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Steels for Tank Barrels

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ABSTRACT: In article is given information on the steels used for the development of tank barrels and combat gun barrels, as well as their quality and properties. Repairability, low price, technology, and high combat performance of steels are noted.

KEY WORDS: Warrior, equipment, barrel, weapon, cannon, metal, liger, mechanism, tank, plasticity, shutter, gunpowder.

I. INTRODUCTION

Military equipment and weapons are made of ferrous and non-ferrous metals.The accuracy is the highest and the cost is guaranteed to be the lowest. Based on these requirements, its reliability should be at an absolute level.

In addition, it is necessary to distinguish between the use of weapons in peaceful conditions and the highly difficult conditions of war.

For the production of combat cannon barrels, special alloyed steel is used.

According to its quality, the steel used in the barrel of the cannon should not only cause corrosion, but also maintain its plastic state in the event of a disaster, should not form large cracks, should not break into pieces in small sizes, and as a result, should not fail the crew members and the entire system.

II. RESEARCH METHODS

The main type of production of cannon barrels is its melting in marten furnaces. For this, high-quality cast iron and pure, refined metal scraps are needed. In order for the steel to have the appropriate qualities, it includes various intervening and alloying elements. The content of these element types (types) in steel is shown in percentages in the first table.

Table 1.

Element	%	Element	%
Carbon S	0,5	Tungsten W	2,0
Manganese Mn	0,85	Vanadium V	0,3
Silicon Si	0,65	Titanium Ti	0,3
Chromium C r	1,8	Copper Cu	0,2
Nickel Ni	5,0	Phosphorus P	0,035
Molybdenum M	1,0	Sulfur S	0,03

Sulfur and phosphorus make steel brittle

Phosphorus makes steel brittle. Phosphorus increases the brittleness of steel at cold temperatures, and sulfur at high temperatures. Due to the fact that sulfur and phosphorus have a negative effect on the properties of steel, their content should not exceed 0.06%. The content of other elements listed in Table 1 in steel is necessary to give other properties. For example, chromium and tungsten give plasticity to steel without reducing its hardness, and nickel also gives plasticity to steel.

The type of steel makes it possible to determine whether the main alloying elements were added during its preparation. For example, OXM means the following: Steel gun-cannon (orudinaya)-(0), chrome-(x), molybdenum – (M); type OXNZN is expressed as follows: gun-cannon (orudiynaya)-(O), chromium-(X) nickel-(N,3%), molybdenum-

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(M). The grade of steel indicates its relative size. For example,) O-600 refers to the highest ratio of cannon steel equal to 600 MP.

Thus, the type of steel and its category determine its strength, chemical composition and main properties. Modern metallurgy is able to obtain steel with high strength from very high grade O-1200MP. Firearms are divided into command detail (KD) and non-command detail (Nk D). KD is directly exposed to compressible gases during firing: barrel, shutter, gas-producing mechanism and ejectors, barrel device. NkD serves auxiliary purposes: shell, barrel box, trigger device, insert, fasteners (bracket, etc.)

KD materials retain gas pressure, resist corrosion and chemical erosion, withstand 400-500oC and some parts withstand 1500-1800oC, should not emit secondary fragments ("explosion sample") and retain them. Even in this case, a repairable (combat) light machine should be kept cheap and not rare in mass production. Otherwise, they will have to be replaced by cheap, simple and technological ones during military operations.

Steel is used for the most common and well-known weapon parts. Advantage: repairability, low cost, technological, high combat performance.

Disadvantages: weight. For special weapons - detection with a metal detector. Usage - from ordinary cannon to tank cannon (OXN3MFA) its durability is increased by 2.5-3 times by chroming with hard chromium to increase corrosion resistance.

In order to prevent erosion due to ignition (erosion) (tank, anti-aircraft, naval guns), their barrels are chromed with thick (50-180μm) chrome. The durability of the 2A46 barrel is increased to 600 shots, and due to the chrome plating of the 2A46M barrel, firing is increased to 1200.

Figure 1. Tank barrels

In practice today, steel is the most suitable material, and the remaining materials are used to reduce weight.

During the processing of all team details under pressure (OMD) (Welding, coating, pushing casting, crimping), defects in raw materials are detected in the initial processing, they become unusable and are no longer used. With the exception of center thrust casting, only secondary parts (hydrotism shell-push, return) pipes or stvolosti (for large-caliber barrels) devices are used for subsequent pressure and mechanical processing mandatory testing.

Titan. Its advantage over steel is 2 times lighter, less magnetic, and almost as strong. Disadvantages: 25-40 times more expensive, rarity, 6-10 times worse handling, intolerant to gunpowder gas (quickly embrittles), quickly loses its mechanical properties when the temperature exceeds 400 0C.

Special solution (EP 722,EP 730). The main part is cobalt. In addition, there is nickel, chromium, molybdenum, iron.

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For details under tension (barrel box), it is better to use low-carbon quality steel (type 20 or 09G2 S) obtained by thickness or stretching.

It is cheap, technological, hard and strong, plastic deformable and very suitable for repair (flexible, but not broken). Also, it can be welded, brazed, sheared in any way in the field. In this regard, it is better than all materials.

Thus, the most suitable material for making tank barrels is high-alloyed steel. For example, OXN3MA, OXN3MA, OXN3MFA and other types are used.

Corrosion of the inside of the barrel reduces the effectiveness of the weapon, even if other parts are adjusted. Repair or replacement of the barrel requires shipping it to the factory with parts and putting it out of action. At this moment, an important question arises: what is the period of use of the weapon?

After a certain number of projectiles (bullets) are fired from the weapon, it becomes impossible to use it in combat situations. The barrel fails after 150-200 shots from large and medium-caliber weapons, and after 10-15 thousand shots from small and medium-caliber weapons. In addition, if the barrel is made of precious metal, its recasting will be extremely expensive, and the economic loss will be large.

Therefore, it is thought that in order to update the weapon, it is necessary to replace its thin layer, not completely. To perform this operation, the stem pipe is routed. A thin-walled pipe is placed in the cut and is called a liner. Modern cannons use two types of liners: reinforced and loose liners.

Line (ingl. liner - connection (insertion) - is a replaceable part of the barrel. It is a wearable thin-walled pipe, which is installed from the beginning to the end of the barrel.

A loose liner is quickly replaced in the field with wear, while a reinforced one is not, so the liner is used more often.

III. CONCLUSION

To conclude from the above, it was found that the steels used for the development of tank barrels and combat cannon barrels are made of alloy steels. The type of steel and its category determine its strength, chemical composition and main properties. Modern metallurgy is at a very high level O-1200MP is able to obtain steel with higher strength.

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