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Experience in Improving Residential Deposits with Ore Magazination

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ABSTRACT: The article describes the conditions for the application of various variants of the development system with ore storage in the development of thin and low-power vein deposits. Such a system of development of vein deposits is the most productive and quite safe. Ore grading systems allow more than 60% of ore to be extracted from vein deposits, and in deposits such as gold, tin and tungsten, these systems are practically the only ones.

KEY WORDS: labor productivity, ore dilution, ore loss, ore shrinkage, vein deposits, separation from the massif, ore drawing, steep-dipping deposits, hard rocks, floor, sub-floor.

I.INTRODUCTION

The development of vein deposits by the ore storage system is the most productive and quite safe. Ore-storing systems extract more than 60% of ore from vein deposits, and in such deposits as gold, tin and tungsten, these systems are practically the only ones. The large distribution of these systems in comparison with others is explained by the relatively low labor input, more favorable conditions for breaking and ore output, and the low consumption of lining materials. Recent circumstances play an important role in the development environment in Uzbekistan.

II. SIGNIFICANCE OF THE SYSTEM

Development systems with ore shrinkage are usually used in the development of steeply falling ore bodies that are stable, not prone to caking, oxidation, and ignition with sufficiently stable host rocks. The scope of these systems has been significantly expanded due to the creation of new system options for the development of lived in insufficiently stable rocks: short shrinkage, floor shrinkage and scatter piling, as well as systems with shrinkage and gob road system with a stull timbering.

III. LITERATURE SURVEY

In Russia, a mining system with ore storage was first introduced by prof. N.I. Trushkov in 1912 at the Aydirlinsky mine during the development of the Miass vein. As a result of prolonged use, significant changes were made to this system, which led to its significant modification.
Currently, in the development of vein deposits, many variants of ore storage systems are used, which differ from each other in various structural elements and the technology of the treatment excavation.

IV. METHODOLOGY

In variants of the development system with full storing, the beaten ore gradually fills the mined-out space to the entire height of the floor as it moves to the treatment ditch, after which it is completely released. Typically, with these system

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options, ore extraction is carried out in separate rebellion units. This version of the system is most often found in domestic and foreign practice.

Among the various options for an ore storage development system, rebellion extraction systems are most effective. The floor height with these variants of the system is usually taken 40-50 m, the block length is 50-60 m. The depth of the holes is 1.5-2 m. The ore is discharged through loading chutes located at a distance of 3-5 m from each other. In the presence of large pieces of ore and significant detachments of waste rock, sometimes screening chambers are constructed or a chutless ore drawing is used.

In the case of the full-stacking development system, a ceiling-mounted face is more often used (Fig. 1), which provides a wide front for drilling horizontal holes with hand punchers. However, the use of vertical or angle boreholes when breaking off is inefficient. After blasting the ledges, the surface of the beaten ore turns out to be uneven, which requires a significant amount of labor to level it.

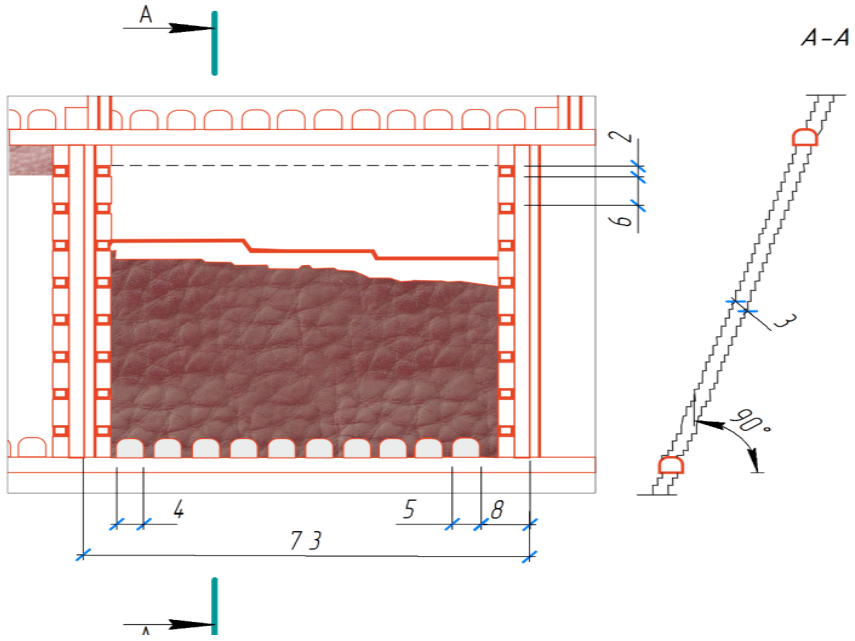

Fig.1. Development system with full ore storage with backstoping rise working.

When using the ceiling-mounted form of the face with drilling horizontal holes, the release of broken ore should be organized in such a way that the working space under the ledges of the required height is maintained. Where excessive ore production is allowed, flaking of host rocks may increase, which contributes to the formation of hangs during production. This reduces the productivity of downhole workers.

Ore breakdown in the development system with a complete staling with a recess in the uprising from the uprising is carried out by bore holes drilled not from the clearing space of the block, but from the uprising. The essence of the considered variant of the system is that, as the ore is mined in the block, rebels pass 5-5 meters ahead of each other, 4-5 m ahead of which ore layer is drilled with horizontal bore holes 2-2.2 m long. The drop raises are fastened with a crown support racks. For drilling between crowns organizes windows. The beaten ore is shopped between the drop raises and the ore is released through the chutes in the bottom of the block (Fig. 2) [4]

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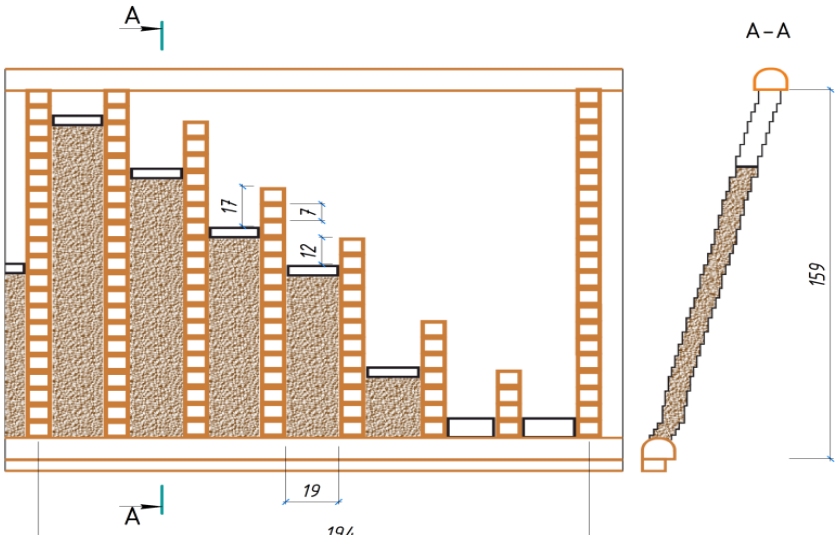

Fig. 2. Development system with storing and breaking ore from the uprising

Blasting out from the insurgents ensures the safety of operations with unstable rocks and ore, minimal dilution and convenient ore release. However, a significant amount of threaded work and a large consumption of fixing material reduce the effectiveness of the system variant.

At some mines, a variant of the system was tested with the release of ore directly to the drift soil with its loading into trolleys by scraper units or loading and delivery machines. Ore excavation was carried out on the uprising by ceilings or continuous faces. The experience of chuteless output shows that loading ore from the bottom of the haul-off drift can significantly increase labor productivity, eliminate the cost of arranging loading hatches and keeping them during operation. In addition, this discharge scheme increases the safety of work, improves the conditions for secondary crushing, reduces ore dilution due to a more intensive release. However, due to the significant cost of funds for driving openings in waste rocks, especially when excavating low-power cores, the chuteless release with loading by loading machines in some cases showed its inefficiency.

Among the most important advantages of a whole-store system are:

• a small amount of preparatory and rifling work, especially for options without leaving the pillars above the recoil drift and about the rebels. An exception in this case are systems with storing and breaking from special workings;

• convenient working conditions for drillers and high efficiency of blasting and ore delivery;

• simplicity of the system, ease of resizing of structural elements, taking into account mining and geological conditions, the ability to switch to another development system;

• small losses under favorable conditions.

The above advantages provide high labor productivity, low cost of production and high intensity of block extraction (up to 15-20 m / month). Compared to a recess with a spacer support and an open treatment space, the intensity of a treatment recess is about 2–2.5 times higher, and compared to a recess with a tab, it is 3-4 times higher.

The presence of a large stock of ore in stores allows you to maintain a constant mine production and to regulate the metal content in the ore that is delivered to the factory. Good supervision of the bottom of the face and the proper management of the release of ore ensure the safety of workers in the treatment ditch. The ease of ventilation of the working faces creates favorable working conditions for downhole workers.

The most significant drawbacks of a shopping system are:

• fairly stringent conditions of use: angle of incidence of at least 55-60 °, absence of sharp blows and pinches, as well as branches from the ore body, inclusions and interlayers of gangue, inadmissibility of caking, ignition and oxidation of ore;

• the need for careful monitoring of the surface of the beaten ore in order to identify and eliminate hidden cavities, ore freezes, the collapse of which can cause accidents with drillers;

• the impossibility of issuing ore from the block by grade;

• with insufficiently stable lateral rocks, the presence of rock inclusions in the ore body and its thickness less than 0.7-0.8 m, strong ore dilution occurs, since the waste rock is selected and left in the treatment space or discharged from the block separately from the ore, as usually not.

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Although variants of a system with a magazine and spacer or bar support are worse than conventional versions, they are becoming more common in practice. One of the areas for further improvement in the development of very thin veins is the reduction of mining capacity. At the same time, the cost of extracting 1 ton of ore mass increases, but the cost of extracting 1 ton of balance ore is significantly reduced, the cost of processing (concentration) and losses during concentration are reduced. In many cases, the effectiveness of variants of a system with a magazine can be increased by improving the production and loading of ore. Promising in this regard is the release of ore into the soil of the retreat horizon with subsequent loading of ore.

V. EXPERIMENTAL RESULTS

Experimental work to test the development technology with temporarily stationary stacked ore in a variety of mining and geological conditions was carried out at the mine named after Matrosov during the development of experimental treatment blocks and the refinement of the upper parts of the blocks, in which the further movement of the working face with the basic development system with ore storage was impossible or unsafe. Treatment blocks are located on the horizons and in the areas of the deposit, characterized by the power of the ore body, the angle of incidence, and the stability of the ore and host rocks. The preparation of the block consists in carrying out the haulage, scraper drift with draw hole, block drop raises. The cleaning recess is carried out with the introduction of an additional technological process - removal of surplus broken ore by scraper delivery from the treatment space instead of a partial discharge, which ensures the immobilized ore store during the treatment breakdown. Unlike the well-known technology options, the location of the scraper winch for the delivery of surplus and the design of the ore outlet assembly have been changed. The scraper winch is installed in the expanded windows of one of the block rebels and is transferred as the working face moves after 8-10 m in the uprising. A separate mine is planned for the delivery of excess beaten ore - an ore pass formed along the axis of the cutting uprising (Fig. 3.). After breaking off the stockpiles of the treatment chamber, the ore was finally released through the bottom of the block.

In the rocks of medium stability and unstable with the new technological scheme, higher indicators are achieved: ore losses and reserve deficiencies are reduced by an average of 12%, i.e. 2 times; dilution - by 6-17%, i.e. 1.5-2 times; the pace of treatment works is accelerating; labor productivity in the treatment ditch does not decrease. The safety of work is increased due to the improvement in the condition of the hanging side of the block supported by the beaten ore, which is in the stationary state during the period of breaking the chamber; eliminates the need to plan the surface of the ore manually. The working conditions of the driller are more convenient, which reduces the time needed to prepare his workplace (according to timing data, an increase in the productivity of the driller due to this is up to 15.2%).

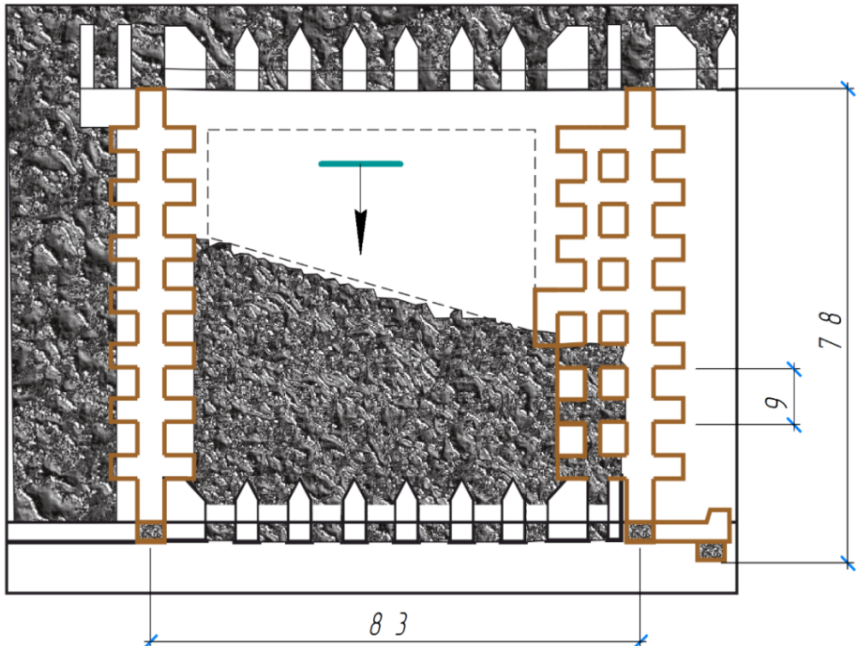

Fig. 3. A typical version of a development system with a temporarily immovable, staged ore

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VI. CONCLUSION

In the process of experimental work, the following aspects were identified that have a significant positive impact on working conditions and indicators of a development system variant: there is no danger of sudden subsidence of the surface of stained ore; the set height of the working treatment space between the bottom of the face and the surface of the broken ore is easily maintained and easily adjusted; the working conditions of the driller and, accordingly, the quality of drilling operations (the given location of the holes) are improved; expanding the possibilities of blending the ore mass in the mine, since the ore pass contains ore of higher quality, not subjected to secondary dilution.

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