive effect is assessed, experience gained from the war shows that a single direct hit by a 152 mm shell is enough to destroy the strongest enemy earth-and-timber emplacement with seven layers, and the explosive action of the 203 mm shell is more than needed.

Engineering analysis of M-40 howitzer barrel planned for mounting on the M-17 SP gun (TsAMO).



V. A. Ilyin, Deputy Chief Designer of Factory No. 172's design bureau. He was involved in designing a number of towed artillery pieces and also oversaw SP gun development programs at Factory No. 172.

Therefore, the 152 mm gun-howitzer fully achieves its missions and meets the requirements of the Field Service Regulations that prohibit use of larger caliber guns when a tactical objective can be achieved with a smaller caliber.

The heavy 203 mm howitzer can be an auxiliary-propelled gun intended for powerful fire support of infantry and motorized units.

Since these weapons primarily fire from cover far from the forward edge of the battle area, their armor can be limited to light frontal and side plates for protecting the gun crew against shrapnel.

This system should permit high-trajectory fire, i.e., fire at angles of 60°–70°.

Therefore, the auxiliary-propelled gun is a conventional field gun carriage capable of moving under its own power.

The weight improvement resulting from removal of armor made it possible to mount a more powerful gun.

The large-caliber self-propelled assault gun is assigned to destroy field fortifications at short range.

However, since a direct hit on a fortified position requires more than one shot, and that as quickly as possible, i.e., at a high rate of fire, the advantage falls to the 152 mm self-propelled gun howitzer, which has a practical rate of fire of two rounds per minute, as opposed to the 203 mm self-propelled howitzer's theoretical rate of fire of one round in 80 seconds.

To summarize, the GAU's Artillery Committee has come to the following conclusion:

1. *The M-17 203 mm self-propelled howitzer's firepower and shell offer no advantages over the SU-152 152 mm gun-howitzer in service with the Red Army.*
2. *The GAU's Artillery Committee considers it inadvisable to manufacture a prototype of the M-17 203 mm howitzer and continue work on the design.*
3. *The GAU's Artillery Committee believes it necessary to suggest that Factory No. 172 of the People's Commissariat of Arms develop a design for the B-4 203 mm howitzer model 1931 (consideration given to mounting the BR-2 152 mm gun model 1935).*

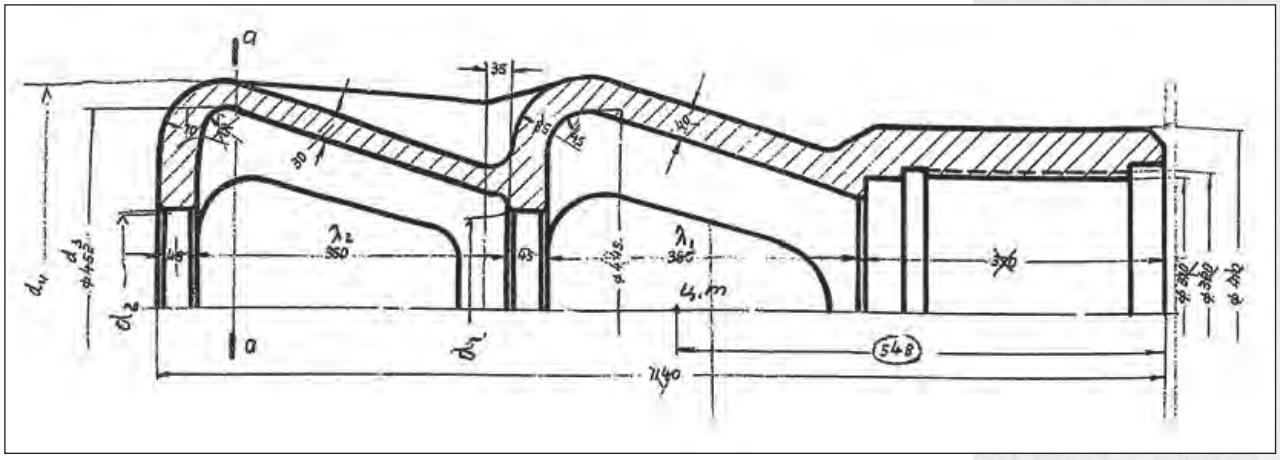
The project design should eliminate the powerful, all-round armor and limit itself to a light gun shield.

Increase the elevation angle to 60–70°. The total weight of the system must not exceed that of the SU-152 152 mm self-propelled gun-howitzer, i.e., 45 tonnes.[7]

E. A. Satel, chairman of the Technical Council of the People's Commissariat of Arms, expressed the same opinion in his letter of July 28, 1943:

After analyzing the above, the Technical Council has concluded that the M-17 203 mm self-propelled gun proposed by the factory in its engineering design has no advantages in terms of its firepower and the effectiveness of its shell over the SU-152 152 mm self-propelled gun-howitzer currently in service with the Red Army. Therefore, there is nothing to justify bringing the new system into the inventory.

[7] TsAMO RF, collection 81, series 12063, file No. 11, p. 152.



Engineering analysis of the M-17 SP gun's muzzle brake (TsAMO).

The Technical Committee of the People's Commissariat of Arms hereby denies approval of the engineering design of the M-17 203 mm self-propelled gun forwarded with No. 2424 for development of engineering drawings and manufacture of a prototype.

The Committee proposes that work on development of the M-17 203 mm self-propelled gun with the ballistics of the experimental M-40 cease.

At the same time, given the Red Army's requirement for a self-propelled gun armed with a more powerful cannon than the ML-20 152 mm gun-howitzer intended for destroying enemy high-strength reinforced defensive fortifications, I suggest exploring the possibility of developing the 203 mm howitzer model 1931 (with consideration given to the possibility of mounting the BR-2 152 mm gun model 1935), based on the requirement set forth in Artillery Committee finding No. 829360s.

Submit a conceptual design for approval with a detailed calculation of the stability of the self-propelled howitzer during firing by September 20 to the Technical Council of the People's Commissariat of Arms, the GAU's Artillery Committee, and the Self-Propelled Artillery Office of the Red Army's Main Armor Directorate.[8]

The M-17 was the next-to-last project that involved mounting the 203 mm howitzer in an enclosed superstructure on either the SU-152 chassis or the later ISU-152. The Central Artillery Design Bureau (TsAKB, in Kalingrad, now Korolev) was the last organization to work on a similar project. In October 1943, it developed an enclosed SP gun that would mount either a 152 mm gun with the ballistics of the BR-2 or a 203 mm howitzer with the ballistics of the B-4. The work took place under the S-51 project, but it went no further than the conceptual stage.

After that, the design effort proceeded along two lines. According to the requirements of the Technical Council of the People's Commissariat of Arms, work began on designs for an open auxiliary-powered system mounting

[8] TsAMO RF, collection 81, series 12063, file No. 11, pp. 164–165.

the B-4 203 mm heavy howitzer (this system will be discussed in the next chapter). Attempts to mount a more powerful system on the SU-152 without changing its superstructure continued.

It should be noted that work to install a system other than the ML-20 had begun in the spring of 1943. As mentioned above, the experimental projects involving the SU-152 included mention of installation of an A-19 122 mm corps-level gun-howitzer in an SP gun. The GAU's Artillery Committee authorized the work, and the Chelyabinsk Kirov Factory and Factory No. 172 were to carry it out. By April 29, 1943, the Chelyabinsk Kirov Factory had received one A-19 system, and work was underway to install it and develop the ammunition rack. A prototype SU-152 mounting the A-19 gun was expected by May 10, but work stalled for various reasons.

Meanwhile, in the summer of 1943 the Red Army came face-to-face with an opponent more formidable than the Tiger. Among the new armored vehicles employed by the Germans on the Kursk Salient, the 8.8 cm PaK 43/2 Sfl L/71 Panzerjäger Tiger (P) SP gun, better known as the "Ferdinand," stood out. The glacis and superstructure of the heavy German tank destroyer

The German Ferdinand heavy tank destroyer captured on the Kursk Salient.
This vehicle forced the GAU and the GABTU to change their approach to artillery and armored vehicle development for the second time in 1943 (TsAMO).

boasted armor 200 mm thick, which meant it could survive fire even from corps-level artillery.

To say that the Soviet military took note of the Ferdinand greatly understates their reaction. The appearance on the front of this vehicle, which had had a production run of 90 units, sparked a number of projects. Suffice it to say that the "Object 701" heavy tank (the future IS-4), for which specifications were developed in November 1943, was created specifically to counter the Ferdinand. Work on the D-25 122 mm tank gun was also related to Ferdinand Porsche's creation, although, in all fairness, development of that gun had begun earlier.

The M75 107 mm antitank gun reappeared among a list of tank, antitank, and self-propelled artillery projects dated September 15, 1943. One reason for the revival of that project, which had been abandoned in 1942, was that the gun was based on the ML-20 gun-howitzer carriage. It was theoretically possible that the idea of putting the M75 on a self-propelled vehicle, which had been buried in the summer of 1941, might have a chance at revival two years later, especially since targets worthy of it had appeared. However, the return to the 107 mm antitank gun project was very short-lived. In the same letter that mentioned the M75, GAU Artillery Committee chief Maj. Gen. Khokhlov suggested dropping a number of projects and replacing them with more promising ones:

<...>

Work should stop on other projects in this group for the following reasons:

1. *The ZIS-3 76 mm antitank gun with a muzzle velocity of 850 m/s differs little from the ZIS-2 57 mm antitank gun in terms of its armor-piercing effect.*
2. *Upgrading the F-34 to a muzzle velocity of 850 m/s would require a new tank turret. A new tank turret would make it possible to mount an 85 mm tank gun that would be more powerful than an upgraded F-34 76 mm gun.*
3. *The 85 mm, with its muzzle velocity of 1000–1050 m/s, would have almost the same armor-piercing effect as the D-25 122 mm gun. It would be advantageous to put the latter gun into production as it would enable a more rapid resolution of the problem, and because the prospects for increasing the power of the 122 mm are better. In addition, an 85 mm shell at that velocity and against thick armor would be less effective and durable than a 122 mm at the same velocity.*
4. *Because the M75 107 mm gun, with a muzzle velocity of 1020 m/s, is far from being finished, and because no ammunition is being manufactured for it, it would be better to work on the more powerful 122 mm gun with a muzzle velocity of 1000 m/s.*

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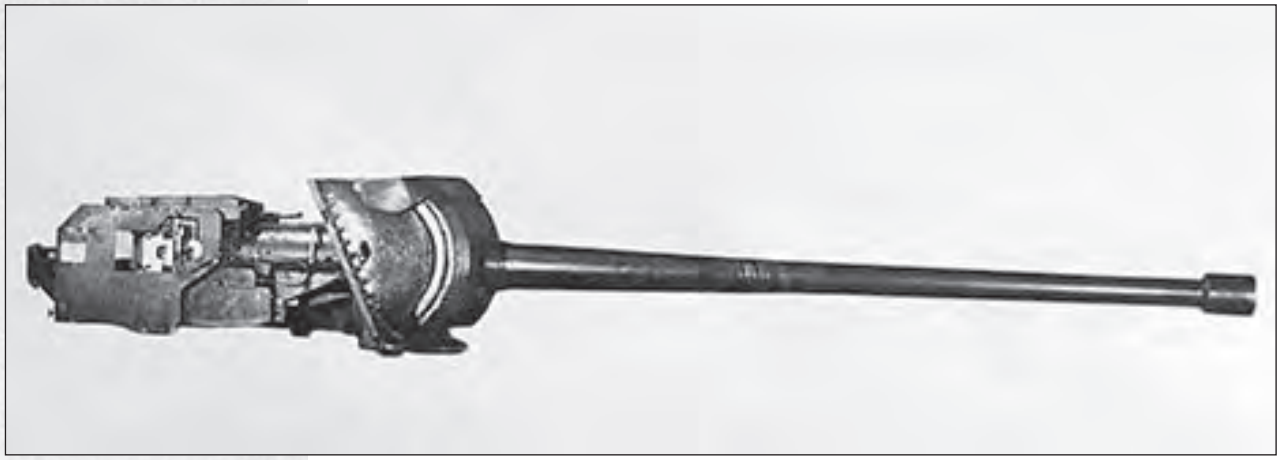


S-26-1 122 mm SP gun developed by TsAKB as part of the program to counter Germany's menagerie of weapons (TsAMO).

The Artillery Committee stresses that, of all of the projects it has approved, the following should be given priority:

1. *The upgrade of the F-34 76 mm tank gun chambered for the 76 mm antiaircraft gun model 1931.*
2. *The upgrade of the D-5 tank gun to give it a muzzle velocity of 900 m/s.*
3. *The upgrade of the KS-1 85 mm antiaircraft gun.*
4. *Refinement of the D-25 122 mm tank gun.*

Production of these guns can begin quickly to bring our tank guns to the level of similar guns in the enemy's inventory.

The remaining projects are of lower priority, and work on them must not come at the expense of the higher priority projects listed above.

The Artillery Committee also believes a project not mentioned by the Technical Council of the People's Commissariat of Arms is a top priority—the completion of work to mount the 122 mm gun model 1931 on the M-30 122 mm howitzer carriage underway at Factory No. 9 under the designation D-2.

For its part, the Artillery Committee proposes the following as high-priority projects:

1. *Manufacture of a 122 mm self-propelled gun with a muzzle velocity of 1000 m/s for a projectile weighing 25 kg with armor penetration of 200 mm at a range of 1000 m.*
2. *Manufacture of the D-25 122 mm tank gun with a sliding wedge breechblock as a more suitable gun for the armored forces.*
3. *Refinement of the 25 mm antitank gun designed by Comrade Sidorenko of the Artillery Academy and the ChK 37 mm antitank gun as more powerful antitank guns.*
4. *Manufacture of the 37 mm automatic antiaircraft gun on the SU-76 vehicle as a mobile air defense weapon for tank and mechanized troops.*[9]

Thus, instead of reviving the idea of using a 107 mm antitank gun, it was decided to develop a new gun based on the A-19 122 mm gun. That was

approved at a meeting of the Technical Council of the People's Commissariat of Arms and the GAU's Artillery Committee held that same day—September 15, 1943.

On September 24, the chairman of the Technical Council of the People's Commissariat of Arms sent a letter to TsAKB chief V. G. Grabin:

By the decision of the People's Commissar of Arms and the Chief of the Main Artillery Directorate of the Red Army, you are hereby required to begin development of a 122 mm tank gun and self-propelled gun with a muzzle velocity of 1000 m/s for a projectile weighing 25 kg.

You should submit the conceptual design for the gun by October 10, paying particular attention to the development of a ballistic solution and barrel for the gun.

At the same time you submit the conceptual design, send the People's Commissariat of Arms and the Artillery Committee your draft of the operational requirement for the gun.

The concept is to mount this 122 mm gun on the chassis of a SU-152 122-millimeter self-propelled gun and on the T-34 tank chassis; the latter case will be a self-propelled gun with relatively light armor and will be open at the top. The concept for the 122 mm tank gun is to mount it on an IS tank with specially enhanced armor. The conceptual design should clarify outstanding questions concerning the possibility of mounting this gun on these chassis. [10]

A similar letter went that same day to A. I. Nekhovsky, director of Factory No. 172, and Col. N. A. Ivanov, chief of OKB-172. It called for the joint development of a gun with similar characteristics by Factory No. 172's design bureau and OKB-172; the conceptual design was expected by October 20. The operational requirement for signing the gun was drafted three days later and approved on October 4 by the chief of the GAU's Artillery Committee:

I. Role and mission

1. *The 122 mm tank and heavy self-propelled guns are intended for arming heavy tanks (like the IS) and self-propelled guns manufactured using assemblies from heavy tank chassis.*
2. *The chief fire mission of the 122 mm heavy gun is the destruction of heavy enemy tanks and self-propelled guns (with armor up to 200 mm) at ranges of 1000–1500 meters and the destruction of the armored covers of concrete bunkers and armored embrasures.*

The gun is also intended for destroying enemy personnel and artillery.

II Ballistic data.

3. *The 122 mm tank and self-propelled guns must have the following ballistics:*
   - *a. Caliber* — *122 mm*
   - *b. Projectile weight* — *25 kg*

[9] TsAMO RF, collection 81, series 12063, file No. 10, pp. 50–52.

[10] TsAMO RF, collection 81, series 12063, file No. 10, p. 55.

c. Muzzle velocity	*1000 m/s (for an armor-piercing shell)*
d. Charge density	*no more than 0.75*
e. Powder grade	*22/1 or 24/1*
f. Maximum pressure	*approximately 3200 kg per cm²*

In addition, the basic load must include the high-explosive fragmentation shell of the A-19 gun. The muzzle velocity of the HE/fragmentation shell must be less than 1000 m/s in order to increase the service life of the barrel and obtain larger angles of descent for the projectile.

III. Tactical specifications.

4. The gun must have the following characteristics:

a. Rate of fire	*6–7 rounds per minute*
b. Accuracy at a range of 1000 m	*0.15 mu (axes of zone of dispersion)*
c. Effort on laying mechanism flywheels:	
To start	*no more than 4–5 kg*
While turning	*no more than 2–3 kg*
d. Laying mechanism	

S-26 130 mm SP gun during testing. Like the S-26-1, this gun was tested on the ISU-152, not on the SU-152 (TsAMO).

Flywheel play	*1/4 turn*
e. Effort on mechanical trigger mechanism	*no more than 10 kg*
f. Vertical arc of fire	*-5° to +20°*
Flywheel aiming rate	*-0.5 per turn*

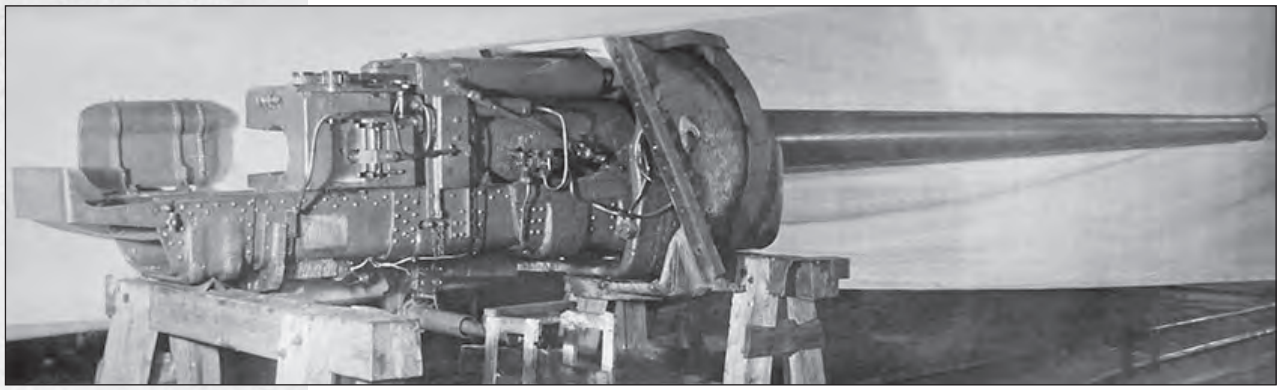
5. *The gun must have separate loading.*
6. *The gun's main sight is a collapsing telescopic sight. The tank has a conventional telescopic sight for redundancy.*
7. *The tank gun must have a clinometer for firing from cover. The self-propelled gun has a ZIS-3-type field sight.*
8. *During firing, the gun is served by a crew of three: the gunner and two loaders.*
9. *The gun must have a coaxial machine gun.*

B) IV. General design specifications.

10. *The tipping parts of the 122 mm gun must be designed such that it can be mounted in a rotating tank turret and in a self-propelled artillery vehicle's hull.*
11. *The overall layout of the gun must provide for the lowest line-of-fire height and the most favorable loading level.*
12. *The weight of the gun without armor must be no more than 3500 kg, and the weight of the recoil mechanism must be less than 2700 kg.*
13. *The dimensions of the gun when mounted in a turret with an 1800 mm support ring must support convenient working conditions for the crew.*
14. *It would be desirable to have a natural balancing action; however, an equilibrator may be used.*
15. *A barrier must be provided for the recoiling parts.*
16. *The strength margins of the gun parts must provide the opportunity to further improve the ballistics and mount a 152 mm barrel with the ballistics of the BR-2.*
17. *Domestic factories must be able to employ the materials stipulated for manufacture of the gun. High-alloy steels and nonferrous metals must be kept to a minimum.*
18. *The gun must be simple to manufacture and rely on existing technological processes. Commonality of fasteners, threads (in terms of dimensions, classes, precision, and types), holes, and slots must be extensive.*
19. *The overall design of the gun must allow for the lack of adjustment mechanisms in field units.*[11]

The TsAKB did not handle the project in a conventional manner. According to correspondence, the bureau received it and started work on September 25. The project for a long-barreled 122 mm gun was assigned the factory designation S-26-1. However, Grabin decided to go his own way. Simultaneously with the S-26-1, TsAKB was able to push the idea of a

[11] TsAMO RF, collection 81, series 12063, file No. 1, pp. 39–40.



OKB-172's solution for a new gun—the OBM-50 122 mm SP gun (TsAMO).

130 mm and SP gun, which it developed on the basis of the ballistics of the B-13 naval gun. Development of the project, which received the designation S-26, was delayed. It was approved in early 1944, when the SU-152 was no longer relevant. For that reason, the ISU-152 SP gun began to emerge as the base chassis for the S-26 and S-26-1.

In this instance, it was not assigned to work jointly with the Perm design bureau. Instead, Factory No. 172 and OKB-172 began developing competing projects. The first with this important task was OKB-172, which succeeded in drafting the documentation in record time—less than two weeks. M. Yu. Tsirulnikov, OKB-172's chief designer for ground artillery, oversaw the design bureau's efforts. Like other sharashka workers, he was a prisoner, but he received an early release (by State Defense Committee Decree No. 3612, dated June 18, 1943) when the M42 45 mm antitank gun project got underway.

By October 5, 1943, a conceptual design for the gun lay on the desk of the chief of the GAU's Artillery Committee. To be more precise, it was a conceptual design for more than one gun, because in addition to the 122 mm high-power gun, OKB-172 had developed a project to mount the OBM-43 152 mm system with the ballistics of the BR-2 in the SU-152:

By special telegram No. 5014, dated 24 September of this year, in accordance with a decision by the People's Commissariat of Arms and the chief of the Main Artillery Directorate, OKB-172 and Molotov Factory No. 172 have been assigned to develop a 122 mm self-propelled gun having a muzzle velocity of 1000 m/s with a projectile weight of 25 kg.

OKB-172 of the People's Commissariat of Arms places a great deal of importance on the project and has completed the conceptual design ahead of schedule. It is hereby submitted for your review.

Preparation of the conceptual design resulted in the following determinations:

1. *The task of developing a 122 mm self-propelled gun with a muzzle velocity of 100 m/s can be completed by placing a new barrel on the KV-14*

vehicle in place of the model 1937 gun howitzer and using a single-action hydropneumatic balancing mechanism.

2. *Since the power of self-propelled guns is constantly growing, our proposed installation of the OBM-43 barrel, which has a muzzle velocity of 880 m/s with a shell weighing 43.5 kg, on a KV-14 vehicle instead of the assigned 122 mm barrel with a muzzle velocity of 1000 m/s cannot be neglected, because doing so would increase the power of the system by 33.5% and enhance the concrete-penetrating and explosive effect of the shell.*

This approach both employs an extremely powerful gun for the vehicle and takes advantage of sharing components with the field gun, which would significantly facilitate production and use of these guns.

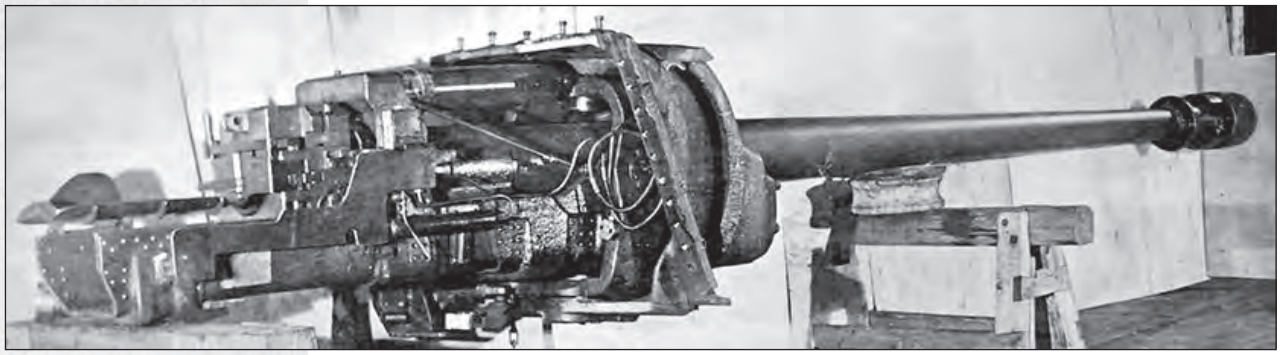
We hereby submit data comparing the KV-14 SP gun with the OBM-50 project:

No.	Parameter	Unit	KV-14	OBM-50	
				122 мм gun	152 мм gun
1.	Caliber	mm	152.4	121.98	152.4
2.	Shell weight	kg	43.5	25.2	43.5
3.	Muzzle velocity	m/s	650	1000	880
4.	Range at 23°	m	12	21	18
5.	Armor thickness penetrated at 1500 m.				
	0°	mm	-	195	195
	30°	mm	-	160	160
No.	**Parameter**	**Unit**	**KV-14**	**OBM-50**	
				122 мм gun	**152 мм gun**
6.	Traverse angle	degrees	+/-7	+/-7	+/-7
7.	Basic load on vehicle	Rounds	16	16	16
				38 (modified fighting compartment)	
8.	Rate of fire:	Rounds/ min	1.5	2	1.33
9.	Vehicle weight with gun and basic load	t	47	48	48

Having submitted the conceptual design, OKB-172 is continuing work on the project, which enables OKB-172 to produce the engineering drawings immediately upon receipt of your findings. [12]

Moreover, three versions of the OBM-50 were submitted, all with the same muzzle velocity—1000 m/s. The first version of the gun (referred to as "Version A" in documentation), which was discussed in a memorandum, had a barrel 8566 mm (70.2 calibers) long and a maximum pressure of 2670 kg/cm.[2] According to its design, this version resembled the A-19 120 mm

[12] TsAMO RF, collection 81, series 12063, file No. 1, pp. 45.



OBM-53 152 mm SP gun developed jointly with the OBM-50 (TsAMO).

gun very closely. Two additional versions of the OBM-50 were submitted on October 28. They were referred to as "Versions I and II." Version I's barrel was shortened to 8390 mm (68.7 calibers) and its chamber lengthened to 990 mm. Version II featured many more differences. The length of its barrel was reduced to 7430 mm (60.9 calibers); it also had a 990 mm chamber. Its maximum pressure was increased to 3000 kg/cm.^{2} The increased pressure required a new design for the breech end, which was given a sliding wedge breechblock.

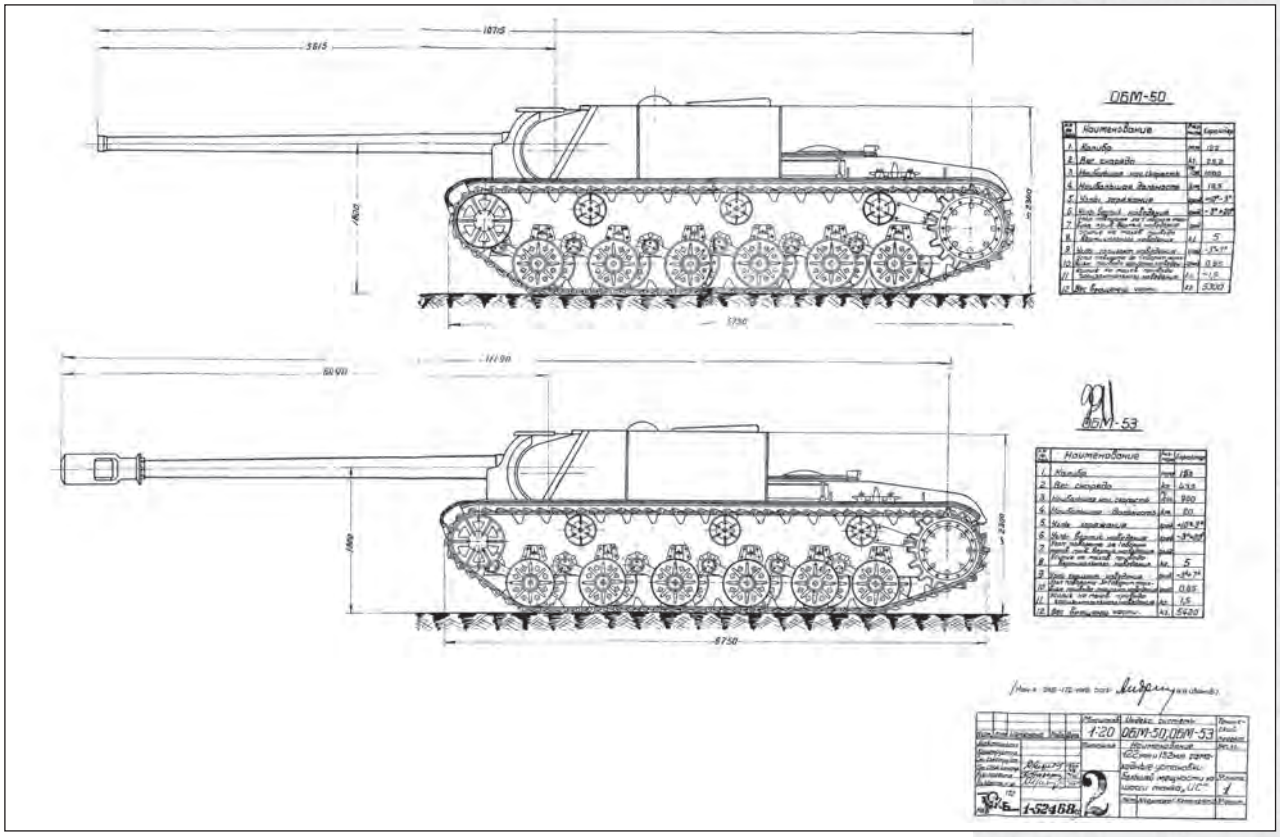
The GAU's Artillery Committee issued its finding on the OBM-50 conceptual design on November 12, 1943. Interestingly, the Artillery Committee's 1st Department proposed its own ballistic solution for the gun in addition to these three versions. It had a 7440 mm barrel with a maximum pressure reaching 3200 kg/m.^{2} Thus, there were four projects to choose from:

These ballistic solution versions must be reviewed based on the chief design and tactical requirements for the gun. Three such requirements apply:

1. *The barrel must be as short as possible; a barrel length of 55–58 calibers would be desirable.*
2. *The barrel must have a diameter as small as possible.*
3. *Manufactured of steel with a strength grade of 0-70.*

Rough calculations done by the Artillery Committee's 2nd Department showed that the pressure in the bore must not ever exceed 3000 kg/cm.^{2} For a maximum pressure of 3200 kg/cm^2, the outer diameter of the barrel would be 400 mm, which would require a breech width of at least 600 mm. A gun that wide would take up one third of the fighting compartment's width. Next—the thick walls of the barrel parts for a monobloc (about 125 mm) would make heat treatment very difficult, but their hardening characteristics could be achieved if OKhNZM steel is used.

A built-up barrel cannot be introduced under wartime conditions due to the difficulty of manufacture. Moreover, the process for building up barrels is not currently in use at Factory No. 172.



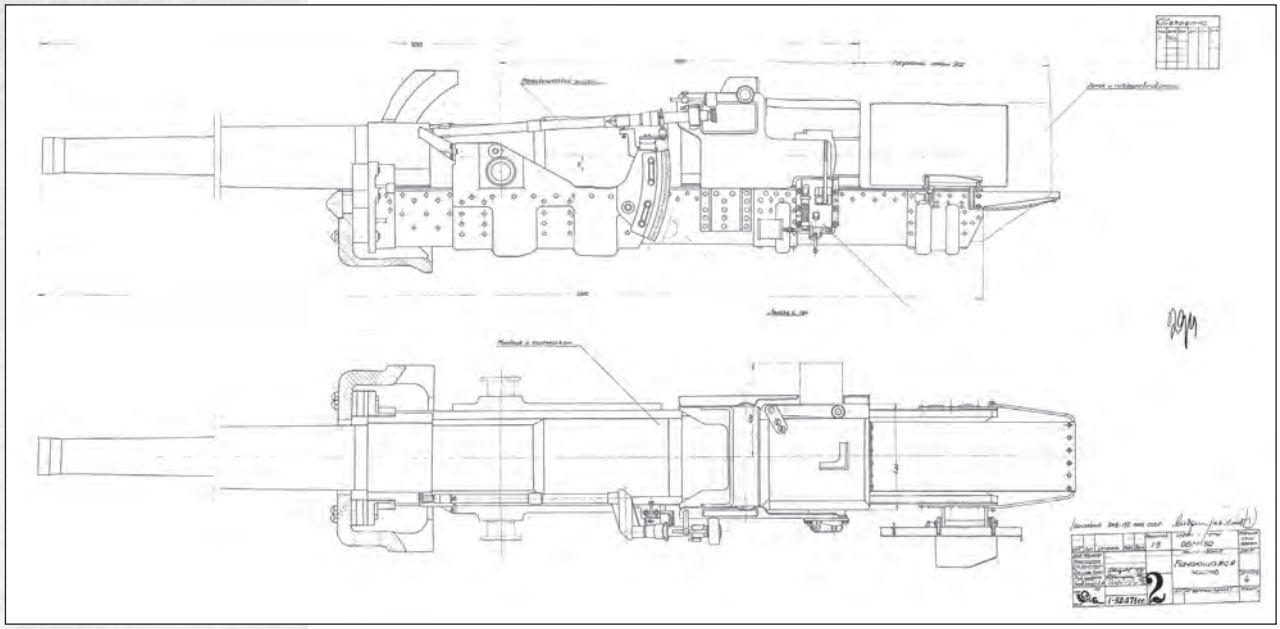
Modified design for mounting the OBM-50 and OBM-53 SP guns. Interestingly, the superstructure was taken from the ISU-152, and the running gear obviously came from the KV-1S or SU-152 (TsAMO).

From the standpoint of minimizing the barrel length, maximum pressures under 2800 kg/cm² are also unacceptable because, as research has shown, the barrel length would be more than 67 calibers.

Considering the gun's special role and its proposed relatively limited fielding (not a high-volume gun), the generally accepted requirements for the cost-effectiveness of the use of charges should be discarded. The coefficient of charge utilization for the guns should be established between 80 and 90 by increasing the relative and absolute weight of the charge. This would make the ratio of the powder burn point to the projectile path about 0.75, which would be a reasonable guarantee of complete combustion of powder in the bore. Consequently, the muzzle velocity would not vary due to incomplete powder combustion.

This approach is already being used in modern artillery practice to achieve high velocities and powerful guns. Examples include the 88 mm self-propelled gun model 43/1 (Germany), 75 mm antitank and tank guns (Germany, mass-produced guns), and a heavy 3-inch tank gun (United States, prototype).

To ensure that the chamber design is as practical as possible and easy to load, and to ensure that the barrel has the best design shape, the chambrage should be increased to match the diameter of a 152 mm gun, and the calculated charge density should be between 0.73 and 0.75. [13]



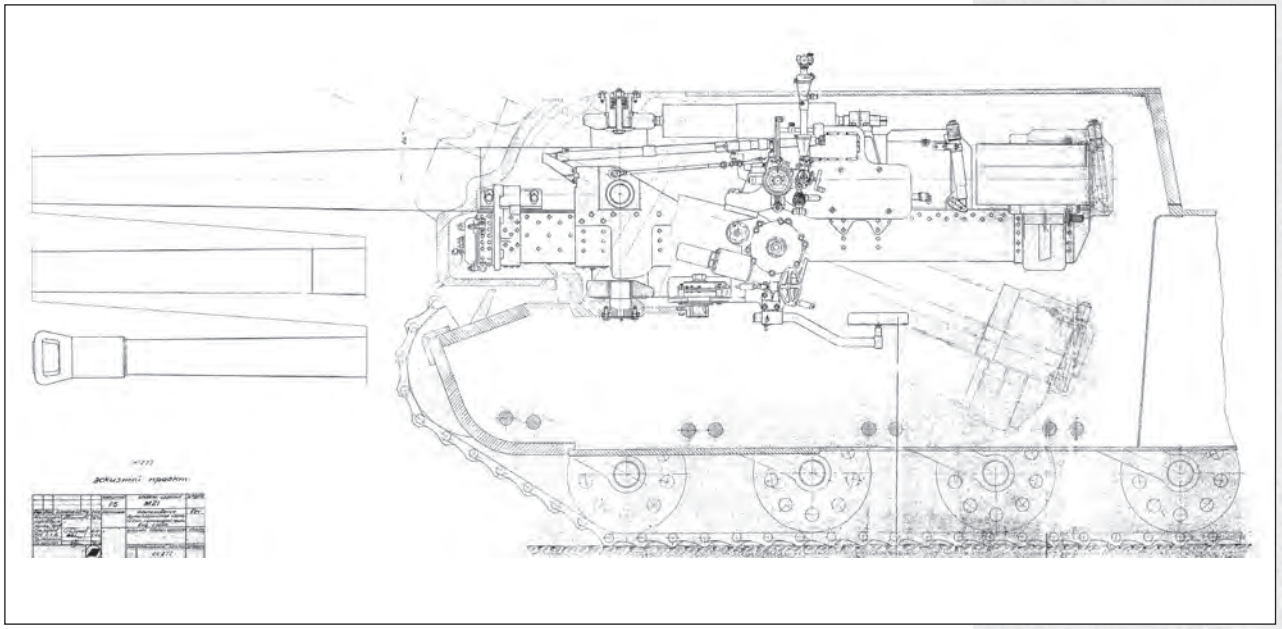
Factory drawing of barrel for the modified OBM-50's 122 mm gun (TsAMO).

Thus, Version II's design was the most suitable for the OBM-50 project. The breech end with a sliding wedge breechblock stipulated in the specifications for the gun was favored. However, a requirement to increase the spacing between the barrel gibs or modify them was expressed, because the existing design could result in excessive pitching or vibration. The designers were also required to simplify the breechblock because it required a great deal of machining, and reduce its width to 420–450 mm. They were also required to simplify the breech mechanism, which needed to be equipped with a former-type semiautomatic system.

Modifying the gun was not OKB-172's only task. The last SU-152's that the gun was designed for were rolling off the assembly line as the finding on the OBM-50 at the Chelyabinsk Kirov Factory was being signed. Therefore, the SP gun needed to be changed.

1. *Instruct OKB-172 to submit to the Artillery Committee an engineering design of a 122 mm heavy self-propelled gun that incorporates all of the remarks made in the "Technical Analysis" and "Conclusions" sections.*
2. *Make provision for mounting the gun in the IS-152 vehicle. It is hereby requested that the People's Commissariat of the Tank Industry (NKTP) assign the design for mounting the gun in the vehicle to NKTP Factory No. 100.*
3. *In developing the engineering design, OKB-172 is to coordinate the positioning coordinates and overall dimensions of the gun with Factory No. 100.*

[13] TsAMO RF, collection 81, series 12063, file No. 1, pp. 81–82.



The M21's heavy 122 mm gun, October 1943 (TsAMO).

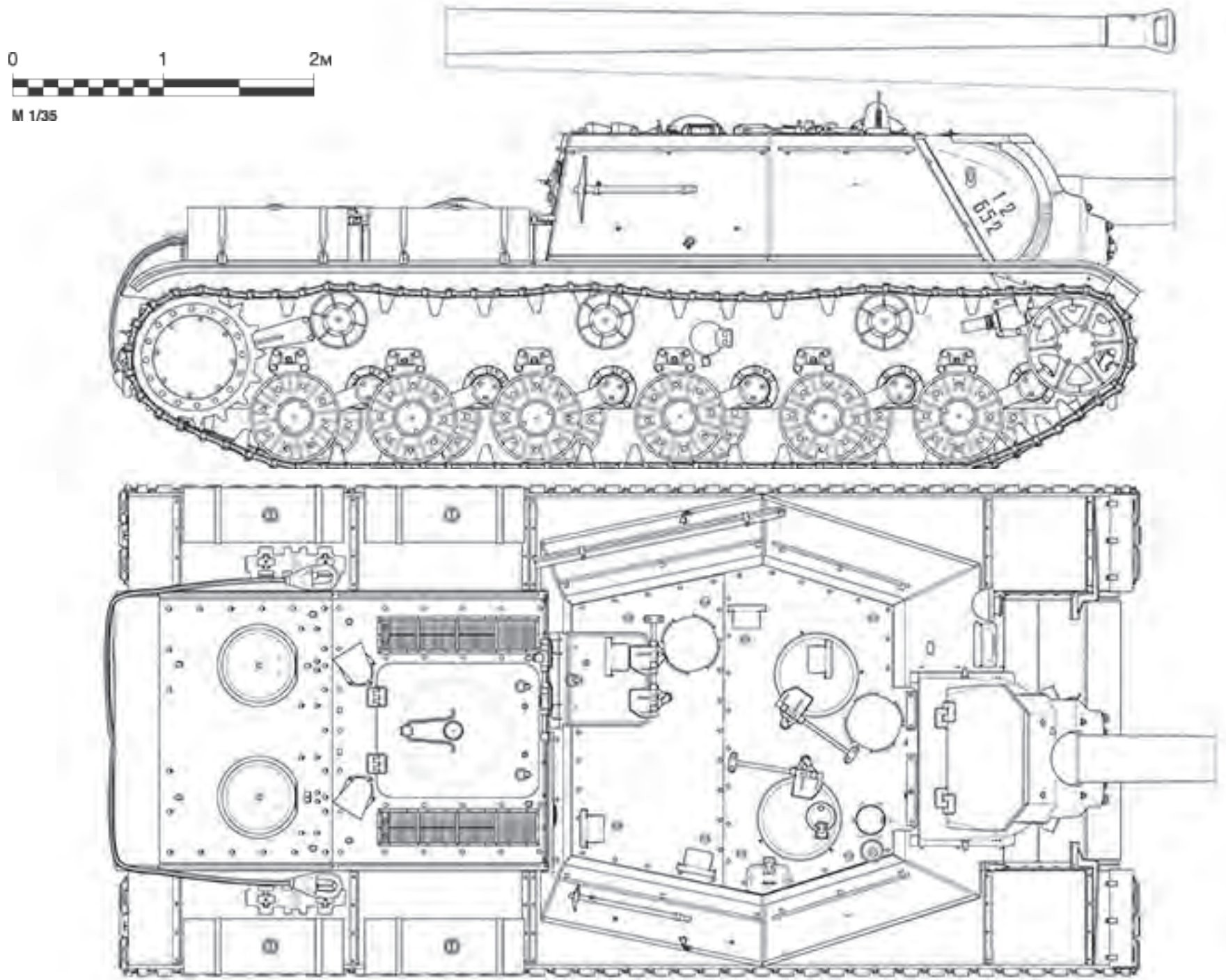
4. *It is hereby requested that the People's Commissariat of Arms manufacture the heavy 122 mm gun at Factory No. 172 during the first 10 days of January 1944.*
5. *It is hereby requested that the NKTP manufacture the high-power 122 mm gun and mount it on a vehicle by January 25, 1944.*[14]

The engineering drawings for the modified system were reviewed on December 4, and OKB-172 submitted the design documentation for mounting the OBM-50 on the ISU-152 by the 14th. In addition to the heavy 122 mm gun, the project also included mounting the OBM-43 152 mm system on the ISU-152. The self-propelled version of that gun was assigned the designation OBM-53.

And what was Factory No. 172's design bureau doing at the time? According to documentation, the conceptual design of the heavy 122 mm gun designated the M21 was finished by October 9, 1943. But something strange happened: according to the same documentation, the chairman of GAU's Artillery Committee received the conceptual design from the Technical Council of the People's Commissariat of Arms only on November 12; that is, on the same day the decision on the OBM-50 was reached. Why the documentation sat, going nowhere, for over a month is unclear.

Work on the M21 was led by Factory No. 172's artillery design bureau chief V. A. Ilyin (who was also serving as acting chief designer at the same time). The design took the elevation and traversing mechanisms, cradle armor, and sights from the ML-20S. It also incorporated the frame and cradle, with some

[14] TsAMO RF, collection 81, series 12063, file No. 1, pp. 84.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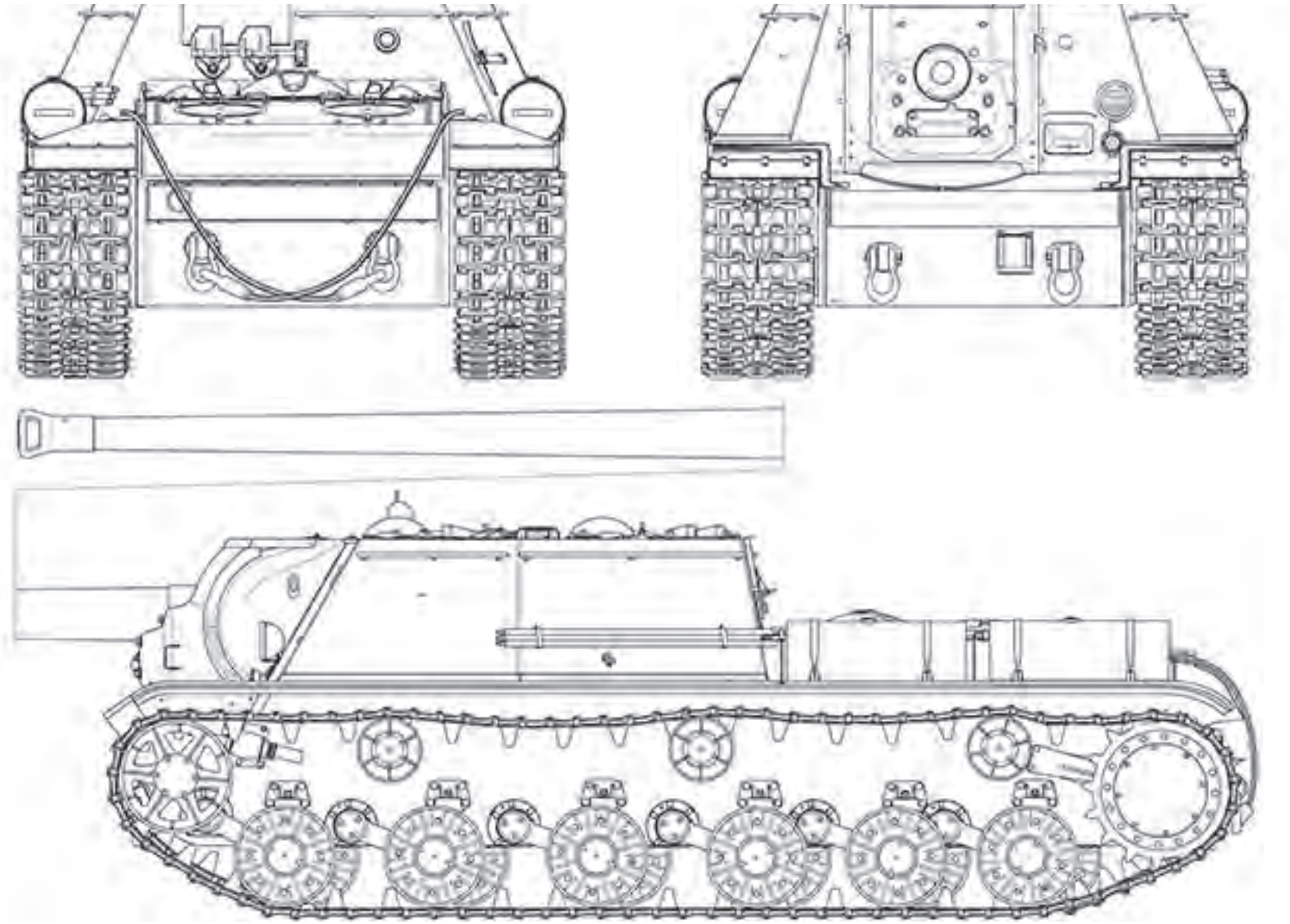
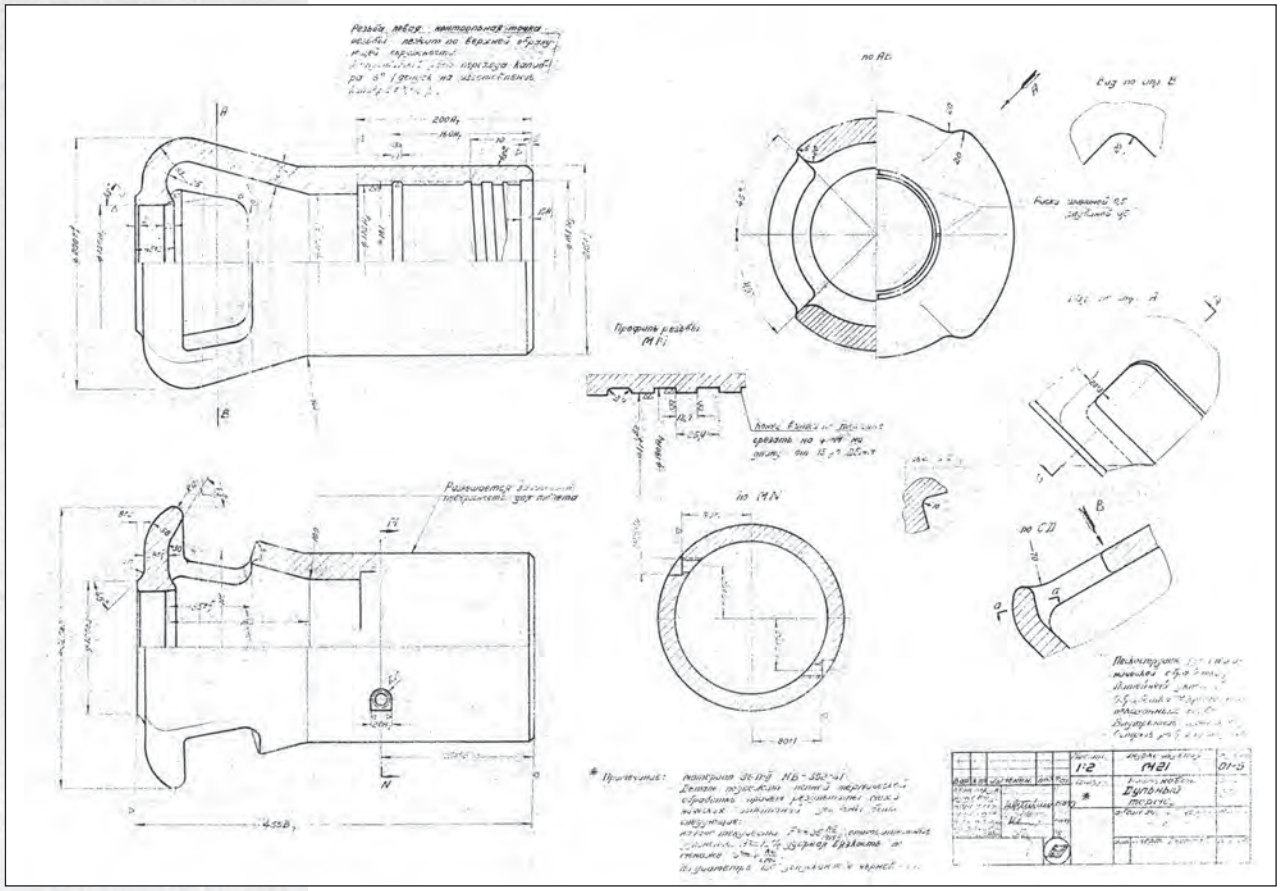
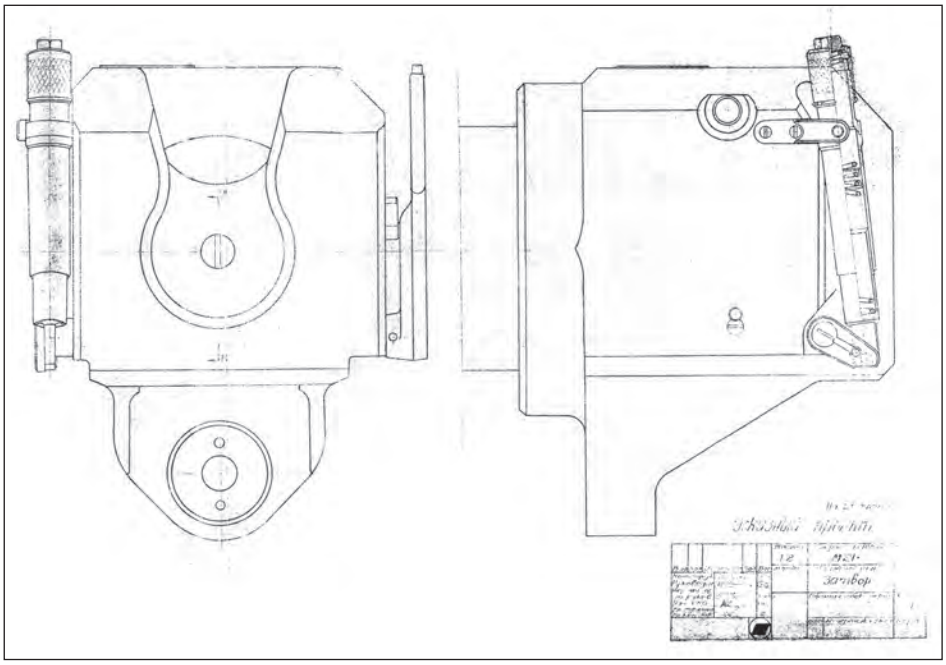


M21 heavy 122 mm SP gun, 1:35 scale drawing.



Muzzle brake for the M21 heavy 122 mm gun (TsAMO).



The M21's breechblock closely resembled the breechblock of the M75 107 mm antitank gun (TsAMO).

modifications. The barrel was 7747 mm (63.5 calibers) in length. According to calculations, the M21 could penetrate 208.4 mm of armor from a range of 1000 m, and it could penetrate 169.8 mm at a 30° angle of incidence.

As required by the gun's specifications, the barrel was equipped with a single-chamber muzzle brake. According to the calculations, it absorbed up to 54% of the energy from a shot. Also in accordance with the specifications, the M21 used a sliding wedge breechblock design copied from the M75 107 mm antitank gun. Minor modifications to some parts were the only differences between the new gun's breech mechanism and that of the M75. The firing mechanism design was similar to that of the ZIS-3. The cradle differed only in that the recoil mechanism included a counter-rod that provided a shorter recoil length, and the trigger mechanism was modified for use of the sliding wedge breechblock. No changes were planned to the design of the SU-152's superstructure; only the storage racks needed modifying for the new rounds.

There was no further correspondence after the GAU's Artillery Committee received the M21 documentation. The delay in reviewing the project in the Technical Council of the People's Commissariat of Arms took its toll: by mid-November, there was no longer a need for another heavy gun, especially since the design would have to be modified for mounting on the ISU-152.

CHAPTER 9. **Exposed to the Elements**

The idea of using a KV tank chassis as the base for an open heavy artillery system was first expressed in the fall of 1942. Eng. Col. Afonin, chief of the GABTU's Armor Directorate, received a letter from Factory No. 92's director, A. S. Yelyan, on November 26:

Comrade P. F. Muravyev, our senior design engineer, spoke with you while he was in Moscow about developing a 400 mm self-propelled gun based on the KV tank. We have now developed the idea to the point that we can discuss it in more detail.

We have developed a conceptual design of the system, which we will send you after verifying some information on the KV tank, and the T-34, which is completely unknown to us, but about which we hereby request information. We are particularly interested in the following data:

1. *The gross weight of the KV-1 tank produced in 1941 (before the war with Germany) and the weight of its turret with the basic load for the 76.2 mm gun and the gun itself.*
2. *The gross weight of the KV-1 tank manufactured in 1942 whose weight was increased as a result of an upgrade, and the weight of its turret with the basic load for the 76.2 mm gun and the gun itself.*
3. *The gross weight of the KV-1S tank produced in 1942 after its weight was reduced, and the weight of its turret with the basic load for the 76.2 mm gun and the gun itself. Whether the overall length and width, the area of track in contact with the ground, the engine power, the engine and driver location, and the strength of the suspension and hull components were modified in order to reduce the tank's weight. Whether the suspension and hull could withstand a load from firing of 100 tonnes acting as shown in the attached diagram, and how the tank's engine and running gear would perform on the road if the weight of our new system, 20 tonnes, is added to its total weight (less the turret, gun, and basic load).*
4. *We are also working to mount the system on the T-34 tank. Therefore, we also request that you inform us how all running gear components, the hull, and the engine will perform on the road and under the loads shown in the attached diagram, because Factory No. 112 was unable to give us complete answers to these questions, citing their lack of strength calculations for the T-34 tank.*
5. *We are most interested in the KV-1S tank for installation of our system. According to information in our possession, its gross weight is 37 tonnes. If the turret, the gun, and the gun's basic load weigh 7 tonnes, the*

entire vehicle will weigh 50 tonnes, i.e., the weight of the KV-1 tank manufactured in 1941 (before the war with Germany). That means that if the KV-1S's engine, track, and suspension durability are the same as those of the KV-1 manufactured in 1941, the new vehicle's road performance will be quite satisfactory. If these assumptions about the new KV-1S tank are reasonable, we request that an order be sent to Factory No. 92 for a set of drawings of the KV-1S hull and suspension and that Factory No. 92 be informed of the rationale regarding opportunities and ways of obtaining this tank for purposes of mounting a prototype of the system.

Based on your analysis, please advise which tank we should to settle on and issue an order to have drawings of that tank's hull sent to Factory No. 92; we have drawings of the T-34.[1]

Unfortunately, we still do not know what 400 mm mortar was planned for mounting on a KV-1S or T-34 chassis. Nothing is known about the development of such systems by Factory No. 92. Yelyan received an answer to his letter on December 14:

Operation of KV tanks has shown that the running gear and engine of the 50-tonne tank are under a heavy load and frequently break down. This led to the development of the lighter KV-1S tank, which weighs 42.5 tonnes.

The power of the KV-1S engine, its location, and the strength of its suspension and hull components differ little from those of the KV-1 tank.

We cannot say whether the tank's suspension would hold up under a 100-tonne load because we have no experience with use of the system under such loads.

Without knowing the design characteristics of the mortar, we can draw no conclusions about the feasibility of installing it in the tank.[2]

The idea of an open SP gun based on the KV-1S surfaced again in the spring of 1943. Paragraph 12 of a report on the state of SP artillery manufacturing and developmental efforts prepared by the GAU's Artillery Committee addressed a "203 mm self-propelled howitzer on a KV-1S tank chassis." The report was dated April 28, 1943:

The April 15, 1942, resolution of a plenary session of the Artillery Committee proposed development of an engineering design for a BR-2 self-propelled gun on a chassis incorporating assemblies from the KV tank.

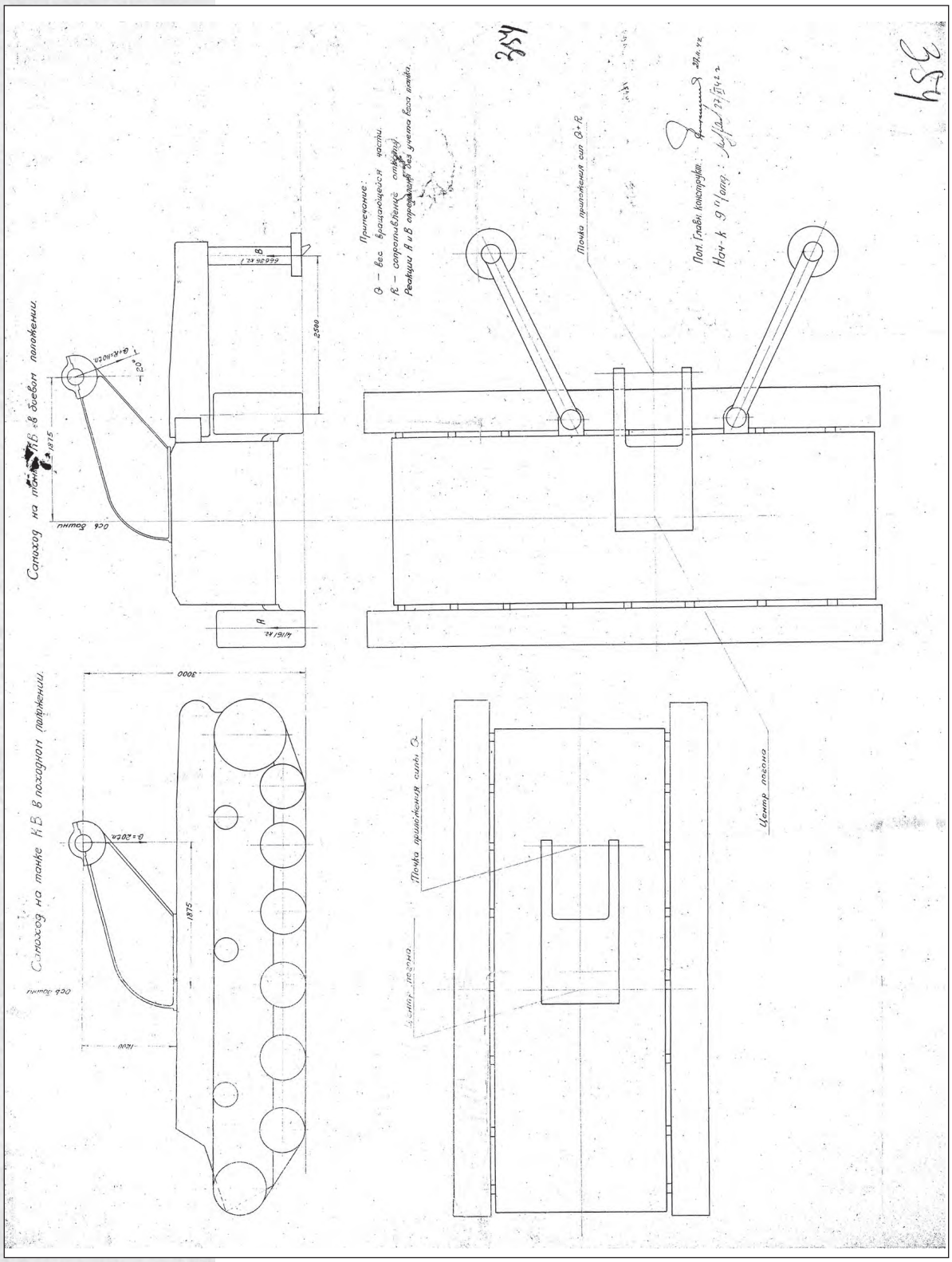
Experience gained in building vehicles between 1942 in 1943 has shown that a B-4 howitzer can be mounted on a KV-1S chassis in the form of a semi-enclosed vehicle.

By agreement with the 16th Department of the Artillery Committee, the Kirov Factory and Factory No. 172 are developing this project. Each factory is working independently.[3]

[1] TsAMO RF, collection 38, series 11355, file No. 693, p. 351.

[2] TsAMO RF, collection 38, series 11355, file No. 697, p. 1.

[3] TsAMO RF, collection 38, series 11369, file No. 91, p. 11.



400 mm SP mortar on the KV-1S tank chassis, November 1942 (TsAMO).

There is almost no information about the Kirov Factory design. According to the correspondence, drawings of the rounds and traversing mechanisms of the B-4 and BR-2 guns were sent to SKB-2 on June 19, 1943. Work ceased at that point. No information about this project exists in SKB-2's experimental work. Publications by some Russian authors mention similar efforts at the Ural Heavy Machinery Plant, but they found nothing like that among the Sverdlovsk projects. These projects may have involved mounting the BR-2 and U-3 in the SU-152, but these are SP assault guns, not open vehicles.

As far as Factory No. 172 is concerned, its design bureau developed the M-17 heavy SP assault gun with the M-40 203 mm howitzer, which clearly was not what the GAU's Artillery Committee was asking for. As discussed above, instead of the M-17 the GAU's Artillery Committee and the Technical Council of the People's Commissariat of Arms required Factory No. 172 to develop a design for an open SP gun chassis armed with the B-4 203 mm heavy howitzer. Despite the fact that the task was issued in July 1943, there was no activity on that project in either August or September. In early September, the Central Artillery Design Bureau was added to the heavy SP gun program, and some of the designers who had proposed a similar SP gun less than a year previously were transferred to it.

It is worth noting that, in addition to the KV-1S chassis, the TsAKB was also considering other platforms for mounting the BR-2 and BR-4. A September 8, 1943, letter discussed transferring to the design bureau materials for SP gun projects based on the T-34 that Factory No. 221 had developed in early 1942. The BR-33P and BR-33G were then scrapped as not conforming to the specifications for bunker busters. That is absurd because the wording of the specifications changed radically a year and a half later:

The TsAKB of the People's Commissariat of Arms has appealed to the GAU's Artillery Committee with a request for materials in the Artillery Committee's files on the 203 mm and 152 mm SP guns developed by Factory No. 221.

In early 1942, Factory No. 221 submitted projects for 152 mm and 203 mm self-propelled guns on chassis incorporating T-34 tank assemblies for a finding by the Artillery Committee.

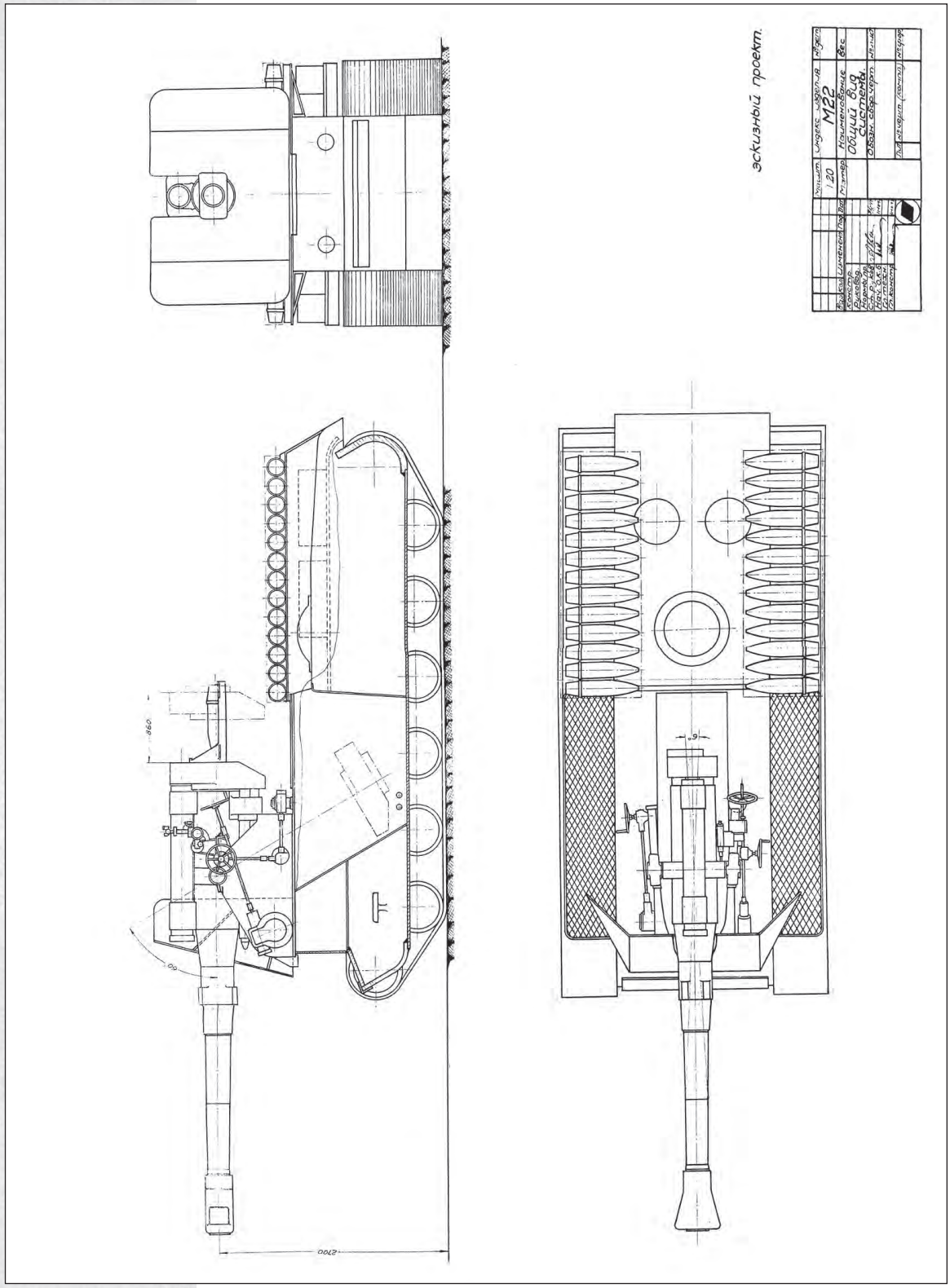
The Artillery Committee approved these projects, but the situation at the time prevented them from being implemented.

In the belief that it is desirable and timely to begin developing new heavy self-propelled guns, and as one version of a plan prepared by Factory No. 221, which the Artillery Committee currently approves, I hereby request that the appropriate task for completion of this project be issued to TsAKB of the People's Commissariat of Arms.[4]

On September 15, 1943, when the decision was made to continue work on tank, towed, and self-propelled artillery, the TsAKB was the only bureau working on SP guns mounting the B-4 and BR-2. According to documentation, the project was not a high priority. Nevertheless, on

V. G. Grabin – chief designer of Factory No. 92's design bureau and, later, TsAKB. He developed numerous towed, tank, and self-propelled guns.

[4] TsAMO RF, collection 38, series 11369, file No. 107, p. 92



M22 203 mm self-propelled gun, October 1943 (TsAMO).

October 8 People's Commissar of Arms Ustinov reported to Beria on the status of the Central Artillery Design Bureau's new SP gun projects:

The Central Artillery Design Bureau (TsAKB) of the People's Commissariat of Arms for lightly armored, semi-open vehicles for the BR-2 152 mm gun and the B-4 203 mm howitzer, as well as a closed assault vehicle for a 152 mm gun with the ballistics of the BR-2 and a 203 mm howitzer with the ballistics of the B-4.

For the TsAKB to manufacture prototypes of the vehicles, it needs to obtain from the People's Commissariat of the Tank Industry two KV-1S or IS tanks without guns and turrets, one SU-152 chassis without its gun, and drawings, including general view drawings, of the KV-1S and IS tanks and the SU-152 vehicle.

I hereby request that the People's Commissar of the Tank Industry (Comrade Malyshev) be instructed to act accordingly. [5]

An unexpected competitor to the TsAKB project emerged just a few days later. On October 15, a letter forwarding the engineering design for the M22 SP gun was sent to the Technical Council of the People's Commissariat of Arms, the GAU's Artillery Committee, and the GABTU. Judging by the dates on the drawings, this SP gun had been developed in early October under the leadership of V. A. Ilyin, chief of Factory No. 172's artillery design bureau. Despite the fact that this project was not recorded in the factory's plans, the M22 was not his own initiative, as is evident from a memorandum:

Based on GAU Artillery Committee letter No. 829360s and People's Commissariat of Arms letter No. 1888s, dated August 28, the Design Bureau of Factory No. 172 has developed and hereby submits the conceptual design for the M22 203 mm self-propelled howitzer.

The M22 system involves mounting the traversing mechanism of the B-4 203 mm howitzer on the KV-14 tank chassis.

This project entails little design change to the B-4 howitzer or the KV-14 tank chassis. The changes are as follows:

The recoil distance is taken to be 860 mm (the relative position of the rod and counter-rod recorded on short recoil) due to the possible lowering of the line-of-fire height and the need to stabilize the entire system during firing and while traveling.

The recoil resistance needed to be reduced from 88 tonnes to 45 in order to ensure stability during firing.

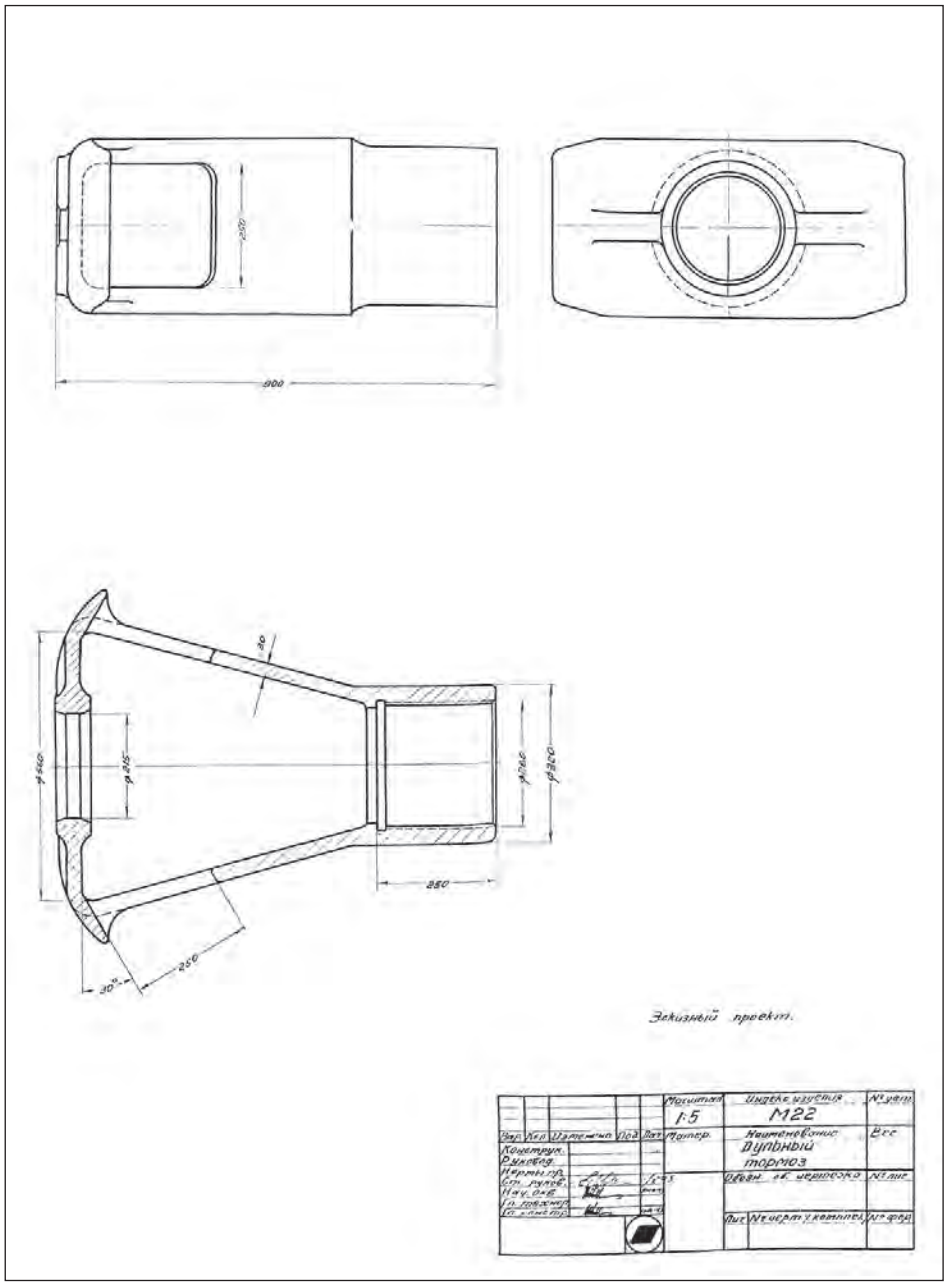
The design calls for adding a muzzle brake with an absorption coefficient of 48.9% to achieve that.

The design calls for removing metal from the muzzle and giving up the barrel's normal safety margin in order to keep the center of gravity of the tipping parts on the trunnion axis.

The rest of the B-4 howitzer traversing mechanism remains unchanged.

The howitzer is mounted on a special raised area on the tank hull without inclusion in the mantlet, which made it possible to reduce the weight of the vehicle with its full complement of 26 rounds to 43 tonnes.

[5] TsAMO RF, collection 38, series 11369, file No. 108, p. 25.



Muzzle brake for the M22 203 mm SP gun (TsAMO).

To protect the howitzer against bullets and shrapnel, it is equipped with a gun shield attached to the top carriage.

The projectiles are located on special racks above the engine compartment.

Loading is done manually by two or four men using a loading tray.

When loading, the tray is brought to the rack, and one man rolls a projectile into it.

This loading method is simple and enables a good rate of fire, considering the overall dimensions of the system.[6]

The delayed response by Factory No. 172's design bureau to the requirement to develop a semi-open SP gun mounting the B-4 howitzer can only partially be attributed to installation on the chassis of the SU-152. Almost nothing remained from the original chassis; the initial KV-1S tank was actually well-suited to modification for this purpose. To achieve the significant reduction in the height of the SP gun, only the tipping parts were taken from the B-4, and the howitzer itself was somewhat modified, of course.

Unfortunately, the situation at that point did not favor the M22. The design was submitted later than its competitor from the TsAKB. Even a week's delay mattered at this stage. In addition, Factory No. 172's design team had made changes to both the design of the howitzer and that of the SU-152 chassis. The addition of a massive muzzle brake to an SP gun that was mainly intended to fire from cover clearly worked against the M22. In addition, the muzzle brake would raise a great deal of dust during direct fire, which would give away the gun's position and make it difficult for the crew to fire the weapon. The outcome was inevitable: The technical Council of the People's Commissariat of Arms ordered further work on the M22 to cease.

In late November 1943, Factory No. 172's design bureau tried for a second time to push through a heavy SP gun project. On the 27th, the design bureau sent materials on the M24 203 mm howitzer project led by A. Ya. Drozdov to the GAU's Artillery Committee. It involved mounting a barrel with the ballistics of the B-4 203 mm howitzer on the ML-20 152 mm gun-howitzer's carriage. It also proposed that consideration be given to mounting a barrel with the ballistics of the BR-5 280 mm mortar (designated the M25) on the same carriage. A spot was also found at the end of the memorandum for mention of a self-propelled version of the two systems:

In addition, the traversing mechanisms of both the M24 and the above-listed options for mounting a barrel would also be beneficial for mounting on a vehicle for the same reason.

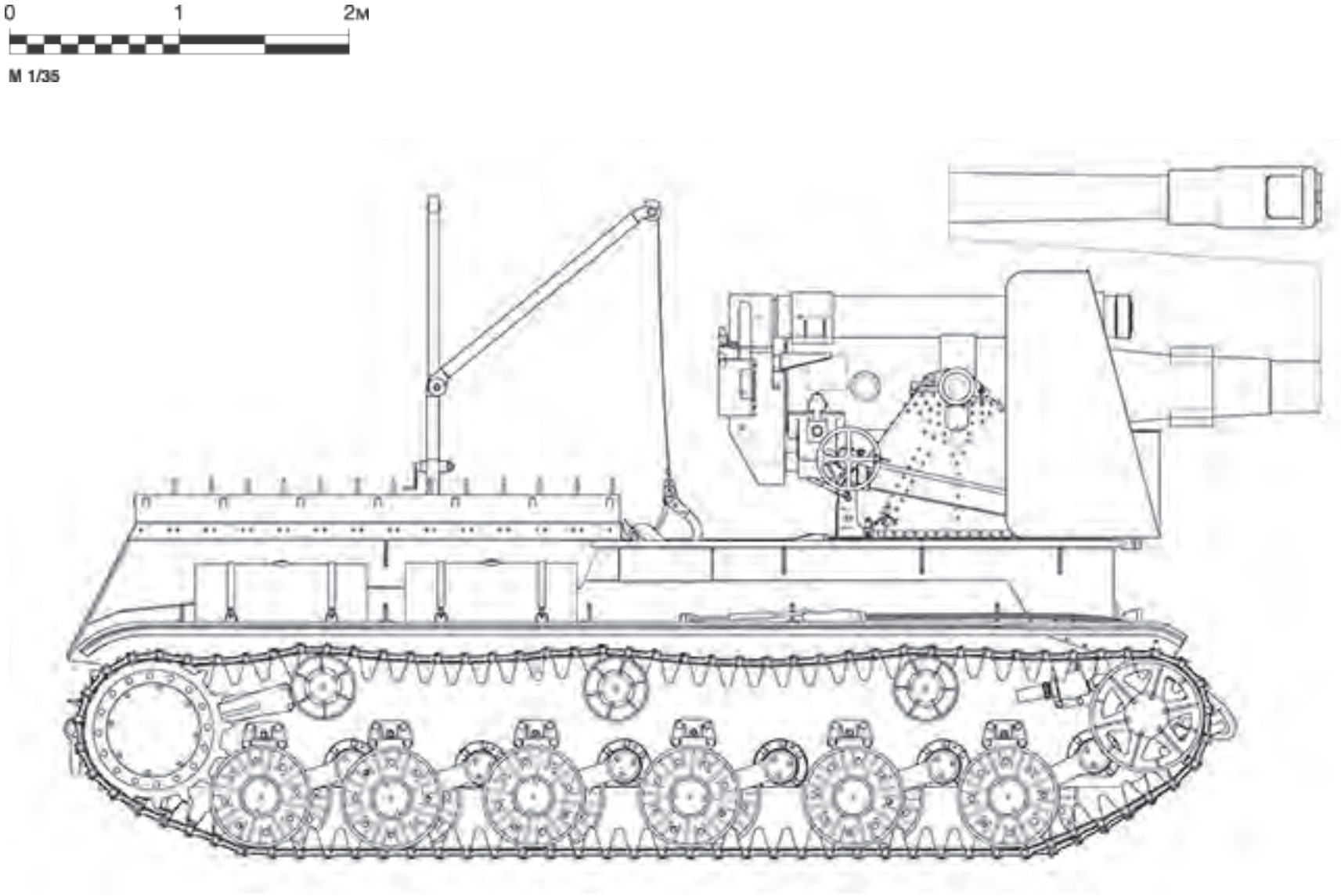
To illustrate that, the attached materials include a sketch showing the traversing mechanism of the M24 system mounted on a KV-1S or KV-14 tank chassis.[7]

The version of the M22 with an M24 gun was assigned the factory designation M26, and the version mounting the M25 was designated the M27. According to the memo, they planned on using the KV-1S or IS as the chassis. However, the only difference between the M26 and the M22 was that the M26 had a new gun system and no shield. In addition, the project envisaged placing the BR-2 152 mm gun on the same carriage. This was the M23 152 mm gun, which was under development at the same time.

On 15 December, the GAU's Artillery Committee reviewed the M24 howitzer project. It was decided to proceed with that project and turn it into

[6] TsAMO RF, collection 38, series 11369, file No. 108, pp. 48–49.

[7] TsAMO RF, collection 81, series 12038, file No. 235, p. 10.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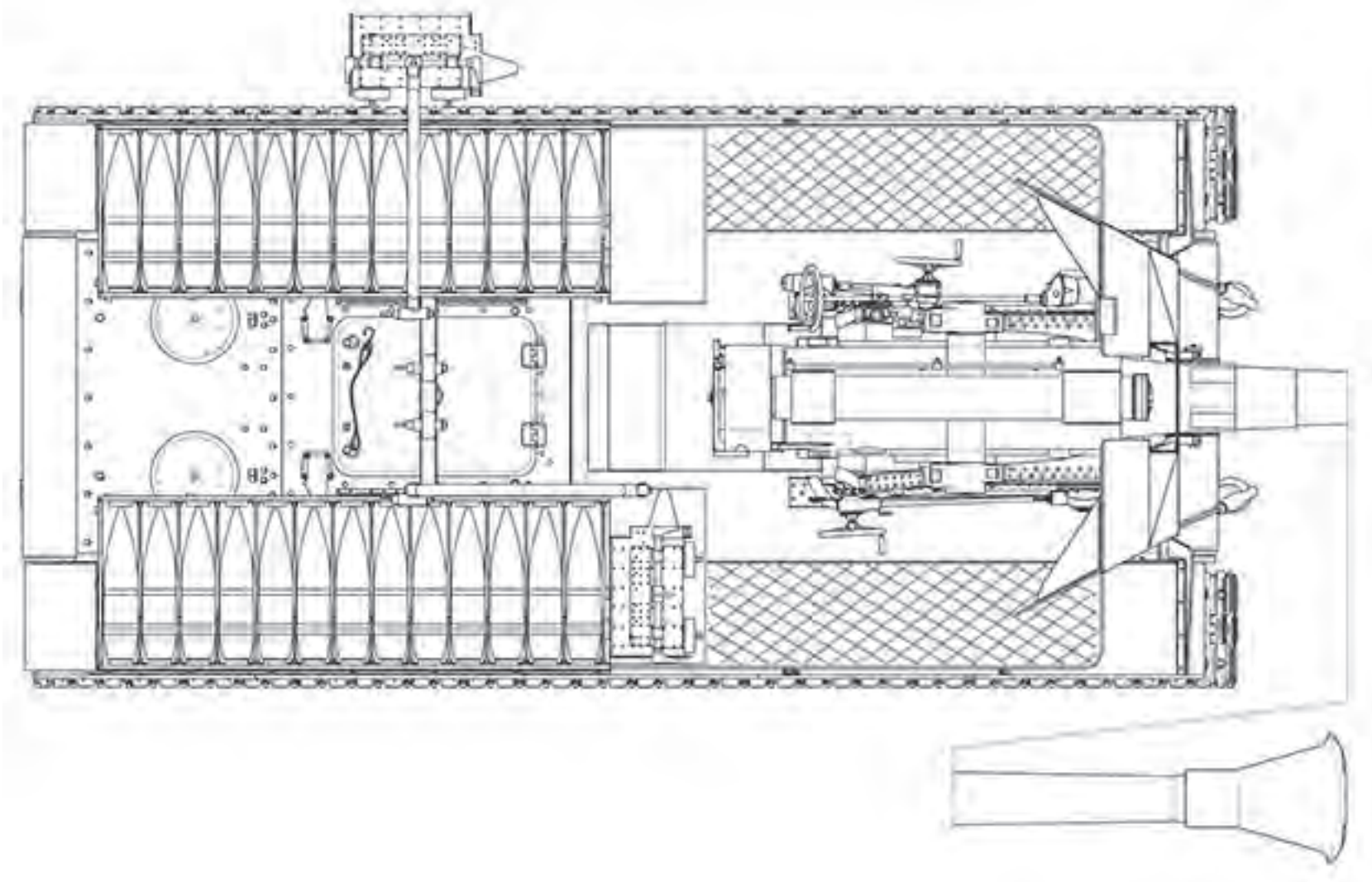
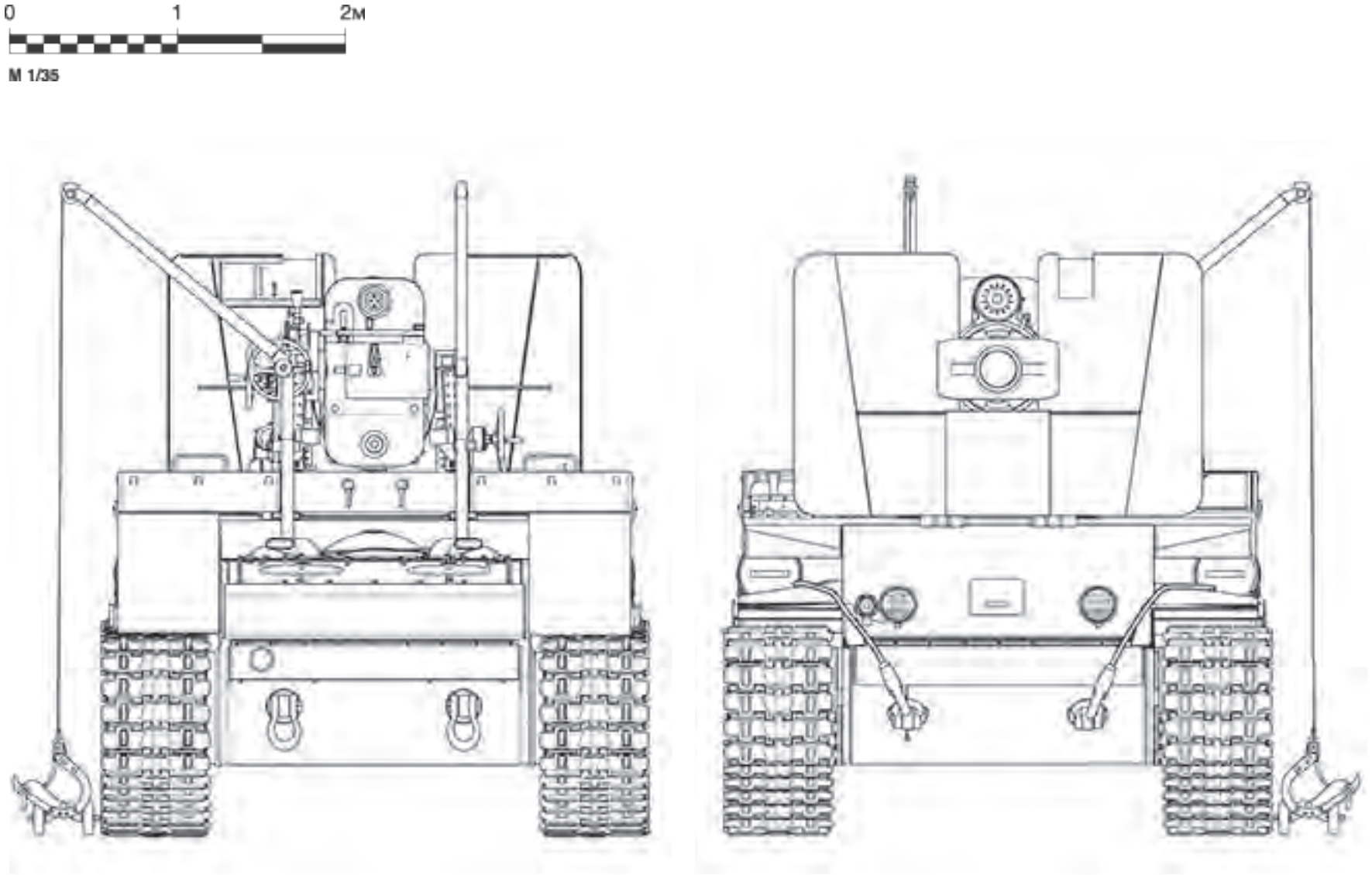


M21 heavy 122 mm SP gun, 1:35 scale drawing.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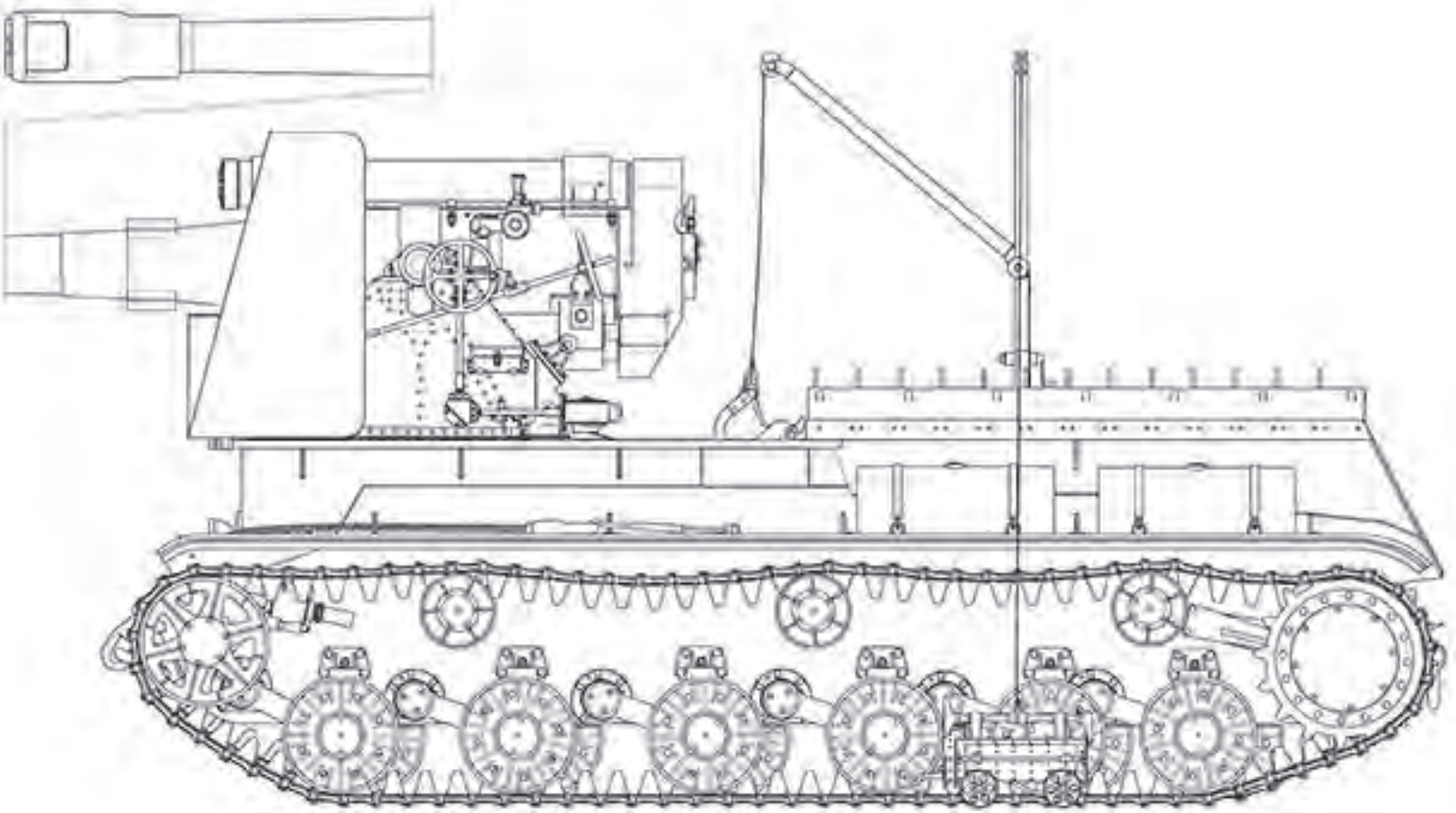


M21 122 mm heavy SP gun, 1:35 scale drawing.

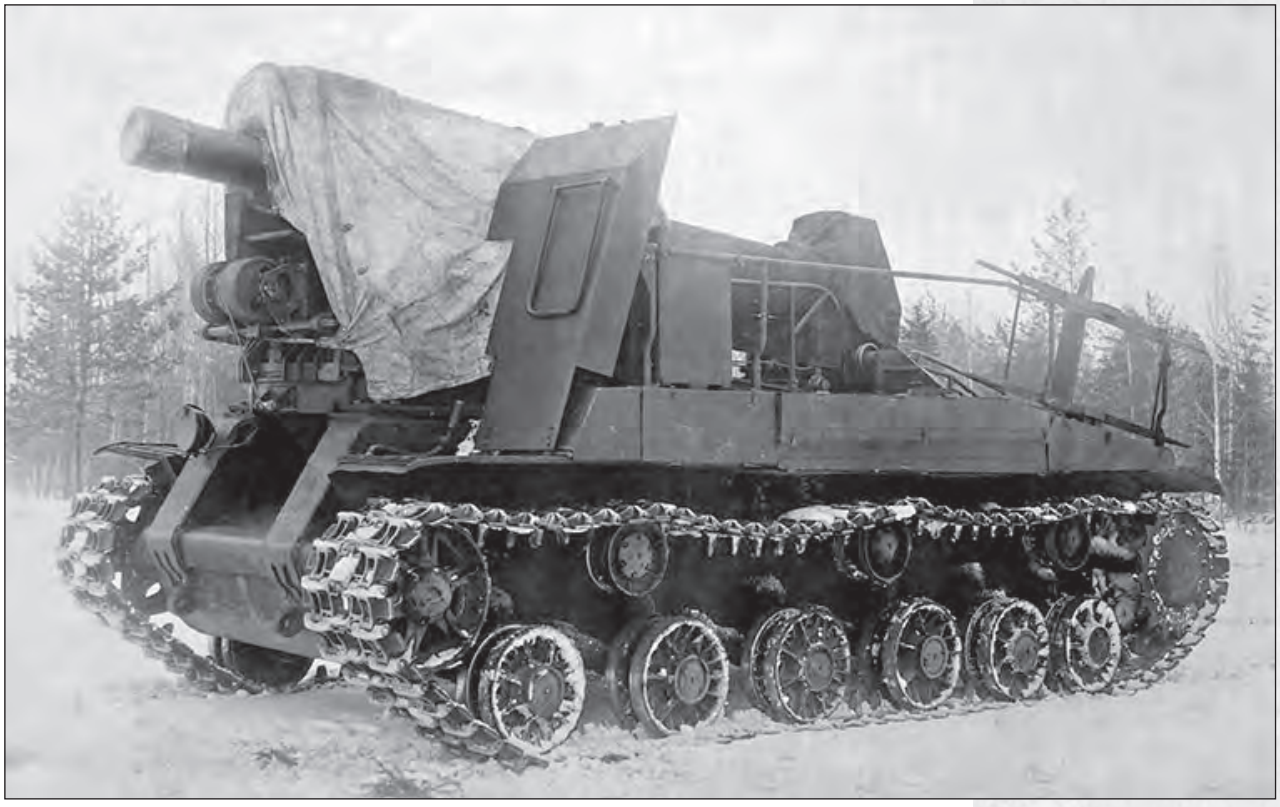
metal while at the same time rejecting the version with the barrel from the BR-5 280 mm mortar. The M26 and the M27 were not even mentioned. The TsAKB's brainchild thus was finally left with no competitors.

There was some backstage maneuvering going on with the transfer to TsAKB of KV-1S and SU-152 vehicles in repair status that Grabin had requested to serve as chassis for new systems. It became clear in 1943 that production of the KV-1S and SU-152 was coming to an end. The TsAKB chief therefore requested one IS tank and the drawings for it in addition to an order for two KV-1S and one SU-152. GABTU sent a report about that to Beria on October 11:

In accordance with letter No. NV-10/5070, dated October 6, 1943, from Comrade Ustinov, the People's Commissar of Arms of the USSR, I hereby report the following:

1. *Two type KV-1S tanks without armament and turret may be transferred from repair status to the Central Artillery Design Bureau of the People's Commissariat of Arms, since new KV-1S tanks are no longer in production.*
2. *One SU-152 self-propelled gun in repair status may also be transferred.*
3. *General-view drawings of the hulls of both the KV-1S tank and the SU-152 may also be transferred by the People's Commissariat of the Tank*

M24 203 mm howitzer considered as armament for the M22 SP gun (KBM).



S-51 203 mm SP gun in travel position (TsAMO).

Industry, for which transfer People's Commissar Comrade Malyshev has given his consent.

The People's Commissariat of the Tank Industry may only transfer an IS and the drawings for it after testing of the tank is complete and the drawings are brought up to date, because only prototypes of IS tanks are currently being manufactured. They will not complete testing and go into production until November of this year.[8]

Two KV-1S tanks and one SU-152 were sent to TsAKB in November. Because the bureau had begun working on new systems, in a letter dated November 10, Grabin tried to get a KV-85 in place of one KV-1S. The request was granted: TsAKB tested an S-34 100 mm gun on the KV-85. The design bureau did not make use of the SU-152 because subsequent projects involved the ISU-152.

The situation with development of the semi-open SP guns equipped with the B-4 howitzer was also quite interesting. The fact is that the design bureau was working on systems without having clear specifications for them. With only a vague assignment in hand, TsAKB initially considered several options for the SP gun chassis. The situation was unchanged in October; TsAKB decided to undertake the project without approved specifications.

[8] TsAMO RF, collection 38, series 11369, file No. 107, p. 101.

The GAU's Artillery Committee finally drew up an operational requirement "for 152 mm and 203 mm auxiliary-propelled guns for the Artillery Reserve of the High Command (ARGK)" on November 16. It was signed by GAU chief Col. Gen. Yakovlev on November 18:

I. Definition and role.

1. The auxiliary-propelled ARGK guns consist of an open system with the traversing mechanism of a 152 mm gun model 1935 (203 mm howitzer model 1931) mounted on a special chassis incorporating assemblies from KV or IS tanks and having light armor protection only in the front.

2. The ARGK auxiliary-propelled guns are heavy mobile artillery guns attached to large units on the main axis of advance.

3. The guns are intended to accomplish the following fire missions: destruction of enemy concrete fortifications, including by direct fire at ranges of 1500–2000 meters, and the destruction and suppression of enemy artillery.

II. Main specifications

A. The cannon unit.

1. The following basic specifications apply to the cannon unit of the ARGK auxiliary-propelled guns:
f. Vertical arc of fire from -3° to +65°
horizontal arc of fire 60°
traverse rate: same as for the BR-2 and B4 systems
Rate of fire:
for the 152 mm gun 2–3 rounds per minute
For the 203 mm: 1–2 rounds per minute
Basic load transported with the gun: 10–12 rounds
Gun crew (including driver-mechanic): 8
Time for transition to and from travel and firing positions: not more than 2 minutes

2. Weight of gun in firing position: 45–48 tonnes

3. The gun's front armor protection must consist of a gun shield with lateral extensions about 35 mm thick (for protection against shrapnel).

4. For convenience of crew operation in the travel position, the area of the platform may be extended by means of folding decks that are stored for travel.

5. To support delivery of fire throughout a 60° arc, vehicles may be equipped with side-mounted (anchor type) trails.

6. For long marches, the guns may have provision for a special travel position accomplished either by rotating the traversing mechanism by 180° or by retracting the barrel.

7. For loading the guns, a special device must be developed that is actuated either by means of a motor or manually (requiring no more than 4 people to operate).

The guns may have a set loading angle in accordance with the design of the BR-2 and B-4.

8. The guns must incorporate the sights normally used for the B-4 and BR-2 that support both direct fire and fire from maximum range.

9. Each gun must be equipped for both radio and telephone communications.

B. The chassis.

10. To achieve the specified weight, the chassis must be made of high-hardness steel armor plates 35 mm thick.

11. Special braces may be used inside the hull of the vehicle.

12. The chassis may be lengthened as required to accommodate an additional road wheel.

13. It would be desirable for the gun to retain the speed of movement and mobility of the IS-152 vehicle.

14. Fuel endurance: 100–120 km

III. General requirements.

1. The gun crew must be provided with seats for long marches.

2. The chassis must have areas for storage of a SPT&A for the gun and vehicle, the telephonic communications equipment, a first-aid kit, dry rations, and the crew's personal gear.

3. The bow and the stern must have tow hitches like those on the IS tank.

IV. Additional specifications.

1. For transporting ammunition in excess of that stored on the vehicle and intended for carrying out a specific fire mission, develop a tracked armored trailer capable of carrying 50 rounds for the B-4 or 100 rounds for the BR-2 that can be towed behind the vehicle.[9]

Ironically, the specifications for vehicle type and weight differed little from those for the heavy SU-14 SP gun developed 10 years previously.

Manufacture of the SP gun, dubbed the S-51, began in January 1944. In theory, mounting PB-4 on the KV-1S chassis required extending the hull and adding an additional pair of road wheels. Also, talk about a special chassis during wartime was tantamount to putting a project on the back burner. Therefore, TsAKB decided not to modify the running gear. The only changes made to the KV-1S in repair status had to do with mounting the new gun on it.

The tipping parts of the B-4 203 mm howitzer were adopted without change. The gun was moved far forward; its base partially overhung the driver's compartment. The howitzer barrel was retracted in the travel position. The gun was mounted on a special frame that partially obscured the view from the driver-mechanic's vision block. The system did not have a gun shield at

[9] TsAMO RF, collection 81, series 12063, file No. 1, pp. 86–88.

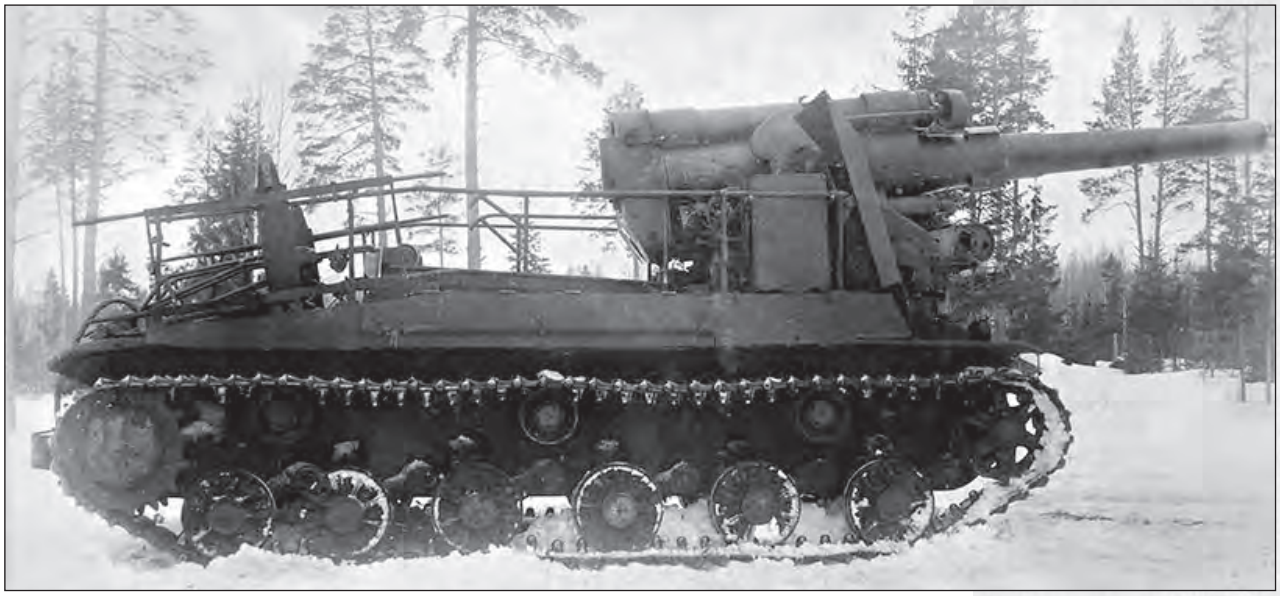
first. Later, a 7 mm thick gun shield was installed to protect the crew against shrapnel. The shield consisted of two parts that folded forward to facilitate movement of the B-4 barrel from the travel position to the firing position. When that was done, the shield rested on special supports on the vehicle.

A platform to hold some crew members when the gun was in firing position was built on shelves over the S-51's tracks. The platform's internal spaces served as containers for the SPT&A, and the platform was given a railing to prevent accidents. The main ammunition was stored in regular wooden boxes that were attached to rails and lay on the floor of the platform while the gun was in travel position. Fold-out ladders were added to the SP gun's stern to facilitate getting on and off the vehicle. Folding guide rails on which a loading tray was placed were located between the ladders. The guide rails were primarily needed for loading the gun from the ground. The S-51's basic load consisted of just 12 rounds. When firing from cover, therefore, the basic calculation was based on the ammunition carried. It should be noted that when the S-51 was in firing position, part of its 10-man crew was located on the vehicle and the rest on the ground.

Rear view of S-51 203 mm SP gun in travel position (TsAMO).

S-51 203 mm SP gun in fighting position (TsAMO).

Right side view of S-51 203 mm SP gun in fighting position (TsAMO).

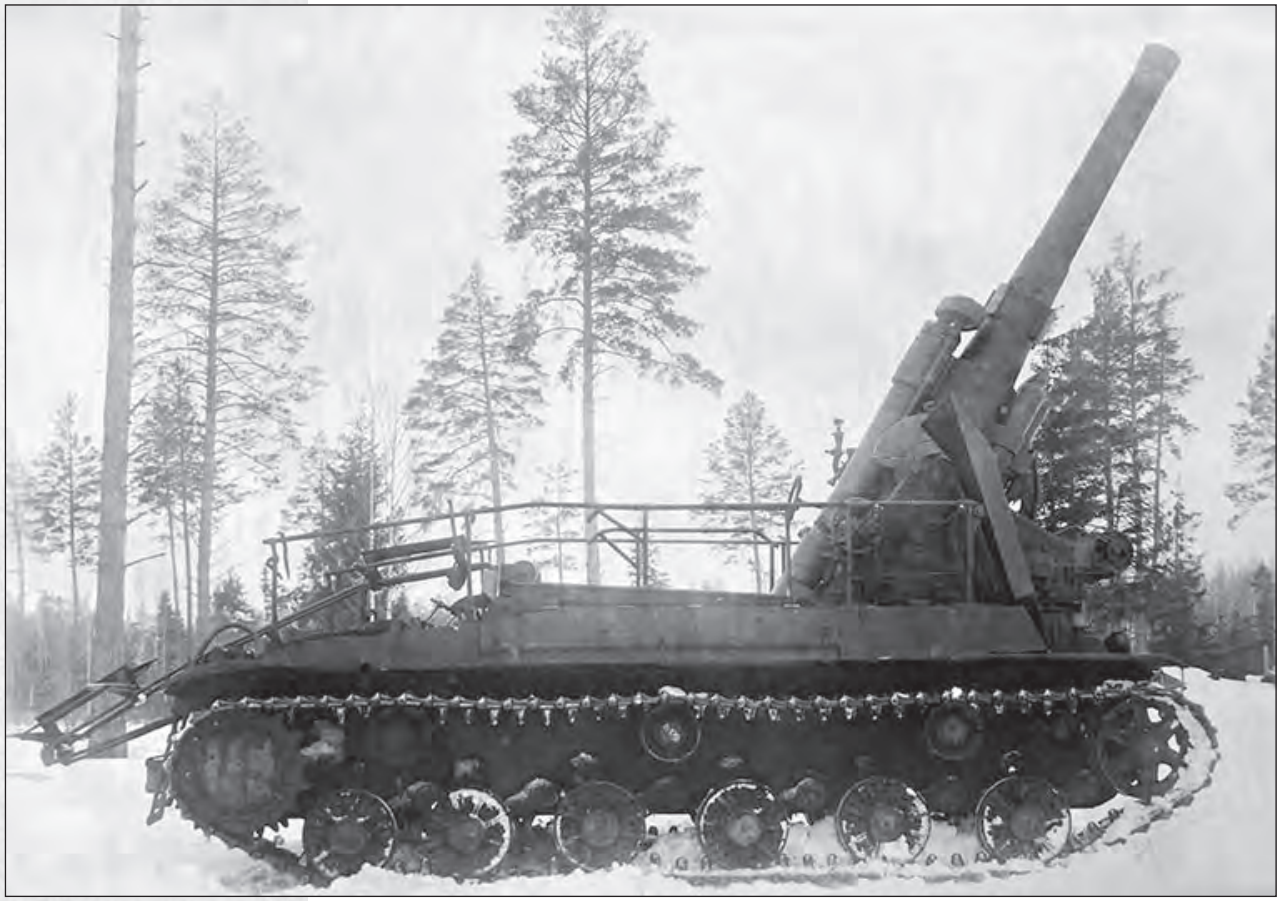


The heavy, open-type SP gun program entered its active phase in early February. The S-51 continued to be a low priority and therefore is not included on the list of high-priority programs mentioned above. The SP gun was first mentioned in a letter Ustinov wrote to Yakovlev on February 15, 1944, concerning the finished vehicle:

This is to inform you that the TsAKB of the People's Commissariat of Arms has manufactured the B-4 203 mm howitzer on a KV-tank chassis (the S-51 system). The S-51 system underwent factory firing tests at Factory No. 88's test range (at low elevation angles) and at the Sofrinsky Artillery Range of the People's Commissariat of Munitions (at high elevation angles). During the factory tests, 49 rounds were fired. The S-51 system past both the factory firing tests and the road test done at the same time. During the tests, a rate of fire 30% higher than that obtained on the V-4 system on this normal carriage was measured.

Before the S-51 system is handed over for proving-ground tests, TsAKB is modifying the system in accordance with instructions received from the Artillery

S-51 SP gun at maximum elevation (TsAMO).



Committee Chairman Lieut. Gen. of Artillery V. I. Khokhlov (it is adding an armored shield for protection against small arms fire).

I hereby request your guidance on conducting proving-ground tests of the S-51. It would be advisable to carry out these tests at the Sofrinsky Artillery Range of the People's Commissariat of Munitions because the Gorokhovets Artillery Proving Ground lacks the hoisting equipment needed to disassemble the system before and after testing.

This disassembly can be done in TsAKB shops.

Please provide information about the test program and the procedure for performing such tests as you deem necessary.

I further report that the S-51 development project of TsAKB of the People's Commissariat of Arms also examined installation of the BR-2 152 mm gun on the same chassis.

Under our agreement with you, we anticipate receiving the BR-2 system in TsAKB in order to manufacture the prototype vehicle for this gun. TsAKB has a KV tank for building the vehicle. [10]

The GAU's Artillery Committee approved the test program for the S-51 on March 2. The SP gun had arrived at the Gorokhovets Artillery Proving Ground prior to that—on February 26. The technical documentation came two days later. The problem with the lack of hoisting equipment at the proving ground was solved by breaking down and measuring the howitzer at Factory No. 112. However, the system could not be disassembled as completely as required. Before the tests were performed, the S-51 traveled a distance of 150 kilometers, 120 kilometers of it traveling from the proving ground to Factory No. 112 and back.

Testing of the SP gun began on March 16, 1943. Because the proving ground lacked high-explosive shells for the B-4, the test for firing accuracy was performed using concrete-piercing projectiles, thus shortening the proving-ground tests. On the 16th, 18 rounds were fired. During the entire course of the firing test, which lasted until March 24, 209 rounds were fired, 135 of them supercharged.

During firing at an angle of 30°, it was found that the S-51 moved backwards 1000–1300 mm, and it had a counterrecoil of 200 mm. When fired, the SP gun's bow lifted 250 to 450 mm, and its stern lowered by 200–300 mm. At the same time, it was observed that the right side jumped by 100 mm more than the left. When fired at an angle of 45°, the vehicle moved backwards 750–1000 mm; it had a counterrecoil of 330 mm; its bow lifted 100–180 mm; and its stern lowered by 120–140 mm. Firing at an angle of 57° revealed a backward movement of 400–750 mm, a counterrecoil of 300 mm, an upward movement at the bow by 60–150 mm, and a downward movement at the stern of 50–100 mm. Thus, the S-51's stability was considered unsatisfactory. The sight was also highly unstable.

Firing for durability (with 100 supercharged rounds), no damage was found on inspection. The rate-of-fire tests with a seven-man crew yielded an average figure of one round every 1.5 minutes.

[10] TsAMO RF, collection 38, series 11369, file No. 250, p. 22.

Front view of S-51 SP gun at maximum elevation (TsAMO).

The road tests took place between March 25 and April 4. The SP gun was tested under different road conditions; the snow depth reached 200 mm. Overall, the S-51 travel 524 kilometers, 16 of them on cobblestones and 40 off road. Most of the on-road tests took place on asphalt highway, as required by the trips to Factory No. 112. A maximum speed of 32 km/h was reached in the on-road tests, and 22 km/h off the road. No special tests were carried out because of various running-gear failures. At 240 kilometers, the right-side steering clutch and brake band went out, and the right steering clutch broke down again at 360 kilometers. Problems occurred with the tracks several times; bolts on the track roller cap broke. However, there were no problems with the engine or torsion bars, again confirming the durability of the running gear after the firing test program.

The tests concluded on April 6, and the proving-ground commission issued the following finding on the 9th:

1. *The S-51 self-propelled howitzer successfully passed most tests because:*
   a) *The operation and durability of the gun's assemblies and mechanisms are satisfactory.*
   b) *The durability of the gun mounting parts is satisfactory.*
   c) *The operation and durability of the vehicle assemblies and mechanisms are satisfactory, except for the transmission group, which had a number of defects during testing caused by its overall poor technical condition prior to the tests and wear to parts.*
2. *Shortcomings of the S-51 self-propelled howitzer during firing are as follows:*
   a) *A large movement backwards and instability of aim, especially at low elevation angles, due to the vehicle's instability during firing.*
   b) *A large lateral spread of rounds caused by sideways movement of the gun during firing.*

These flaws can be eliminated by placing trails on the vehicle's rear as was done on the SU-14 203 mm self-propelled gun designed and manufactured by the Kirov Factory, which underwent proving-ground tests in 1936.

Considering that the howitzer will primarily be fired at high angles of elevation during which backward movement and instability of aim are less significant, the placement of wooden beams constructed from locally improvised materials can be recommended to eliminate the vehicle's backward movement on the rare occasions when the gun is fired at low angles of elevation.

3. *The Gorokhovets Artillery Proving Ground believes that the S-51 203 mm self-propelled howitzer is more maneuverable and exhibits better firepower and lethality than the B-4 203 mm howitzer, and it can be recommended for adoption by the Red Army when the flaws identified during testing and noted in this report are corrected.* [11]

Based on the test results, Grabin wrote Beria to express his thoughts about putting the S-51 into production. The TsAKB's chief felt that a total of 20–30 SP guns of that type should be manufactured. The Self-Propelled

[11] TsAMO RF, collection 38, series 11369, file No. 287, p. 18.

Converting from travel position to fighting position (TsAMO).

Artillery Office had a negative reaction to that idea. They felt that it did not make sense to use the KV-1S chassis to manufacture a heavy SP gun with a light gun shield. In addition, the S-51's combat weight was 50 tonnes, and the tankers still remembered the way things were in 1942 when KV-1 tanks weighing that much were dropping their engines and transmissions. A decision was made to conduct additional tests on the SP gun, but they did not take place because the chassis required major overhaul after the road trips that spring.

The S-51 program temporarily ground to a halt. GAU Artillery Committee chairman Lieut. Gen. Khokhlov attempted to get things moving again by sending Yakovlev a letter on July 22 expressing his thoughts about how the SP gun would be used in battle:

Because our troops will soon be crossing the border between the Soviet Union and Eastern Prussia, the Red Army's artillery will acquire the mission of engaging the enemy's permanent fortifications.

According to information from the Intelligence Directorate of the Red Army's General Staff, the concrete in the fortifications in that region is between 1.4 and 2 meters in thickness.

Rear view of S-51 SP gun. The fold-out ladders and guide rails for the loading tray are clearly visible (TsAMO).

The most suitable system for use against concrete of that thickness is the B-4 203 mm howitzer, which is capable of penetrating modern concrete of the following thicknesses:

At a range of 1000 m: 1.4 m;
At a range of 2000 m: 1.3 m;
At a range of 3000 m: 1.2 m.

Firing trials. Part of the S-51 crew was located on the ground during firing (TsAMO).

Experience from 1939 through 1944 has demonstrated that this howitzer is most effective against concrete bunkers when fired from short range.

The TsAKB of the People's Commissariat of Arms has developed and manufactured a prototype S-51 203 mm auxiliary-powered howitzer with the B-4's traversing mechanism mounted on a KV tank chassis.

The prototype has been range tested with satisfactory results, except for stability during firing: a 1.5-m backward movement by the howitzer, and a 450 mm upward hop at the bow.

I believe that this system, which has greater mobility and fire maneuverability than the B-4 howitzer, can be successfully employed against concrete bunkers using direct fire.

The backwards movement of the howitzer can be eliminated by placing wooden blocks under the tracks.

[12] TsAMO RF, collection 81, series 12038, file No. 413, pp. 3–4.

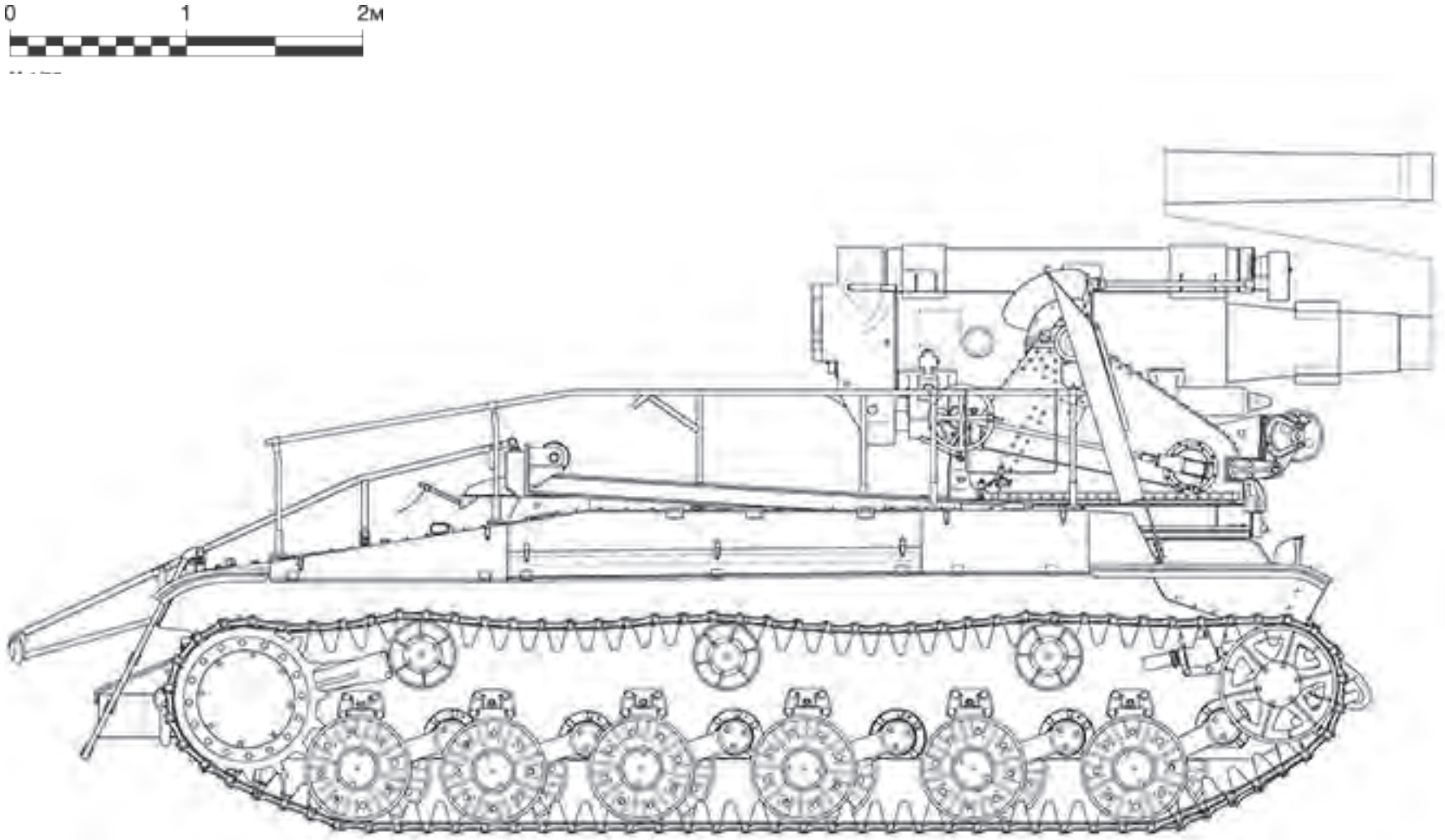
I propose ordering a batch (several dozens) of these auxiliary-powered howitzers to be manufactured in August of this year. A production run of that size would be entirely realistic. [12]

The letter forwarded a draft State Defense Committee decree "on the manufacture of a batch of B4-S51 auxiliary-powered 203 mm howitzers" that would clear the way for production of the S-51 in the event of a positive decision. The name of the person meant to sign the decree was not indicated, but Stalin usually put his own signature on decisions of that type.

1. *Accept the B4-S51 203 mm auxiliary-powered howitzer developed by the Central Artillery Design Bureau of the People's Commissariat of Arms with the traversing mechanism of the B-4 203 mm field howitzer model 1931 mounted on a KV-1S tank chassis for service with the Red Army.*
2. *The People's Commissariat of the Tank Industry (Comrade Malyshev) and the Main Tank Repair Directorate of the Red Army (Comrade Sosenkov) shall deliver 50 reconditioned KV-1S tanks minus turrets and with running gear, engines (with no more than 10% of their operating hours used), transmissions, and complete field SPT&A kits in good working order to the People's Commissariat of Arms by the following deadlines:*
   By August 10: 25
   By August 25: 25
3. *The People's Commissariat of Arms (Comrade Ustinov) shall, by August 10 of this year, manufacture adapters and mounting parts using drawings produced by TsAKB and organize production engineering for the B4-S51 203 mm howitzers by the following deadlines:*
   By August 20: 20 auxiliary-powered howitzers
   By August 30: 30 auxiliary-powered howitzers
4. *During production, eliminate flaws with the 203 mm howitzer installation identified during proving-ground tests by requiring TsAKB (Comrade Grabin) to make the necessary changes to the drawings and submit them to the Red Army's GAU for approval by August 1 of this year.* [13]

However, the decree was never signed. The repair plants were unable to provide the required number of repaired KV-1S chassis. Furthermore, chassis of that type were being used to manufacture recovery vehicles, which were urgently needed by armor units. In addition, the management of the Self-Propelled Artillery Office had a large number of questions about the S-51, as did Malyshev. Malyshev (People's Commissar of the Tank Industry), Ustinov (People's Commissar of Arms), Fedorenko (Main Armor Directorate), and Yakovlev (Main Artillery Directorate) came together for a meeting in late July 1944. Malyshev and Fedorenko were strongly opposed to manufacturing the S-51. Their argument was that the SP gun was obviously overloaded and could not sustain long-term use.

[13] TsAMO RF, collection 81, series 12038, file No. 413, pp. 8–9.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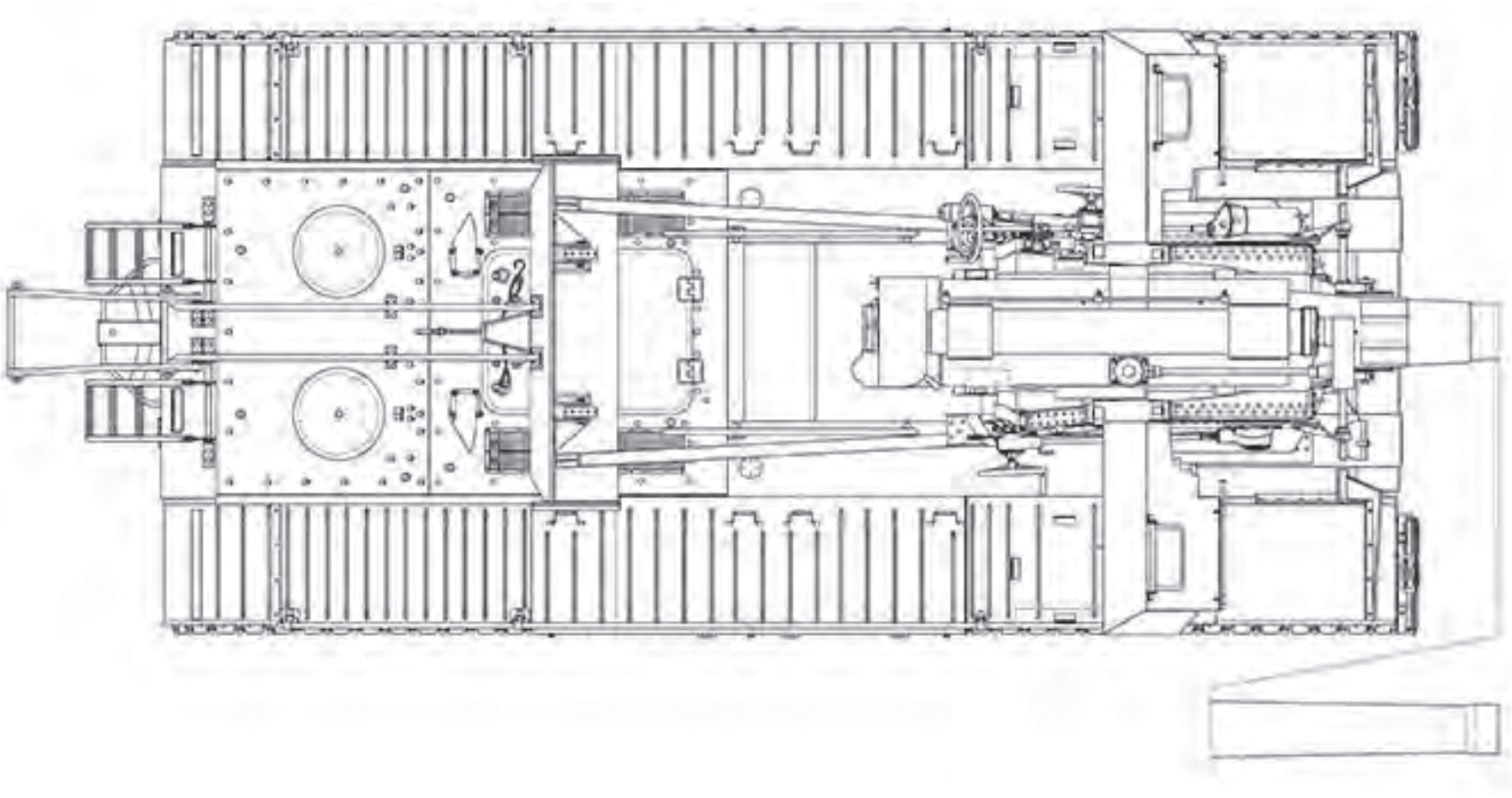

S-51 SP gun, 1:35 scale drawing.

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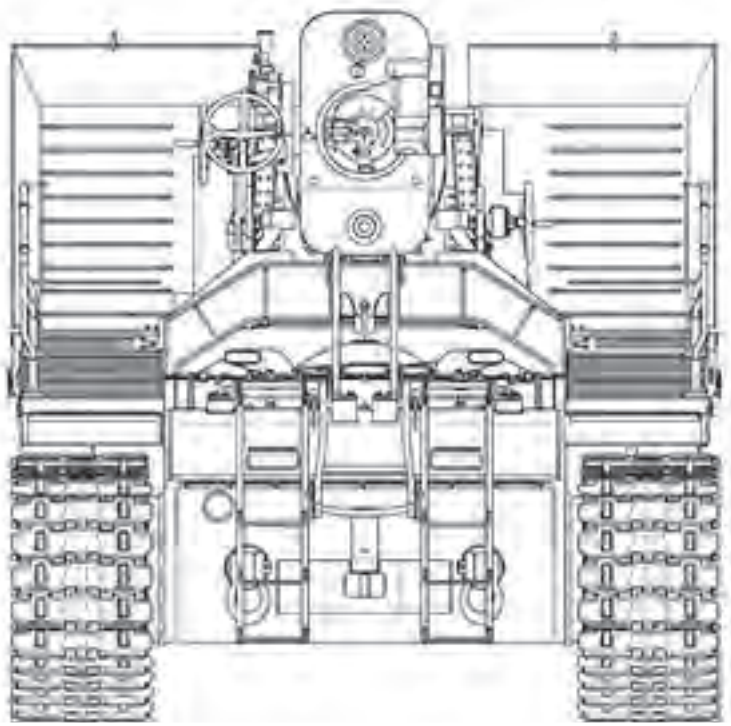
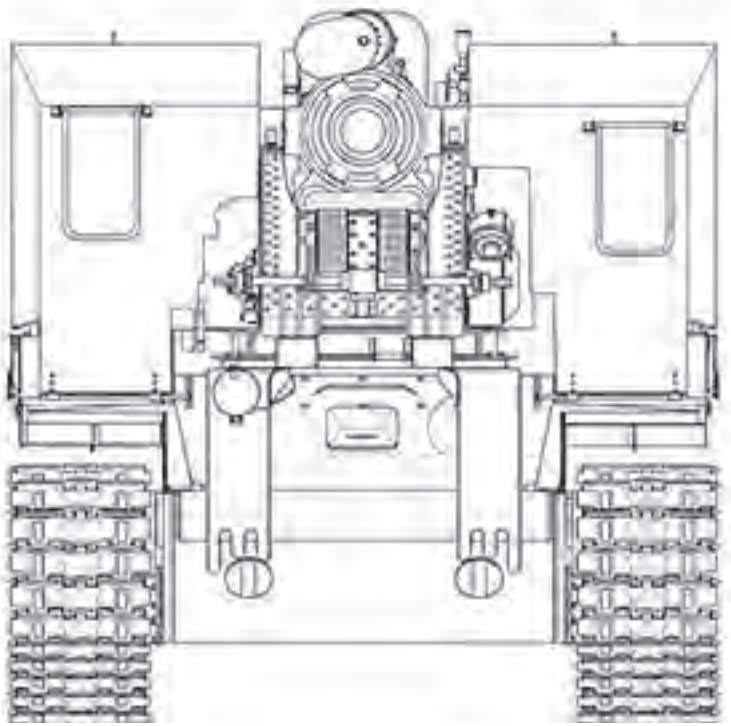
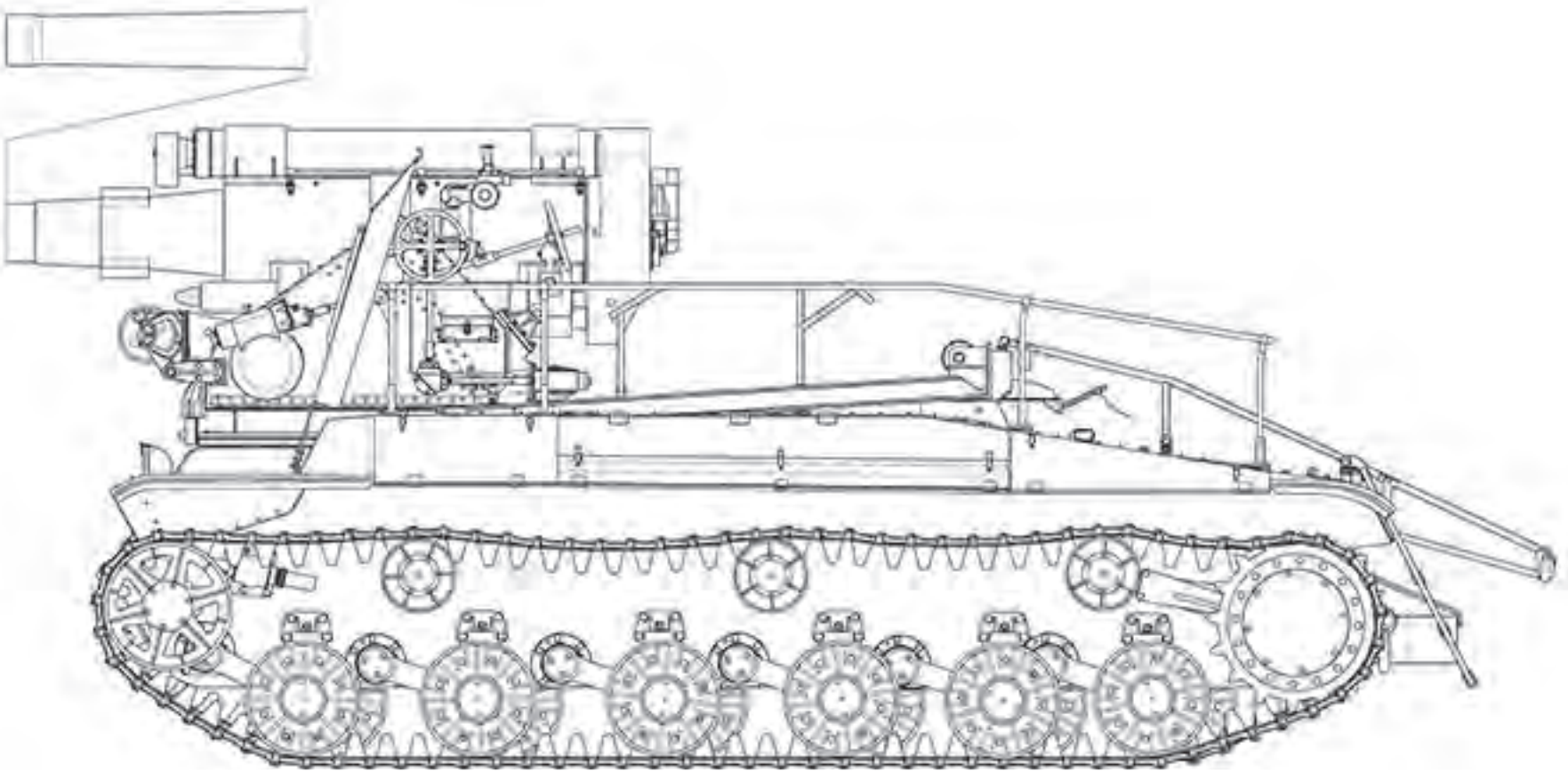
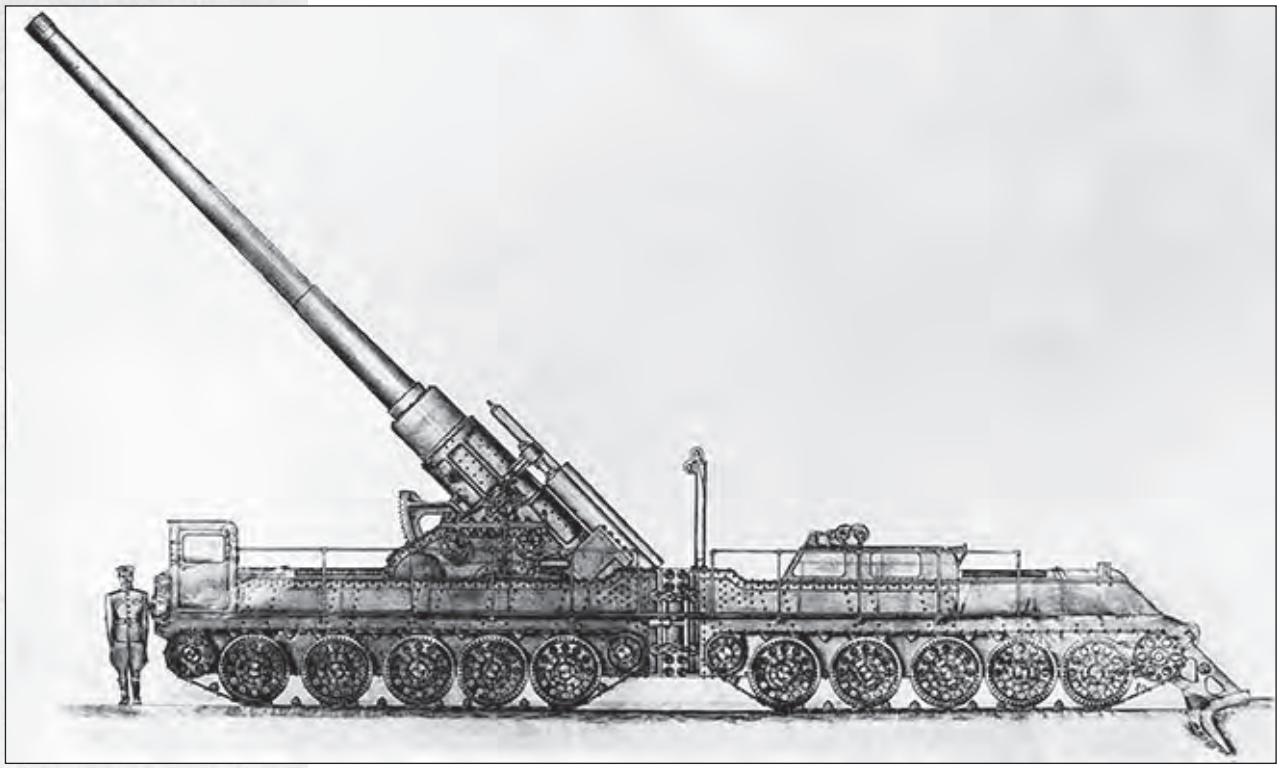






S-51 SP gun, 1:35 scale drawing.



The BR-17 210 mm gun or the BR-18 305 mm howitzer mounted on a T-34 tandem tank chassis. This SP gun was considered an alternative to the S-51 and S-59 (TsAMO).

Meanwhile, TsAKB continued working on heavy SP guns. In the summer of 1944, the design bureau built the S-59—an SP gun armed with the BR-2 152 mm heavy gun. To make it, TsAKB used a repaired KV-1S with hull serial number 30164 and engine number 309512 that had been provided by Repair Plant No. 1 on October 29, 1943. Few modifications were made because the same components were used for both the BR-2 and the B-4. According to the documentation, the S-59 was accepted for proving-ground tests in late August 1944.

However, the tests performed on the S-59 were largely academic because the KV-1S chassis had been rejected. The logical solution, which was settled on in late June 1944, was to replace the KV-1 chassis with an IS. Also, on July 29 the Leningrad branch of TsAKB proposed mounting the BR-17 210 mm gun or the BR-18 305 mm howitzer on a T-34 tandem tank chassis. This project was developed as an alternative solution. According to documentation, People's Commissar of Arms Ustinov proposed drawing up an operational requirement for that vehicle, but it did not advance beyond the conceptual design stage.

On August 14, the chairman of the GAU's Artillery Committee approved an operational requirement "for a 203 mm auxiliary-powered howitzer and a 152 mm auxiliary-powered gun based on the IS heavy tank." The chassis replacement was not the only modification made to the future SP gun's

design. It was proposed that the vehicle be equipped with a turret-mounted DShK machine gun (with 1000 rounds of ammunition) for self-defense, and that it also have two DP machine guns (with 2520 rounds), four PPSh submachine guns (with 4000 rounds), and 25 F-1 hand grenades. The crew size was increased to 10, and the basic load from 12 to 15 rounds for the B-4, or 25 rounds for the BR-2.

On September 22, GAU chief Marshal of Artillery Yakovlev wrote a memorandum for Beria. In the memo, he suggested that consideration be given to producing a modified version of the SP gun that would thereafter be based on the IS tank chassis. The report also clarifies some details regarding the revised project:

In my letter No. 623605ss of July 27 to you I reported on the issue of manufacturing a batch of 203 mm self-propelled howitzers developed by the TsAKB of the People's Commissariat of Arms (Comrade Grabin).

As your response to my report instructed, I have discussed the matter in a joint meeting with the People's Commissariat of Arms, the People's Commissariat of the Tank Industry, and the Main Armor Directorate.

We decided that it would not make sense to mount a 203 mm howitzer on the KV tank chassis, given that there are insufficient numbers available and that doing so would overload it. We would be better advised to mount this howitzer on the IS tank chassis, which is currently in production.

Based on that decision, GAU has issued the People's Commissariat of Arms and the People's Commissariat of the Tank Industry an operational requirement for a 203 mm auxiliary-powered howitzer on an IS tank chassis, and the People's Commissariats have issued appropriate orders to TsAKB and Factory No. 100 concerning project development.

The Main Armor Directorate has no requirement for this type of weapon for the armored forces and has expressed no interest in developing a 203 mm auxiliary-powered howitzer. On the contrary, it believes that it would be inadvisable to use an armored chassis for this purpose.

The People's Commissariat of the Tank Industry is of the same opinion.

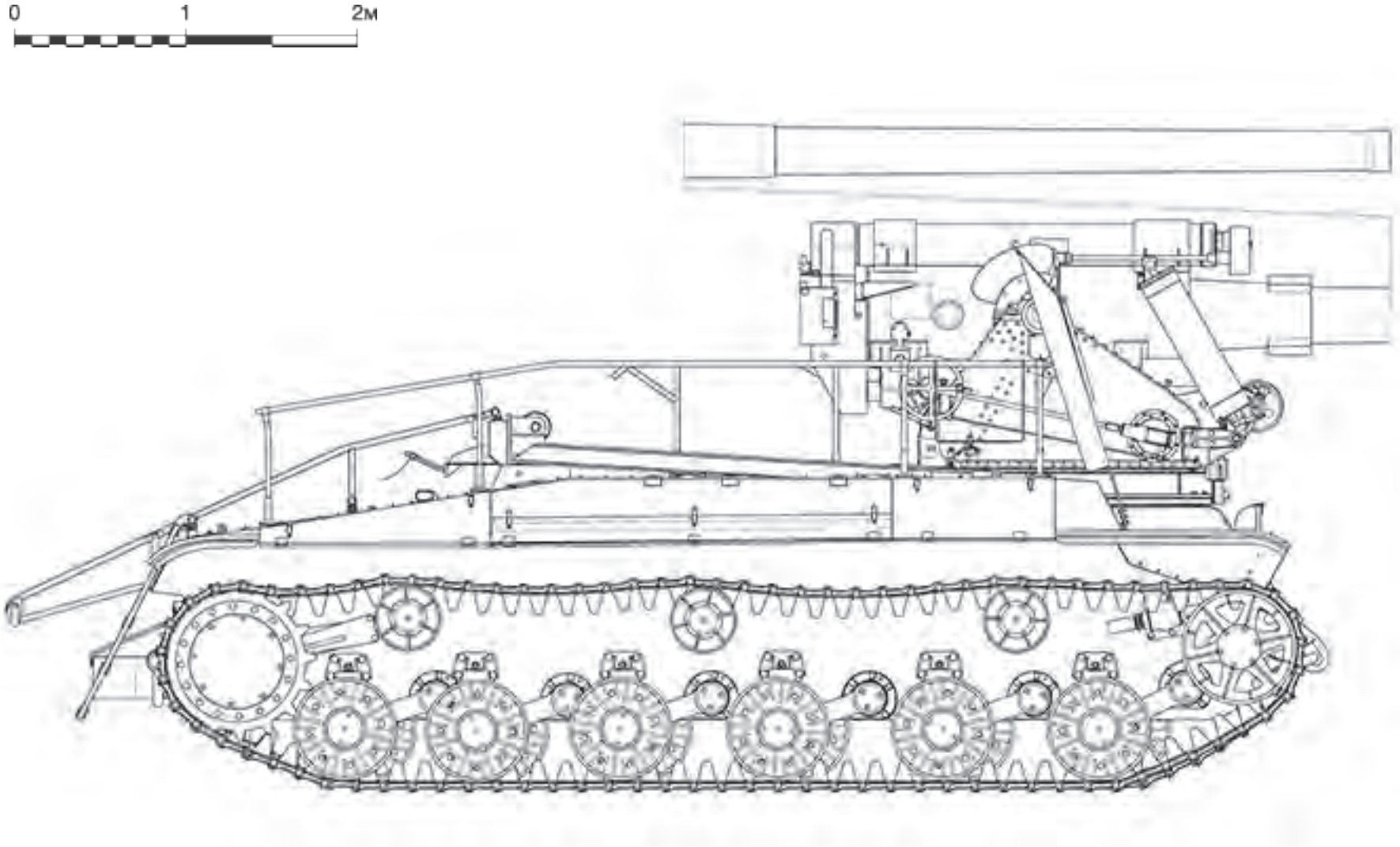
That opinion is hindering development of this weapon despite the formal order from the People's Commissariat of the Tank Industry to Factory No. 100 to undertake the project.

The GAU fully agrees that armor as strong as that on the IS tank is unnecessary for an auxiliary-powered gun and, in proposing that the IS be used, is thinking of the opportunity it offers to rapidly acquire a weapon of this type based on a system currently in mass production.

GAU believes that there is an urgent need for 203 mm auxiliary-powered howitzers at this stage of Red Army combat operations.[14]

As in July, the report forwarded a draft State Defense Committee decree, this time for the "manufacture of 203 mm auxiliary-powered howitzers on the IS tank chassis." This time the artillerymen's appetite was more modest:

[14] TsAMO RF, collection 81, series 12038, file No. 413, pp. 30–31.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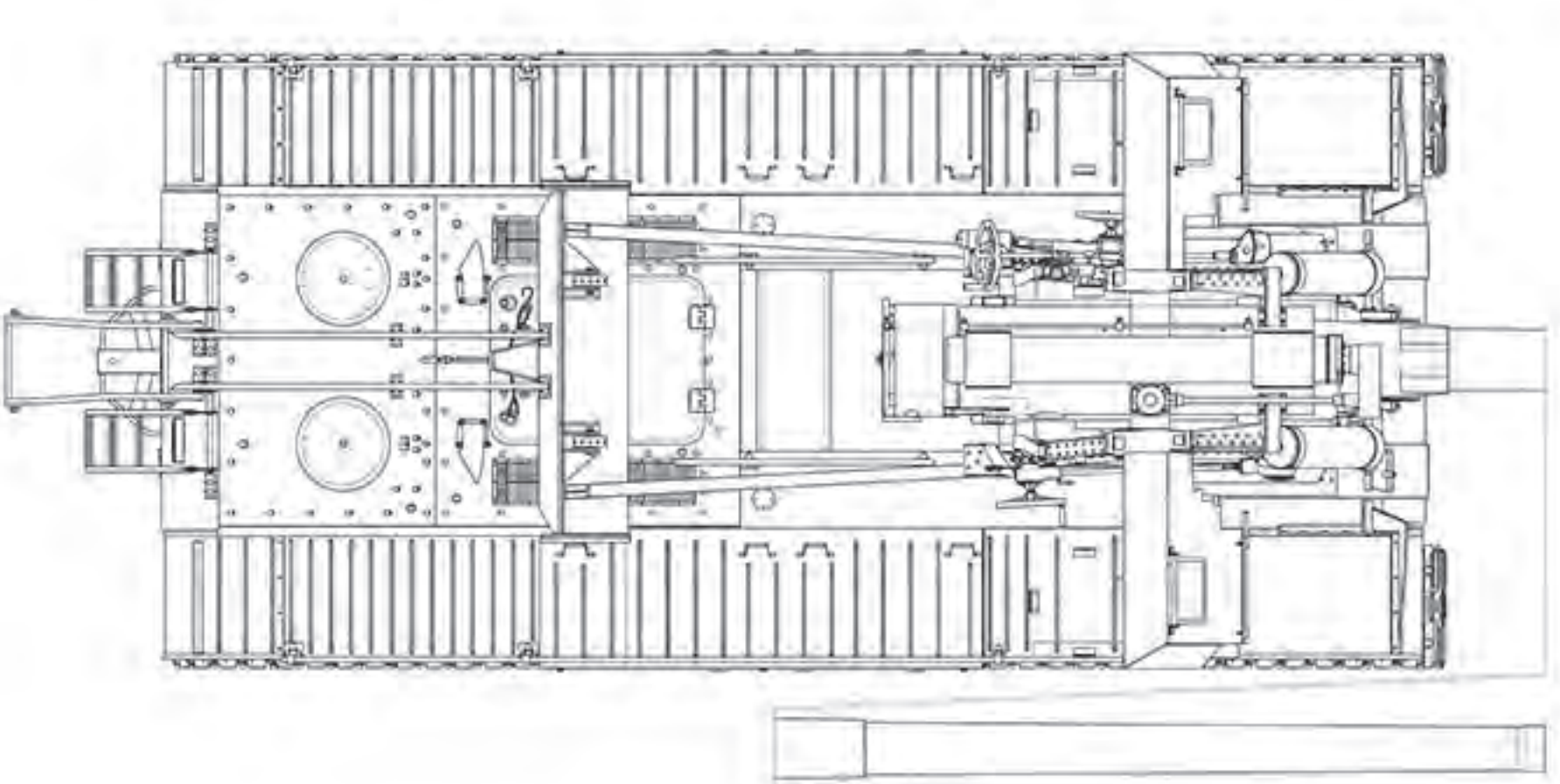

S-59 SP gun, 1:35 scale drawing.

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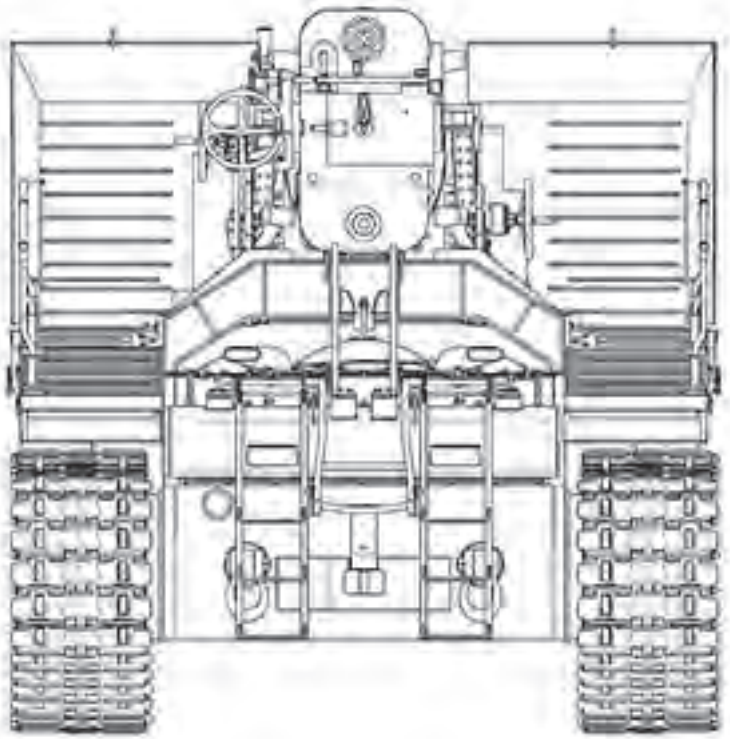

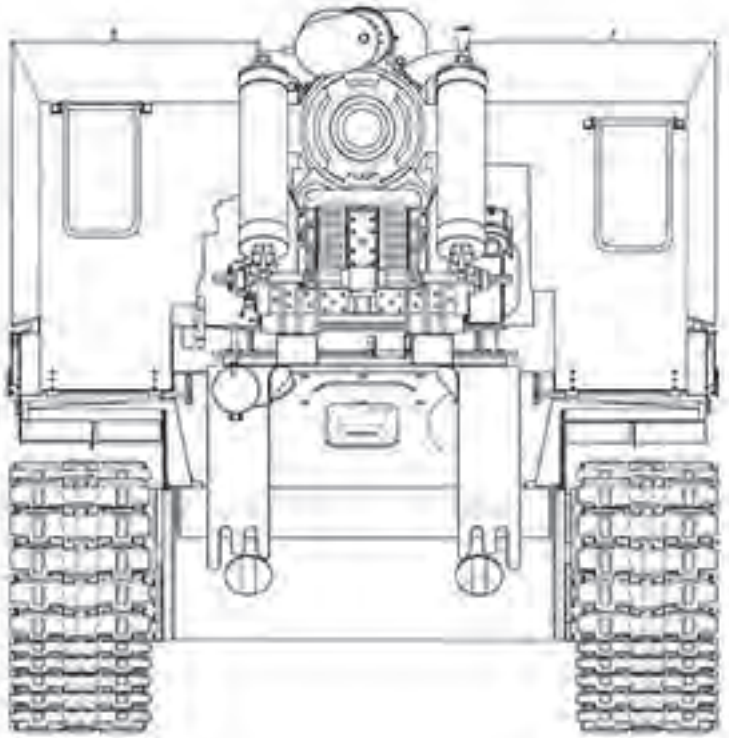

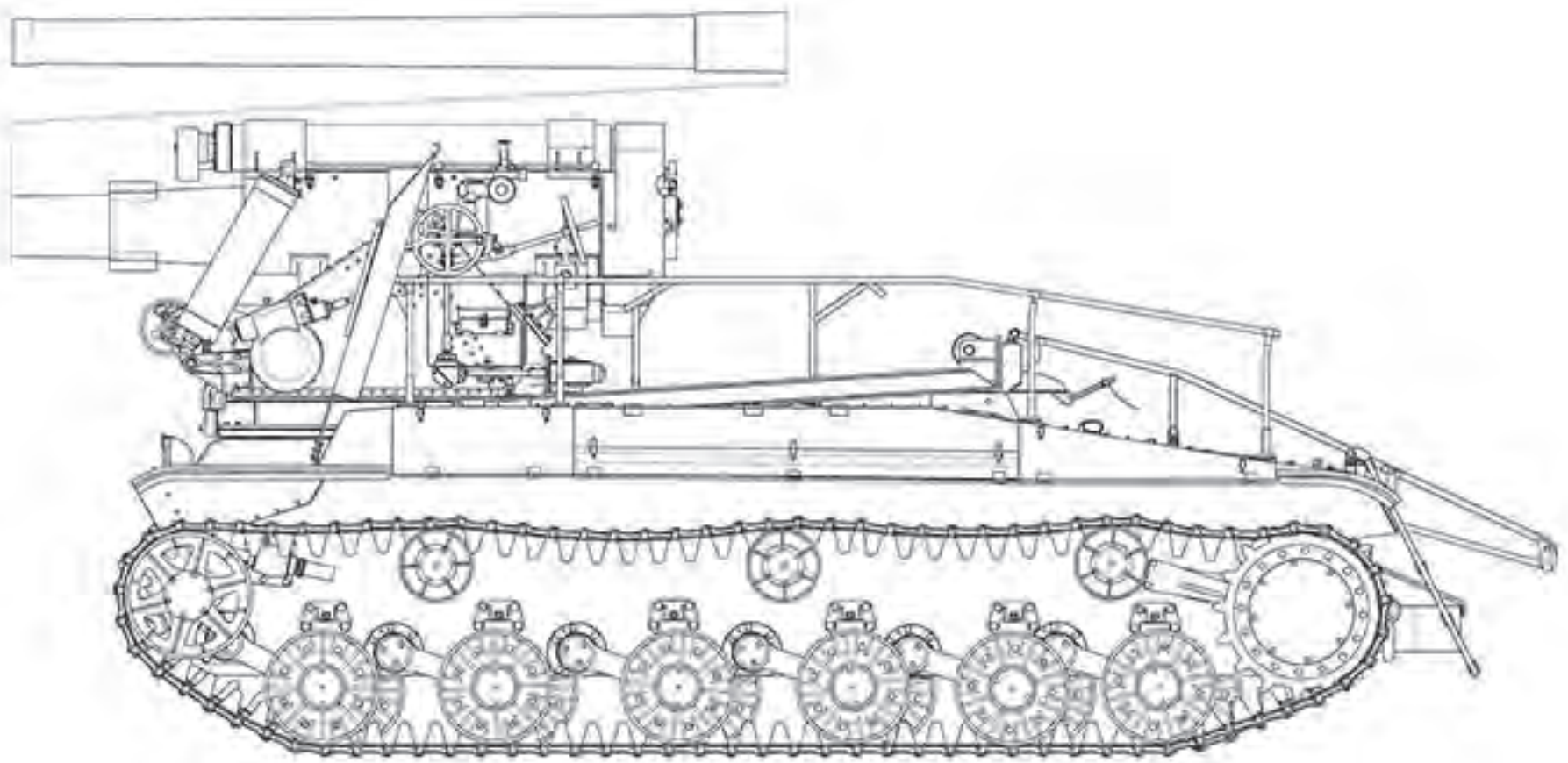

S-59 SP gun, 1:35 scale drawing.

1. *The People's Commissariat of Arms (Comrade Ustinov and Comrade Kotin) and the People's Commissariat of the Tank Industry (Comrade Malyshev) shall by October 15, 1944, prepare engineering drawings for a 203 mm auxiliary-powered howitzer based on the IS tank in accordance with the GAU's operational requirement.*
2. *The People's Commissariat of Arms (Comrade Ustinov and Comrade Grabin) shall send the number of designers required to coordinate all issues concerning mounting of the howitzer and developing engineering drawings to Factory No. 100 of the People's Commissariat of the Tank Industry, where all of the work will be completed.*

   The GAU (Comrade Yakovlev) shall, upon completion of the engineering drawings, send a representative to Factory No. 100 to approve the drawings on site.
3. *The People's Commissariat of the Tank Industry (Comrade Mlyshev, Comrade Zaltsman, and Comrade Kotin) shall, upon securing IS tanks, manufacture a batch of 20 203-mm systems on IS tank chassis by the following deadlines:*

   During October: 5
   During November: 15. [15]

This second attempt at crossing the river turned out to be no more successful than the previous one. It should be noted that TsAKB was extremely cool to the idea of developing a system like the S-51 on an IS chassis. TsAKB's deputy chief designer, K. K. Renne, wrote a letter to Khokhlov and Satel expressing the opinion that it would be inadvisable to take on another development project before the decrees are issued. In other words, TsAKB was holding firm to the idea of an SP gun using the KV-1S chassis. The People's Commissariat of the Tank Industry and the Main Armor Directorate were also cool to the SP gun concept, but for a different reason.

It would be inadvisable to mount the B-4 203 mm howitzer on the KV-1S tank chassis for the following reasons:

1. *The system would weigh about 50 tonnes, 7 tonnes more than the KV-1S, which would cause the vehicle assemblies to operate unreliably.*
2. *It would not make sense to manufacture an open artillery vehicle based on a tank with strong armor protection.*
3. *The KV-1S tanks have been dropped from production, and they would be difficult to repair due to the lack of spare parts.*

The GAU's Artillery Committee has developed an operational requirement for designing a 203 mm howitzer vehicle based on the IS tank.

In its letter No. 556976s of July 30, 1944, GABTU's Self-Propelled Artillery Office wrote the GAU's Artillery Committee concerning the inadvisability of using the IS tank with strong armor for an open 203 mm howitzer system.

[15] TsAMO RF, collection 81, series 12038, file No. 413, p. 32.

[16] TsAMO RF, collection 81, series 12038, file No. 413, p. 32.

A B-4 203 mm heavy howitzer's crew conducts direct fire on the enemy, Berlin, April 1945. This photo might have featured the S-51 had it not been for the controversy surrounding the heavy SP guns (RGAKFD).

The GABTU's Self-Propelled Artillery Office has recommended designing a special chassis using assemblies from a heavy tank and a tractor.[16]

The situation finally reached an impasse in November. On the one hand, the TsAKB had not warmed to the idea of reworking the S-51 project. On the other, both the People's Commissariat of the Tank Industry and the Self-Propelled Artillery Office of the Red Army's Main Armor Directorate were firmly opposed to both SP gun versions. In commenting on the draft State Defense Committee decree, Malyshev suggested designing a new SP gun. Under wartime conditions that essentially killed the project.

The story had come to an appropriate end. The controversy meant that the S-51 and S-59 went no further than the prototype stage, and the SP howitzer that the artillerymen needed so badly was never fielded. As they did in the winter of 1939–1940, the artillerymen "took down" enemy fortifications with heavy guns and mortars that were exposed to direct fire.

MAIN COMBAT AND TECHNICAL CHARACTERISTICS OF SP GUNS BASED ON THE KV TANK

SP gun	212A	KV-7*	U-18 (project)	U-19 (project)	ZIK-20 (project)
Length, mm	8000	6750	8975	7900	8385
Width, mm	3360	3250	3250	3250	3250
Height, mm	3070	2450	2450	3510	2620
Road clearance, mm	500	470	470	470	470
Track width, mm	660	700	700	700	700
Combat weight, kg	65,000	65,000	65,000	65,000	65,000
Crew	7	6	6	6	6
Armor, hull					
Upper glacis plate, mm	60	100	100	100	100
Lower glacis plate, mm	60	100	100	100	100
Side, mm	60	75	75	75	75
Upper rear plate, mm	60	75	75	75	75
Lower rear plate, mm	60	75	75	75	75
Top, mm	20	30–40	30–40	30–40	30–40
Bottom, mm	20–30	30–40	30–40	30–40	30–40
Armor, superstructure					
Front, mm	60	105	105	75	75
Mantlet, mm	60	100	100	75	90
Side, mm	60	75	75	60	75
Rear, mm	60	75	75	40	75
Top, mm	20	40	40	30	40

*** Data in parentheses pertain to the version with the U-14**

MAIN COMBAT AND TECHNICAL CHARACTERISTICS OF SP GUNS BASED ON THE KV TANK *(continued)*

SP gun	212A	KV-7*	U-18 (project)	U-19 (project)	ZIK-20 (project)
Armament:	1×BR-2 152 mm gun model 1935 2×7.62 mm DT machine guns	1×76 mm F-34 gun 2×45 mm guns 2 + 1×DT 7.62 mm machine gun 2×76 mm ZIS-5 guns 2 + 1×7.62 mm DT machine gun	1×ML-20 152 mm gun-howitzer model 1937 2 + 1×DT 7.62 mm machine gun	1×B-4 203 mm howitzer model 1931	1×ZIK-20 152 mm gun-howitzer 1×DT 7.62 mm machine gun
Basic load	47 shells 3000 cartridges	93×76 mm shells 200×45 mm shells 3950 cartridges (150 shells, 2646 cartridges)	60 shells 3950 cartridges	20 shells 3950 cartridges	30 shells
Aiming angles					
Elevation, degrees	-3/+15	-5/+15	-5/+15	-5/+10	-3/+15
Traverse, degrees	4/4	7.5/7.5	7/7	4.3/4.3	6/6
Aiming devices	T-9	TMFD-8	TOP	T-9	PG-1
Communications equipment	71-TK-3M	–	–	–	–
Powerplant	V-2F (V-10)	V-2K	V-2K	V-2K	V-2K
Engine type	Diesel	Diesel	Diesel	Diesel	Diesel
Power output, hp	850	600	600	600	600
Maximum speed, km/h					
Highway	35	34	–	–	–
Off-road	–	25	–	–	–
Endurance, km					
Highway	200	225	–	–	–
Off-road	160	160	–	–	–
Ford, mm	–	1600	–	–	–
Maximum gradient, degrees	31	36	–	–	–

*** Data in parentheses pertain to the version with the U-14**

MAIN COMBAT AND TECHNICAL CHARACTERISTICS OF SP GUNS BASED ON THE KV-1S TANK

SP gun	SU-152	SU-203 (project)	M21 (project)	M22 (project)	S-51*
Length, mm	8960	8675	11,950	9530	9350 (11,650)
Width, mm	3250	3250	3250	3250	3250
Height, mm	2450	2550	2450	3450	3400 (3370)
Road clearance, mm	440	440	440	440	400
Track width, mm	650	650	650	650	650
Combat weight, kg	45,500	48,000	–	43,000	50,000 (50,800)
Crew	5	5	5	–	10 (9)
Armor, hull					
Upper glacis plate, mm	75	75	75	75	75.
Lower glacis plate, mm	60	60	60	60	60
Side, mm	60	60	60	60	60
Upper rear plate, mm	60	60	60	60	60
Lower rear plate, mm	60	60	60	60	60
Top, mm	30–40	30–40	30–40	30–40	30–40
Bottom, mm	30–40	30–40	30–40	30–40	30–40
Armor, superstructure					
Front, mm	75	70	75	10	7
Mantlet, mm	75	70	75	–	–
Side, mm	60	30	60	–	–
Rear, mm	60	25	60	–	–
Top, mm	20	20	20	–	–
Armament:	1×152 mm ML-20S gun-howitzer	1×203 mm M-4 mortar 1×7.62 mm DT machine gun	1×122 mm M22 gun	1×203 mm B-4 howitzer Model 1931	1×203 mm B-4 howitzer Model 1931 1×152 mm BR-2 gun Model 1935

*** Data in parentheses pertain to the S-59**

MAIN COMBAT AND TECHNICAL CHARACTERISTICS OF SP GUNS BASED ON THE KV-1S TANK *(continued)*

SP gun	**SU-152**	**SU-203 (project)**	**M21 (project)**	**M22 (project)**	**S-51***
Basic load	20 rounds	20 rounds	–	26 rounds	12 rounds (32 rounds)
Aiming angles					
Elevation, degrees	–3/+20	–5/+15	–3/+22	–1.3/+58	–1.3/+58
Traverse, degrees	12/12	7.5/7.5	12/12	4.3/4.3	4.3/4.3
Vision devices	ST-10 KT-5	ST-10 KT-5	ST-10 KT-5	PG-1	PG-1
Communications equipment:	9-R or 10-R	–	–	–	–
Powerplant	V-2K	V-2K	V-2K	V-2K	V-2K
Engine type	Diesel	Diesel	Diesel	Diesel	Diesel
Power output, hp	600	600	600	600	600
Maximum speed, km/h					
Highway	42.8	–	–	–	32
Off-road	23	–	–	–	22
Endurance, km					
Highway	330	–	–	–	200
Off-road	200	–	–	–	150
Ford, mm	1600	–	–	–	1600
Maximum gradient, degrees	30	–	–	–	22

*** Data in parentheses pertain to the S-59**

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Note: *Italics indicate production drawings or photographs.*

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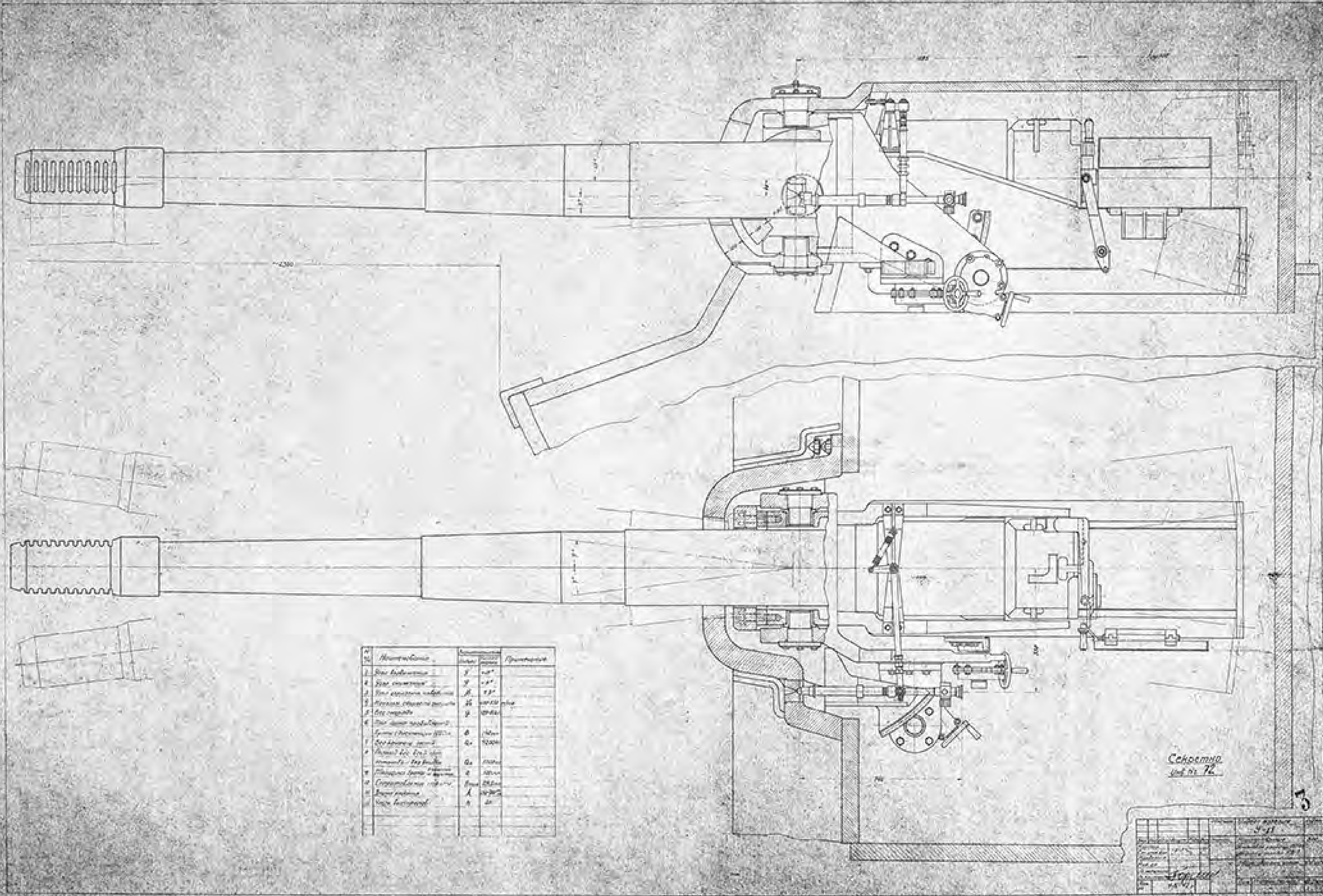
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For the first time in English — photos and drawings from secret Soviet archives and museums — many never previously published! Recently translated documents are used to present the true story of the SU-152 and other self-propelled (SP) guns based on the KV tank chassis, including:

The plan for Soviet heavy artillery SP guns began in 1931

Competition to develop a "bunker buster" SP gun started in earnest in 1938 but just missed a battlefield test in the 1939-1940 Russo-Finnish Winter War

Soviet pre-war intelligence indicating that Germany was working on super heavy tanks increased the urgency of the SP program—although the German invasion of the Soviet Union in 1941 showed that intelligence to be wrong

The impact of evacuating factories and other industry beyond the Ural mountains as German forces advanced

Joseph Stalin's personal interest in the SP program and competition between factory design teams for resources and support

How the destruction of the Barricades factory in Stalingrad (modern day Volgograd) severely reduced Soviet manufacturing of 152-mm and larger guns

After it was deployed on the battlefield, the SU-152 became nicknamed "Beast Killer" because its big gun was the only anti-tank weapon able to damage or destroy the menagerie of German heavy armor—Tigers, Panthers, and Elephants

Why SU-152 manufacture stopped after only 670 were produced and why no new heavy SP artillery was deployed to help Soviet armies batter their way through German fortifications in 1944-45

BONUS

Current ***World of Tanks*** players as well as new players who buy the printed version of this book can find a number on the inside back cover that provides a special Bonus Code they can immediately use in play.

ISBN-13: 978-1-940169-08-8

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